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Modular Communications Interface for Energy Management

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FOREWORD

This document was developed by the Consumer Electronics Association's R7.8 Modular Communications Interface for Energy Management subcommittee.

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Contents

1	Introduction	1
2	Scope	2
2.1	References	3
2.1.1	Normative References	3
2.1.2	Normative References List	3
2.1.3	Normative References Acquisition	3
2.1.4	Informative References.....	3
2.1.5	Informative References List	3
2.1.6	Informative References Acquisition.....	4
2.2	Compliance	4
2.3	Acronyms & Abbreviations	5
3	Physical/Electrical Interface	5
3.1	Removal and Exchange of a UCM	5
3.2	Block Diagram	6
4	Serial Protocol	6
4.1.1	Message Type Field.....	7
4.1.2	Payload Length Field	8
4.1.3	Checksum Field	8
4.1.4	Bit and Byte Order.....	8
4.1.5	Message Synchronization and Timing.....	8
4.1.6	SGD Handling of Conflicting Messages	12
5	Simple Implementation	12
6	Data-Link Messages	12
6.1.1	Link NAK Error Codes	15
6.1.2	Interface Power Limit Negotiation.....	16
6.1.3	Bit Rate Negotiation.....	17
6.1.4	Message Type Supported Query.....	18
6.1.5	Power-Up and State Reset	19
6.1.6	Security	19
6.2	Setting Slot Numbering.....	19
7	Basic DR Application (Message Type = 0x08, 0x01).....	19
7.1.1	Basic Message Fixed Length.....	25
7.1.2	Event Duration Field.....	25
7.1.3	Grouped Messages.....	26
7.2	Usage and Details of Basic DR Application Messages.....	26
7.2.1	Request for Power Level (Opcode 0x06).....	26
7.2.2	Relative Price Commands (Opcode 0x07 and 0x08)	27

7.2.3	Time Remaining in Present Price Period (Opcode 0x09)	28
7.2.4	Operating State Monitoring (Opcodes 0x12 and 0x13)	29
8	Intermediate DR Application (Message Type = 0x08, 0x02)	30
8.1	Usage and Details of Intermediate DR Application Messages	32
8.1.1	Info Request	32
8.1.2	Get/Set UTC Time.....	36
8.1.3	Get/Set Energy Price	37
8.1.4	Get/Set Tier	38
8.1.5	Get/Set Temperature Offset	40
8.1.6	Get/Set Set Point.....	41
8.1.7	Autonomous Cycling	42
8.1.8	Demand Reduction – Terminate Cycling.....	43
8.2	Demand Response Event Schedules	44
8.2.1	Send Scheduled Events Request	44
8.3	Energy Consumption.....	44
8.3.1	Commodity Read.....	45
8.3.2	Get/Set CommodityType	46
9	Commissioning and Network Messages (Message Type = 0x08, 0x04)	48
10	Pass-Through of Standard Protocols.....	49
10.1	Example Pass-Through Handling Instructions.....	50
10.1.1	USNAP 1.0 Protocol Pass-Through.....	50
10.1.2	SEP1.0 Pass-Through.....	51
10.1.3	ClimateTalk Pass-Through.....	51
10.1.4	General Internet Protocol Pass-Through	51
11	Example Communication Exchanges.....	52
12	General Security Principles.....	53
13	Load Management Event Randomization	54
14	Compliance	55
15	Appendix A – Low Voltage DC Form Factor (normative)	55
15.1	Overview	55
15.1.1	Limitations.....	55
15.2	Physical Layer	55
15.2.1	Power for UCM.....	55
15.2.2	Mechanical Interface	55
15.3	Data-Link	64
15.3.1	Messages.....	64
15.3.2	Operation	66
16	Appendix B – AC Form Factor (normative)	71
16.1	Physical Form	71
16.1.1	AC SGD and AC UCM Connector	71
16.1.2	AC Enclosure requirements.....	75

16.2	AC Power.....	79
16.3	Obtaining Message Sync	80
17	Appendix C – Fletcher Checksum (normative).....	81
17.1	Calculating the Checksum	81
17.2	Decoding the Checksum.....	81
17.3	Example VB Code	81
18	Appendix D – Guideline for Computing Average Price (informative)	82
	Explanation for non-regulated utilities.....	84
19	Appendix E – Product Safety Considerations (informative).....	86

Figures

Figure 2-1	– Illustrations of the Modular Communications Concept on a controlled device (left) or Energy Management Console (right)	2
Figure 3-1	– Modular Interface - Block Diagram.....	6
Figure 4-1	– Data-Link Timing	9
Figure 4-2	– Basic/Intermediate DR Application Layer Timing	11
Figure 7-1	– Non-Linear Event Duration Scaling	26
Figure 7-2	– Non-Linear Relative Price Scaling	28
Figure 10-1	– Pass-Through Message	50
Figure 10-2	– USNAP1.0 over Serial.....	51
Figure 10-3	– SEP1.0 over Serial	51
Figure 10-4	– ClimateTalk Over Serial.....	51
Figure 10-5	– Internet Protocol Pass-Through (IPV6 Example)	52
Figure 13-1	– Example of Randomization of Events by Communications Modules	54
Figure 15-1	– DC Form Factor PCB Dimensions	56
Figure 15-2	– DC Form Factor Housing Dimensions – Top View.....	58
Figure 15-3	– DC Form Factor Housing Dimensions – Side View	59
Figure 15-4	– DC Form Factor Housing Dimensions – End View.....	60
Figure 15-5	– Pin Assignment	61
Figure 15-6	– SPI Mode 0 Bit Timing.....	62

Figure 15-7 – SPI Data-Link Transaction Sequence: SGD-initiated message to the UCM.....	66
Figure 15-8 – SPI Data-Link Transaction Sequence: UCM-initiated message to the SGD.....	67
Figure 15-9 – SPI Data Transfer State Machine	69
Figure 16-1 – Panel Mount AC Connector Form Factor (Device Side Shown) and Pin-Out.....	72
Figure 16-2 – PCB-mount AC UCM connector (housing)	72
Figure 16-3 – Cable AC UCM Connector (housing)	72
Figure 16-4 – Panel Mount AC SGD Connector Form Factor dimensions.....	73
Figure 16-5 – PCB Mount Connector dimensions	74
Figure 16-6 – Cable Connector dimensions	74
Figure 16-7 – Contact dimensions for Cable Connector and PCB mount connector.....	75
Figure 16-8 – Reserved area and dimensions on SGD (receptacle).....	76
Figure 16-9 – Right side and top view of maximum UCM dimensions.....	77
Figure 16-10 – Left side and bottom view of maximum UCM dimensions	78
Figure 16-11 – Typical RS-485 Polarity and Byte Transfer	79
Figure 16-12 – RS-485 Connections	80

Tables

Table 4-1 – Protocol Data Unit Format.....	6
Table 4-2 – Message Type Assignments	7
Table 4-3 – Message Timing Requirements.....	10
Table 4-4 – Basic/Intermediate DR Application Layer Timing Parameters.....	11
Table 5-1 – Mandatory Message Summary	12
Table 6-1 – Data-Link Command Set.....	15
Table 6-2 – Link NAK Error Codes	16
Table 6-3 – Interface Power Level Indicator Codes	17
Table 6-4 – Bit Rate Indicator.....	18

Table 6-5 – Message Type Supported Query	18
Table 7-1 – Basic Application Data Format	20
Table 7-2 – Basic DR Application Command Set	25
Table 7-3 – Operating State Codes	29
Table 8-1 – Intermediate DR Application Command Set (Command Byte Description)	31
Table 8-2 – Intermediate DR Application Command Set	32
Table 8-3 – Response Code Values	32
Table 9-1 – Commissioning and Network Messages	49
Table 15-1 – Low Voltage Interface Signal Definitions	62
Table 15-2 – SPI Physical Timing Requirements	68

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Modular Communications Interface for Energy Management

1 Introduction

Utilities worldwide are investing heavily in smart grid infrastructure that extends to homes and businesses, with the goal of improving grid reliability and efficiency through increased consumer awareness and participation. High hopes abound for grid connected homes and buildings to be better prepared and more willing to react to changing grid conditions. But, how do we enable grid connectivity today and into the future, in the midst of an evolutionary wave of standards competition and innovation?

This standard provides a solution to this problem through a modular communications interface (MCI) enabling any product to connect to any type of demand response system (Advanced Meter Reading (AMI), Smart Energy Profile (SEP), OpenADR), and/or home or building network. The concept is simple; encourage manufacturers to build an MCI interface into their products that can accept a simple communications module. Consumers and program managers are then free to select whatever communication solution works best for their particular environment.

The concept is relatively straightforward. Utilizing the RS-485 and Serial Peripheral Interface (SPI)¹ supported by most silicon chips today, the MCI protocol is capable of simply passing through standard protocols including Internet Protocol (IP), OpenADR, and SEP from the communications module to the end-device. Network security is supported through the selected transport protocol, such as Wi-Fi, ZigBee, HomePlug, Z-Wave, LonWorks, etc., in addition to network or application layer security.

Communications messaging supported by this MCI standard supports direct load control, TOU, CPP, RTP, peak time rebates, all kinds of block rates, and a range of ancillary services. The functionality of the removable modules can be tailored by utilities or other load managing entities to provide support for the unique needs in a given region or service territory, without impacting the end-devices.

The CEA-2045 Modular Communications Interface for Energy Management standard will enable a new generation of “smart grid ready” products that limit risks and constraints of proprietary communications technologies and evolving standards. This approach simplifies Home Area Network (HAN) device and network interoperability, fosters program and product innovation, and opens DR programs to a broader range of consumer products while respecting customer choice and a competitive market landscape.

¹ See <http://www.rs485.com/rs485spec.html> and http://en.wikipedia.org/wiki/Serial_Peripheral_Interface_Bus

2 Scope

This standard specifies a modular communications interface (MCI) to facilitate communications with residential devices for applications such as energy management. The MCI provides a standard interface for energy management signals and messages to reach devices. Such devices may include an energy management hub, an energy management controller, an energy management agent, a residential gateway, an energy services interface, a sensor, a thermostat, an appliance, or other consumer products.

The specific residential devices to use an MCI are not specified. For energy management the choice depends on the system and the network topology. If a hub topology is chosen, the MCI may be located on the hub. The connection between the hub and end devices such as appliances is not specified.

The MCI specifies a physical connection from a communication module to residential Smart Grid Devices and a communications protocol with OSI (Open System Interconnection) layer specifications including application layer messaging. An optional translation function is specified for connection to another communications medium. Examples include power line carrier or radio (RF), depending on the home area network installed or the connection to an energy management system access-network supplied by a service provider. This second medium is outside the scope of this standard. The MCI also specifies a pass-through mechanism through to allow for an alternate architecture in which the Smart Grid Device terminates the passed-through protocol (e.g., SEP, OpenADR, etc.).

CEA-2045 details the mechanical, electrical, and logical characteristics of a socket interface that allows communication devices (hereafter referred-to as UCMs – universal communication modules) to be separated from end devices (hereafter referred-to as SGDs – Smart Grid Devices). Although the potential applications of this technology are wide-ranging, it is intended at a minimum to provide a means by which residential products may be able to work with any load management system through user installable plug-in communication modules. Figure 1-1 illustrates the general concept.



Figure 2-1 – Illustrations of the Modular Communications Concept on a controlled device (left) or Energy Management Console (right)