DLMS/COSEM and ION technology

This protocol document provides setup instructions for using DLMS/COSEM with PowerLogic™ ION8650 (firmware v406 and later), ION7400 (firmware v1.4.1 and later) and ION8800 (firmware v350 and later) meters. This document assumes that you are familiar with DLMS/COSEM, your meter and the system in which it is installed.

What's in This Document

Additional information

Visit www.schneider-electric.com to download additional documentation.

For additional information regarding installation and operation of these meters, see the following documents available for download from the website:

- your meter's user guide and installation information
- *ION Reference*

For more information on DLMS and COSEM, see the following:

- DLMS User Association website - http://dlms.com
- Green Book 5th Edition - COSEM Architecture and Protocols
- Blue Book 7th Edition - COSEM Identification System and Interface Classes
- Yellow Book 2nd Edition - COSEM Conformance Test Process
- White Book 1st Edition - COSEM Glossary of Terms

Notices

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DLMS/COSEM overview

DLMS stands for Device Language Message Specification.

The objective of DLMS is to provide an interoperable environment for structured modeling and meter data exchange. DLMS supports applications such as remote meter reading, remote control, and value-added services for metering any kind of energy, such as electricity, water, gas or heat.

It is an international standard published as IEC 62056.

COSEM stands for Companion Specification for Energy Metering. It is an interface model for communicating with energy metering equipment, providing a view of the functionality available through the communications interfaces. The model uses an object-oriented approach.

The COSEM model allows for a manufacturer-independent and controlled method to identify, retrieve and interpret the information held in any meter.

Key terms

Term	Description
Client (master)	The workstation running software. In this implementation, only the Client can initiate requests.
Server (slave)	The meter.
Logical device	A logical device is a container for COSEM objects. In this implementation, each ION meter running the DLMS protocol contains a single logical device.
Object	A collection of attributes and their methods.
Attribute	A value that describes the data.
OBIS (Object Identification System)	OBIS allows for unique identification of each of the many data items used in the energy metering equipment.
Method	An operation performed on attributes, e.g., the SET method allows you to time sync the meter (GET means read, and SET means write).

COSEM interface

By using the COSEM interface specifications, data collection systems and metering equipment from different vendors can exchange data.

This interoperability is accomplished through object modeling.

The information of an object is organized in attributes. The attributes represent the characteristics of an object by means of attribute values. The value of an attribute may affect the behavior of an object. An object may offer a number of methods to either examine or modify the values of the attributes.

Objects that share common characteristics are generalized as an interface class with a class_id. Within a specific class, the common characteristics (attributes and methods) are described once for all objects. Each instance of an interface class is called a COSEM object.

Specific implementation of DLMS

Details of this implementation of the DLMS protocol are outlined below.

Physical layer

DLMS is available on the following communications ports, depending on your meter and options.

Meter	Optical	RS-232/RS-485	Modem	Ethernet
ION8650	x	x	x	x
ION7400	x	x		x
ION8800	x	x	x	x

Data link layer

The following operation selections for HDLC (ISO/IEC 13239) are used in this implementation of DLMS:

- unbalanced connection-mode data link operation
- two-way alternate data transfer
- the selected HDLC class of procedure is UNC, extended with UI frames
- non-basic frame format transparency (HDLC Frame format type 3)

DLMS/COSEM specification	Supported implementation
Maximum Info Field Transmit	128
Maximum Info Field Receive	128
Maximum Window Size Transmit	1
Maximum Window Size Receive	1
Transparent transfer of long MSDUs	Not supported
Inactivity timeout	120 seconds
Inter-frame time out	Determined by the value of the meter's RxTimeout setting (configurable)
Device Addressing Length	4 bytes
Physical Device Address	The value of the meter's Unit ID on the serial port being used for DLMS communications (configurable)
Logical Device(s)	Management Logical Device only at specified address 0x0001

Application layer

DLMS/COSEM specification	Supported implementation
Supported application context	LN (logical name) referencing
Available services	attribute0-supported-with-GET
	block-transfer-with-get
	get
	set (supported for time synchronization only)
	selective-access

COSEM layer

Standard COSEM objects

Supported COSEM Objects
Association LN - 0-0:40.0.0*255
SAP Assignment - 0-0:41.0.0*255
Logical Device Name - 0-0:42.0.0*255
Clock - 0-0:1.0.0*255

Default COSEM objects

ION8650 and ION8800 meters have default COSEM objects configured to provide load profile and billing information. ION7400 meters can be configured to provide this information.

You can also configure your meter to provide any data recorded by your meter's data recorders; see "Changing the data exported to DLMS client software".

NOTE: The register attributes listed in the table below are scaled by 1000 to provide resolution to three decimal points.

Supported COSEM Objects	Capture Objects	COSEM/OBIS representation of capture objects
Profile Generic 1-0:99.1.0*255 (Load Profile)	Record Timestamp	Clock attribute 2 - 0-0:1.0.0*255
	Status (see below)	Data attribute 2 - 0-0:97.97.0*255
	kWh del int	Register attribute 2 - 1-1:1.29.0*255
	kVARh del int	Register attribute 2 - 1-1:3.29.0*255
	kWh rec int	Register attribute 2 - 1-1:2.29.0*255
	kVARh rec int	Register attribute 2 - 1-1:4.29.0*255
Profile Generic 1-0:98.1.0*255 (Billing Data)	Record Timestamp	Clock attribute 2 - 0-0:1.0.0*255
	Status (see below)	Data attribute 2 - 0-0:97.97.0*255
	kWh del	Register attribute 2 - 1-1:1.8.0*255
	kWh rec	Register attribute 2 - 1-1:2.8.0*255
	kWh del-rec	Register attribute 2 - 1-1:16.8.0*255
	kVARh del	Register attribute 2 - 1-1:3.8.0*255
	kVARh rec	Register attribute 2 - 1-1:4.8.0*255
	kVARh del-rec	Register attribute 2 - 1-1:128.8.0*255
	kVAh del+rec	Register attribute 2 - 1-1:9.8.0*255
	kW sd del-rec	Register attribute 2 - 1-1:16.4.0*255
	kVAR sd del-rec	Register attribute 2 - 1-1:128.4.0*255
	kVA sd del+rec	Register attribute 2 - 1-1:9.4.0*255
	PF sign mean	Register attribute 2 - 1-1:13.0.0*255

Status capture object bitmap

When all bits are set, the status is considered invalid.

Status (unsigned 16 bit)	Value
bit 15	Reserved
bit 14	Reserved
bit 13	Reserved

Status (unsigned 16 bit)	Value
bit 12	Reserved
bit 11	Reserved
bit 10	Reserved
bit 9	DST Ended
bit 8	DST Started
bit 7	Power Down
bit 6	Power Up
bit 5	Time Changed
bit 4	Reserved
bit 3	Master Reset
bit 2	Reserved
bit 1	Reserved
bit 0	Reserved

The ION meter and DLMS communications

ION8650 and ION8800 DLMS-enabled meters come preconfigured with frameworks that allow the meter to provide selected values to a DLMS master. ION7400 meters can be configured to provide these values.

The values available by default are outlined in “Default COSEM objects”.

ION architecture and DLMS

The modules used in the ION meter implementation are:

- Factory module
- Clock module
- Event Log Controller module
- Data Recorder modules
- DLMS Log Export module

See the *ION Reference* for detailed information on module settings and operation.

NOTE: Changing these modules and any of their inputs from the default template is an advanced setup procedure that requires an understanding of the protocol and your meter’s internal operations.

Recording interval

The value of the Profile Generic attribute for `recording interval` (attribute 4) is determined by the *Record* input of the Data Recorder linked to the DLMS Log Export module:

- If the *Record* input is linked to a Periodic Timer module, the value of the *Period* setup register for that Periodic Timer module is reported as the recording interval for attribute 4.
- If the *Record* input is not linked to a Periodic Timer module, the recording interval is reported as 0.

Configuring meter communications

You need to configure the meter’s communication settings before you can access values using DLMS master software.

Use the front panel or ION Setup to set the Protocol for the communication port you want to use to DLMS.

See your meter's user manual for detailed instructions on configuring communications.

NOTE: DLMS over Ethernet can be enabled and disabled using ION Setup.

Changing the data exported to DLMS client software

You can configure your meter to export the values from its Data Recorder modules to DLMS client software.

To do this, you need to map the applicable Data Recorder to a DLMS Log Export module and configure that module's setup registers with the appropriate OBIS codes.

NOTE: Changing these modules and any of their inputs from the default template is an advanced setup procedure that requires an understanding of the protocol and your meter's internal operations.

1. Start ION Setup and open your meter in Advanced mode. See the online ION Setup help for more information.
2. Navigate to the DLMS Log Export Module Modules folder.
3. Create a new module or edit an existing module. Double-click the module to edit its configuration.
4. Select the **Inputs** tab to link the module to a Data Recorder module.
5. Select the input and double-click (or click **Edit**).
6. Navigate to the Data Recorder module that you want to link to the DLMS Log Export module, select the associated data log, and click **OK**.

   NOTE: You can link a Data Recorder module to multiple DLMS Log Export modules but you can only link each DLMS Log Export module to one Data Recorder module.
7. Select the **Setup Registers** tab and double-click a register to edit it.

Setup register	Description
Profile Generic OBIS	Enter the Profile Generic OBIS code you want to assign to the values associated with the module.
Status Register	Setting this register to ENABLED includes the status field in the Profile Generic object. If the *Record* input of the associated Data Recorder module is linked to a Periodic Timer, the status of the DLMS Log Export module is updated at that recording interval. If the Data Recorder *Record* input is not linked to a Periodic Timer, the value of the status register is 0xFFFF. For information on the *Status* register attribute bitmap, see "Status capture object bitmap".
OBIS Code Source 1 – OBIS Code Source 16	Enter the register attribute OBIS codes for each input of the linked Data Recorder module that you want to export. Each *OBIS Code Source* setup register maps to the equivalent input register of the linked Data Recorder module. If you do not want to export a particular value, enter none for that *OBIS Code Source* setup register (this is the default value for a newly created DLMS Log Export module).

8. Click **Send** to save your changes to the meter. Use your DLMS client software to validate that you are receiving the expected values.

Example

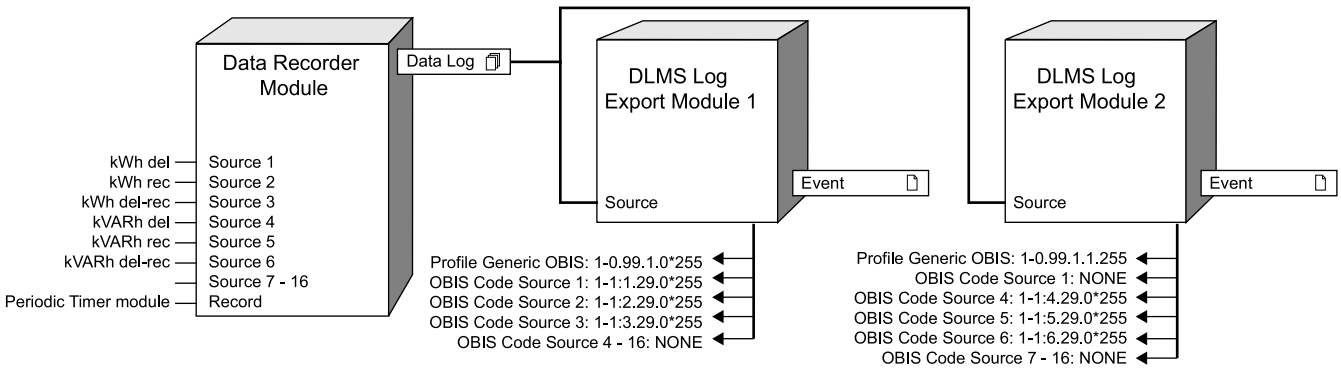
You have a Data Recorder module with its source inputs linked as follows:

Data Recorder module inputs	
Source 1	kWh del
Source 2	kWh rec
Source 3	kWh del-rec
Source 4	kVARh del
Source 5	kVARh rec

Data Recorder module inputs	
Source 6	KVAR del-rec
Source 7 - 16	unlinked
Record	Linked to a Periodic Timer module

You want to export the kWh values as one Profile Generic object and the kVARh values as another Profile Generic object. To do this, link the Data Recorder module's *Data Log* output to 2 DLMS Log Export modules and configure the setup registers for those modules as follows:

DLMS Log Export modules		
Setup registers	**Module 1**	**Module 2**
Profile Generic OBIS	1-0.99.1.0.255	1-0.99.1.1.255
OBIS Code Source 1	1-1:1.29.0*255	NONE
OBIS Code Source 2	1-1:2.29.0*255	NONE
OBIS Code Source 3	1-1:3.29.0*255	NONE
OBIS Code Source 4	NONE	1-1:4.29.0*255
OBIS Code Source 5	NONE	1-1:5.29.0*255
OBIS Code Source 6	NONE	1-1:6.29.0*255
OBIS Code Source 7 - 16	NONE	NONE



DLMS time synchronization

This implementation of DLMS time synchronization uses the SET service to write a new value for attribute 2 (time) on the Clock object.

Meter configuration

For time synchronization using DLMS, you need to configure the meter to receive time sync signals on the communications port you are using for DLMS communications. Use ION Setup to set the *Time Sync Source* to the port used for DLMS. See your meter's user manual for more information.

To set the time on the meter, an Application Association (AA) that supports the SET service must first be established. The client software can then issue a time sync by sending a SET request for attribute 2 on the Clock object.

The type of attribute is date_time. This attribute defines a number of values for each field. This implementation supports all of the "not specified" values. A field will not change if a value is not specified.

The following is not supported:

- dayOfWeek (field is ignored).

The following special values are interpreted as invalid:

- month field settings of 0xFD (DST end month) and 0xFE (DST begin month)

- dayOfMonth field settings of 0xFD (2nd last day) and 0xFE (last day)

This implementation performs a check of ranges on each field. The time synchronization will fail if any field is outside of the valid range.