

# DLMS GUI

## Energy Meter, DLMS Protocol-GUI User's Guide

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### Introduction

This document describes the usage of the GUI application for Energy Meter using DLMS (Device Language Messaging Specification) protocol.

### Target Device

Window PC with Microsoft .NET Framework version 3.5 or above.

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## 1 About Energy Meter-DLMS GUI

Energy Meter- DLMS GUI is a tool running on PC, it supports user to easily control the Energy Meter which use DLMS protocol through a graphic user interface.

## 2 Acronym and Definition

This chapter describes the acronyms and their definition to be used in this manual.

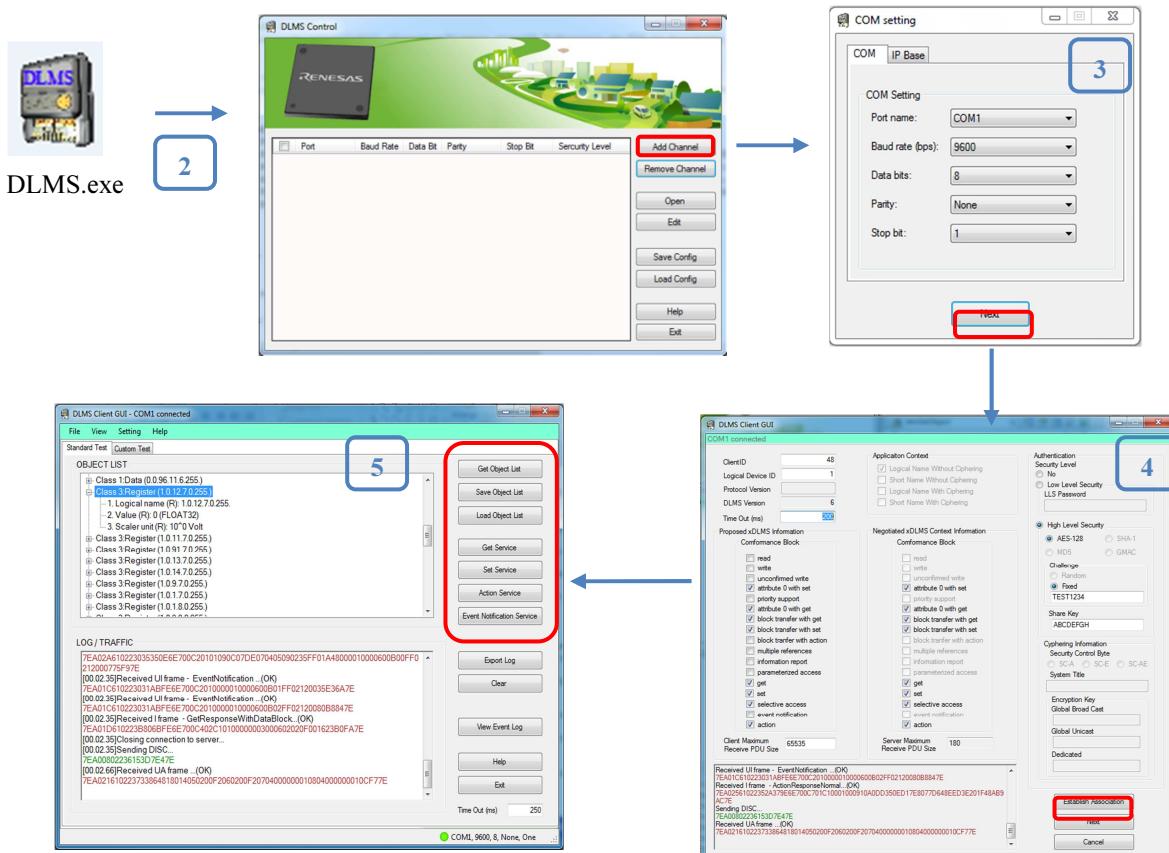
Acronym	Definition
GUI	Graphic User Interface
PC	Personal Computer
EM	Energy Meter
SDK	Software Development Kit
SFR	Specific Function Register
DLMS	Device Language Messaging Specification

## 3 General Sequence

The following procedure describes the basic steps of using the Energy Meter GUI:

1. Connect EM board to PC via a serial cable (\*).
2. Run DLMS-GUI application, add a channel.
3. Set connection configuration (refer to Connection setting).
4. Configure DLMS Association.
5. Execute GUI the function follow the guide of each module (refer to Energy Meter DLMS-GUI usage).

(\* ) Noted: EM board must be running with firmware version which supports DLMS protocol.

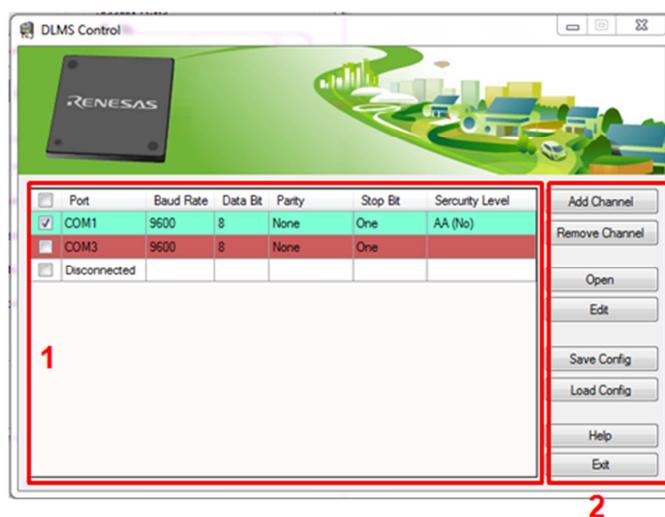


## 4 Energy Meter - DLMS GUI usage

This chapter describes how to use the Energy Meter GUI in detail.

### 4.1 Control window

The Control window of EM DLMS-GUI is as follow:



There are 2 groups of object on Control window:

1. Group 1:

- This table displays a list of communication channel (each channel uses one COM port).
- Information of each channel includes the setting of: Port Name, Baud Rate, Parity, Stop bit and Security Level.
- One or many channel can be selected then the action can be done using control buttons (Group 2).
- Each channel have a representing color for easy to clarify, later this color will appear on their belong windows.
- The maximum number of channel supported is 10.

2. Group 2:

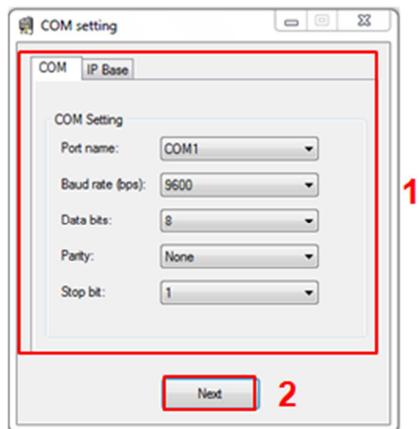
This group contains buttons for controlling channel:

- “Add Channel” button is used to add one new channel to the channel list, the initial status is “Disconnected”.
- “Remove Channel” button is used to close the connection and remove selected channel(s) from the list.
- “Open” button is used to open the main window of selected channel(s) when it is hidden (by closing window).
- “Edit” button is used to disconnect the selected channel(s) and re-setting its connection.
- “Save Config” button is used to save the current channel setting into an xml file.
- “Load Config” button is used to load the save channel setting from an xml file.
- “Help” button is used to show user guidance (T.B.D).

“Exit” button is used to quit the application.

## 4.2 Connection setting

This connection window will appear when a new channel is added or current channel(s) is edited:



(IP Based setting is for further development)

### 1. COM Setting:

Select COM port and its setting for communication, selected COM port must not be used.

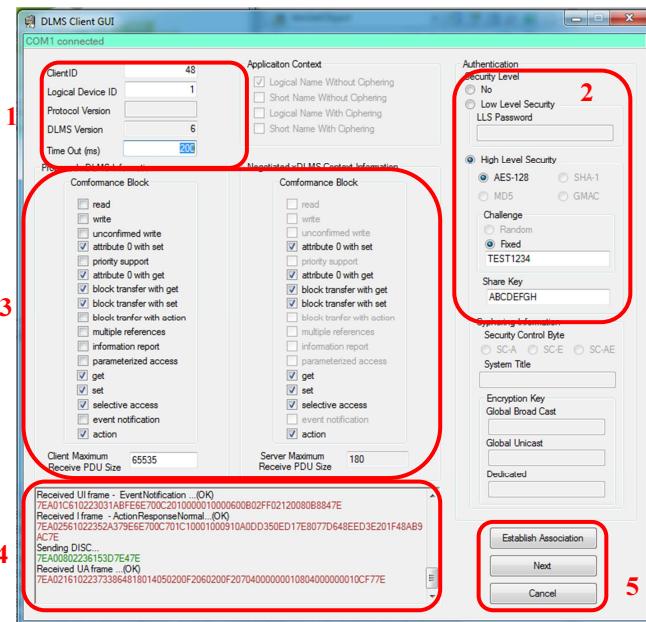
### 2. Next:

Finished COM port setting then move to Communication Protocol setting (see 5.3).

The connection information will be updated on Control window.

### 4.3 Protocol setting

This step followed after COM port setting. In this step, the DLMS protocol setting will be done



(\*) Color bar is used to clarify the window belong to which channels, its color depend on which COM port is used.

#### 1. Client ID, Logical Device ID and Time Out:

The Client ID and Logical Device ID are enabled for input. However, the current firmware uses Client ID equal 16 for “No security”, 32 for “Low security” and 48 for “High security” level.

The Time Out value is for setting the waiting time for receiving data after each command send. Increase it if having error on receiving command frame or decrease if the communication speed is slow.

#### 2. Security Level Setting:

There are 3 levels of security: No, Low and High.

- In “No security” level, no password or security method is applied.
- In “Low security” level, a password is required but no ciphering technique is used.  
Current password is fixed to “**ABCDEFGHI**”.
- In “High security” level, uses AES-128 ciphering technique to encrypt a password (“**TEST1234**”) with length at least 8 char, using an 8 char share key (“**ABCDEFGHI**”).

#### 3. Proposed and Negotiated xDLMS information:

Proposed Conformance information and Client Max Received PDU size will be sent to server (EM board) then when the association is established the Conformance information and Server Max Received PDU Size of the server will be obtained.

#### 4. Communication Log and Data Traffic:

For checking the correctness of command’s format and data transmitted.

#### 5. Control buttons:

- “Establish Association” button is used to establish the communication based on current setting.
- “Next” button will be enabled when the association is established successfully, when clicked, proceed to main test window of the channel.

“Cancel” button is used to close the window (but not disconnect the COM port). This window can be re-opened using “Show” button on Control window.

## 4.4 Test Window

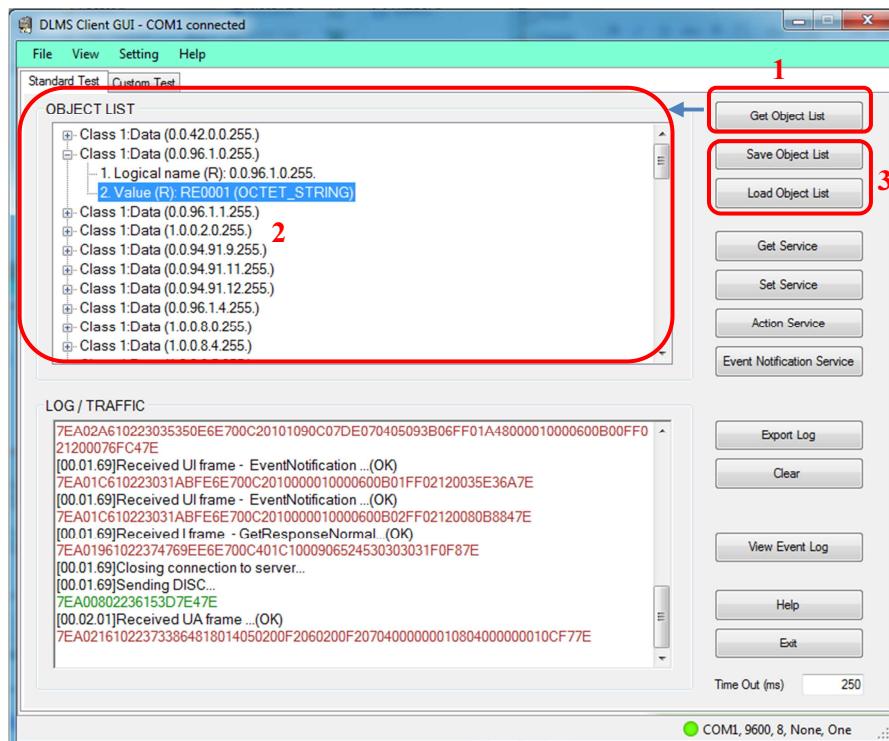
On this window test functions of the client – server communication can be executed. There are 2 type of test, designed into 2 tab pages: Standard Test and Custom Test

1. In Standard Test, fixed functions of the EM can be executed. When a selected function is run, a set of command with correct information will be transmitted which ensure the task can be done. This version supports:
  - o Get Object List ( supported class: 1, 3, 4, 5, 6, 7 ,8 ,9 ,10 ,11 ,15 ,17 ,18 ,19 ,20 ,21 ,22 ,64)
  - o Get/Set single data type of all attribute of above classes.
  - o Display structural data types: time, register scalar, capture object, capture buffer, script, register assignment, mask list.
  - o Get Attribute 0 (get all attribute of the object) : class 1, 3, 4, 5, 6, 7 ,8 ,9
  - o Selective Access: class 7
  - o Action Service: class 7,9,15
  - o Event Notification: Get and save 10 most recent event notifications.
2. In Custom Test (T.B.D), user can customizes the set of command that will be executed as well as the content of each command.

### 4.4.1 Get Object List

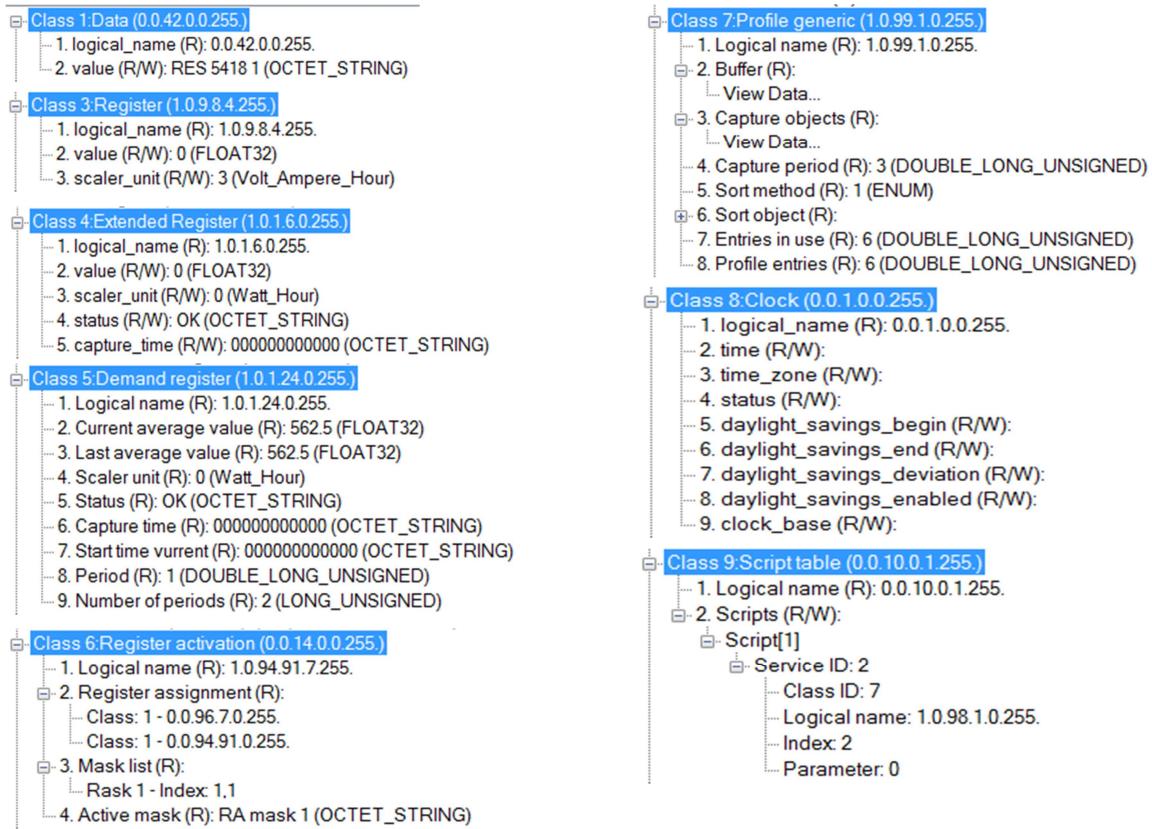
1. Object List Display:

After “Get Object List” button is clicked or a saved Object List is loaded, contain of Object List will be displayed in Tree View format.



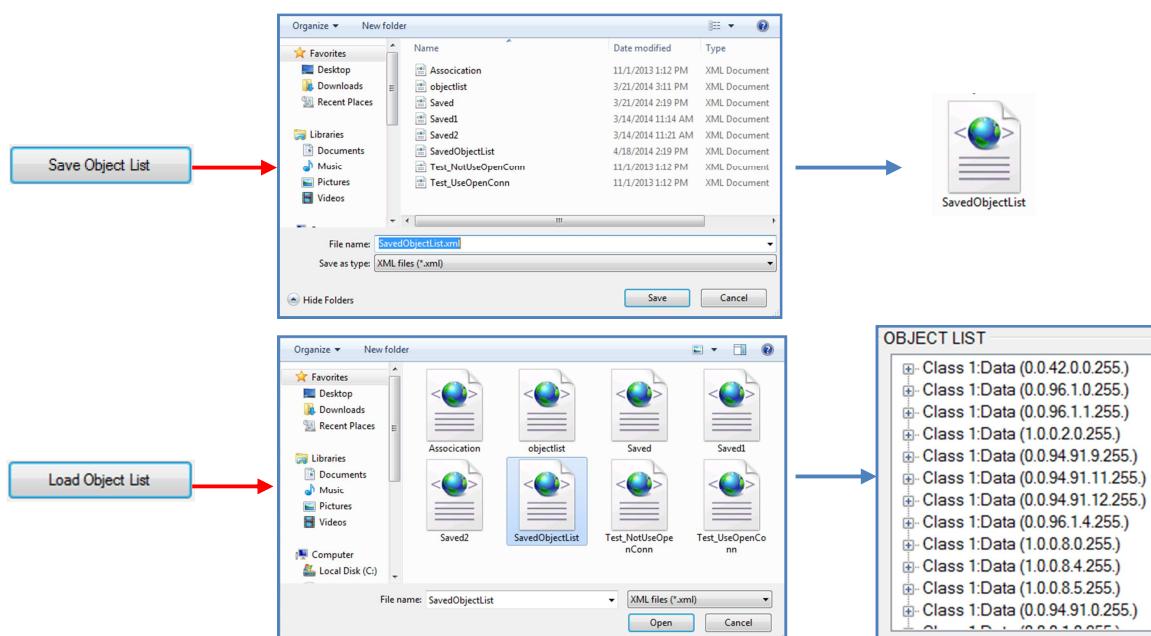
## 2. Class and Attribute Display:

Currently 6 classes in DLMS protocol which can display all the attribute data, the other may have some structural data type which is not supported yet; they can be access in "Object List" window:



## 3. Save/Load Object List:

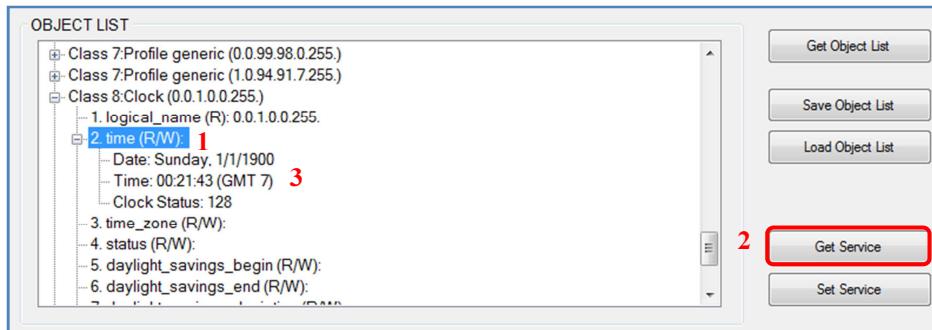
Current Object List can be saved into an xml file then can be loaded back.



## 4.4.2 Get Attribute Value

Value of attribute with access right “Read” (R) can be obtained by select it on Object List window (1) then press “Get Service” button (2) or another way is double click the attribute name on Object List window.

After get command set is executed, received data value will be updated on Object List window (3).



Currently, after getting the complex structure data type will be display as raw data (received Hex string).

## 4.4.3 Get Attribute 0

When press “Get Service” button or by double click on the class object on Object List window all the attribute of this object will be obtained then displayed on Object List window.

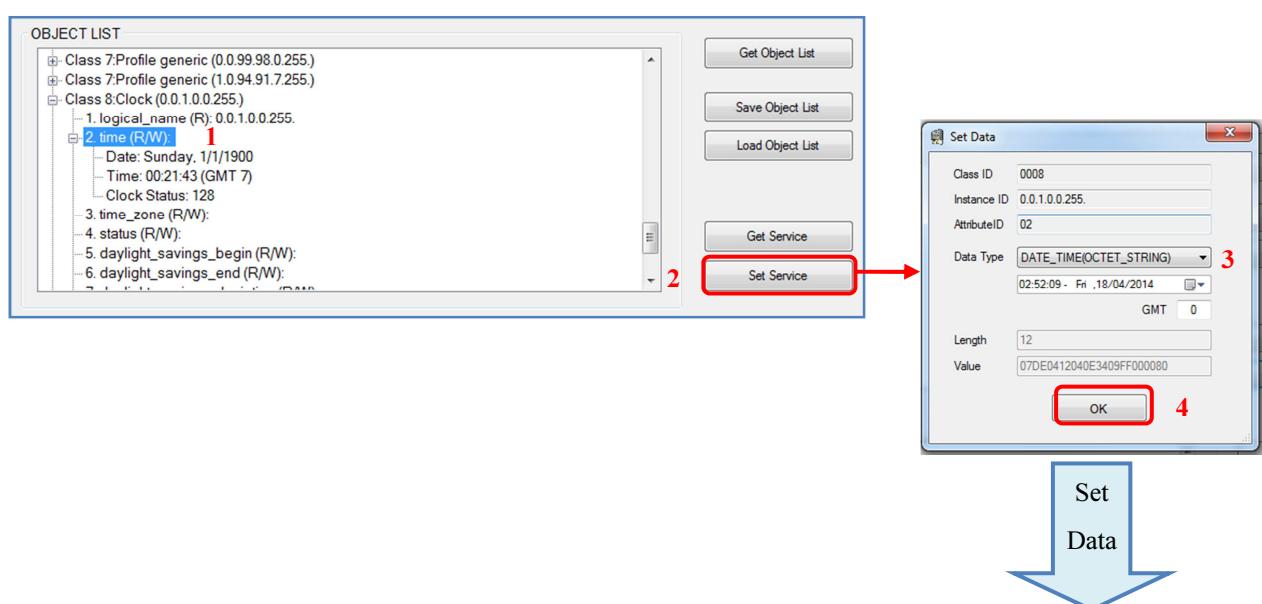
Supported classes: 1, 3, 4, 5, 6, 7, 8, 9

## 4.4.4 Set Attribute Value

Value of attribute with access right “Write” (W) can be written by selecting the attribute on Object List window (1) then press “Set Service” button (2). Next, a “Set Data” window will appear for input the data type and data value (3). When the “OK” button is clicked (4), Set command will be sent.

Set service result will be announced after the command is completed.

Currently, only single data type and “Date-Time” data structure can be set



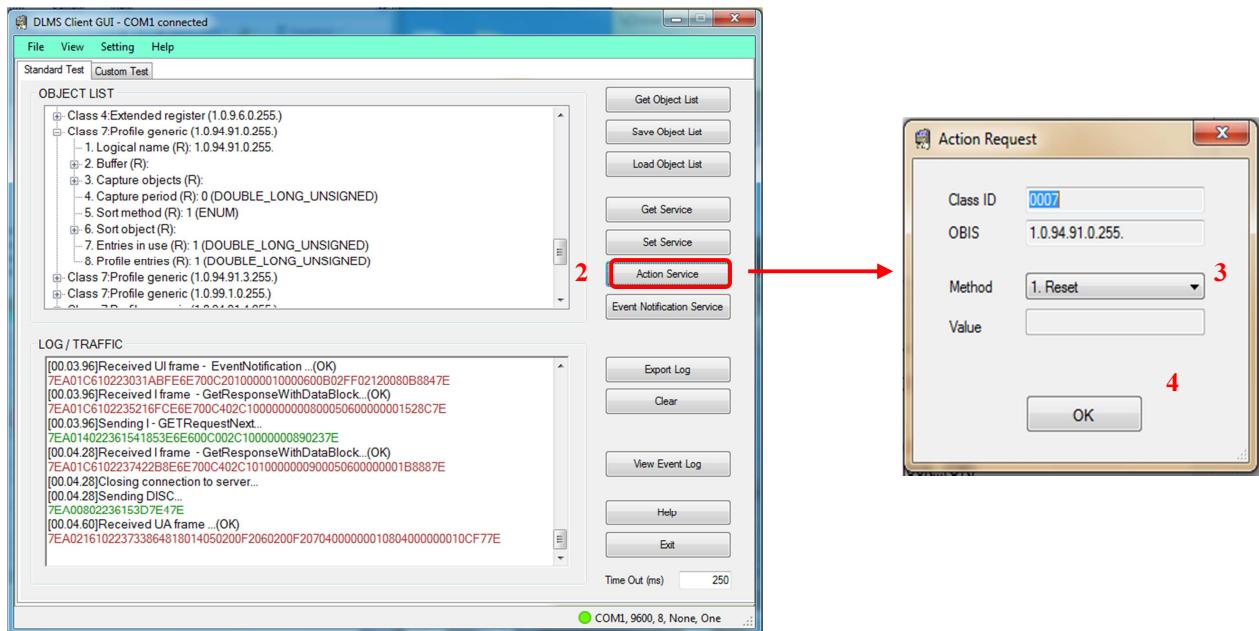
## 4.4.5 Action Service

Some of the object class has Action Service. Currently, the following Action Service is supported:

- Class 7:
  1. Reset buffer
  2. Capture buffer
- Class 9:
  1. Execute script
- Class 15:
  1. Reply to HLS authentication
  2. Change HLS secret
  3. Add object

Action Service can be called by selecting a class object on Object List window (1), then click “Action Service” button to open the setting window (2). On that window, select the action method needed and input the value (if required) (3) then click “OK” (4) to perform that action.

Action result will be announced after the command is completed.



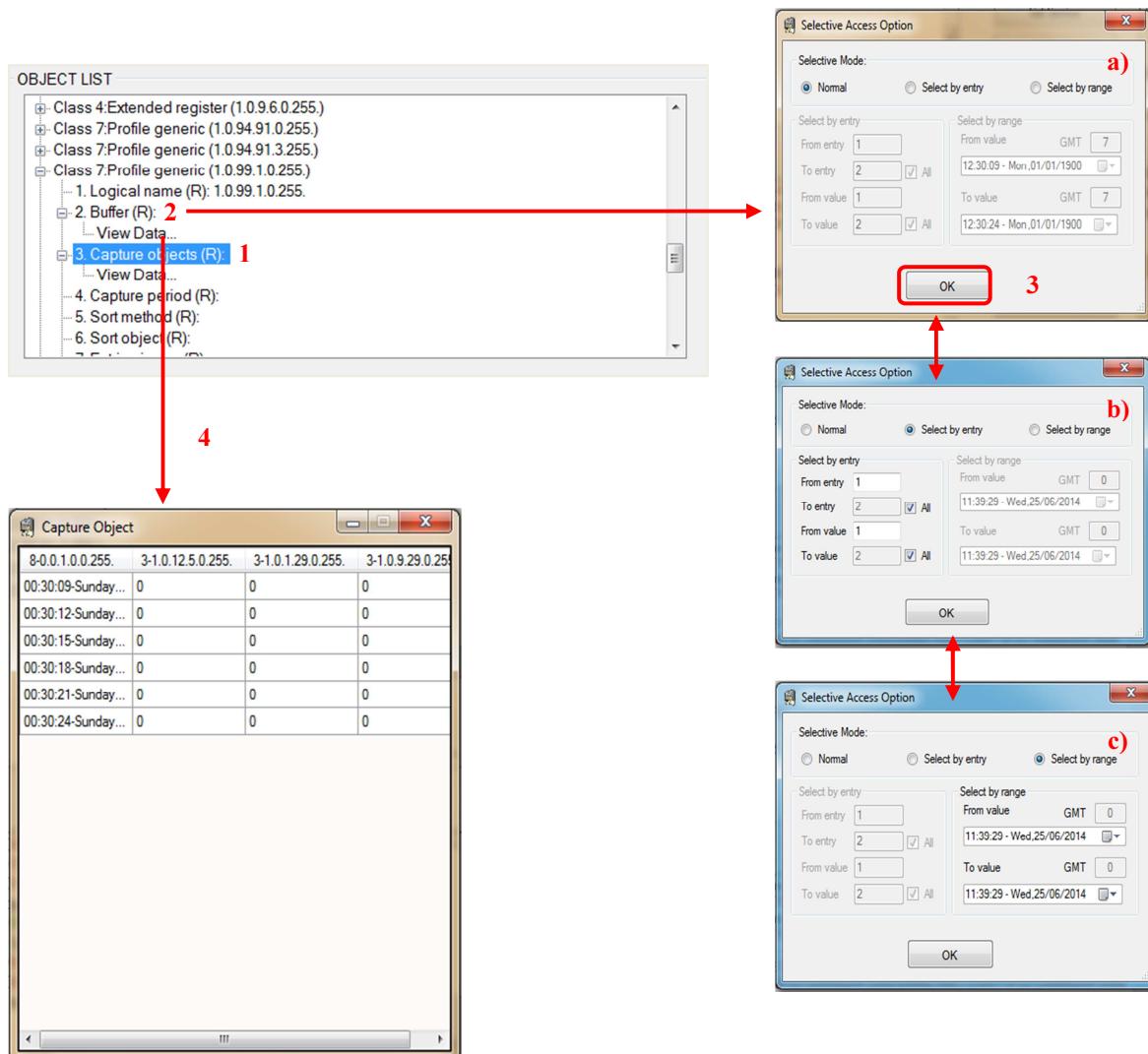
#### 4.4.6 Selective Access

Selective Access is a function of class 7 object. It is used for accessing buffer data by its range or its entries. In order to access class 7 object's buffer, first the capture object needs to be obtained (1). Then, double click on the buffer attribute (2) to open the Selective Access Option window.

On that window, there are three access modes that can be selected:

- Normal: Get the entire buffer with all entries of it.
- Select by entry : Get the selected entries of buffer only
- Select by range : Get the selected time range of buffer only

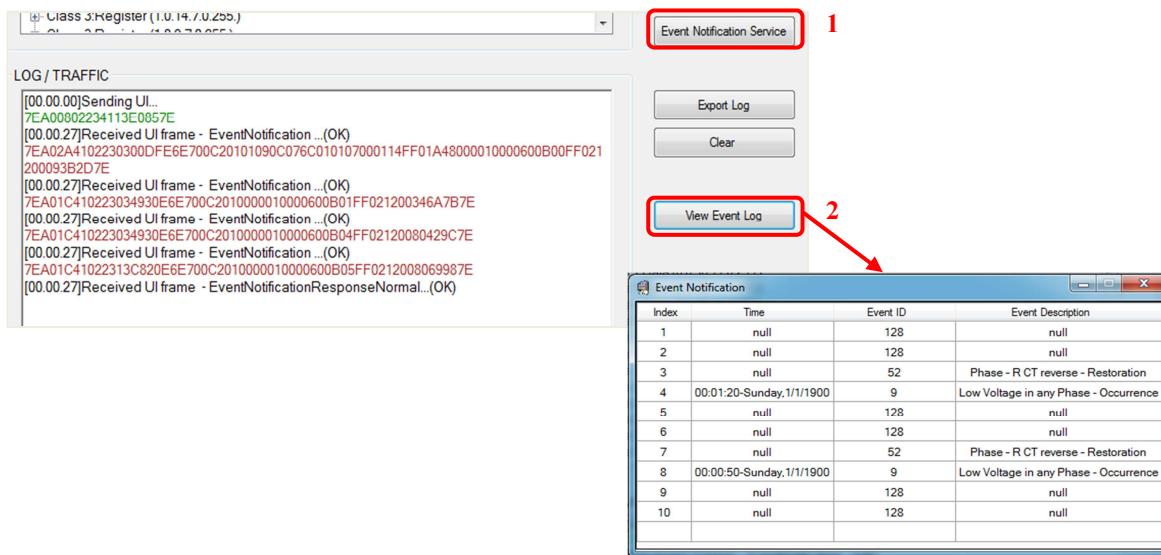
Then click “OK” button (3) to perform the command, after that click on the “View data...” option (4) to open the “Capture Object” window and see the data of buffer.



## 4.4.6 Event Notification

Event notification will be obtained during communication together with other command. However, by using “Event Notification Service” button to get only the event notification (1).

Click “View Event Log” button (2) to open Event Notification window (3) which recorded the 10 most recent event notifications received.



## 4.4.7 Other features

- Display activity log and data traffic can be exported into text file by using “Export Log” button.
- “Help” button is used to show user guidance (TBD).

## 5 Trouble shooting

This chapter describes some common error messages and guide user what to do when meet an error message.

Error message	How to fix
	<ul style="list-style-type: none"> <li>- Check if the serial is properly connected to the EM.</li> <li>- Set the connection configuration then try again. (Please refer to Connection setting).</li> </ul>
	<ul style="list-style-type: none"> <li>- This error occurs when user try to connect to the COM port which is already used by other application. To solve this, find out which application is connecting to target COM port then disconnect it.</li> </ul>
	<ul style="list-style-type: none"> <li>- This error occurs when there is error in association setting which make association cannot be established. Please check your setting again to solve it.</li> </ul>
	<ul style="list-style-type: none"> <li>- Check if the serial is properly connected to the EM then try again.</li> <li>- If timeout error still occurs, ensure the serial cable is not damaged.</li> </ul>
	<ul style="list-style-type: none"> <li>- One module of GUI is communicating to EM, please wait until this module finishes its processing then try again.</li> </ul>
	<ul style="list-style-type: none"> <li>- Response error when decoding data frame may be because the time out value is not high enough. Increase Time Out value to fix this error.</li> </ul>

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## Revision Record

Rev.	Date	Description	
		Page	Summary
1.00	Apr.22.14	13	First edition issued
1.10	Jun.26.14	16	Update Get Attribute 0, Action Service, Event Notification, Selective Access, Data structure display.

## General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

### 1. Handling of Unused Pins

Handle unused pins in accordance with the directions given under Handling of Unused Pins in the manual.

- The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

### 2. Processing at Power-on

The state of the product is undefined at the moment when power is supplied.

- The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.  
In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.  
In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

### 3. Prohibition of Access to Reserved Addresses

Access to reserved addresses is prohibited.

- The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

### 4. Clock Signals

After applying a reset, only release the reset line after the operating clock signal has become stable.  
When switching the clock signal during program execution, wait until the target clock signal has stabilized.

- When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal.  
Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

### 5. Differences between Products

Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

- The characteristics of an MPU or MCU in the same group but having a different part number may differ in terms of the internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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