



## **IEC-60870-5-101 OPC Device Driver**

# IEC-60870-5-101 OPC Device Driver Manual

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# IEC-60870-5-101 OPC Device Driver Manual

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## Overview

**IEC-60870** is a Substation Automation design standard - part of the IEC reference architecture for electric power systems.

## ReLab IEC-60870-5-101 OPC Device Driver

ReLab OPC Server has an advanced architecture with ability to plug-in multiple drivers supporting multiple protocols into one instance of the OPC Server.

ReLab's IEC-60870-5-101 OPC device driver fully addresses the need of collecting, processing and analyzing IEC-60870 data.

This manual will assist you in configuring communications between IEC-60870 compliant devices (IED's) and ReLab's IEC-60870-5-101 OPC Device Driver.

## Operating System and Hardware Requirements

### Operating System (OS)

- Windows® 7
- Windows® 8, 8.1
- Windows® Server 2003
- Windows® Server 2008, 2008 R2, 2010

### Hardware

- CPU – 1GHz (minimum)
- Memory – 500MB (minimum)
- Hard Drive Storage – 500MB (minimum)

## Configuring RL60870-5-101 OPC Device Driver

Follow the steps blow to configure the IEC-60870-5-101 OPC Device Driver (RL60870-101):

1. Open ReLab OPC Console and navigate to the main menu item **Configure | Load Driver**

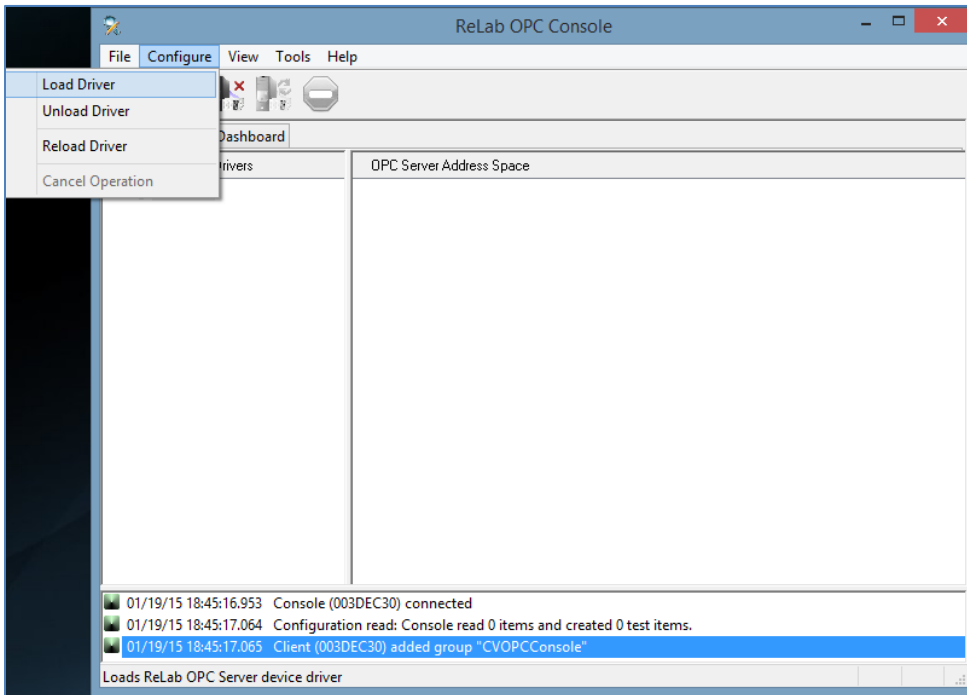


Figure 1

2. Select IEC-60870-101 Device Driver

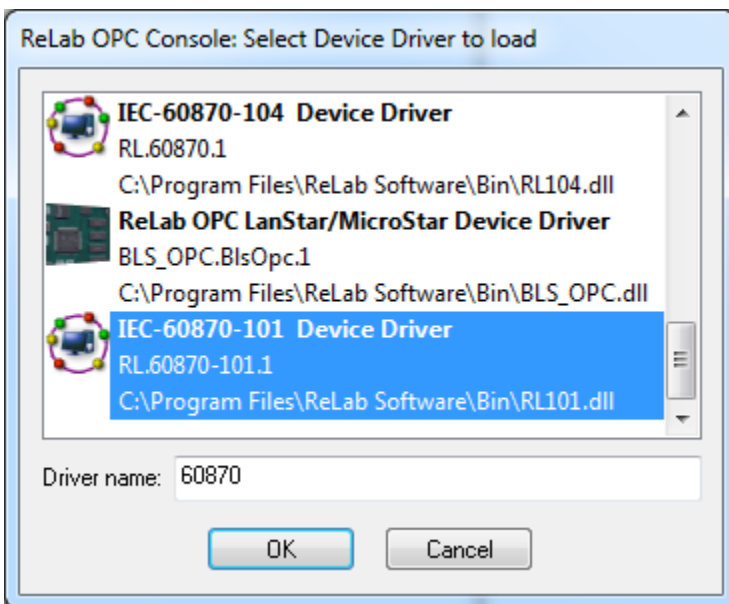


Figure 2

3. Specify **Driver name** and click **OK**

4. The **Driver Configuration** dialog will appear

## Driver Configuration Dialog

The following Properties can be configured for the Driver:

### Connection Tab Properties

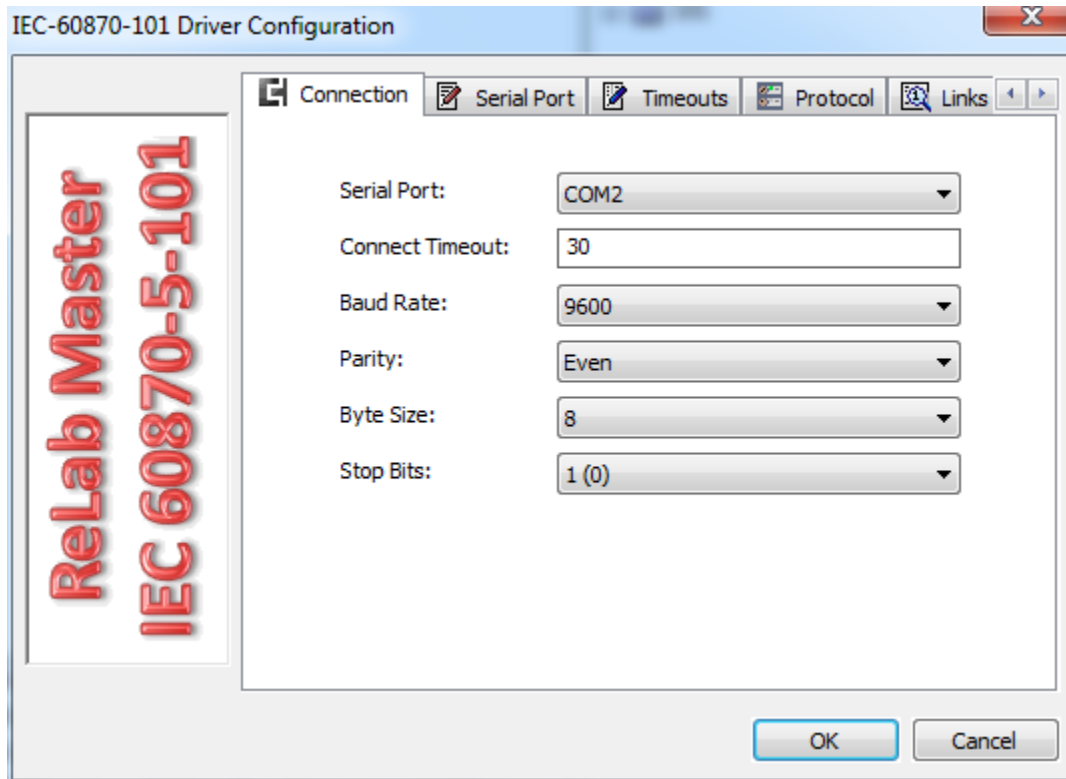


Figure 3

Property	Description	Type	Default
Serial Port	Serial Port	Dropdown list	Com1
Connect Timeout	Time in seconds the Driver waits after failed attempt to initiate Serial communication before it tries again.	Integer	30
Baud Rate	Serial Communication Baud Rate.	Dropdown list	19200
Parity	Serial Communication Parity: None, Even, Odd. Mark or Space	Dropdown list	Even
Byte Size	Serial Communication Byte Size: 5,6,7 or 8	Dropdown list	8

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Stop Bits	Stop Bits: 1, 1.5 or 2	Dropdown list	1
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Table 1

## Serial Port Tab Properties

The screenshot shows the 'IEC-60870-101 Driver Configuration' dialog box with the 'Serial Port' tab selected. On the left side of the dialog, there is a large red watermark that reads 'Relab Master IEC 60870-5-101'. The dialog has five tabs: 'Connection', 'Serial Port', 'Timeouts', 'Protocol', and 'Links'. The 'Serial Port' tab contains the following settings:

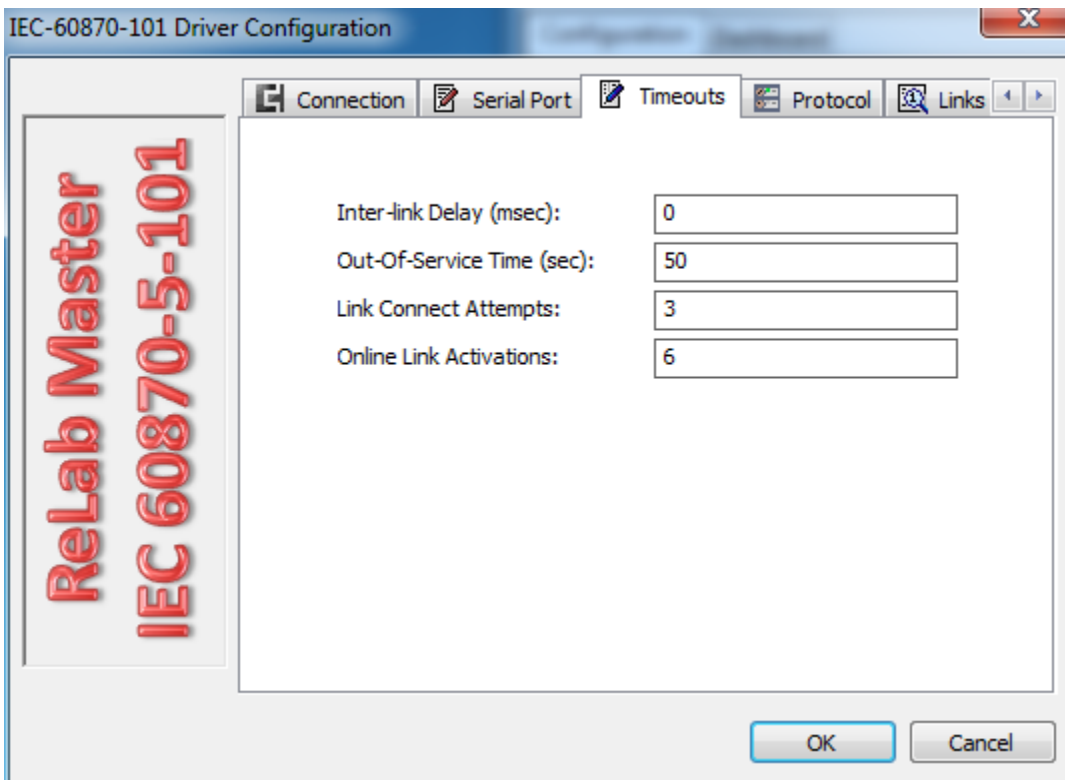
- Flow Control:** Dtr: Default (0), Rts: Default (0)
- Thresholds:** Xon: [text box], Xoff: [text box]
- Characters:** Xon: [checkbox], Xoff: [checkbox], Error: [checkbox], Eof: [checkbox], Evt: [checkbox]
- Flags:**
  - Outx Cts Flow: [checkbox], Outx Dsr Flow: [checkbox], Dsr Sensitivity: [checkbox]
  - Out X: [checkbox], In X: [checkbox], Null: [checkbox]
  - Abort On Error: [checkbox], TX Continue: [checkbox]

At the bottom right of the dialog are 'OK' and 'Cancel' buttons.

Figure 4

This tab allows changing Extended Serial Port Properties. By default the driver will use the Properties provided by the Operating System. Please refer to Serial protocol Properties for details.

## Timeouts Tab Properties



**Figure 5**

In a multi-link configuration the driver polls links serially one after another. The Link which is currently polled by the driver is considered as an Active link. The following Properties define driver behavior in multi-link configuration.

Property	Description	Type	Default
Inter-Link Delay (msec)	The driver Time in milliseconds before activation of the next link.	Integer	0
Out of service time (sec)	Time interval for which the driver will not attempt to activate the “Out of Service” links.	Integer	50
Link Connect Attempts	The number of attempts to set the link online. If the link cannot be set online after the number of attempts specified it is placed in “Out of Service” mode. For the links that are “Out of Service” the driver will not attempt to activate them for “Out of service time” Property above.	Integer	3
Online Link Activations	While going through activation cycle the driver tries to poll “Online” links first. The Online Link Activations Property specifies how many times the “Online” links will be activated before an	Integer	6

## IEC-60870-5-101 OPC Device Driver Manual

Property	Description	Type	Default
	attempt to activate an “Offline” link.		

Table 2

### Protocol TAB Properties

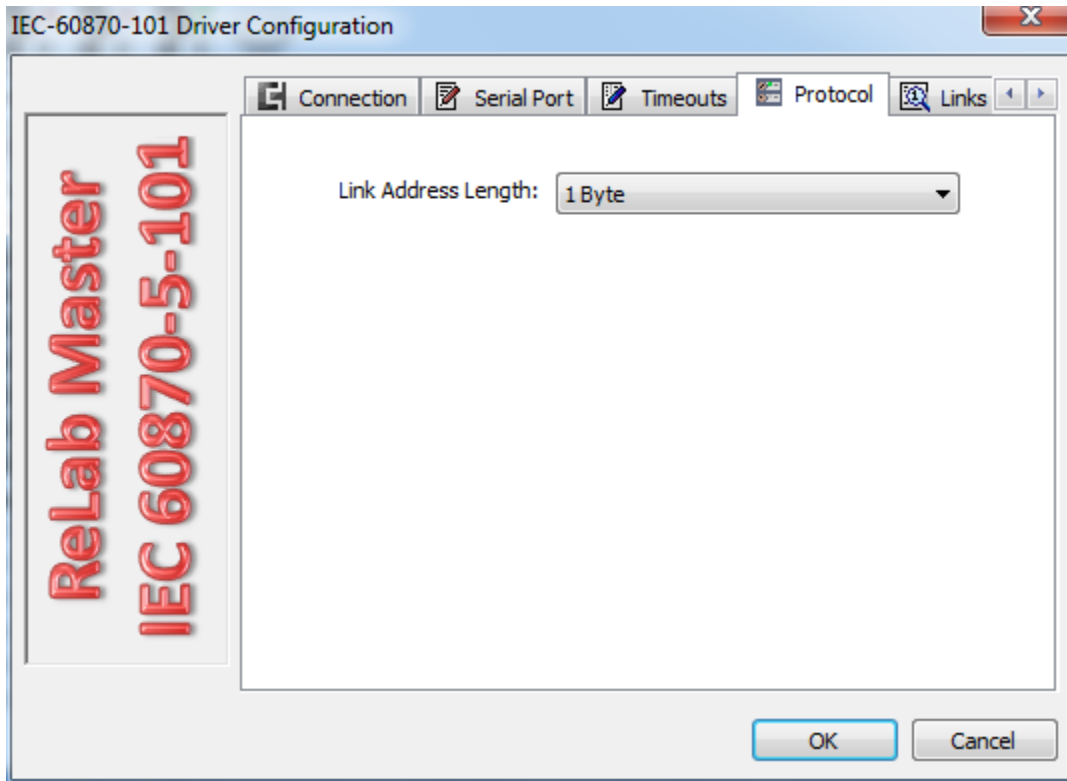


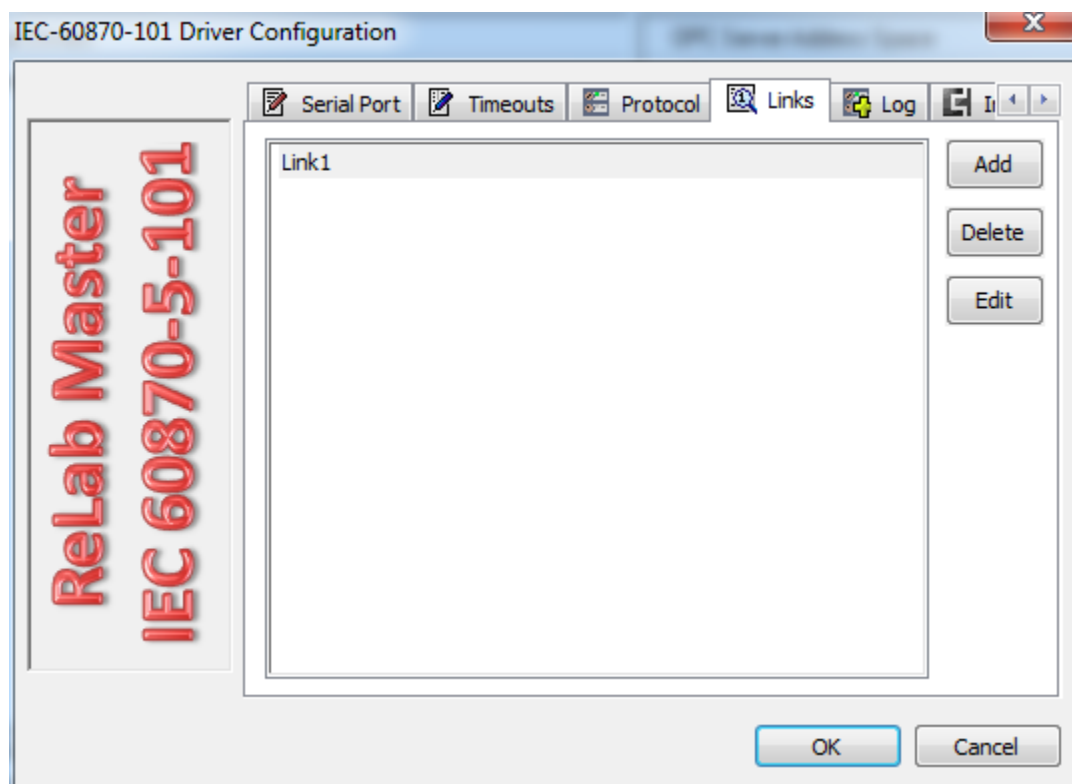
Figure 6

Option	Description	Type	Default
Link Address Length	The length of Link address in bytes	Dropdown list	1 Byte

Table 3



## Links TAB Properties



**Figure 7**

Links Tab allows adding a link to a configuration, deleting a link from the configuration, or editing link's properties.

**Link Properties dialog****General Tab**

Link Properties

General Initialization Time Settings Modem Settings

Link Name: Link1

Link Address: 1

Common Address: 1

Originator Address: 1

Link Mode: Unbalanced Transmission

OK Cancel

**Figure 8**

Option	Description	Type	Default
Link Name	Link Name	String	Link <N>
Link Address	Unique address of the link	Integer	1
Common Address	The address of a particular sector of a physical device. The valid range is 0 to 254 or 0 to 65534, depending on whether the Common Address (ASDU) size Property is set to one or two octets.	Integer	1
Originator Address	Transmitter's address.	Integer	1
Link Mode	Sets the driver operation mode either to Balanced or Unbalanced transmission.	Dropdown list	Unbalanced Transmission

**Table 4**

## Initialization Tab

On initialization tab a user can specify the sequence of optional commands the Driver will send to a Slave on an initialization. The Initialization sequence will be executed on the driver start-up and on every connection to a Slave.

Figure 9

Property	Description	Type	Default
Start Initialization after	Start initialization after a connection to a Slave is established or after Slave's Initialization is completed	Dropdown String	Slave Connection
Delay (sec)	Delay in seconds between Initialization steps	Textbox Integer	0 seconds
Step	Steps from 1 to 4, each step containing one of: General Interrogation Clock Synchronization Counter Interrogation Test Procedure	Dropdown list	Step1: Clock Synchronization Step2: General Interrogation Step3: Counter Interrogation Step4: None

Table 5

## Time Settings Tab

**Link Properties**

General Initialization **Time Settings** Modem Settings

Clock Synchronization Interval (sec): 0

Time Zone: (UTC) Casablanca

☐ Respect Daylight Savings

Response Timeout (sec): 3

Number of Attempts: 3

Class 1 Timeout if data available (msec): 0

Class 1 Timeout if data not available (msec): 0

Class 2 Timeout if data available (msec): 0

Class 2 Timeout if data not available (msec): 0

Test Frame Interval (sec): 10

OK Cancel

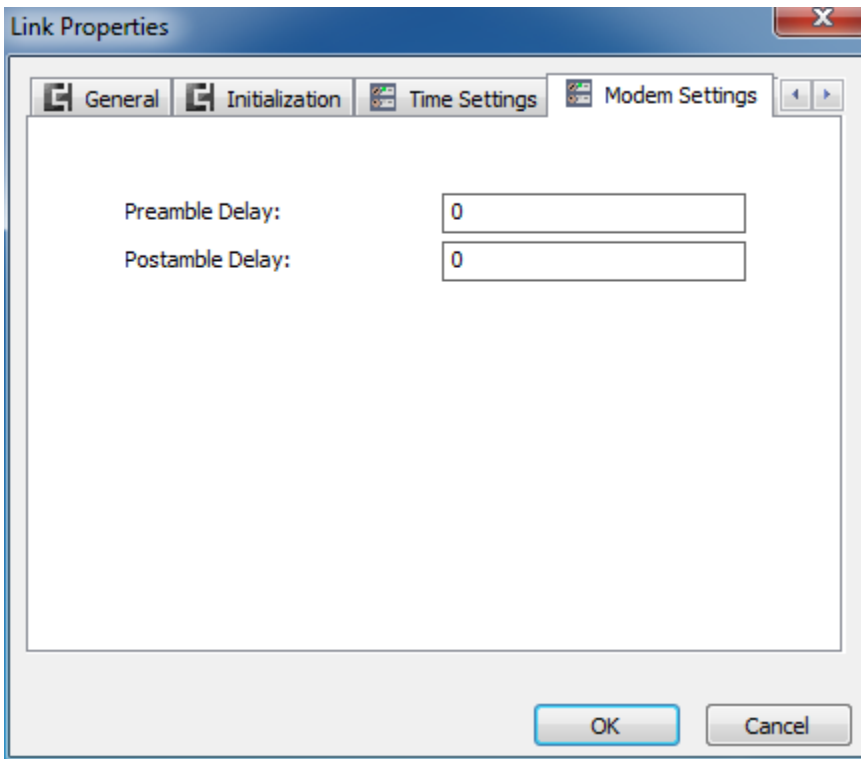
Figure 10

Setting	Description	Type	Default
Clock Synchronization Interval (sec)	Time-out in seconds of sending of clock synchronization messages.	Textbox Integer	0 – clock synchronization messages are not sent
Time Zone	Specifies the device's time zone	Dropdown list	UTC time
Respect Daylight Savings	If checked then the driver will respect Daylight Saving Time when synching the device time.	Checkbox	Unchecked
Response Timeout (sec)	Number of seconds the driver waits for a slave's response. If there is no response within the timeout the request is considered as failed.	Textbox Integer	3 seconds
Number of Attempts	The number of attempts the driver will make to communicate to a link. If all attempts fail the session with the link is considered to be broken, and reconnection to the link starts	Textbox Integer	3

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Setting	Description	Type	Default
Class 1 Timeout if Data available (msec)	Delay in milliseconds after a successful response to the Class1 Data Request before sending the next Class1 Data Request if more data is available.	Textbox Integer	0
Class 1 Timeout if Data is not available (msec)	Delay in milliseconds after a successful response to the Class1 Data Request before sending the next Class1 Data Request if more data is not available.	Textbox Integer	0
Class 2 Timeout if Data available (msec)	Delay in milliseconds after a successful response to the Class2 Data Request before sending the next Class2 Data Request if more data is available.	Textbox Integer	0
Class 2 Timeout if Data is not available (msec)	Delay in milliseconds after a successful response to the Class2 Data Request saying that more data is not available before activating next link (if appropriate) or sending the next Class1 Data Request for this link.	Textbox Integer	0
Test Frame Interval (sec)	Time-out in seconds for sending test frames in case of a long idle state. When enabled (interval is greater than 0), the driver periodically sends a test command ASDU. For Balanced mode only.	Textbox Integer	10

**Table 6**

**Modem Settings Tab****Figure 11**

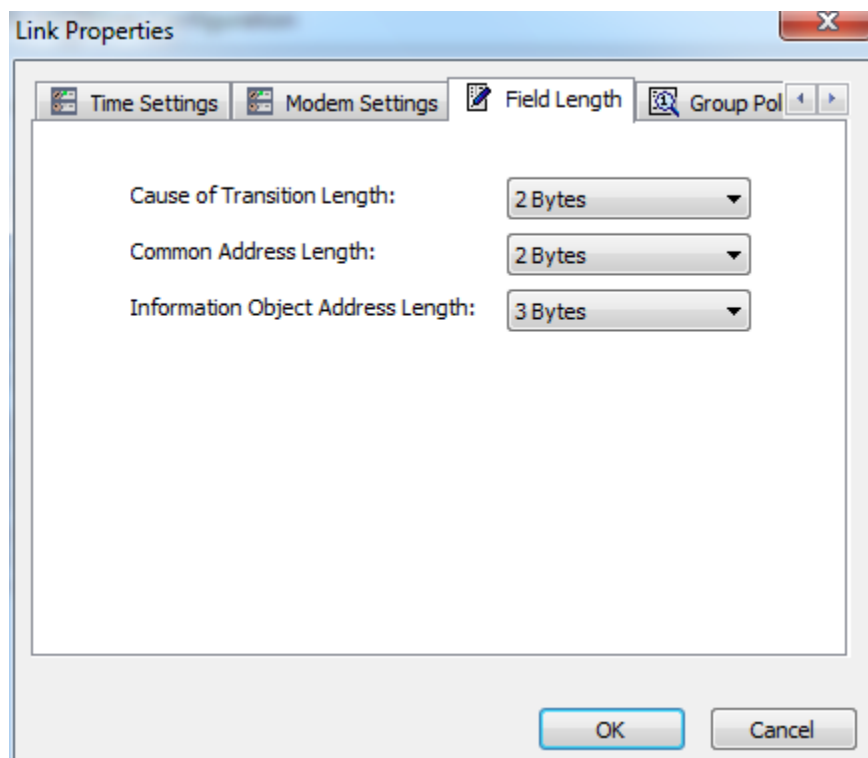
A preamble is a signal used in network communications to synchronize transmission timing between two or more systems. In general, preamble is a synonym for "introduction."

The role of the preamble is to define a specific series of transmission criteria that is understood to mean "someone is about to transmit data". Proper timing is required to ensure that all systems are interpreting the start of the information transfer correctly. The actual preamble varies depending on the network communication technology in use.

In wireless transmissions, the radio preamble (also called a header) is a section of data at the head of a packet. The length of the preamble can affect the time it takes to transmit data by increasing the *packet overhead*. Packet overhead includes all the extra bytes of information that are stored in the packet header. When combined with the assembly and disassembly of packets, increased packet overhead affects throughput by reducing the transmission speed of raw data.

Setting	Description	Type	Default
Preamble Delay (msec)	Delay in milliseconds between a modem power-up and start of data transmission	integer	0
Postamble Delay (msec)	Delay in milliseconds between the end of data transmission and a modem power off	integer	0

**Table 7**

**Field Length Tab****Figure 12**

Property	Description	Type	Default
Cause of Transmission Length	The Cause of Transmission data length, can be 1 or 2 octets (Bytes).	Dropdown list	2 Bytes
Common Address Length	Common Address of ASDU length, can be 1 or 2 octets (Bytes).	Dropdown list	2 Bytes
Information Object Address Length	Information Object Address length, can be 1, 2 or 3 octets (Bytes).	Dropdown list	3 Bytes

**Table 8**

## Group Polling Tab

Group Polling Tab specifies how often the General Interrogation and Group Interrogation commands will be executed.

Link Properties

Field Length Group Polling Counter Polling

Global Interval (sec): 0

Group Intervals (sec)

Gr1: 0	Gr2: 0	Gr3: 0	Gr4: 0
Gr5: 0	Gr6: 0	Gr7: 0	Gr8: 0
Gr9: 0	Gr10: 0	Gr11: 0	Gr12: 0
Gr13: 0	Gr14: 0	Gr15: 0	Gr16: 0

OK Cancel

Figure 13

Property	Description	Type	Default
Global Interval (sec)	Specifies in seconds how often the Driver will send periodic General Interrogation (GI) commands to a Slave	Integer	0 – disables periodic GI commands
Group Intervals (sec)	Specifies in seconds how often the Driver will send a periodic Group Interrogation command to a Slave	Integer	0 – disables sending periodic Group Interrogation commands

Table 9



## Counter Polling Tab

Counter Polling Tab specifies how often the Counter Interrogation and Group Counter Interrogation commands will be executed. The commands are executed with the Freeze option. If Reset Counters is set, the command will be executed with Freeze and Reset option.

Figure 14

Property	Description	Type	Default
General Interval	Specifies in seconds how often the Driver will send a periodic Counter Interrogation (CI) command to a Slave	Textbox	0 – disables periodic CI commands
Group N Interval	Specifies in seconds how often the Driver will send a periodic Counter Group Interrogation command to a Slave	Textbox	0 – disables periodic Group Interrogation commands
Reset Counters	Specifies if the counters will be reset with the Counters Interrogation Command	CheckBox Boolean	False

Table 10

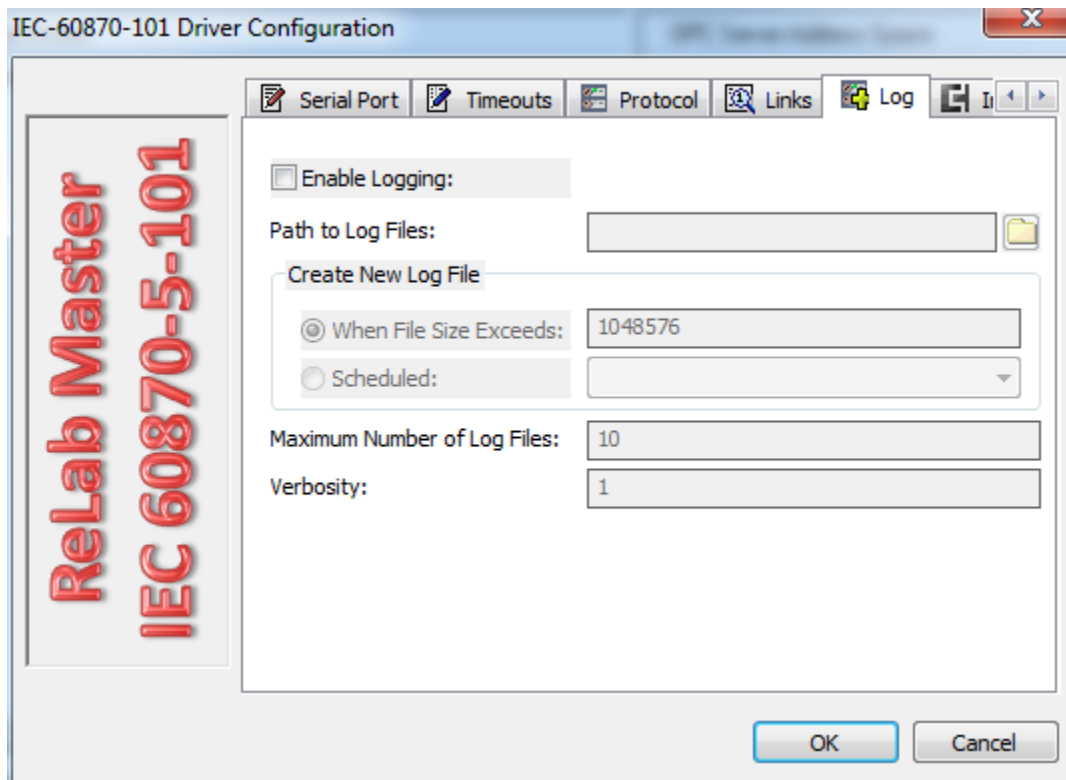
**Log Tab**

Figure 15

Property	Description	Type	Default
Enable logging	Enables or disables driver logging	Boolean Checkbox	False
Path to log file(s)	Specifies location of the log file(s)	String Textbox	Empty
When file size exceeds	Specifies when the new file will be created based on file size entered (in bytes)	Long Textbox	1048576
Scheduled	Specifies when the new file will be created based on user selectable schedule   Daily (every 24 hours)   Every 12 hours   Every 8 hours   Every 6 hours   Every 4 hours   Every 2 hours   Hourly	Enumeration Dropdown	Empty
Maximum number of log files	Specifies maximum number of log files before the files are overwritten	Integer Textbox	10
Verbosity	Specifies verbosity level of the log files (Valid entry is 1 – 9)	Integer Textbox	1

Table 11

## Immediate IO Tab

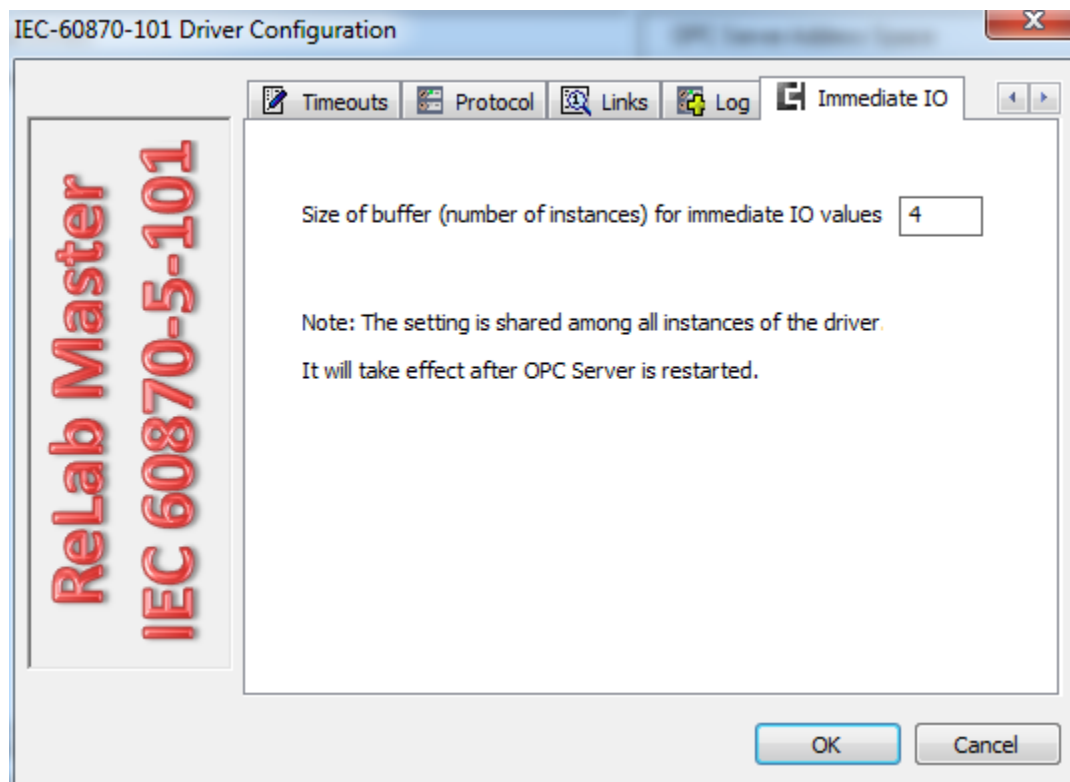


Figure 16

Property	Description	Type	Default
Size of the buffer (number of instances) for immediate IO values	Specifies the receiving buffer size. If the number of values exceeds the buffer size the older values will be discarded.	Textbox	512

Table 12

## OPC Tag Types

The following tag types are supported by the Driver.

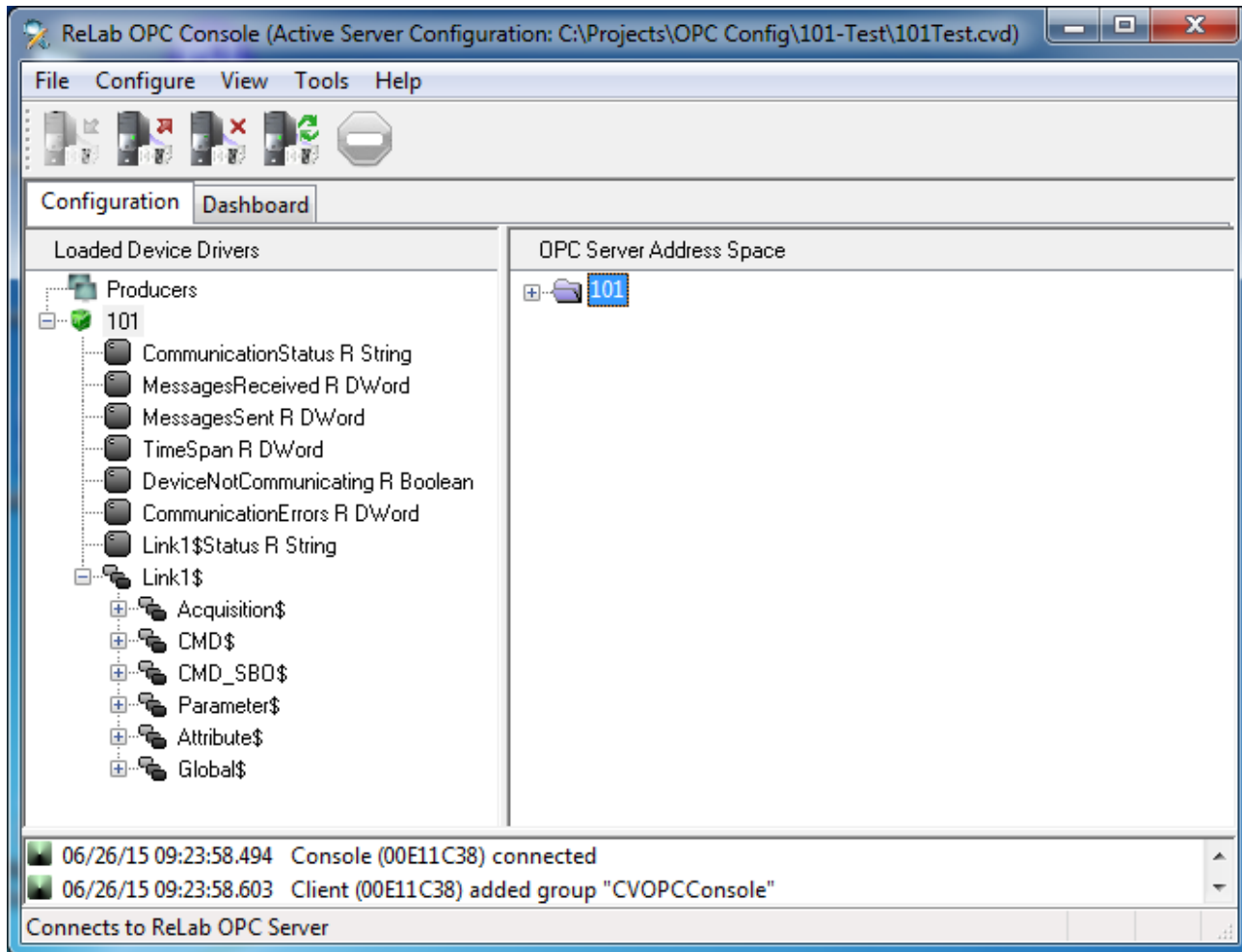


Figure 17

Tag Type	Description
System	Tags that reflect the driver's and Links' communication status
Acquisition	Tags associated with Monitoring ASDUs, read only
CMD	Direct commands
CMD_SBO	Commands that require Select before Operate

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Parameter	Parameters are used to change the configuration of a device, for example, to change a parameter such as a threshold value or the lower/upper limit for an alarm.
Attribute	Tags that serve as attributes for the complex commands like SBO, complementary tags for parameters, etc. See Attribute Tags description below.
Global	Tags for the Commands like General Interrogation, Counter Interrogation, etc., that are not associated with a particular Information Object Address but have a global scope.

**Table 13**

### System Tags

Tag	Description	Data Type
CommunicationStatus	<p>CommunicationStatus tag can take one of the following values:</p> <ol style="list-style-type: none"> <li>1. Initializing - this status is entered when driver's method Start is called by the OPC Server</li> <li>2. Connecting - this status is entered when the driver starts opening open serial communication channel</li> <li>3. Online - this status means normal operation of the serial communication channel.</li> <li>4. Failed – connection to a Slave via serial communication channel is failed, waiting for the next reconnection attempt. The timeout for the next connection attempt is set by the <b>Connect Timeout</b> configuration option.</li> </ol>	String
MessagesReceived	The number of messages received from the device	DWord
MessagesSent	The number of messages sent to the device	DWord
TimeSpan	Time in seconds after driver's initialization	DWord
DeviceNotCommunicating	<b>True</b> means that the Device is not connected	Boolean
CommunicationErrors	Communication Errors, the number of disconnects	Boolean
<Link Name>\$Status	<p>Link &lt;Link Name&gt; communication status</p> <p>1 - Online – the session with the link is established</p> <p>0 - Offline – the session with the link is not established, attempts to open session are periodically done</p> <p>-1 - Out-of-Service – the session with the link is</p>	Integer 1, 0 or -1

# IEC-60870-5-101 OPC Device Driver Manual

	not established, and attempts to open session are put on hold for configured Out of Service Time	
--	--	--

Table 14

## Acquisition Tags.

**Acquisition Tags** should be mapped to Monitor ASDUs addresses. The driver will convert data between ASDU type and Tag type. If conversion is not feasible the corresponding Tag(s) will have bad quality. Recommended mapping between Monitor ASDU types and Tag types are in the table below.

Tag type	Data type	Monitor ASDU	
Boolean	Single bit	1, 30	
Byte	Unsigned 8 bit value	To any Monitor ASDU that can be converted to Byte.	
Short	Signed 16 bit value	11, 35	
Int	Signed 32 bit value	15, 37	
Float	32 bit floating-point value	9, 13, 21, 34, 36	
Double	64 bit floating-point value	To any Monitor ASDU that can be converted to Double.	
Word	Unsigned 16 bit data	To any Monitor ASDU that can be converted to Word.	
DWord	Unsigned 32 bit data	7, 33	
Char	Signed 8 bit data	3, 5, 31, 32	

Table 15

## Command Tags

Command tags trigger a command on the address they are mapped to.

### CMD Tags

Tag	Description	Control TypeID	ASDU	Data Type
SngPoint	Single Command. By default the command is executed in the Persistent mode. To issue a ShortPulse or LongPulse	C_SC	45	Boolean

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	command a user needs to map a complimentary CmdOption tag to the same address as the command. See Table 19 below.			
DblPoint	Double Command	C_DC	46	Int
StepPos	Regulating Step Command	C_RC	47	Int
NormVal	Measured Value, Normalized Value	C_SE_NV	48	Float
ScaleVal	Set Point Command, Scaled Value	C_SE_SV	49	Short
FloatVal	Set Point Command, Short Floating Point Value	C_SE_FV	50	Float
BitStr	Bit String	C_BO	51	DWord

Table 16

### CMD\_SBO Tags

Tag	Description	Control TypeID	ASDU	Data Type
SngPoint	Single Command	C_SC	45	Boolean
DblPoint	Double Command	C_DC	46	Int
StepPos	Regulating Step Command	C_RC	47	Int
NormVal	Measured Value, Normalized Value	C_SE_NV	48	Float
ScaleVal	Set Point Command, Scaled Value	C_SE_SV	49	Short
FloatVal	Set Point Command, Short Floating Point Value	C_SE_FV	50	Float

Table 17

### Parameter Tags

Parameter Tags are used to modify the configuration of a device, for example - to change a parameter such as a threshold value or the lower/upper limit for an alarm.

Parameter loading for all parameters except the Activate parameter requires two steps.

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1. Specifying the type of the parameter (threshold value, filter factor, lower limit or upper limit). This is accomplished by writing the corresponding value to a ParType Tag associated with the Parameter. To associate a ParType Tag with a Parameter Tag a user must map the ParType Tag to the same address as the Parameter Tag.
2. Sending the parameter loading command to the device with the desired value for the parameter. This is accomplished by writing the desired value to the Parameter Tag.

Once a parameter loading operation has been successfully completed, the new value for the parameter is received from the device and transmitted to the OPC client that performed the operation.

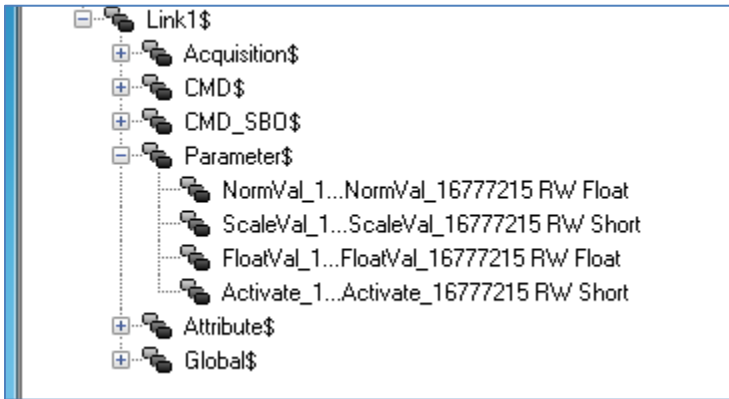


Figure 18

Tag	Description	Data Type
NormVal	Parameter for the Measured Value, Normalized value. ParType Tag must be mapped to the same address as the NormVal Parameter Tag.	Float
ScaleVal	Parameter for the Measured Value, Scaled value. ParType Tag must be mapped to the same address as the ScaleVal Parameter Tag.	Short
FloatVal	Parameter for the Measured Value, Short Floating Point number value. ParType Tag must be mapped to the same address as the FloatVal Parameter Tag.	Float
Activate	Activates/deactivates of persistent cyclic or periodic transmission of the addressed object.  Activation parameter types are loaded directly by writing the activation value (0: Activation, 1: Deactivation) to the tag representing the device parameter. There is no complementary Attribute Tag attached to this parameter type.	Short

Table 18



## Attribute Tags

Attribute tags are the complementary tags that can be mapped to the same address as the main tag to specify the type of the operation that is performed when the main tag is changed (like for ParType tags) or to provide extra information about the operation (like CauseOfTrans or CmdOption tags).

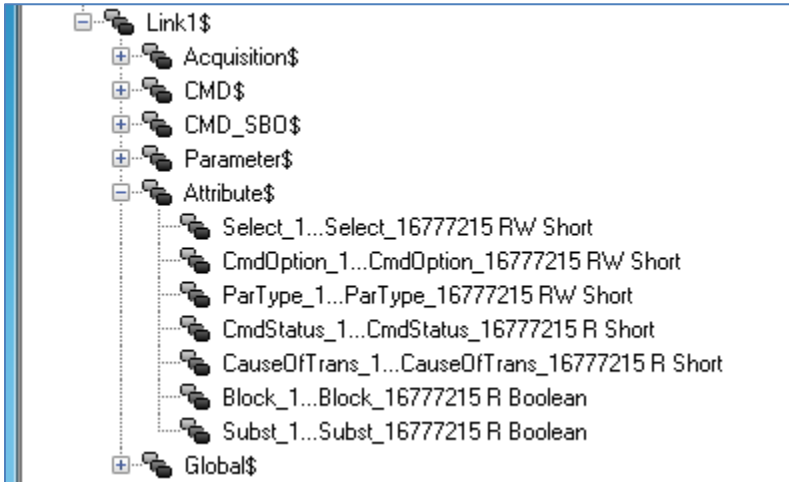


Figure 19

Tag	Description	Data Type
Select	<p>The Tag is used in Manual SBO mode, see <b>Select Before Operate (SBO) commands for more details.</b></p> <p>When mapped to the same address as an SBO command the value of the Select tag the message the Master will send to a Slave.</p> <p>If Select Tag is set to:</p> <ul style="list-style-type: none"> <li>1 – the Driver will send Select message</li> <li>0 – the Driver will send Execute message</li> <li>2 – the Driver will send Cancel message. The message will cancel previous Select.</li> </ul>	Short
CmdOption	<p>An optional complementary tag for a Single (SngPoint) command. Specifies the command type.</p> <ul style="list-style-type: none"> <li>1 - short pulse duration (circuit-breaker), duration determined by a system parameter in the outstation</li> <li>2 - long pulse duration, duration determined by a system parameter in the outstation</li> <li>3 - persistent output</li> </ul>	Short

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Tag	Description	Data Type
ParType	<p>ParType is a complementary tag that must be associated with a respective Parameter Tag by mapping it to the same address as the Parameter Tag.</p> <p>To load a Parameter it is necessary to specify the Parameter Type by writing the corresponding value to the Tag, and then – writing the Parameter Value to the Parameter tag itself.</p> <p>The Parameter Type tag can take one of the following values:</p> <ul style="list-style-type: none"> <li>1 - threshold value</li> <li>2 - smoothing factor (filter time constant)</li> <li>3 - low limit for transmission of measured values</li> <li>4 - high limit for transmission of measured values</li> </ul>	Short
CmdStatus	<p>The CmdStatus attribute can be used with SBO command to show the detailed status of SBO command.</p> <p>If mapped to the same address as SBO command the CmdStatus tag will have the following values:</p> <ul style="list-style-type: none"> <li>0- Undefined,</li> <li>1- Select message sent,</li> <li>2- Select message response is “OK”,</li> <li>3- Select message response is “fail”,</li> <li>4- Execute message sent,</li> <li>5- Execute message response is “Ok”,</li> <li>6- Execute message response is “fail”,</li> <li>7- Cancel message sent,</li> <li>8- Cancel message response is “OK”</li> </ul>	Short
CauseOfTrans	CauseOfTrans tag can be associated with Acquisition tag by mapping it to the same address as the Acquisition tag. The CauseOfTrans possible values are listed in the Table 21 below.	Short
Block	The value of IEC quality, bit 0x10 (Blocked/Not Blocked) of 8 high-order bits. The value of the Information Object is blocked for transmission; the value remains in the state in which it was acquired before it was blocked. Blocking and unblocking may be initiated by a local lock or a local automatic cause, for example.	Boolean
Trans	The value of IEC quality, bit 0x20 (Substituted / Not Substituted) of 8 high-order bits. The value of the Information Object is provided through operator input (dispatcher) or by an automatic source.	Boolean

**Table 19**

## Global Tags

Global Tags are used to send the commands like General Interrogation, Counter Interrogation, etc., that are not associated with a particular Information Object Address but rather work globally for the driver. The command is sent when the appropriate value is written to a global tag, see Table 20 below.

### Error handling:

After the value is written to a Global command tag the value of the tag is set to 0 and the corresponding command is sent to the slave:

- In case of success the value of the tag will be subsequently changed to the desired value.
- In case of failure the tag's value will be changed to (-1).
- If wrong value is written to the tag the command is not sent to the slave and the tag value is immediately changed to (-2).

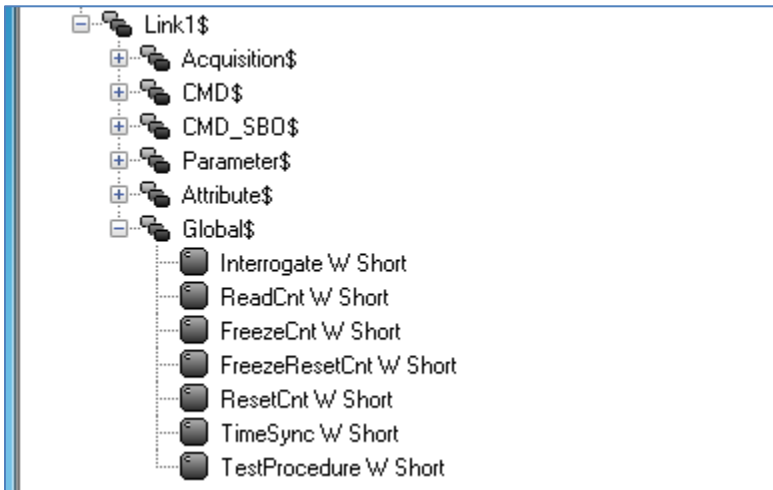


Figure 20

Tag	Description	Data Type
Interrogate	Writing a value to this tag will send the Interrogation command to a Slave. Values from <b>1</b> to <b>16</b> will trigger the corresponding Group Interrogation command. Value <b>32</b> will trigger the General Interrogation command.	Short
ReadCnt	Writing a value to this tag will send the Read Counters command to a Slave. Values from <b>1</b> to <b>4</b> will trigger the corresponding Group Read Counters command. Value <b>16</b> will trigger the Read All Counters command.	Short
FreezeCnt	Writing a value to this tag will send the Freeze Counters command to a Slave. Values from <b>1</b> to <b>4</b> will trigger the corresponding Group Freeze Counters command. Value <b>16</b> will trigger the Freeze All Counters command.	Short

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Tag	Description	Data Type
FreezeResetCnt	Writing a value to this tag will send the Freeze and Reset Counters command to a Slave. Values from 1 to 4 will trigger the corresponding Group Freeze and Reset Counters command. Value <b>16</b> will trigger the Freeze and Reset All Counters command.	Short
ResetCnt	Writing a value to this tag will send the Reset Counters command to a Slave. Values from <b>1</b> to <b>4</b> will trigger the corresponding Group Reset Counters command. Value <b>16</b> will trigger the Reset All Counters command.	Short
TimeSync	Writing <b>1</b> to this tag will send the Time Synchronization command to a Slave.	Short
TestProcedure	Writing <b>1</b> to this tag will send the Test Procedure command to a Slave.	Short

Table 20

### Cause of Transmission (COT)

The Cause of Transmission field is based on the IEC 60870-5-101 specification and is enumerated according to the table below.

COT Value	Cause
0	Not used
1	Periodic, cyclic
2	Background scan
3	Spontaneous
4	Initialized
5	Request or requested
6	Activation
7	Activation confirmation
8	Deactivation
9	Deactivation confirmation
10	Activation termination

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COT Value	Cause
11	Return information caused by a remote command
12	Return information caused by a local command
13	File transfer
14-19	Reserved for further compatible definitions
20	Interrogated by station interrogation
21-36	Interrogated by group 1-16 interrogation
37	Requested by general counter request
38-41	Requested by group 1-4 counter request
42-43	Reserved for further compatible definitions
44	Unknown type identification
45	Unknown Cause of Transmission
46	Unknown Common Address (ASDU)
47	Unknown Information Object Address (IOA)
48-63	For special use (private range)

Table 21

### Select Before Operate (SBO) commands.

Select Before Operate Commands, also known as Select and Execute require two messages to be sent from Master to a Slave.

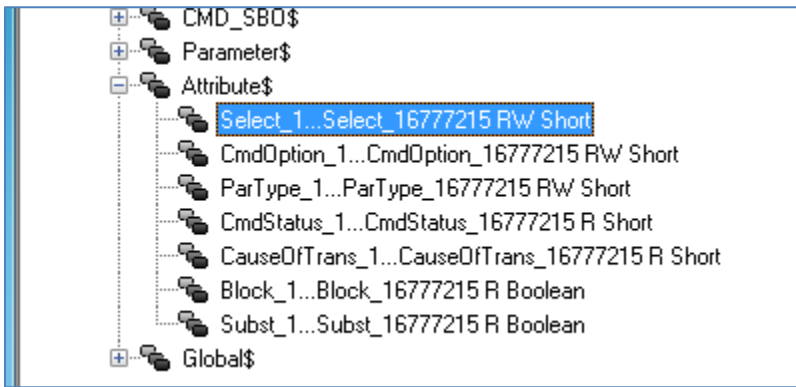
The first "Select" message reserves Master's right to write to the selected address, if "Select" was successful the Master then sends a write (Operate) command to the address.

ReLab's Driver supports two modes for SBO commands: Automatic and Manual

The Automatic mode is the default mode. A write request to SBO command tag will automatically execute the SBO command:

1. Send the Select request to a Slave
2. Analyze Select results
3. In case of success - Send the Operate request to the Slave

For the Manual mode a user need to map a "Select" tag from the Attribute tags to the same address as the SBO Command.



**Figure 21**

The values of the Select tag will determine which message the Master will send to a Slave.

User has first to write value to a Select tag and then write a required value to the Command tag.

If Select Tag is set to:

- 1 – the Driver will send Select message
- 0 – the Driver will send Execute message
- 2 – the Driver will send Cancel message. The message will cancel previous Select.

**Note:** The driver will send the above messages only upon writing to the corresponding Command tag.

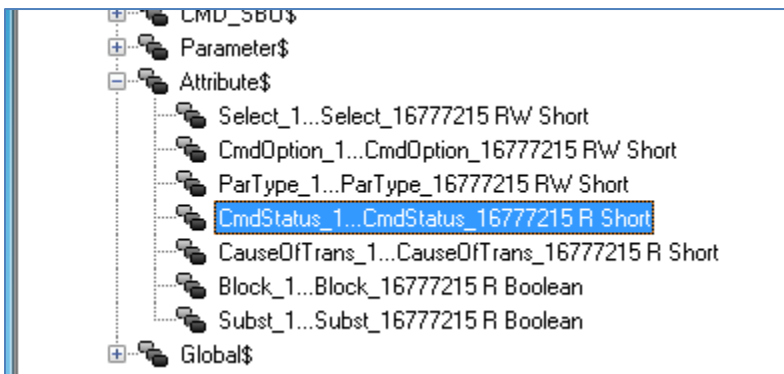
The same Select tag indicates the result of Select and Operate actions.

Depending on the result of the Select or Operate action the Select tag will change it's value to:

- 0 – the action was successful
- 2 – the action generated an error.

### **CmdStatus attribute.**

The CmdStatus attribute can be used with SBO command to show the detailed status of SBO command.



**Figure 22**

If mapped to the same address as SBO command the CmdStatus tag will have the following values:

- 0- Undefined,
- 1- Select message sent,

- 2- Select message response is "OK",
- 3- Select message response is "fail",
- 4- Execute message sent,
- 5- Execute message response is "Ok",
- 6- Execute message response is "fail",
- 7- Cancel message sent,
- 8- Cancel message response is "OK"

## Mapping RL60870-5-101 Items to ReLab OPC Server

To create an OPC group right-click the OPC Server Address Space and Click “Create Group”.

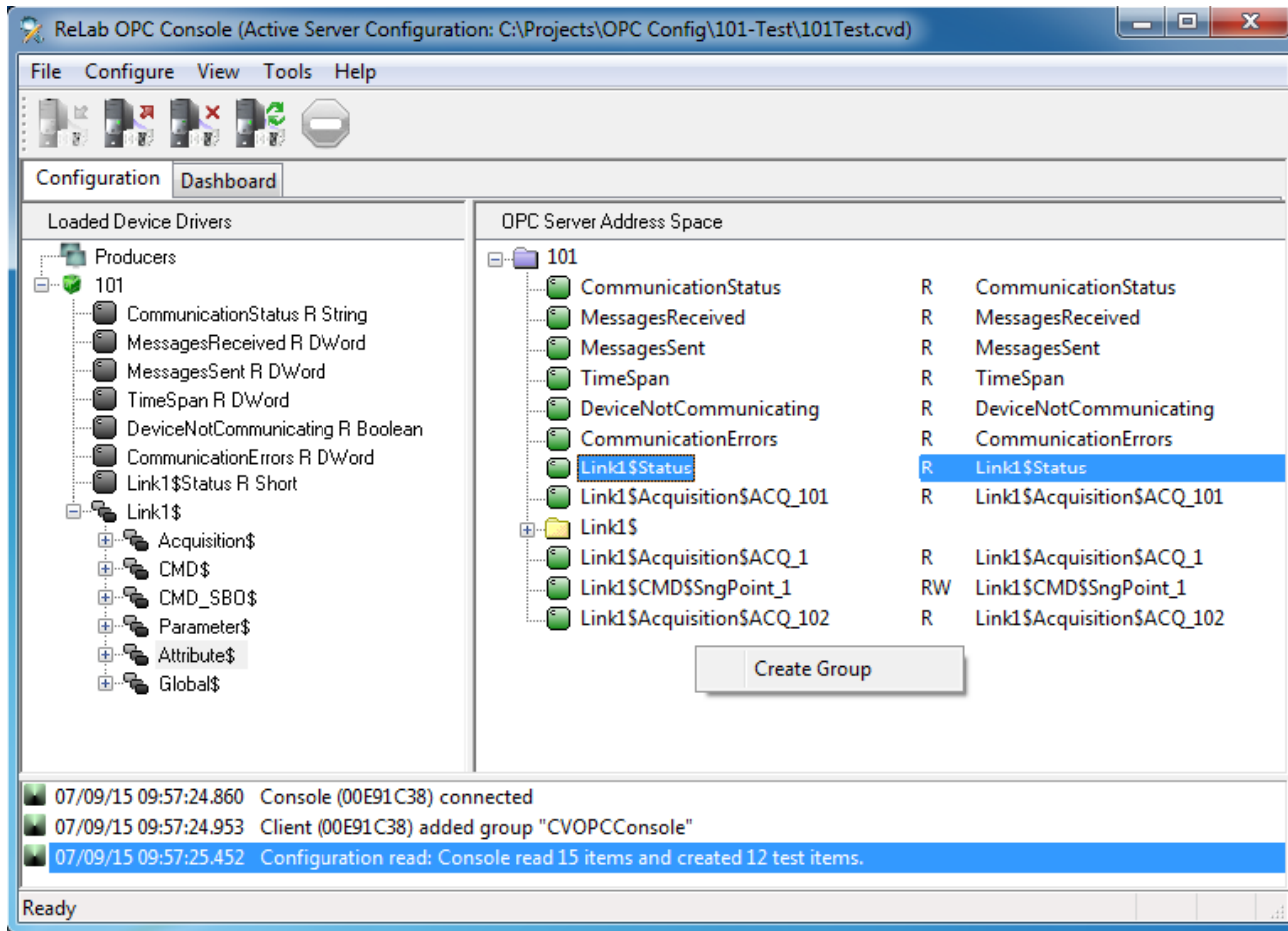


Figure 23

To map System or Global Tags select one or more Tags, right click on the selected tags, and choose either “Map Register to” or “Auto Map” from the context menu.

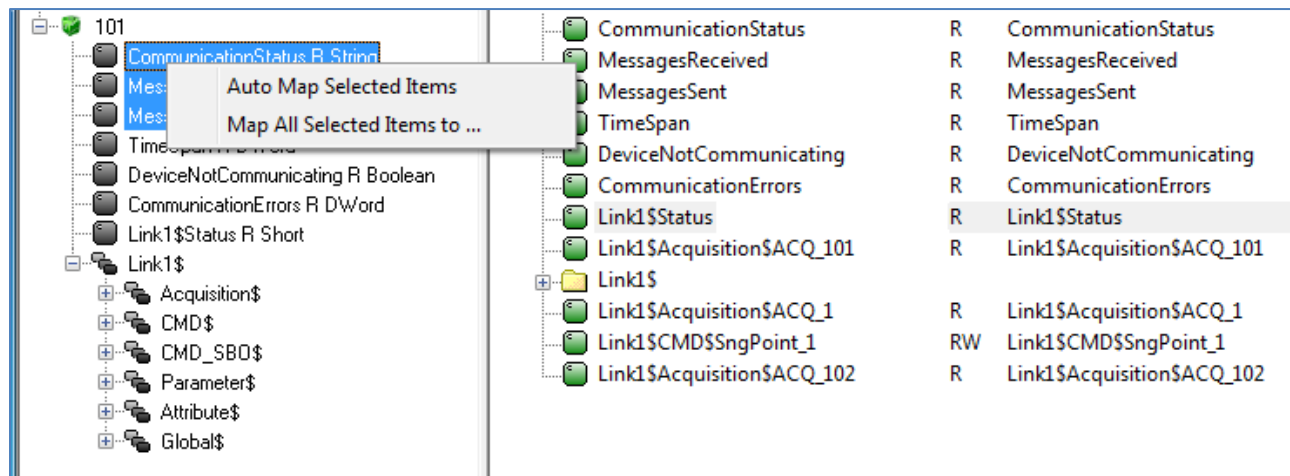


Figure 24



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Choosing “Map Register to” will show a dialog to choose one of previously created OPC groups.

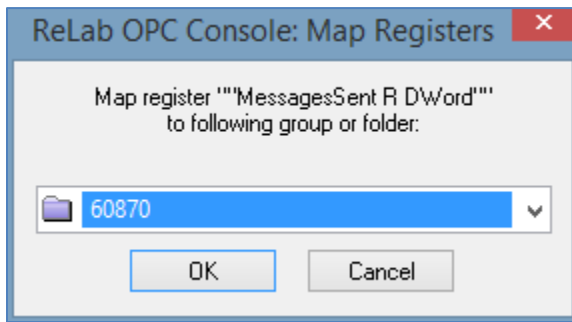


Figure 25

Choosing “Auto Map” will create the corresponding OPC group(s) and map the items to the group. To map the tags other than System or Global tags right-click on the needed tag type and click “Map Register to”.

Use the following dialog to choose the address or the address range and the group you want the tags to belong to.

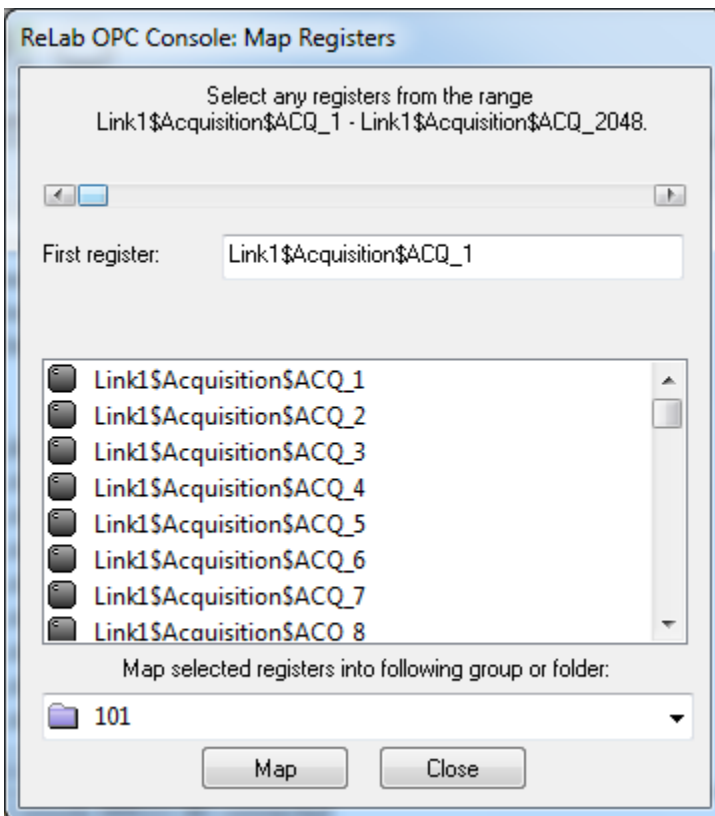


Figure 26

If the range of the addresses is selected the Console will map multiple tags of the chosen type to the range of selected addresses, one tag per each address.

Note that to navigate to the addresses higher than 2048 you can use the scroll bar at the top of the address window. Keyboard buttons: Up, Dn, PgUp, PgDn, Home, End can also be used to navigate the address space. First Register field provides a quick navigation to the required register(s).