

# **RLSYNC**

**Synchrophasor IEEE C37.118 OPC Device Driver**

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## Overview

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Blackouts in several power systems around the world have accentuated the need of new methods for improving the reliability of vital electrical power systems. One of the best methods to solve this problem is to find better ways to monitor the power disturbance by providing real-time and historical data analyzing tools. The electric power grid expands every day and by default pushes the operating limits to the maximum. In order to control and prevent wide scale cascading outages, taking measurements of power flows through the grid is essential. On March 22, 2006 IEEE Power Engineering Society published a standard for "Synchrophasors for Power Systems" (IEEE C37.118). IEEE addressed the definition of phasor measurements, time synchronization, and protocol for communication with phasor measurement units (PMU).

Shortly afterwards the IEEE C37.118 standard was universally adopted by hardware manufactures. Nevertheless, the need to capture, process and analyze the data still was not satisfied.

In April 2006 ReLab began developing the universal OPC device driver, which fully addresses the need of collecting, processing and analyzing the phasor data. With clear confidence in reliability, accuracy and performance of our products, ReLab introduces the first Synchrophasor IEEE C37.118 OPC Device Driver to the market (RLSYNC).

This manual will assist you in configuring communications between Phasor Measurement Units (PMU) and ReLab's RLSYNC OPC Device Driver.

## Trademarks

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## Hardware Configuration Requirements

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- ✓ Synchrophasor measurements shall be synchronized to UTC time with precision sufficient to meet the accuracy requirements specified in IEEE C37.118 standard. The PMU/PDC must be capable of receiving time from a highly reliable source, such as the Global Positioning System (GPS) that can provide sufficient time accuracy.
- ✓ The PMU shall support data reporting. Required rates for 50 and 60 Hz systems are listed in IEEE C37.118 standard specification.
- ✓ The phasor measurement unit (PMU) or phasor data concentrator (PDC) shall have unique numeric (integer) ID
- ✓ The user shall consolidate all required data in the phasor measurement unit (PMU) or phasor data concentrator (PDC) prior to configuring ReLab Synchrophasor Device Driver (RLSYNC)

ReLab Synchrophasor Device Driver (RLSYNC) uses unique optimization technology that allows processing up to 16 PMU's (Phasor Measurement Units) at 60 frames per second.

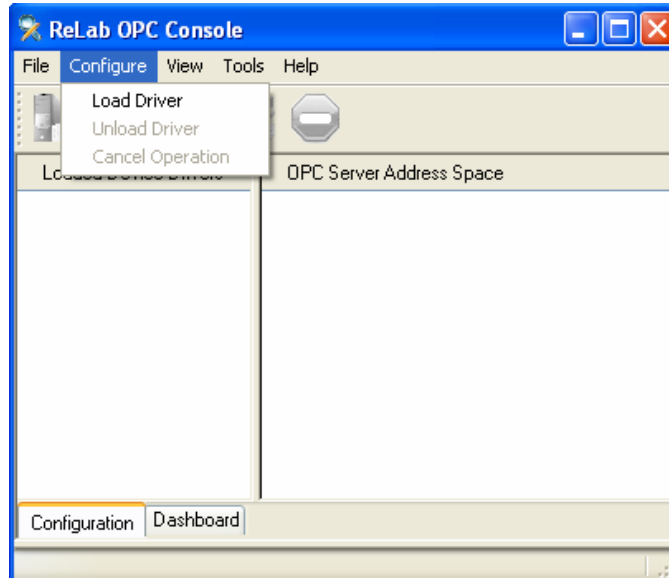
## Phasor(s) Data Type

<p><b>STAT</b></p>	<p><b>Bit 15</b> Data valid, 0 when PMU data is valid, 1 when invalid or PMU is in test mode  <b>Bit 14</b> PMU error including configuration error, 0 when no error  <b>Bit 13</b> PMU sync, 0 when in sync  <b>Bit 12</b> Data sorting, 0 by time stamp, 1 by arrival  <b>Bit 11</b> PMU trigger detected, 0 when no trigger  <b>Bit 10</b> Configuration changed, set to 1 for 1 minute when configuration changed  <b>Bits 09–06</b> Reserved for security, presently set to 0.  <b>Bits 05-04</b> Unlocked time: 00 = sync locked, best quality              01 = unlocked for 10 sec              10 = unlocked for 100 sec              11 = unlocked over 1000 sec  <b>Bits 03-00</b> Trigger reason:              1111-1000 Available for user definition                  0111 – Digital                      0110 - Reserved                  0101 - df/dt High                0100 - Frequency High/Low                  0011 - Phase Angle Diff        0010 - Magnitude High                  0001 -Magnitude Low            0000 - Manual</p>
<p><b>PHASORS</b></p>	<p><b>16-BIT INTEGER VALUES</b>  <i>Rectangular format</i>          16-bit signed integers          Real and imaginary (real value first)          Range -32,767 to +32,767  <i>Polar format</i>          Magnitude 16-bit signed integers          Magnitude and angle (magnitude first)          Magnitude range 0 to 65535          Angle 16-bit signed integer, in radians x 10<sup>4</sup>          Angle range -31416 to +31416  <b>32-BIT VALUES IN IEEE FLOATING POINT FORMAT</b>  <i>Rectangular format</i>          Real and imaginary in engineering units (real value first)  <i>Polar format</i>          Magnitude and angle in engineering units (magnitude first)          Angle in radians, range -π to + π</p>
<p><b>FREQ</b></p>	<p>Frequency deviation from nominal (Hz X 10<sup>3</sup>)          Range – nominal (50 or 60) –32.767 to +32.767 Hz          16 bit integer or 32 bit floating point          16 bit integer: 16 bit signed integers, range –32,767 to +32,767          32 bit floating point: actual frequency value in IEEE floating point format</p>
<p><b>DFREQ</b></p>	<p>Rate-of-change of frequency, in (Hz/sec X 10<sup>2</sup>)          Range –327.67 to +327.67 Hz/sec          Can be 16 bit integer or IEEE floating point, same as FREQ above</p>
<p><b>ANALOG</b></p>	<p>Analog word. 16 bit integer          It could be sampled data such as control signal or transducer value          Values and ranges defined by user          Can be 16-bit integer or IEEE floating point</p>
<p><b>DIGITAL</b></p>	<p>Digital status word          It could be bit mapped as status or flag          Values and ranges defined by user</p>

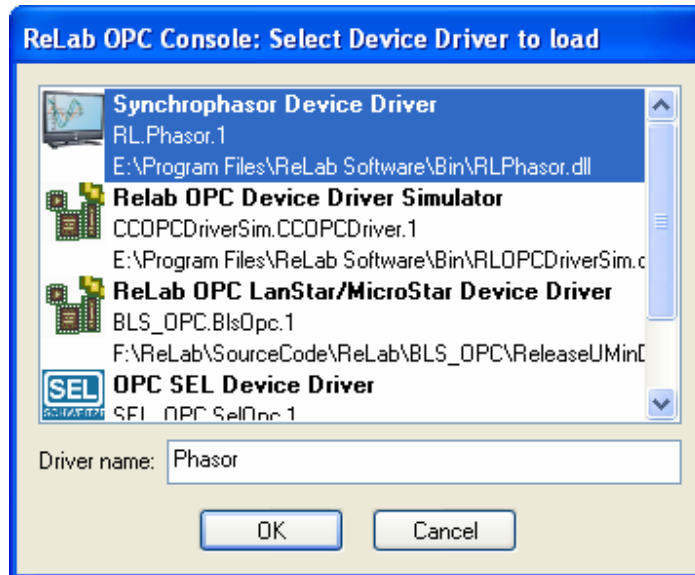
## Configuring RLSYNC Device Driver

Follow these steps to configure the Synchrophasor Device Driver (RLSYNC): Load OPC SEL Device Driver

1. Open ReLab OPC Console and select **Configure | Load Driver** from main menu



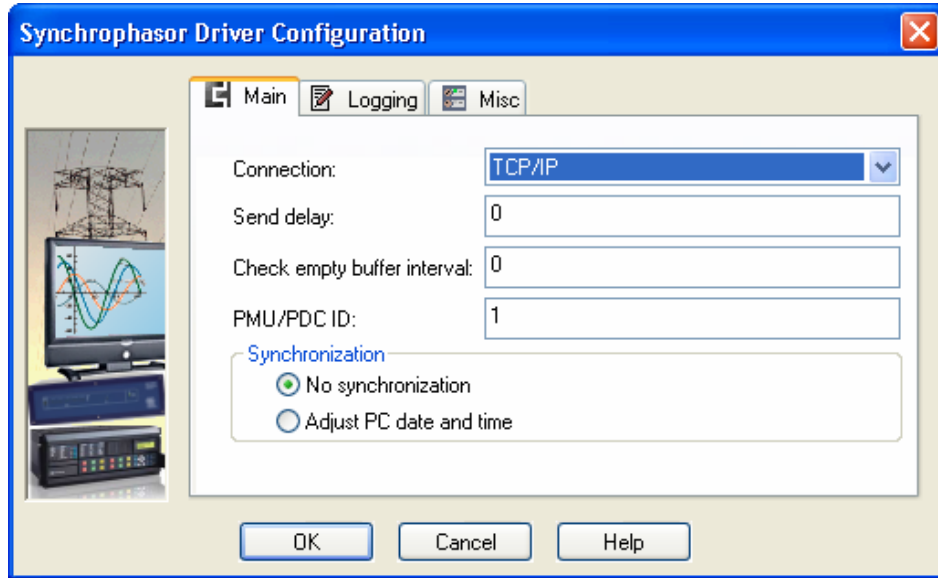
2. On the **ReLab OPC Console: Select Device Driver to load** dialog box, select **Synchrophasor Device Driver**



Specify the **Drive name** and click **OK** button

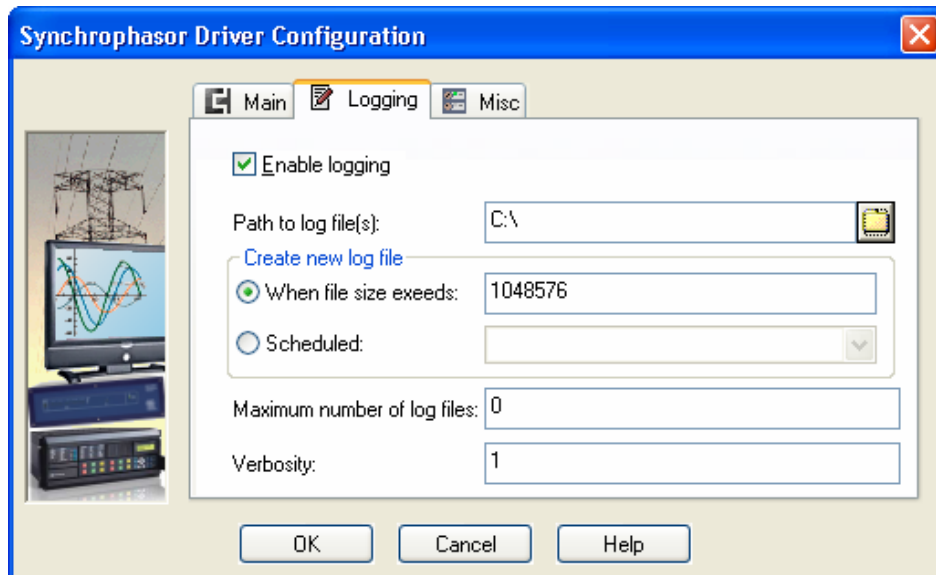
## Configuring RLSYNC Device Driver

3. The **Synchrophasor Driver Configuration** dialog will appear



### Main Tab

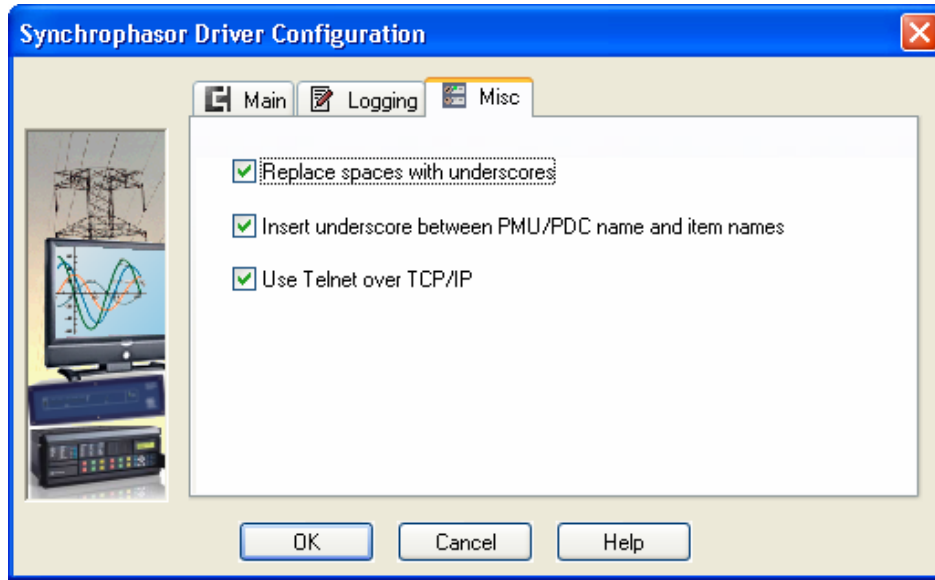
Specify <b>Connection</b> Type	Default: Serial	Required
Specify <b>Send delay</b> timeout	Default: 0	Optional
Specify <b>Check Empty buffer interval</b>	Default: 0	Optional
Specify <b>PMU/PDC ID</b> (phasor monitoring unit/ phasor data concentrator)	Default: 0	Required
Specify <b>Synchronization</b> type	Default: No Synchronization	Optional



### Logging Tab

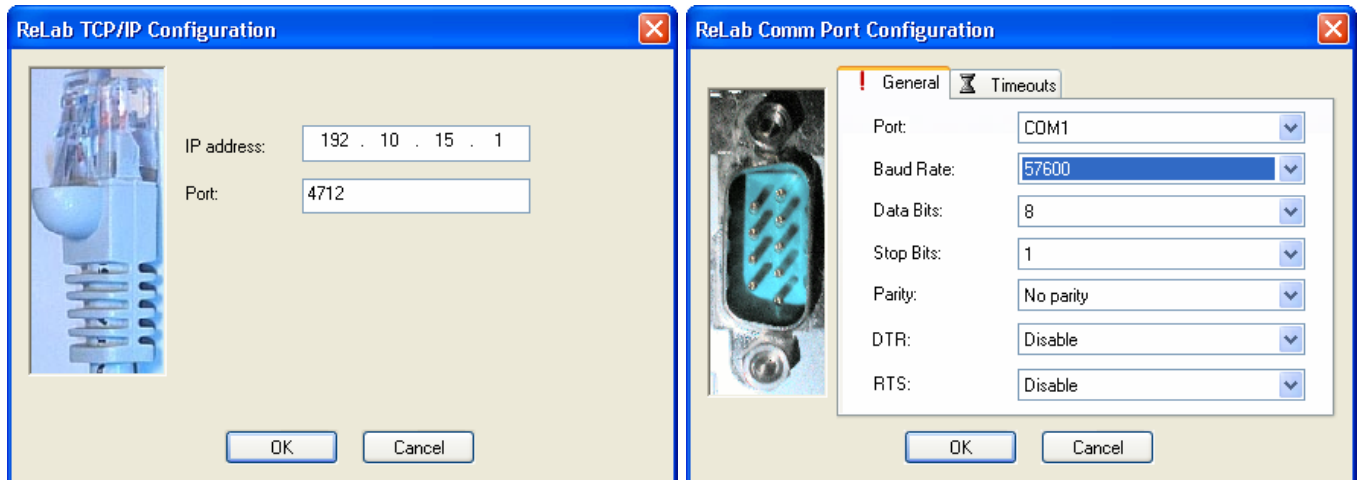
Please refer to ReLab OPC Server help manual for details on how to configure driver logging (RLOPC Manual.chm)

## Configuring RLSYNC Device Driver



Mis Tab		
<b>Replace spaces with underscores</b>	Default: Unchecked	Required
<b>Insert underscores between PMU/PDC name and names</b>	Default: Unchecked	Optional
<b>Use Telnet over TCP/IP (telnet session)</b>	Default: Unchecked	Optional

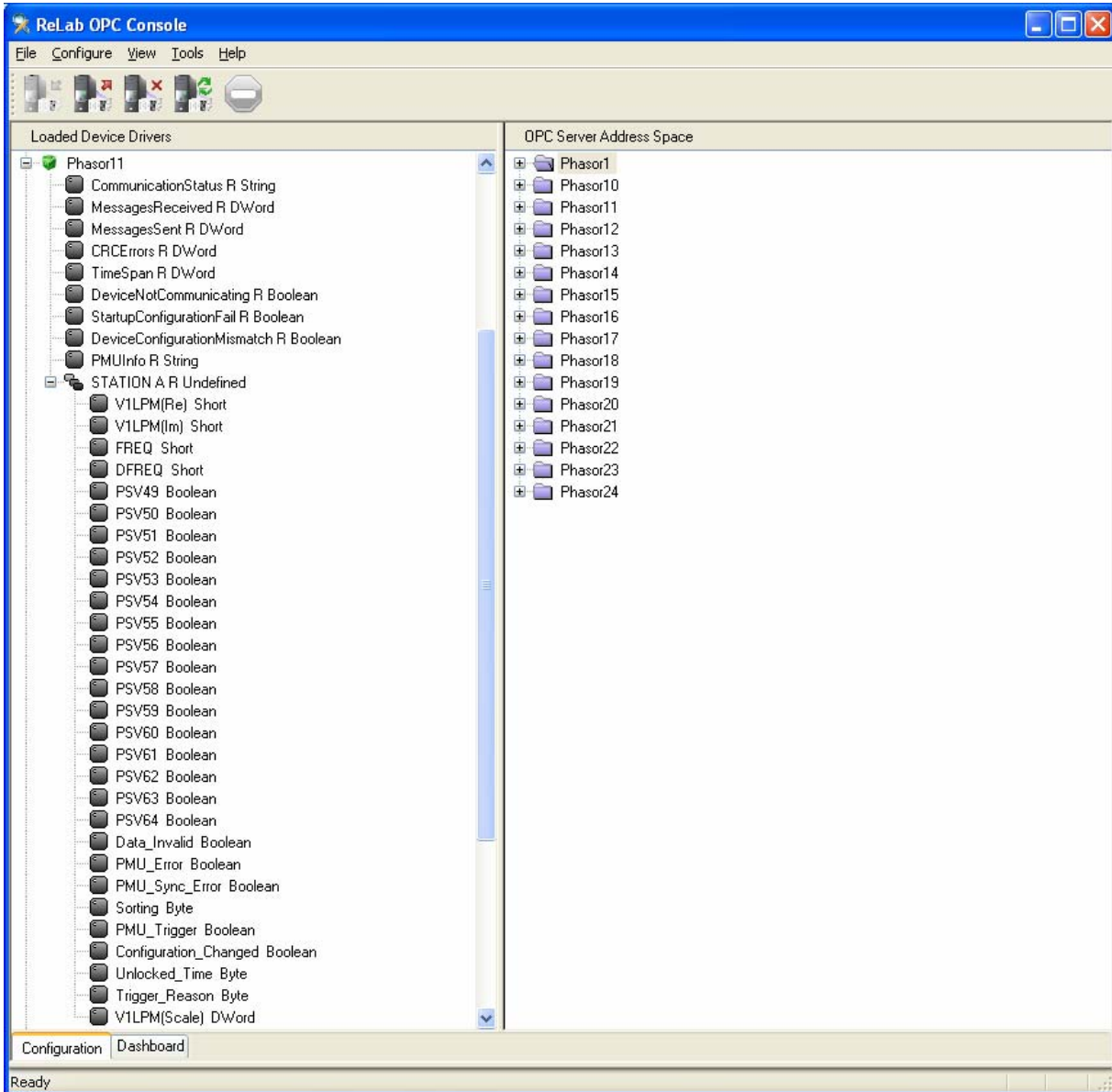
4. Based on previous selection the Serial or TCP/IP dialog will show one of the following screens



Please refer to RLOPC manual for details on serial or TCP/IP parameter settings.



# Mapping Synchrophasor Registers to ReLab OPC Server



After adding and configuring the RLSYNC Device Driver, map registers to the ReLab OPC Server by following the steps in this section.

1. Create an OPC Group as described in the **RLOPC User's Manual**
2. Type a descriptive name for the Group you created, such as "PMU1"
3. Right-click on the data you want to map to the Group, then click **Map Register(s) to...**
4. Find the range of registers you want to map to the Group
5. Select the desired registers, and then click **Map**.  
The registers are automatically mapped to the Group shown in the OPC Server Address Space of the ReLab OPC Console
6. On the ReLab OPC Console, click the **Dashboard** tab to see the values in the registers

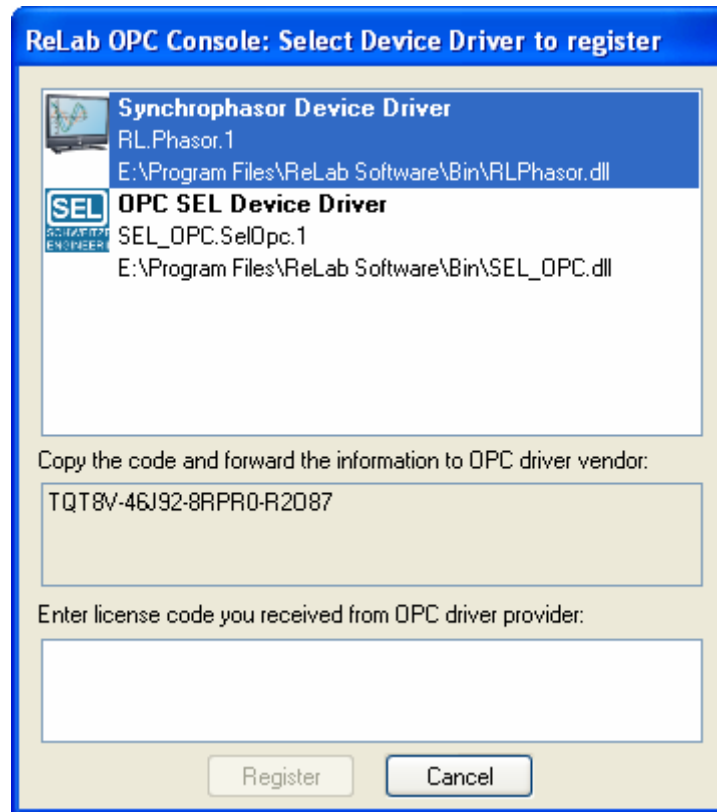
Note: For more details on mapping registers to ReLab OPC Server please refer to ReLab OPC Server help manual.

## Registering ReLab Synchrophasor Device Driver

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Follow these steps to obtain a registration request code.

1. On the Tools menu of the ReLab OPC Console, click Register Driver
2. The **Select Device Driver to register** dialog box appears
3. In the **Select Device Driver to register** dialog box, select the Synchrophasor Device Driver from the list



4. A registration request code will appear. Note the registration request code and provide it to the ReLab Software LLC
5. Click Cancel to close the dialog box

Follow these steps after receiving a license code from the ReLab Software LLC.

1. On the **Tools** menu of the ReLab OPC Console, click **Register Driver**
2. In the **Select Device Driver to register** dialog box, select the driver to register from the list
3. In the Enter license code field, type the license code received from the ReLab Software LLC
4. Click Register
5. Click Cancel to close the dialog box