



Product:	SeatexMRUSerialIOServer
Product version:	V1.1
Document ID:	UM-SeatexMRUSerialIOServer
Doc revision:	A
Written/Apr.:	RE / SL
Date:	13. Oct. 2008

Industrial Control Design AS



SeatexMRUSerialIOServer

User Manual

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Contents

1. INTRODUCTION.....	3
1.1. About.....	3
<hr/>	
2. CONFIGURATION.....	4
2.1. Serial Configuration.....	4
2.1.1. Description.....	4
2.1.2. Example XML.....	4
2.2. AutomaticInitialization.....	5
2.2.1. Description.....	5
2.2.2. Example XML.....	5
2.3. MRUTransmitIntervalMilliseconds.....	5
2.3.1. Description.....	5
2.3.2. Example XML.....	5
2.4. MRUCommunicationToken.....	5
2.4.1. Description.....	5
2.4.2. Example XML.....	5
2.5. IOConfig/Node.....	5
2.5.1. Description.....	5
2.5.2. Example XML.....	6
2.6. Port.....	6
2.6.1. Description.....	6
2.6.2. Example XML.....	6
2.6.3. Elements.....	6
2.7. ChannelGroup.....	6
2.7.1. Description.....	6
2.7.2. Example XML.....	6
2.7.3. Elements.....	6
2.8. AnalogChannel Scaling.....	7
2.9. Alarms.....	7
2.10. Signals.....	7
2.11. Parameters.....	8
2.12. Setting up the SeatexMRUSerialIOServer.....	8

1. Introduction

1.1. About

The SeatexMRUSerialIOServer is a component that is used to communicate with a Kongsberg Seatex (1,2,3,4,5,6,Z,H) Motion Reference Unit (MRU) on the 'MRU Normal' format. Using this protocol, a datatransfer at up to 100Hz can be achieved.

2. Configuration

Configuration is done by modifying the component .xml file inside the Application\Components\ folder.

2.1. Serial Configuration

The serial configuration is explained in the document 'UM-Serial Setup', but is included here for your convenience.

2.1.1. Description

The serial configuration is the same in all components using a serial connection. It contains several elements to manipulate the properties of the Serial communication, and has XML similar to this:

2.1.2. Example XML

```
<IRQ>0</IRQ>
<BaudRate>19200</BaudRate>
<Parity>None</Parity>
<StopBits>1</StopBits>
<DataBits>8</DataBits>
<ClockFrequencyMhz>1.8432</ClockFrequencyMhz>
<Protocol>None</Protocol>
<BufferSize>1024</BufferSize>
<MultiDrop>None</MultiDrop>
<ComPort Number="1" BaseAddress="0" NetworkConvert="0"></ComPort>
```

Element Name	Description
IRQ	Serial Port IRQ number. '0' means 'use default' but only works for COM1-COM4.
BaudRate	Serial Port Baudrate to set
Parity	Character Parity. Can be Even, Odd, Mark, Space and None
StopBits	Character Stop bits, can be 1 or 2 bits per character. Note that on RTOS32 you can specify 1.5 stop bits by specifying DataBits to 5 and StopBits to 2
DataBits	Number of Data bits per character. Can be 5,6,7 or 8. Note that DataBits = 8 and StopBits=2 is not allowed.
ClockFrequencyMhz	Clock Frequency of serial port crystal. If a non-standard crystal frequency is used on your controller, specify the frequency here to get correct baud rate calculation.
Protocol	The protocol to use. Supported protocols are: None, XonXoff, RtsCts and DtrDsr
MultiDrop	Valid choices are 'None', 'HalfDuplex' and 'FullDuplex'. This is used to enable RS485 communication, and set whether it should be half duplex (uni-directional) or full duplex (bi-directional).MultiDrop will only function as intended when Protocol is set to None.
BufferSize	Used On RTOS32 as the BufferSize to use. Default to 1024 bytes.
ComPort	The Com port settings, see table below

ComPort Attributes	Description
Number	The com port number, '1' as in 'COM1'. Must be 1 or bigger.
BaseAddress	The Base Address for the COM port, typically listed in the BIOS for the controller. A BaseAddress of '0' means 'use default'
NetworkConvert	Set to 1 if you want automatic network byte conversion for values.

2.2. AutomaticInitialization

2.2.1. Description

Setting this to 1 will cause the SeatexMRUSerialIOserver to:

- Change baudrate until successful contact with the MRU.
- Change baudrate to that set in XML Configuration.
- Set the MRU LeverArmVector
- Set the packet for the MRU to Send
- Set the time the MRU should wait between each transmission of data (minimum 10 milliseconds).

Setting AutomaticInitialization to 1 will of cause change the MRU setup, so you should know what you are doing if the MRU is shared between several listeners.

2.2.2. Example XML

```
<AutomaticInitialization>1</AutomaticInitialization> <!-- WARNING! Set at your own risk! -->
```

2.3. MRUTransmitIntervalMilliseconds

2.3.1. Description

Only used if AutomaticInitialization is set to 1. This is the time that the MRU waits between each data-block it sends.

2.3.2. Example XML

```
<MRUTransmitIntervalmilliseconds>10</MRUTransmitIntervalmilliseconds>
```

2.4. MRUCommunicationToken

2.4.1. Description

Only used if AutomaticInitialization is set to 1. This is the token that the MRU sends out (part of header)

2.4.2. Example XML

```
<MRUCommunicationToken>12</MRUCommunicationToken> <!-- Token for communicating with MRU-->
```

2.5. IOConfig/Node

2.5.1. Description

IOConfig is an XML element that wraps the packet and Input / Output configuration. A minimal configuration is shown below.

2.5.2. Example XML

```
<IOConfig>
  <Node Name="TestIO">
    <Port>
      </Port>
    </Node>
  </IOConfig>
```

2.6. Port

2.6.1. Description

Contain the ChannelGroup to send (The SeatexMRUSerialIOserver only has one ChannelGroup).

2.6.2. Example XML

```
<Port Name="Seatex MRU 0" Alias="HeaveComp-Unit" Type="Binary">
  <ChannelGroup Type="BinaryInput">
    <Channel Nr="0" Type="byte" Name="q - header value"></Channel>
    <Channel Nr="1" Type="byte" Name="Packet Length"></Channel>
    <Channel Nr="2" Type="byte" Name="MRUCommunicationToken"></Channel>
    <Channel Nr="3" Type="float" Name="Heave Pos" MRUSourceCodeValue="109">
      <Unit Name="m" HWLow="-50.0" HWHigh="50.0" UnitLow="-50.0" UnitHigh="50.0"></Unit>
    </Channel>
  </ChannelGroup>
</Port>
```

2.6.3. Elements

Packet Attributes	Description
Name	A name for the Port. Currently not used.
Alias	An Alias for the port. Currently not used.
Type	A Type for the port. Should be set to Binary.

2.7. ChannelGroup

2.7.1. Description

Contains the Channels / signals

2.7.2. Example XML

```
<ChannelGroup Type="BinaryInput">
  <Channel Nr="0" Type="short" Name="Input module 0.0"></Channel>
  <Channel Nr="1" Type="short" Name="Input module 0.1"></Channel>
</ChannelGroup>
```

2.7.3. Elements

Element	Description
ChannelGroup	An enclosing element for a group of channels/signals.
Channel	A Signal / Channel that correspond to one value received in.

ChannelGroup Attribute	Description
Type	In this IOserver, only 'BinaryInput' is supported since we can not send any sensible data to the MRU.

Channel Attribute	Description
Number	The number in a sequence beginning at 0, must be last channel number+1. On Digital channels this also signifies the bit position.
Type	The c++ data type, can be bool, char, byte, unsigned char, short, unsigned short, int, unsigned int, long, unsigned long, float or double. Typical values are bool and short.
Name	The signal name for this channel.
MRUSourceCodeValue	MRUSourceCodeValue tells the MRU what data to send at this position in the packet. The Seatex MRU manual specifies the different MRUSourceCodeValues in the MRU Normal format. You can use any of the defined values here, but make sure you update the Type accordingly.

2.8. AnalogChannel Scaling

Analog Channels can do multipoint scaling each time they are read or written. Please see the document 'AnalogChannel with Multipoint scaling.pdf' in the Doc folder where you installed CDP for more information about this. On a Windows install, there is also a shortcut placed on 'Start Menu'->'CDP'->'Doc'->'IOServers'.

2.9. Alarms

The following alarms can trigger from this IOserver:

Alarm Name	Description
Transmission Error	An error is causing the transmission of signals to fail
Unstable MRU Data	The MRU is sending unreliable MRU data due to a recent power-up or power failure. The internal MRU filters have not stabilized yet. This error should clear itself up in around 15 minutes depending on MRU filter settings.

In addition, you can set up alarms to trigger directly on a Channel mask.

A Channel Alarm is set up in XML like this:

```
<Channel Nr="0" Type="short" Name="4-20 mA input" ErrorMask="0x0003" AlarmMessageCommand="Stop"
AlarmMessageDestination="..ControlCode" AlarmText="Cable break on Valve feedback" Description="A Cable break was detected on
the first input module in the Winch IO Cabinet (cable from winch speed valve feedback)"></Channel>
```

The Alarm will get the name of the channel, and " Alarm" is appended to that name. For this reason, make sure the Channel Name is less than 25 characters to avoid a problem with ShortName being greater than 31 characters.

Channel Alarm Attribute	Description
ErrorMask	Required. Specifies a Mask to AND (&) with the channel. If the result is non-zero, the alarm is set (see Timeout below)
AlarmMessageCommand	MessageCommand to send when alarm is set.
AlarmMessageDestination	MessageDestination for the AlarmMessageCommand.
AlarmText	Text to set in the Alarm, visible in a visualizer
AlarmDescription	Description to set in the alarm, visible in a visualizer
Timeout	Time in seconds that the error condition must be active, before the alarm is set. Default value 0.

2.10. Signals

The following signals are in this IOserver:

Signal Name	Description
OutputDisabled	Inherited from IOServer, not used in the SeatexMRUSerialIOServer

2.11. Parameters

The following parameters are in this IOServer:

Parameter Name	Description
LeverArmXPos	MRU Leverarm X (front-back) position in meters. Only used if Automatic initialization is set to 1 in XML file. Automatic initialization requires a dedicated MRU.
LeverArmYPos	MRU Leverarm Y (left-right) position in meters. Only used if Automatic initialization is set to 1 in XML file. Automatic initialization requires a dedicated MRU.
LeverArmZPos	MRU Leverarm Z (up-down) position in meters. Only used if Automatic initialization is set to 1 in XML file. Automatic initialization requires a dedicated MRU.
SignalTimeout	If no data has been received within this time value, the IOServer will go to Offline state and the transmission error will be set.

2.12. Setting up the SeatexMRUSerialIOServer.

A SeatexMRUSerialIOServer.xml component file might look like this:

```
<?xml version="1.0" encoding="utf-8"?>
<Component Name="SeatexMRUSerialIOServer" Type="SeatexMRUSerialIOServer">
  <Activate>1</Activate>
  <IOConfig>
    <Node Name="Seatex MRU IONode">
      <IRQ>0</IRQ>
      <BaudRate>57600</BaudRate> <!-- The baudrate to use with the MRU -->
      <Parity>None</Parity> <!-- must be None on Seatex MRU -->
      <StopBits>1</StopBits> <!-- must be 1 on Seatex MRU -->
      <DataBits>8</DataBits> <!-- must be 8 on Seatex MRU -->
      <ClockFrequencyMhz>1.8432</ClockFrequencyMhz>
      <Protocol>None</Protocol> <!-- None on Seatex MRU -->
      <BufferSize>1024</BufferSize>
      <ComPort Number="1" BaseAddress="0" NetworkConvert="1"></ComPort>

      <AutomaticInitialization>1</AutomaticInitialization> <!-- WARNING! Set at your own risk! -->
      <MRUTransmitIntervalmilliseconds>10</MRUTransmitIntervalmilliseconds>
      <MRUCommunicationToken>12</MRUCommunicationToken> <!-- Token for communicating with MRU-->

    <Port Name="Seatex MRU 0" Alias="HeaveComp-Unit" Type="Binary">
      <ChannelGroup Type="BinaryInput">
        <Channel Nr="0" Type="byte" Name="q - header value"></Channel>
        <Channel Nr="1" Type="byte" Name="Packet Length"></Channel>
        <Channel Nr="2" Type="byte" Name="MRUCommunicationToken"></Channel>
        <Channel Nr="3" Type="float" Name="Heave Pos" MRUSourceCodeValue="109">
          <Unit Name="m" HWLow="-50.0" HWHigh="50.0" UnitLow="-50.0" UnitHigh="50.0"></Unit>
        </Channel>
        <Channel Nr="4" Type="float" Name="Roll Angle" MRUSourceCodeValue="63">
          <Unit Name="radians" HWLow="-3.1415" HWHigh="3.1415" UnitLow="-3.1415" UnitHigh="3.1415"></Unit>
        </Channel>
        <Channel Nr="5" Type="float" Name="Pitch Angle" MRUSourceCodeValue="64">
          <Unit Name="radians" HWLow="-3.1415" HWHigh="3.1415" UnitLow="3.1415" UnitHigh="-3.1415"></Unit>
        </Channel>
        <Channel Nr="6" Type="float" Name="Heave Velocity" MRUSourceCodeValue="119">
          <Unit Name="m/s" HWLow="-10.0" HWHigh="10.0" UnitLow="-10.0" UnitHigh="10.0"></Unit>
        </Channel>
        <Channel Nr="7" Type="float" Name="Roll Velocity" MRUSourceCodeValue="11">
          <Unit Name="m/s" HWLow="-10.0" HWHigh="10.0" UnitLow="-10.0" UnitHigh="10.0"></Unit>
        </Channel>
        <Channel Nr="8" Type="float" Name="Pitch Velocity" MRUSourceCodeValue="2">
          <Unit Name="m/s" HWLow="-10.0" HWHigh="10.0" UnitLow="10.0" UnitHigh="-10.0"></Unit>
        </Channel>
        <Channel Nr="9" Type="float" Name="Heave Acceleration" MRUSourceCodeValue="88">
          <Unit Name="m/s^2" HWLow="-30.0" HWHigh="30.0" UnitLow="-30.0" UnitHigh="30.0"></Unit>
        </Channel>
        <Channel Nr="10" Type="float" Name="X Position" MRUSourceCodeValue="106">
          <Unit Name="m" HWLow="-1000.0" HWHigh="1000.0" UnitLow="-1000.0" UnitHigh="1000.0"></Unit>
        </Channel>
        <Channel Nr="11" Type="float" Name="Y Position" MRUSourceCodeValue="107">
          <Unit Name="m" HWLow="-1000.0" HWHigh="1000.0" UnitLow="-1000.0" UnitHigh="1000.0"></Unit>
        </Channel>
        <Channel Nr="12" Type="float" Name="X Speed" MRUSourceCodeValue="116">

```

```

<Unit Name="m/s" HWLow="-10.0" HWHigh="10.0" UnitLow="-10.0" UnitHigh="10.0"></Unit>
</Channel>
<Channel Nr="13" Type="float" Name="Y Speed" MRUSourceCodeValue="117">
  <Unit Name="m/s" HWLow="-10.0" HWHigh="10.0" UnitLow="-10.0" UnitHigh="10.0"></Unit>
</Channel>
<Channel Nr="14" Type="float" Name="Heave Period Estimated" MRUSourceCodeValue="129">
  <Unit Name="s" HWLow="0" HWHigh="25" UnitLow="0" UnitHigh="25"></Unit>
</Channel>
<Channel Nr="15" Type="byte" Name="Packet Checksum"></Channel>
</ChannelGroup>
</Port>
</Node>
</IOConfig>
<!--
The leverarm vector, only used if AutomaticInitialization is set to 1.
Transmitted to MRU so it can do relation-calculation for us (WARNING! Will change the LeverArm position internally on
MRU!)
-->
<Parameters>
  <Parma Name="LeverArmXPos" Value="-8.1" Unit="m" DefaultValue="0" PreviousValue="0" TimeLastChanged="Fri Mar 26
12:18:27 2004" Description="MRU Leverarm X (front-back) position in meters. Only used if Automatic initialization is set to 1
in XML file. Automatic initialization requires a dedicated MRU."></Parma>
  <Parma Name="LeverArmYPos" Value="-0.985" Unit="m" DefaultValue="0" PreviousValue="0" TimeLastChanged="Fri Mar 26
12:21:06 2004" Description="MRU Leverarm Y (left-right) position in meters. Only used if Automatic initialization is set to 1
in XML file. Automatic initialization requires a dedicated MRU."></Parma>
  <Parma Name="LeverArmZPos" Value="2.72" Unit="m" DefaultValue="0" PreviousValue="0" TimeLastChanged="Fri Mar 26
12:22:13 2004" Description="MRU Leverarm Z (up-down) position in meters. Only used if Automatic initialization is set to 1
in XML file. Automatic initialization requires a dedicated MRU."></Parma>
  <Parma Name="SignalTimeout" Value="1" DefaultValue="0" PreviousValue="0" TimeLastChanged="Tue Mar 02 11:42:07 2004"
Description=""></Parma>
</Parameters>
<Alarms>
  <Alarm Name="Unstable MRU Data" Text="The MRU is sending unstable data. Please wait..." Level="Warning" Enabled="1"
Set="0" LevelLowWarning="112" LevelHighWarning="114" Signal="q - header value" Unacknowledged="0" Description="The MRU is
sending unstable data due to a recent power-up or the internal filters became unstable. This will usually rectify itself
after 10-15 minutes."></Alarm>
  <Alarm Name="Transmission Error" Text="SeatexMRUSerialIOserver transmission-error alarm" Level="Warning" Enabled="1"
Set="0" Unacknowledged="0" Description="No signals were received from the MRU in 1 second. Check cable and power to
MRU."></Alarm>
  <Alarm Name="Broken signal routing" Level="Error" Enabled="0" Text="Something is wrong with the routing for one or more
of the signals." Description="Something is wrong with the routing for one or more of the signals."></Alarm>
  <Alarm Name="Signal not updated" Level="Error" Enabled="0" Text="The signal is not updated (time stamp too old).
Probably lost connection with i/o." Description="The signal is not updated (time stamp too old). Probably lost connection
with i/o."></Alarm>
</Alarms>
</Component>

```

The model for the SeatexMRUSerialIOserver is 'Models\SeatexMRUSerialIOserver.xml'. If timestamps are not updated in (at least) the interval that the 'SignalTimeout' parameter specifies, the IOserver will go to Offline state and set the 'Transmission Error' alarm.

In the xml described above, an alarm 'Unstable MRU Data' is set if the 'q - header value' is different from the value 113 (ASCII 'q'). This is because the MRU changes this value if it's internal filters are unstable. Since this happens on power-on of the MRU (or some other event, such as the MRU being rotated outside its limits), it might be wise to have such an alarm to prevent specific machinery from being operated with (possible) faulty MRU data.

Each channel has a number, a name, a type and an MRUSourceCodeValue. The Number must be sequential and the Name must be unique. The Type specifies how many bytes the data occupy. A float is 32 bit, a double is 64 bit, and a byte is 8 bit. The MRUSourceCodeValue is the data from the MRU to retrieve into this channel. The Seatex MRU manual specifies the different codes in the MRU Normal format.

For more information about the Seatex MRU, consult your Kongsberg Seatex MRU (1,2,3,4,5,6,Z or H) Manual.