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## Industrial Control Design AS



# FujiFrequencyConverterLib

## V1.4

## User Manual

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# 1. Introduction

## 1.1. About

This document describes how to use the CDP Fuji FrequencyConverter IOserver. The IOserver communicates using RS232 / RS485 with a Fuji FRN55G11S-4EN frequency converter. It sends start/stop commands and can receive and acknowledge alarms.

## 2. Configuration

Configuration is done by modifying the component xml file inside the Application\Components\ folder. It should not be necessary to modify the model xml file. An example of WagoIPCIO.xml file (component xml) is found in Error: Reference source not found.

### 2.0.1. Usage

Instantiate as subcomponent or component in Application.xml:

```
<Subcomponents>
  ..
  <Subcomponent Name="FujiFrequencyConverter" src="Components\FujiFrequencyConverter .xml"></Subcomponent>
  ..
</Subcomponents>
```

### 2.0.2. Serial configuration

The component xml should contain a serial io setup that specifies the serial resource to use. See the document UM-Serial Setup.pdf in the CDP documentation for more information about setting up a serial connection.

## 2.1. fs

The <fs> element specifies the frequency of which to run the reading and writing of the Input/Output values. <fs>100</fs> means 100 Hz, so a read and write is done every 10 milliseconds. If the runningTooFast alarm is constantly set, then you could have specified a too high fs. Typically, the maximum fs for the Wago IPC is 200 Hz.

## 2.2. IOConfig/Node

### 2.2.1. Description

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

### 2.2.2. Example XML

```
<IOConfig>
  <Node Name="WagoIPCIO">
    <Inputs>
    </Inputs>
    <Outputs>
    </Outputs>
  </Node>
</IOConfig>
```

## 2.3. Station

### 2.3.1. Description

For each frequency converter you must specify a `<Station Address="addressnumber">`. Inside the Station you specify the input and output channelgroups. Note that the names inside the channels must have a prefix name of either "speed", "frequencyout", "torquecurrent" or "currentoutput". The names are case-insensitive, and you can add whatever you want at the end of each name. So for a given station, you might want to give it the speed name: "Speed\_Station1", or "Speed 1<sup>st</sup> StationAddress".

### 2.3.2. Example XML

```
<Station Address="3">
  <Inputs>
</Inputs>
  <Outputs>
</Outputs>
</Station>
```

### 2.3.3. Elements

Element	Description
Station	Enclosing element for a frequency converter configuration
Inputs	Enclosing element for input channelgroups
Outputs	Enclosing element for output channelgroups

## 2.4. Inputs

### 2.4.1. Description

Contains the ChannelGroups and Channels / signals to receive input from the Frequencyconverter.

### 2.4.2. Example XML

```
<Inputs>
  <ChannelGroup Type="Analog" NumberOf="2" ModuleNr="0">
    <Channel Nr="0" Type="short" Name="Speed (Station 3)"></Channel>
  </ChannelGroup>
</Inputs>
```

### 2.4.3. 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	Description
Type	Can be 'Analog' or 'Digital'
NumberOf	The Number of channels in this ChannelGroup
ModuleNr	The physical module number, used only for documentation.

Channel Attribute	Description
Number	The number in a sequence, must be last number+1. On Digital channels this also signifies the bit position, starting at 0.
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.

## 2.5. Outputs

### 2.5.1. Description

Contains the ChannelGroups and Channels/signals to send to the Frequency Converter.

### 2.5.2. Example XML

```
<Outputs>
  <ChannelGroup Type="Analog" NumberOf="3" ModuleNr="0">
    <Channel Nr="0" Type="short" Name="FrequencyOut (Station 3)"></Channel>
    <Channel Nr="1" Type="short" Name="TorqueCurrent (Station 3)"></Channel>
    <Channel Nr="2" Type="short" Name="OutputCurrent (Station 3)"></Channel>
  </ChannelGroup>
</Outputs>
```

### 2.5.3. 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	Description
Type	Can be 'Analog' or 'Digital'
NumberOf	The Number of channels in this ChannelGroup
ModuleNr	The physical module number

Channel Attribute	Description
Number	The number in a sequence, must be last 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.

## 2.6. 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'.

## 2.7. Parameters

The following parameters are available:

Value	Description
'SignalTimeout'	Specify the time in seconds when not receiving data before IOserver goes Offline. The IOserver might also go offline if an incorrect answer is received.
'AlarmAckSendsReset'	If value>0; After the last alarm on a station has been acknowledged, a 'Reset Alarm' is sent to the device.
'ContinueAfterAlarmReset'	If value>0; After an 'Alarm Reset' command is sent to the station, the previous operation (Start Fwd, Start Rev, Stop) is commenced.

## 2.8. Messages

The following messages are available:

Value	Description
'Stop' <StationAddress>	Stop FrequencyConverter (i.e. Don't run in any direction).
'StartFwd' <StationAddress>	Start (Forward direction)
'StartRev' <StationAddress>	Start (Reverse direction)
'AlarmReset' <StationAddress>	Acknowledge alarms

## 2.9. Alarms

To avoid duplicating all alarms to all stations, the following scheme has been implemented: When an alarm is set, its *description* will be updated to tell which station caused the alarm. The alarm will remain set until it's acknowledged **and** an AlarmReset message has been sent to the station causing the alarm. Due to the operation mode of the frequency converter, some alarms might need to be acknowledged twice for the alarm to go away.

The following alarms can trigger from this IOserver:

Alarm Name	Description
OCAcc	Overcurrent during acceleration
OCDec	Overcurrent during deceleration
OCCS	Overcurrent while running at constant speed.
GroundFault	Ground fault
OVAcc	Overvoltage during acceleration.
OVDDec	Overvoltage during deceleration.
OVCS	Overvoltage while running at constant speed.
Undervoltage	Undervoltage.
LIP	Lost input phase.
FuseBlown	Fuse blown.
OWE	Output wiring error.
IHSO	Inverter heat-sink overheated

Alarm Name	Description
EAI	External alarm input.
ITO	Internal temperature overheated
OODBR	Overheat of DB resistance
ERTO1	Electronic relay thermal overload (Motor 1)
ERTO2	Electronic relay thermal overload (Motor 2)
ERTOI	Electronic relay thermal overload (Inverter).
OverSpeed	Overspeed.
PGError	PG Error.
MemoryError	Memory Error.
KeyPad	KEYPAD panel communication error.
CPU	CPU Error.
OCE	Option communication error.
OptionError	Option error.
OPE	Operating procedure error.
OutputPhaseError	Output phase error.
CommErr	RS485 Communication error.
CSED	Checksum error detected.
PED	Parity error detected
UED	Unknown error detected.
FED	Format error detected.
CENCM	Command error, no command matched.
POLED	Priority of link error detected.
NWPITM	No write permission in this mode.
FCE	Function code error
FWD	Forbidden write detected.
DataError	Data error.
EDW	Error during write.

# 3. Appendix

## 3.0.1. Example component .xml

```

<?xml version="1.0" encoding="iso-8859-1" ?>
<Component Name="FujiFrequencyConverter" Model="FujiFrequencyConverter">
  <Activate>1</Activate>
  <fs>10</fs>
  <Description><![CDATA[
    SerialIOServer for the Fuji FRN55G11S-4EN frequency converter.
  ]]></Description>
  <IOConfig>
    <Node Name="FFC">
      <Type>Serial</Type>
      <IRQ>0</IRQ> <!-- 0=use default IRQ setting;only used on RTOS -->
      <BaudRate>19200</BaudRate> <!-- The baudrate to use -->
      <Parity>None</Parity> <!-- Even,Odd,Mark,Space,None-->
      <StopBits>1</StopBits> <!-- 1 or 2 -->
      <DataBits>8</DataBits> <!-- 5,6,7 or 8 -->
      <MultiDrop>None</MultiDrop> <!-- For RS422/RS485; HalfDuplex or FullDuplex -->
      <ClockFrequencyMhz>1.8432</ClockFrequencyMhz> <!-- only used for RTOS -->
      <Protocol>None</Protocol> <!-- None,XonXoff,RtsCts or DtrDsr. -->
      <BufferSize>2048</BufferSize> <!-- only used on RTOS -->
      <!-- Comports start at 1. -->
      <ComPort Number="1" BaseAddress="0"></ComPort>

      <!-- This is the configuration for the FrequencyConverter with stationaddress 3:-->
      <Station Address="3">
        <Inputs>
          <ChannelGroup Type="Analog" NumberOf="1" Offset="0" ModuleNr="0">
            <Channel Nr="0" Type="unsigned short" Name="Speed (Station 3)" Description="Speed in Hz" Unit="Hz">
              <Scaling>
                <Point HardwareValue="0" EngineeringValue="0.000000"></Point>
                <Point HardwareValue="40000" EngineeringValue="400.000000"></Point>
              </Scaling>
            </Channel>
          </ChannelGroup>
        </Inputs>
        <Outputs>
          <ChannelGroup Type="Analog" NumberOf="3" Offset="0" ModuleNr="1">
            <Channel Nr="0" Type="unsigned short" Name="FrequencyOut (Station 3)" Description="Output frequency">
              <Scaling>
                <Point HardwareValue="10" EngineeringValue="100.000000"></Point>
              </Scaling>
            </Channel>
            <Channel Nr="1" Type="unsigned short" Name="TorqueCurrent (Station 3)" Description="The Torque current">
              <Scaling>
                <Point HardwareValue="10" EngineeringValue="100.000000"></Point>
              </Scaling>
            </Channel>
            <Channel Nr="2" Type="unsigned short" Name="OutputCurrent (Station 3)" Description="The output
Current"></Channel>
          </ChannelGroup>
        </Outputs>
      </Station>

      <!-- This is the configuration for the FrequencyConverter with stationaddress 4:-->
      <Station Address="4">
        <Inputs>
          <ChannelGroup Type="Analog" NumberOf="1" Offset="0" ModuleNr="0">
            <Channel Nr="0" Type="unsigned short" Name="Speed (Station 4)" Description="Speed in Hz" Unit="Hz">
              <Scaling>
                <Point HardwareValue="0" EngineeringValue="0.000000"></Point>
                <Point HardwareValue="40000" EngineeringValue="400.000000"></Point>
              </Scaling>
            </Channel>
          </ChannelGroup>
        </Inputs>
        <Outputs>
          <ChannelGroup Type="Analog" NumberOf="3" Offset="0" ModuleNr="1">
            <Channel Nr="0" Type="unsigned short" Name="FrequencyOut (Station 4)" Description="Output frequency">
              <Scaling>
                <Point HardwareValue="10" EngineeringValue="100.000000"></Point>
              </Scaling>
            </Channel>
            <Channel Nr="1" Type="unsigned short" Name="TorqueCurrent (Station 4)" Description="The Torque current">
              <Scaling>
                <Point HardwareValue="10" EngineeringValue="100.000000"></Point>
              </Scaling>
            </Channel>
            <Channel Nr="2" Type="unsigned short" Name="OutputCurrent (Station 4)" Description="The output
Current"></Channel>
          </ChannelGroup>
        </Outputs>
      </Station>
    </Node>
  </IOConfig>

  <Alarms>
    <Alarm Name="Alarm OCAcc" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Overcurrent during acceleration (Station)" Description="Overcurrent during acceleration
(Station )"></Alarm>
    <Alarm Name="Alarm OCDec" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Overcurrent during deceleration" Description="Overcurrent during deceleration"></Alarm>
  </Alarms>

```

```

<Alarm Name="Alarm OCCS" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Overcurrent while running at constant speed." Description="Overcurrent while running at constant
speed."></Alarm>
<Alarm Name="Alarm GroundFault" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Ground fault" Description="Ground fault"></Alarm>
<Alarm Name="Alarm OVAcc" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Overvoltage during acceleration." Description="Overvoltage during acceleration."></Alarm>
<Alarm Name="Alarm OVDec" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Overvoltage during deceleration." Description="Overvoltage during deceleration."></Alarm>
<Alarm Name="Alarm OVCS" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Overvoltage while running at constant speed." Description="Overvoltage while running at constant
speed."></Alarm>
<Alarm Name="Alarm Undervoltage" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Undervoltage." Description="Undervoltage."></Alarm>
<Alarm Name="Alarm LIP" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Lost input phase." Description="Lost input phase."></Alarm>
<Alarm Name="Alarm FuseBlown" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Fuse blown." Description="Fuse blown."></Alarm>
<Alarm Name="Alarm OWE" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Output wiring error." Description="Output wiring error."></Alarm>
<Alarm Name="Alarm IHSQ" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Inverter heat-sink overheated" Description="Inverter heat-sink overheated"></Alarm>
<Alarm Name="Alarm EAI" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="External alarm input." Description="External alarm input."></Alarm>
<Alarm Name="Alarm ITO" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Internal temperature overheated" Description="Internal temperature overheated"></Alarm>
<Alarm Name="Alarm OODBR" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Overheat of DB resistance" Description="Overheat of DB resistance"></Alarm>
<Alarm Name="Alarm ERT01" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Electronic relay thermal overload (Motor 1)" Description="Electronic relay thermal overload (Motor
1)"></Alarm>
<Alarm Name="Alarm ERT02" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Electronic relay thermal overload (Motor 2)" Description="Electronic relay thermal overload (Motor
2)"></Alarm>
<Alarm Name="Alarm ERT0I" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Electronic relay thermal overload (Inverter)." Description="Electronic relay thermal overload
(Inverter)."></Alarm>
<Alarm Name="Alarm OverSpeed" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Overspeed." Description="Overspeed."></Alarm>
<Alarm Name="Alarm PGEror" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="PG Error." Description="PG Error."></Alarm>
<Alarm Name="Alarm MemoryError" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Memory Error." Description="Memory Error."></Alarm>
<Alarm Name="Alarm KeyPad" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="KEYPAD panel communication error." Description="KEYPAD panel communication error."></Alarm>
<Alarm Name="Alarm CPU" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="CPU Error." Description="CPU Error."></Alarm>
<Alarm Name="Alarm OCE" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Option communication error." Description="Option communication error."></Alarm>
<Alarm Name="Alarm OptionError" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Option error." Description="Option error."></Alarm>
<Alarm Name="Alarm OPE" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Operating procedure error." Description="Operating procedure error."></Alarm>
<Alarm Name="Alarm OutputPhaseError" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Output phase error." Description="Output phase error."></Alarm>
<Alarm Name="Alarm CommErr" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="RS485 Communication error." Description="RS485 Communication error."></Alarm>
<Alarm Name="Alarm CSED" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Checksum error detected." Description="Checksum error detected."></Alarm>
<Alarm Name="Alarm PED" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Parity error detected" Description="Parity error detected"></Alarm>
<Alarm Name="Alarm UED" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Unknown error detected." Description="Unknown error detected."></Alarm>
<Alarm Name="Alarm FED" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Format error detected." Description="Format error detected."></Alarm>
<Alarm Name="Alarm CENCM" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Command error, no command matched." Description="Command error, no command matched."></Alarm>
<Alarm Name="Alarm POLED" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Priority of link error detected." Description="Priority of link error detected."></Alarm>
<Alarm Name="Alarm NWPITM" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="No write permission in this mode." Description="No write permission in this mode."></Alarm>
<Alarm Name="Alarm FCE" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Function code error" Description="Function code error"></Alarm>
<Alarm Name="Alarm FWD" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Forbidden write detected." Description="Forbidden write detected."></Alarm>
<Alarm Name="Alarm DataError" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Data error." Description="Data error."></Alarm>
<Alarm Name="Alarm EDW" Group="" Level="Error" Trig="0" Enabled="1" EnabledState="" Signal="" Inverted="0"
SignalOutSet="" Text="Error during write." Description="Error during write."></Alarm>
</Alarms>
<Signals>
<Signal Name="Send-Receive Roundtrip time" Unit="s" Type="double" Description="The time needed to perform one send and
receive."></Signal>
</Signals>
<Parameters>
<Parma Name="AlarmAckSendsReset" Value="1" DefaultValue="0" Description="Set to 1 to automatically send alarm reset to
station when all its alarms have been acked." PreviousValue="0" TimeLastChanged="Sun Jun 11 16:57:49 2006" Unit=""></Parma>
<Parma Name="ContinueAfterAlarmReset" Value="1" DefaultValue="0" Description="Set to 1 to continue previous operation
after an alarm reset." PreviousValue="0" TimeLastChanged="Sun Jun 11 17:38:09 2006" Unit=""></Parma>
</Parameters>
<Subcomponents></Subcomponents>
<RemoteComponents></RemoteComponents>
</Component>
    
```