Using the WAGO 750-655 AS-i Module with the SMLC
Introduction

The AS-interface master module 750-655 is used to integrate the AS-interface network into the WAGO-I/O-SYSTEM 750.

The AS-interface master module 750-655 behaves as a master for the AS-interface and as a slave for the field bus. It complies with the new AS-interface specification 2.1. This means that:
• up to 62 AS-interface slaves can be connected to the master
• the transmission of analog values is integrated within the masters
• all other functions of the new specification, such as the evaluation of peripheral errors, are also implemented

The SMLC’s PLC Configuration supports using the 750-655 with any of the 750 Series Ethernet bus couplers.
2.1.2.1 Grouping of AS-interface Master Modules

Note
A maximum of three AS-interface master modules can be incorporated into one fieldbus node!

A single AS-interface master module 750-655 can be placed at any position in the node. However, if two or three modules are to be placed in direct vicinity to each other in one node, they must be placed at the end of the node since in that case power for the field supply should not be derived from the power jumper contacts of the AS-interface master modules. Also, the power for the AS-interface module must not be supplied via the CAGE CLAMP® connections of the modules but must be fed in either between AS-interface master module and the slaves or between the slaves.

Fig. 2.1.2-7: Node design with 2 AS-interface modules
The 750-655 can be configured in several different operating modes. In each of these modes various process image sizes can be selected, allowing access to increasing numbers of AS-i slaves.

The SMLC requires that the 750-655 be configured in operating Mode 1 - permanently configured mailbox.

<table>
<thead>
<tr>
<th>Mode 1</th>
<th>Mode 2.1</th>
<th>Mode 2.2</th>
<th>Mode 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>permanently configured mailbox (normal mode)</td>
<td>overlapping mailbox activated</td>
<td>overlapping mailbox deactivated</td>
<td>register communication</td>
</tr>
<tr>
<td>Control/Status (1 byte, byte 0)</td>
<td>Control/Status (1 byte, byte 0)</td>
<td>Control/Status (1 byte, byte 0)</td>
<td>Control/Status (1 byte, byte 0)</td>
</tr>
<tr>
<td>Internal use (1 byte, byte 1)</td>
<td>Internal use (1 byte, byte 1)</td>
<td>Internal use (1 byte, byte 1)</td>
<td>Internal use (1 byte, byte 1)</td>
</tr>
<tr>
<td>Mailbox (acyclical data, 0-18 bytes long, bytes 2 to n)</td>
<td>Mailbox (acyclical data, 6-18 bytes long, bytes 2 to n)</td>
<td>Process data (cyclical data, 0-32 bytes long, bytes 2 to m)</td>
<td>Register data (2 bytes, bytes 2 to 3)</td>
</tr>
<tr>
<td>Process data (cyclical data, 0-32 bytes long, bytes n+1 to m) (take validity of data into account!)</td>
<td>Process data (cyclical data, 0-32 bytes long, bytes n+1 to m)</td>
<td>Invalid data (bytes 4 to m)</td>
<td></td>
</tr>
</tbody>
</table>
While the 750-655 can be configured for many different process image sizes the SMLC supports a limited number of these.

In the SMLC’s PLC Configuration you can select from the following Mode 1 possible configurations:

- 24 byte process image, 6 byte mailbox
- 12 byte process image, 6 byte mailbox
- 12 byte process image, 0 byte mailbox
- 40 byte process image, 0 byte mailbox
- 48 byte process image, 12 byte mailbox

The 0 byte mailbox configurations only support digital slaves. If you intend to use analog slaves you need to select a configuration with a non-zero length mailbox.

The table at the right shows all of the possible Mode 1 configurations. The SMLC only supports those listed above!
In order to decide which configuration you should insert into the SMLC’s PLC Configuration consider how many slave devices you intend to use and whether they are all digital or if you will have some analog devices.

If you are going to use analog device you must use one of the configuration that supports the mailbox.

If you are going to use all digital devices you can pick one of the configurations with a 0 byte mailbox. The advantage of the 0 byte mailbox is that the AS-i module will take up less memory in the bus coupler’s process image, allowing you to install more I/O modules. Remember that the bus coupler is limited to 255 bytes of inputs and 255 bytes of outputs and a maximum of 64 modules.

For example: if you know that you will have less then 20 digital AS-i devices and no analog devices then selecting the 12 byte process image with a 0 byte mailbox is sufficient.

The table below shows how many slave devices can be supported for a given configuration. 7A indicates 7 slaves on the A bus. 31A/31B indicates 31 slaves on the A bus and 31 slaves on the B bus, etc.

<table>
<thead>
<tr>
<th>Process image size (bytes)</th>
<th>Mailbox length 0 bytes</th>
<th>Mailbox length 6 bytes</th>
<th>Mailbox length 12 bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>19A</td>
<td>7A</td>
<td>-</td>
</tr>
<tr>
<td>24</td>
<td>-</td>
<td>31A</td>
<td>-</td>
</tr>
<tr>
<td>40</td>
<td>31A/31B</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>48</td>
<td>-</td>
<td>-</td>
<td>31A/31B</td>
</tr>
</tbody>
</table>
In order to configure the 750-655 AS-i module and to assign the slave device IDs you need to use the WAGO I/O Check software (759-302). Connect the WAGO programming cable (750-920) to the bus coupler and to a free serial port on your computer.

**NOTE:** If the Ethernet cable is plugged into the bus coupler, unplug it. WAGO I/O Check will not allow you to configure the bus coupler while the fieldbus is active!

The following steps are necessary to prepare a communication connection:

- Switch off the voltage supply of the bus coupler / -controller.
- Open the cover of the configuration interface of the bus coupler / -controller.

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**Warning!**

*Do not touch the contacts of the configuration interface!*

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- Connect the configuration interface with the attendant plug of the communication cable 750-920.
- Connect the D-Sub plug of the communication cable to a free serial interface of the PC.
- Switch on the voltage supply of the bus coupler / -controller again.
Start WAGO-I/O-Check configure the I/O Check COM port using the Settings menu.

In this example the cable is connected to COM2.
Start WAGO-I/O-Check and click on the Node Configuration icon to read the current configuration. In this example we only have the 750-655 AS-i module and a 750-600 end module connected to a 750-342.
Click on the Settings button to configure the process image and mailbox size. The default settings are 24 byte process image and 6 byte fixed mailbox. The SMLC supports this configuration and this selection allows you to access up to 31 AS-i slaves.

The SMLC does **not** support the Overlapped Mailbox so do not check this.

If you change any of the settings click the Apply button to send the new configuration to the bus coupler.
Select the Direct Control mode
Click on the Process Data button to configure the AS-i network
The Master Configuration screen shows the current AS-i network and any connected slaves.

By selecting a slave you can monitor its inputs and toggle its outputs.
Suppose we want to change the address of Slave 1A to 2A. Check the Configuration Active (CA) box and then enter the new address (2A) and click the Set button.
Note that the network view shows <Slave missing> for 1A and the Configuration OK LED is red. Click on the Store Config button.
Now the slave address has been re-assigned and the Configuration OK LED is green.
Uncheck Configuration Active (CA) and close the window.
Quite WAGO I/O Check, reconnect the Ethernet cable to the bus coupler and start CoDeSys.

Add a WAGO Ethernet bus coupler to your PLC Configuration and set the IP address.

In this example the WAGO bus coupler’s IP Address is 192.168.1.12
Right click on the Fieldbus Coupler in the SMLC’s PLC Configuration and select Append Subelement.

The menu expands to show all available Wago modules. The various configurations of the 750-655 AS-i modules that can be selected.
For this example we will use the default configuration of a 24 byte process image with a 6 byte mailbox.

The PLC Configuration tree now shows the AS-i module with 24 input bytes and 24 output bytes. The comment fields for each byte are useful in determining what each byte is.

For our I/O what we are interested in are the device IDs of the slaves on the AS-i network: 1A, 2A, 3A etc.

Each AS-i slave has 4 bits of inputs and 4 bits of outputs available.
It may be helpful to assign variable names to each bit that indicate the AS-i ID and bit number.

In this example the input Flag bits are also given names.
If you wish to name the output flag bits as well an example is shown below. Notice that we are on the output (Q) channels now.

```plaintext
AT %IB28: BYTE; (* 30A/31A *) [CHANNEL (Q)]
AT %QB3: BYTE; (* Control *) [CHANNEL (Q)]
AT %QB4: BYTE; (* Internal *) [CHANNEL (Q)]
AT %QB5: BYTE; (* Mailbox1 *) [CHANNEL (Q)]
AT %QB6: BYTE; (* Mailbox2 *) [CHANNEL (Q)]
AT %QB7: BYTE; (* Mailbox3 *) [CHANNEL (Q)]
AT %QB8: BYTE; (* Mailbox4 *) [CHANNEL (Q)]
AT %QB9: BYTE; (* Mailbox5 *) [CHANNEL (Q)]
AT %QB10: BYTE; (* Mailbox6 *) [CHANNEL (Q)]
AT %QB11: BYTE; (* Flags/1A *) [CHANNEL (Q)]
    io_1A_Out1 AT %QX5.8: BOOL; (* Bit 0 *)
    io_1A_Out2 AT %QX5.9: BOOL; (* Bit 1 *)
    io_1A_Out3 AT %QX5.10: BOOL; (* Bit 2 *)
    io_1A_Out4 AT %QX5.11: BOOL; (* Bit 3 *)
    io_FLAG_offline AT %QX5.12: BOOL; (* Bit 4 *)
    io_FLAG_LOS_Master AT %QX5.13: BOOL; (* Bit 5 *)
    io_FLAG_SetSetupMode AT %QX5.14: BOOL; (* Bit 6 *)
    io_FLAG_SetProtectedMode AT %QX5.15: BOOL; (* Bit 7 *)
AT %QB12: BYTE; (* 2A/3A *) [CHANNEL (Q)]
AT %QB13: BYTE; (* 4A/5A *) [CHANNEL (Q)]
AT %QB14: BYTE; (* 6A/7A *) [CHANNEL (Q)]
```
If you intend to use Analog I/O it is necessary to use the WAGO ASInterface CoDeSys library (ASInterface_01.lib), which is available for download on the WAGO web site. Application notes on using this library are also available on the WAGO web site.

This library contains several function blocks that can perform advanced diagnostic commands using the mailbox interface. If you intend to use this library you must select a configuration with a non-zero mailbox length.

For more information on mailbox commands and additional details on the WAGO 750-655 AS-interface master module refer to the WAGO 750-655 manual.