

14.3 IEC 60870-5-101 Slave

Configuring datapoints (slave)

The IEC 60870-5-101 Slave in WCC Lite has to be configured in Excel. This configuration contains two Excel sheets where parameters must be filled in *Devices* and *Signals*.

IEC 60870-5-101 slave parameters for Devices tab

| Parameter | Type | Description | Required | Default value (when not specified) | Range | |
|--------------|---------|---|----------|---------------------------------------|---|-------|
| | | | | | Min | Max |
| name | string | User-friendly name for a device | Yes | | | |
| description | string | Description of a device | No | | | |
| device_alias | string | Alphanumeric string to identify a device | Yes | | | |
| enable | boolean | Enabling/disabling of a device | No | 1 | 0 | 1 |
| protocol | string | Protocol to be used | Yes | | IEC 60870-5-101 slave | |
| device | string | Communication port | Yes | | PORT1 | PORT2 |
| baudrate | integer | Communication speed (bauds/s) | No | 9600 | 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 | |
| databits | integer | Data bit count for communication | No | 8 | 6 | 9 |
| stopbits | integer | Stop bit count for communication | No | 1 | 1 | 2 |
| parity | string | Communication parity option | No | none | none, even, odd | |
| flowcontrol | string | Number of requests, before the link is considered lost (device status signals are changed) and reconnect attempt will be issued | No | none | none | |
| link_address | integer | Destination address when in transmit and source address when broadcasting | Yes | | 0 | 65535 |
| link_size | integer | Link address size in bytes | No | 1 | 1 | 2 |
| asdu_size | integer | Common address size in bytes | No | 1 | 1 | 2 |

| | | | | | | |
|--------------------|---------|---|-----|-----|---|---------|
| ioa_size | integer | Information object address (IOA) size in bytes | No | 2 | 1 | 3 |
| cot_size | integer | Cause of transmission (COT) size in bytes | No | 1 | 1 | 2 |
| time_sync | boolean | Allow time synchronization, 1 to enable and 0 to disable | No | 0 | 0 | 1 |
| message_size | integer | Maximum length of a message | Yes | 253 | 0 | 255 |
| cache_size | integer | Maximum number of events to store in a buffer | No | 100 | 0 | 1000 |
| respond_delay | integer | Time in microseconds to wait before sending responses | Yes | 100 | 0 | 1000000 |
| single_byte_ack | boolean | Use single character acknowledge, 1 to enable and 0 to disable | No | 0 | 0 | 1 |
| keep_alive_timeout | integer | Time interval in seconds before serial connection is considered offline | No | 60 | | |

keep_alive_timeout timer is used for the connection tracker to display protocol status. This parameter does not affect protocol functionality and only tracks its status in the connection tracker.

IEC 60870-5-101 slave parameters for Signals tab

| Parameter | Type | Description | Required | Default value (when not specified) | Range | |
|-----------------------|---------|---|--------------|---------------------------------------|-------|-----|
| | | | | | Min | Max |
| signal_name | string | User-friendly signal name | Yes | | | |
| device_alias | string | Alphanumeric string to identify a device | Yes | | | |
| signal_alias | string | Unique alphanumeric name of the signal to be Yes used | Yes | | | |
| source_device_alias | string | device_alias of a source device | For commands | | | |
| source_signal_aliases | string | signal_alias of a source signal | For commands | | | |
| enable | boolean | Enabling/disabling of an individual signal | No | 1 | 0 | 1 |
| log | integer | Allow signal to be logged. If the log is 0, the signal will not be logged. If the log is more than 0, the signal will be logged | No | 0 | | |

| | | | | | | |
|--------------------|---------|--|-----|---|---|---|
| gi | boolean | Including/excluding (1 or 0) signals from General Interrogation | No | 0 | 0 | 1 |
| common_address | integer | Address of a destination device | Yes | | | |
| info_address | integer | Information object address | Yes | | | |
| data_type | integer | ASDU type identifier | Yes | | | 1, 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, 14, 30, 31, 32, 34, 35, 36, 45, 46, 47, 48, 49, 50, 58, 59, 60, 61, 62, 63 |
| periodic_update_ms | integer | Signal value is published periodically according to the value set. | No | - | - | |

Device status signals

IEC 60870-5-101 has an additional signal which can be configured to show communication status. It indicates if the master device has disconnected from the slave (WCC Lite). To configure such signal for IEC 60870-5-101 protocol, `job_todo` and `tag_job_todo` fields with string values are required. For IEC 60870-5-101 slave required parameters for status, signal will be **signal_name device alias, signal alias, common_address, info_address, data_type, job_todo** and **tag_job_todo**. `job_todo` value must be `device_status` and for `tag_job_todo` there are 4 variations: `communication_status`, `device_running`, `device_error`, `unknown_error`. Each signal has 4 possible values and is based on the same logic. If the signal returns the value of 0, it means an unknown error has appeared, 1 – the device or protocol connection is on and working properly, 2 – the device is off or protocol is disconnected, and 3 – the error or service is down.

Debugging an IEC 60870-5-101 slave application

If the configuration for IEC 60870-5-101 devices is set up, the handler for the protocol will start automatically. If the configuration is missing parameters or contains errors, the protocol will not start. It is done intentionally to decrease unnecessary memory usage.

If IEC 60870-5-101 does not work properly (e.g. no communication between devices, data is corrupted, etc.), a user can launch a debug session from the command-line interface and find out why the link is not functioning properly. To launch a debugging session, a user should stop the `iec101-slave` process and run the `iec101-slave` command with respective flags as shown in the table below.

Procedure for IEC 60870-5-101 slave service debugging:

- **Step 1:** Service must be stopped by entering the following command into the WCC Lite: **`/etc/init.d/iec101-slave stop`**
- **Step 2:** After the service is stopped it must be started with the preferred configuration file (JSON files found in `/etc/` folder) and a debug level 7:**`iec101-slave-c /etc/iec101-slave/iec101slave.json -d7`** Additional output forming options are described here: [Command line arguments](#).
- **Step 3:** Once the problem is diagnosed normal operations can be resumed with the following command: **`/etc/init.d/iec101-slave start`**

IEC 60870-5-101 command line debugging options

```
-h [ -help ] Display help information
-V [ -version ] Show version
-d<debug level> Set debugging level
-c [ -config ] Config path
-r [ -raw ] Show raw telegram data
-f [ -frame ] Show frame data
-R [ -readyfile ] Ready notification file
```