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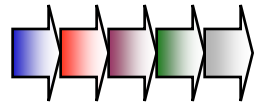

EN/IEC60870 Configuration basics

General

The EN/IEC60870 Code Generator is the program that takes all the information entered in an Excel sheet and generates the STRATON application program code. Optionally the program can in addition be compiled, downloaded and started to run in the RTU32.

User Interface

The Code generator user interface is designed to be simple.
A normal user should only use the Generate bottom to activate the code generation. The code generator provides 3 possibilities;

- Generate new or update an existing EN/IEC60870 application and download it directly to your RTU32.
- Generate new or update an existing EN/IEC60870 application and start STRATON WorkBench for edition and creating additional application program.

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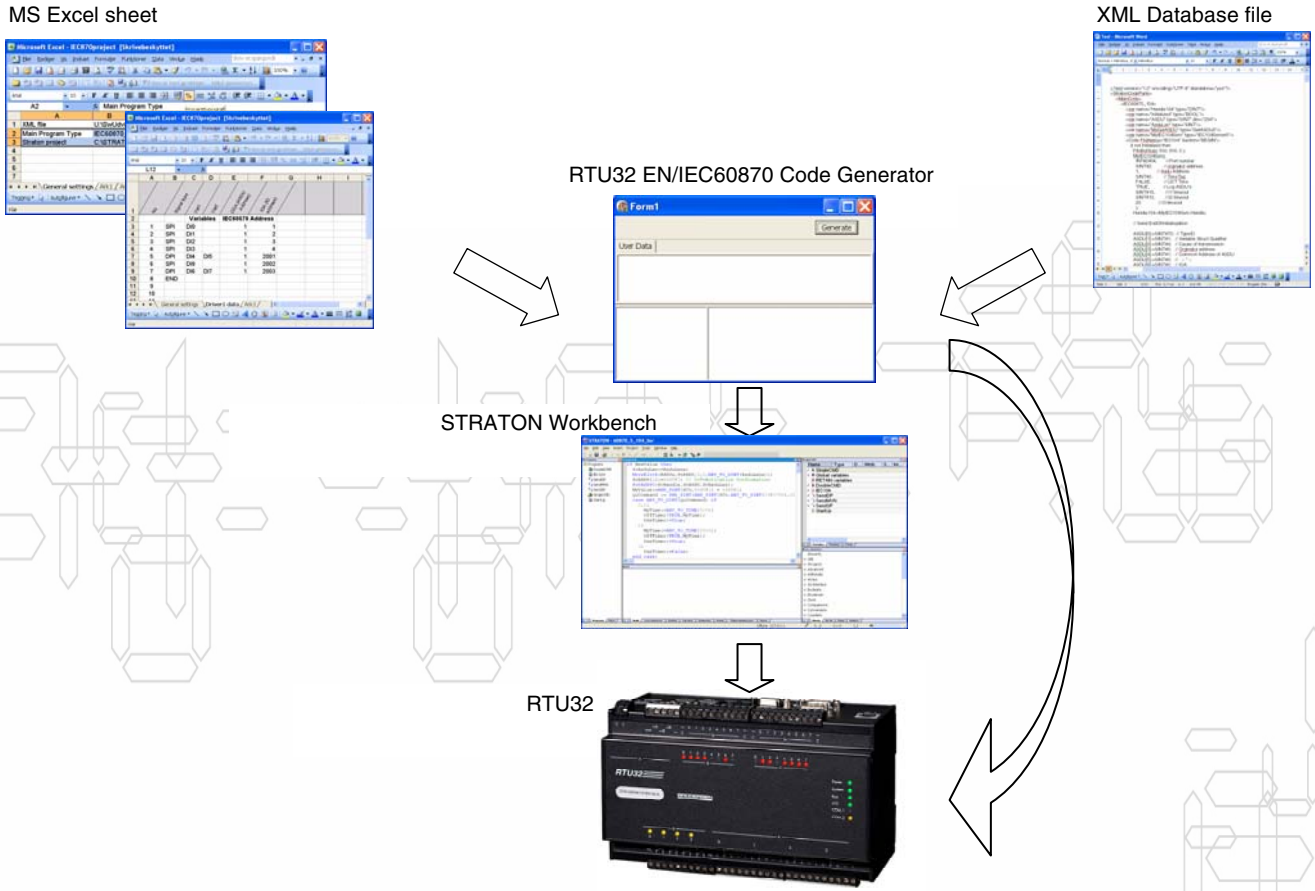
Block Diagram

The figure below shows Configurator tool components and their links.



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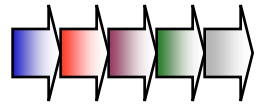


RTU32 EN/IEC60870 Configurator Elements

Excel Sheet

The EN/IEC60870 driver parameters, variables and ASDU types are entered by the user in an Excel sheet. Brodersen provide a standard Excel sheet for setting up all necessary parameters in an RTU32 driver, but you can if required define or use your own Excel sheet if you meet some basic syntax requirements.

EN/IEC60870 Code Generator

The EN/IEC60870 Code Generator is the STRATON program generator which takes user configuration values defined in a MS Excel sheet and build up a STRATON program, download it to the RTU32 and get it started. As the Code Generator uses the STRATON compiler, it is required that the STRATON WorkBench is installed on your PC.

XML Database File

All standard STRATON code including basic driver settings and functions, and definitions of Excel sheet data readings are stored in a XML file.

The database XML file does include almost all settings used by the Configurator Tool – formatted and in clear text. An experienced user can enter own special configuration parameters to this XML file.

Supported EN/IEC60870 Drivers in the Configurator

The present configurator supports the following EN/IEC60870 drivers;

- **EN/IEC60870-5-101 Slave**.
- **EN/IEC60870-5-104 Server**.

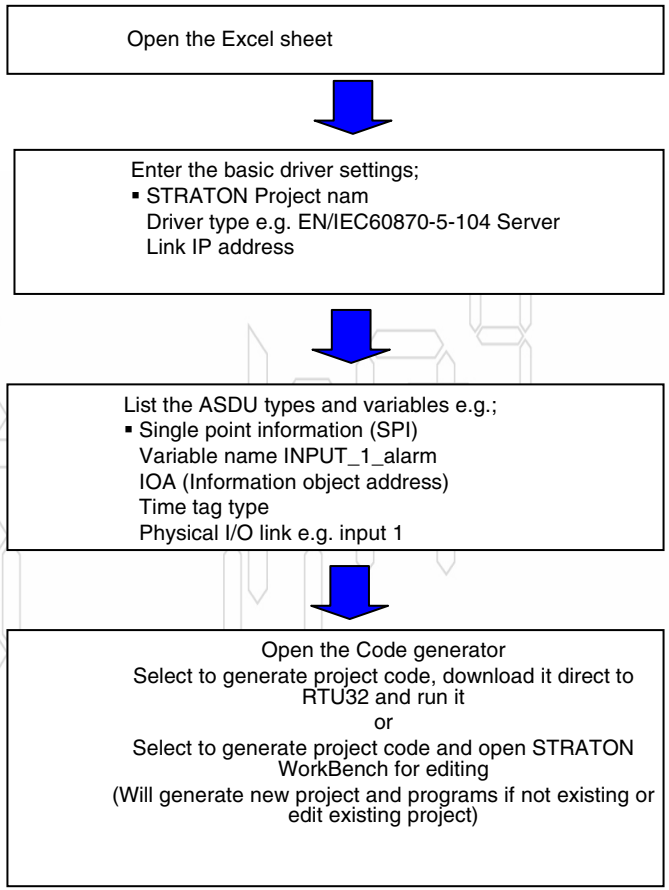
The RTU32 EN/IEC60870 Interoperability documents define all driver parameters supported by the EN/IEC60870 Configurator program.

The Interoperability does NOT reflect the basic STRATON link driver options as the application layer is built up in STRATON and supports almost any possible function defined in the EN/IEC60870-5-101 and -104 standards.

EN/IEC60870 Configurator for RTU32

Work Flow

When developing an EN/IEC60870 Driver in the RTU32, the work flow would be as shown below;



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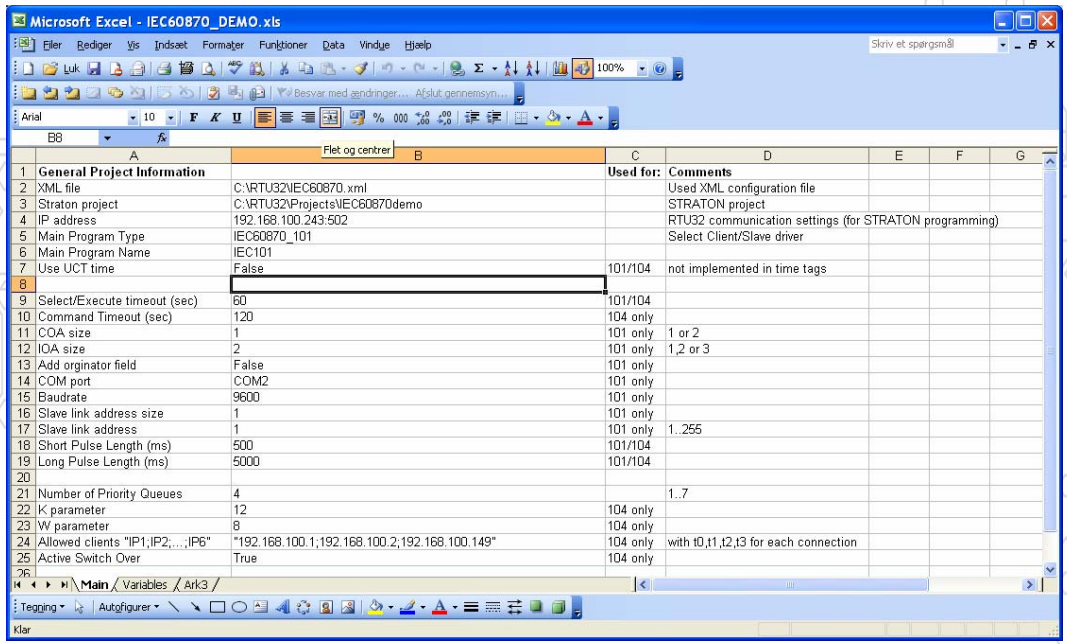
MS Excel File – the User Interface

Work Sheet Structure

The Excel file will include minimum 2 work sheets; Main and specific driver data configuration

Work Sheet - Main

In the Main work sheet all basic driver setting are entered – see figure below:



	A	B	C	D
1	**General Project Information**		**Used for:**	**Comments**
2	XML file	C:\RTU32\IEC60870.xml		Used XML configuration file
3	Straton project	C:\RTU32\Projects\IEC60870demo		STRATON project
4	IP address	192.168.100.243:502		RTU32 communication settings (for STRATON programming)
5	Main Program Type	IEC60870_101		Select Client/Slave driver
6	Main Program Name	IEC101		
7	Use UCT time	False	101/104	not implemented in time tags
8				
9	Select/Execute timeout (sec)	60	101/104	
10	Command Timeout (sec)	120	104 only	
11	COA size	1	101 only	1 or 2
12	IOA size	2	101 only	1,2 or 3
13	Add orginator field	False	101 only	
14	COM port	COM2	101 only	
15	Baudrate	9600	101 only	
16	Slave link address size	1	101 only	
17	Slave link address	1	101 only	1..255
18	Short Pulse Length (ms)	500	101/104	
19	Long Pulse Length (ms)	5000	101/104	
20				
21	Number of Priority Queues	4		1..7
22	K parameter	12	104 only	
23	W parameter	8	104 only	
24	Allowed clients "IP1;IP2;...;IP6"	"192.168.100.1;192.168.100.2;192.168.100.149"	104 only	with t0,t1,t2,t3 for each connection
25	Active Switch Over	True	104 only	
26				

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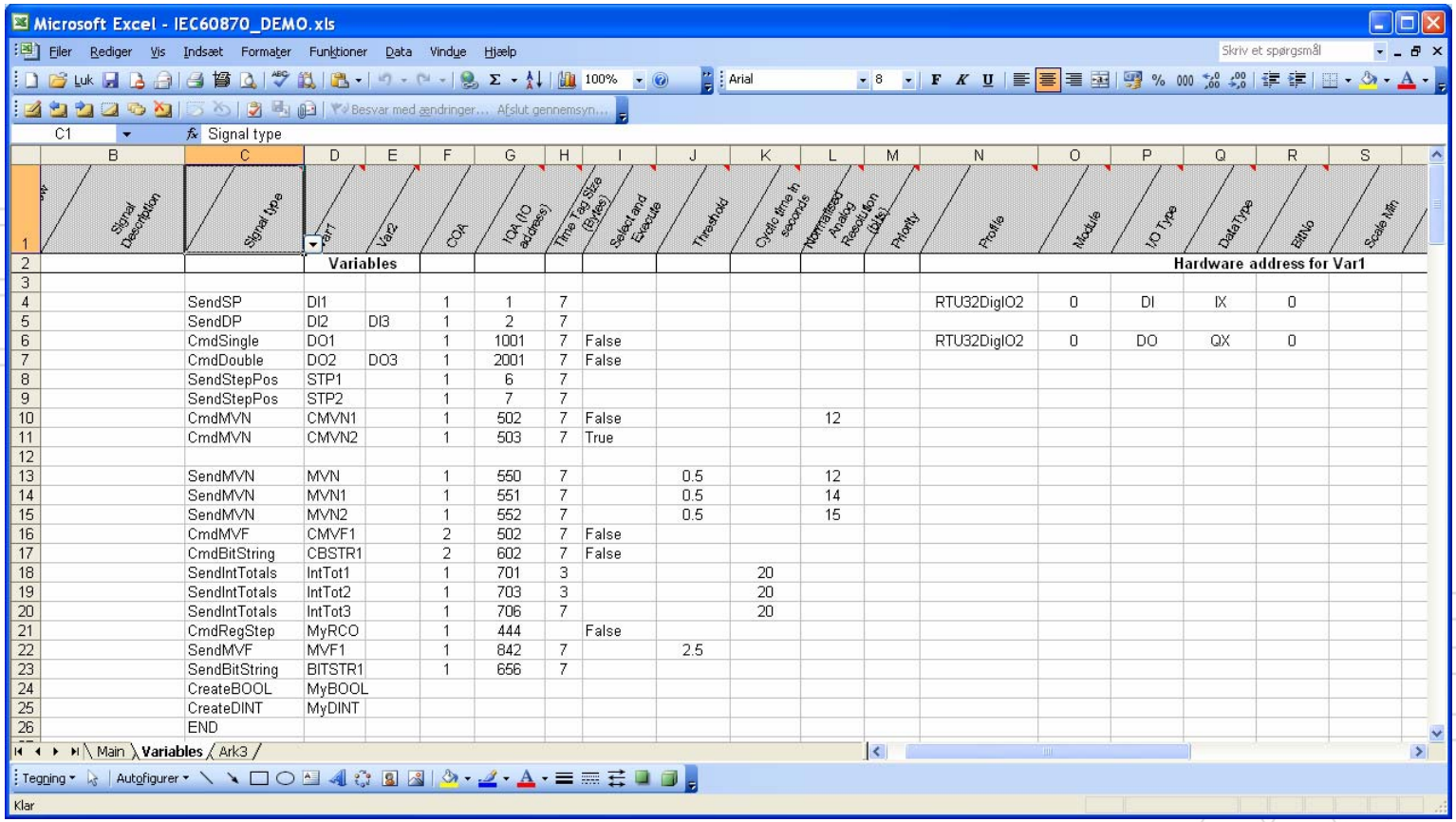
Work Sheet example– 104

The work sheets after the Main define the specific driver data settings:



Microsoft Excel - IEC60870_DEMO.xls

C1: Signal type

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Signal Description	Signal type	Var1	Var2	COA	IOA (IO address)	Time Tag Size (Bytes)	Select and Execute	Threshold	Cyclic time in seconds	Normalized Analog Resolution (bits)	Priority	Profile	Module	I/O Type	DataType	BitNo	Scale Min
2			Variables										Hardware address for Var1					
3																		
4		SendSP	DI1		1	1	7						RTU32DigIO2	0	DI	IX	0	
5		SendDP	DI2	DI3	1	2	7											
6		CmdSingle	DO1		1	1001	7	False					RTU32DigIO2	0	DO	QX	0	
7		CmdDouble	DO2	DO3	1	2001	7	False										
8		SendStepPos	STP1		1	6	7											
9		SendStepPos	STP2		1	7	7											
10		CmdMVN	CMVN1		1	502	7	False			12							
11		CmdMVN	CMVN2		1	503	7	True										
12																		
13		SendMVN	MVN		1	550	7		0.5		12							
14		SendMVN	MVN1		1	551	7		0.5		14							
15		SendMVN	MVN2		1	552	7		0.5		15							
16		CmdMVF	CMVF1		2	502	7	False										
17		CmdBitString	CBSTR1		2	602	7	False										
18		SendIntTotals	IntTot1		1	701	3			20								
19		SendIntTotals	IntTot2		1	703	3			20								
20		SendIntTotals	IntTot3		1	706	7			20								
21		CmdRegStep	MyRCO		1	444		False										
22		SendMVF	MVF1		1	842	7		2.5									
23		SendBitString	BITSTR1		1	656	7											
24		CreateBOOL	MyBOOL															
25		CreateDINT	MyDINT															
26		END																

Main | Variables | Ark3

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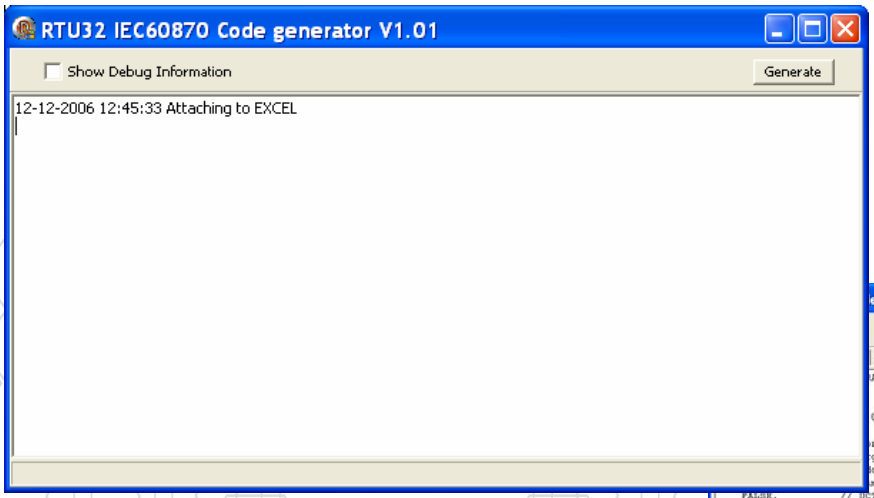
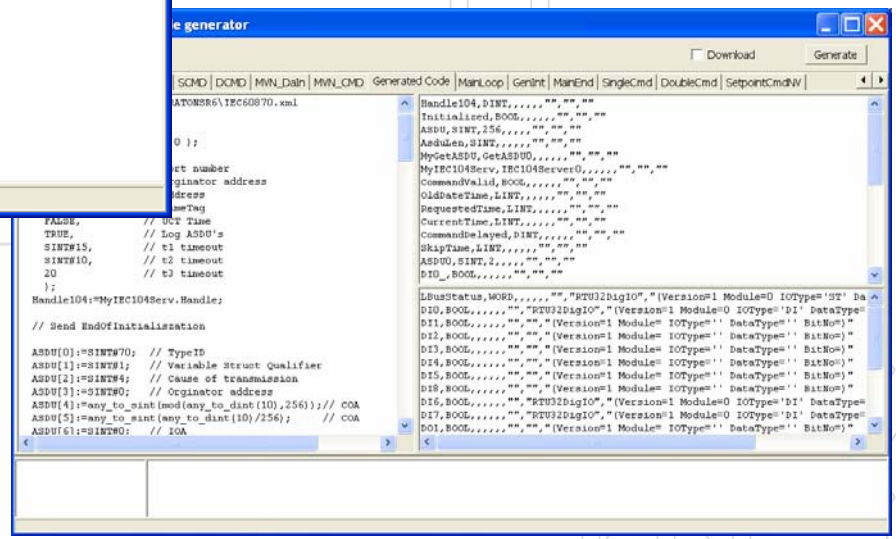
Code generator





Code Generation Details

The code generator is using all the data and settings defined in the Excel sheet to generate a STRATON application program. All settings and references for the code generation which is not defined in the Excel sheet are defined in the XML database file. See XML database file section for details.

When you activate the code generation it will search for the STRATON project defined in the Excel sheet. If there is a STRATON project, it will open it and **ADD** the EN/IEC60870 driver code to this project in Structured Text (ST).

If there is no existing STRATON project, the generator will create a new project according to the name defined in the Excel sheet.

Code generation status and compiling/download status will be listed in event log windows.

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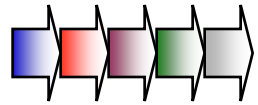


The XML Database File

General

The XML file is a database file for the Code Generator. It includes more or less all settings for the Code Generator which are not entered in the Excel sheet.

XML File Structure

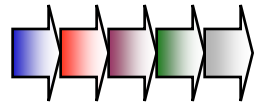
The XML file is divided in 3 basic sections;

- XML file section <Main code>
- XML file section <FunctionBlocks>
- XML file section <SignalTypes>
- XML file section <Macros>

XML File Section <Main code>

This section includes;

- All main code for the different EN/IEC60870 driver types supported by the Configurator.
- Details of Excel user input file. Specifications like work sheet name, row and columns where data is stored.



XML File Section <FunctionBlocks>

This section includes;

- STRATON function blocks for the supported ASDU data types

XML File Section <SignalTypes>

This section includes;

- Definitions of the different variable types in STRATON
- Definitions of all the ASDU types supported by the Configurator.

XML File Section <Macros>

This section includes macros for non systematic parts like;

- Macros for TimeTag handling
- Macros for Select and Execute functions.

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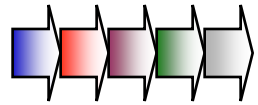

Enhanced functions for the EN/IEC60870-5-104 Server

The RTU32 supports the latest EN/IEC60870-5-104 protocol specification, that include:

Up to 6 redundancy groups

- Each redundancy group has up to 8 prioritized transmission data queues.
- Each redundancy group is generated in a separate Excel sheet.

Each redundancy group support up to 6 Client connections

- The Clients are specified as allowed IP connections.
- Timing setting can be adjusted individually for each Client connection
- The EN/IEC60870-5-104 Server support up to 6 local COA's. This means that the RTU32 can be given up to 6 different COA addresses which is assigned in the IOA list in the Excel sheet.

Data transmission in Reverse Direction

- The actual Server link connection can receive and monitor data send in reverse direction – just like it was working as a Controlling Station (Client).