

EPICS Database Configuration and Setup

Source File Annotation

OPC Server Setup

Both the OPC and the EPICS configuration can be automatically generated from the global variable file of the TwinCAT PLC. The OPC configuration uses special comment lines, bracket by "(*~" and "*)", to specify which channel are exported through the OPC server as well as some additional parameters such as the access right. This is documented [here](#).

For us interesting are the following properties:

```
L1PEM_LTEMP: LREAL;
(*~ (OPC          : 1          : Make variable visible for OPC-Server)
    (OPC_PROP[0005] : 1          : OPC_PROP_RIGHTS, here read only access)
    (OPC_PROP[0100] : C          : OPC_PROP_UNIT, unit string, EGU)
    (OPC_PROP[0101] : LVEA temperature : OPC_PROP_DESC, description, DESC)
    (OPC_PROP[0102] : 30          : OPC_PROP_HIEU, high operations value, HOPR)
    (OPC_PROP[0103] : 10          : OPC_PROP_LOEU, low operations value, LOPR)
    (OPC_PROP[0104] : 100         : OPC_PROP_HIRANGE, absolute maximum value, DRVH)
    (OPC_PROP[0105] : -40         : OPC_PROP_LORANGE, absolute minimum value, DRVL) *)

_L1PEM_LSW1 AT %QX0.0: BOOL = FALSE;
(*~ (OPC          : 1          : Make variable visible for OPC-Server)
    (OPC_PROP[0005] : 3          : OPC_PROP_RIGHTS, here read and write access)
    (OPC_PROP[0101] : Light switch : OPC_PROP_DESC, description, DESC)
    (OPC_PROP[0106] : ON          : OPC_PROP_CLOSE, name for closed state, ONAM)
    (OPC_PROP[0107] : OFF         : OPC_PROP_OPEN, name for open state, ZNAM) *)
```

The above OPC properties will be read by the EPICS database generator program regardless, whether these properties are actually supported by the OPC server.

A comment to the notation:

- The opening comment sequence "(*~" can not contain any spaces in between.

- Each OPC command has to be surrounded by parenthesis containing a triplet of properties or values separated by colons.
- The first item is the property as listed above.
- The second item is its value.
- The third item is a comment. In the above example they indicate the corresponding EPICS fields.

The access right can either be read-only (1) or read/write (3); write-only (2) is not supported by EPICS and should be avoided. Read/write privileges are default. The minimum string to add a variable to the OPC server has the form of

```
(*~ (OPC : 1 : available for OPC-Server) *)
```

If it is read-only, the access right should be specified as well and set to 1.

EPICS Database Configuration

The EPICS database configuration follows a similar form as the OPC setup. In order to add a channel to the EPICS database a special comment line, bracket by "(*&" and "*)", is used. Since a variable has to be exported by the OPC server in order to be available by EPICS, this comment has to follow the OPC comment immediately. The EPICS comment lists a series of database fields with their corresponding value. The value is separated from the field by a colon. The individual field specifications are separated from each other by white space characters. Example

```
L1PEM_LTEMP: LREAL;  
(*~ 'same as above' *)  
(*& PREC: 1 LOLO: 20 LOW: 23 HIGH: 27 HIHI: 30 *)
```

Here we specify the default display precision and some alarm values in addition to the values that have already been specified in the OPC setup. The minimum setup string that triggers an EPICS record is

```
(*&*)
```

The above channel name will be distributed through EPICS as "L1:PEM-LTEMP". We have automatically inserted a colon after the site and interferometer tags, and we have changed the underscore character that separates the system name from the remainder with a dash. Any leading underscores will also be removed in the process. This is the default behaviour and it is recommended that the PLC program follows this standard in naming global variables. In cases this is not possible the name can be explicitly specified by

```
IAMnotFOLLOWINGanyCONVENTION; (*~ (OPC : 1 : ) *)
(*& NAME: "L1:PEM-ANYTHING" *)
```

Notice, that the value is enclosed in double quotes. Any value string that contains a colon, a white space or an asterisk needs to be enclosed by double quote characters.

If a field is multiple defined, the later definition takes precedence. Normally, an input record is defined as a read-only OPC variable and the PINI field is set to "1". An output record will be defined with read/write access and the PINI field defaults to "0". The default behaviour is to take the timestamp of the OPC server and use it in the EPICS server, meaning the TSE field has been set to "-2". The default value of the DTYP field is "opc". It can be overwritten with "opcRaw" when it makes sense. The fields SCAN, DOL and INP will always be set by the generator program and can not be changed.

Only a couple of EPICS record types are supported by the OPC/EPICS server: bi, bo, ai, ao, longin, longout, stringin, stringout, mbbi, mbbo, mbbiDirect, and mbboDirect. Depending on the PLC variable type, the default behaviour is to convert

SINT, INT, DINT, LINT, USINT, UINT, UDINT, ULINT, BYTE, WORD, DWORD, LWORD	→ longin/longout
REAL, LREAL	→ ai/ao
BOOL	→ bi/bo
STRING	→ stringin/stringout
any other	→ ai/ao

This is not always the desired option and it can be overridden using the TYPE field. Depending whether it is an input or output field the correct IO type will be selected automatically.

Global configuration options

The most useful global configuration option is the ability to specify the name of the OPC server. Meaning

```
(*& _DEFOPC: hlex **)
```

will prefix the opc variable names by "h1ex." This option is typically used at the top of the global variable definitions. Also notice the use of double asterisks in the closing parenthesis. This will prevent the generation of an EPICS record. Other global options are

```
(*& _DEFTSE: 0 _ALLOPC: ON **)  
(*& _ALLOPC: OFF **)
```

The first one will change the default time stamp source selected in the TSE field to the EPICS server. The later two options will turn on or off the automatic generation of an EPICS database record for all variables exported to OPC. When ALLOPC is ON, an EPICS comment is no longer necessary, but can still be provided to set field values. When generating EPICS records automatically one can use the

```
(*&**)
```

combination to prevent it.

Examples

Input	Output
📄example input file	📄EPICS database output

How to use it

Open the PLC project and go to global variables page. Check that all the OPC and EPICS annotations are as they need to be. No use the export menu command to write a text file. Alternatively, the text can just be copy/pasted into the separate file. Assuming that text file with the global variable declaration is named var.txt and that the desired output will be stored at epics.db, run

```
EpicsDbGen var.txt epics.db
```

Pay attention to the displayed warning and error messages. Then, open epics.db and check that the result is as expected.

Where to get it

The program can be downloaded from [here](#). It has been compiled with Visual C++, but it is standard C and should work with any C compiler. The source code can be found at [T1100579](#).

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