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# Pult

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Manual

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( English Version )

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## 2.About Pult

The tool Pult developed as a help for testing Simatic programs. Pult shall substitute the classical test panel with lamps and switches, which has been used by Simatic programmers of of former years to test their programs.

Simatic S7,S5, TIA cpus and the compatible VIPA Speed7 cpus are supported.  
Pult2 bases on the Linux-Simatic Communications server family **rk\*\_server**.

Because *\*rktcp\_server\**, *\*rk512\_server\** and *\*rk511\_server\** use the same client interface they can be exchanged without any changes.

Therefore in the following text they will be called *rk\*\_server*.

Pult enables the handling of 48 *\*switches\** and the use of 96 *\*lamps\** and also the use of 18 input und 18 output variables as word or double words.

In this version all elements have to be in data blocks. A transfer of other elements should be no problem for the experienced Simatician.

Pult can be multiply started at one time, the common use of other *rk\**- programs like *\*LogAn\** will not lead into problems.

Features in difference to the older Version Pult(1):

- Higher transparency of coubling state.
  - The structure-file also contains the name of the das rc-file
  - 18 Analog inputs ( Word or DWord ), old: 6
  - 18 Analog outputs ( Word or DWord ), old. 6
  - displays the name and parameters of the used variables.
  - info about the linked server.
  - connect and disconnect the server.
  - direct mode: no software in the plc necessary
- For saving data integrity, the old mode with command DB can be used..

### 3. Installation of Pult2

Voraussetzungen:

Pult uses the **Xforms** - resp.. Xforms-Toolkit graphic library.

Xforms is „out fashioned“: no objects, small, quick and robust.

It is easy to learn and therefore fine for older people ( like the author) who only quickly want to write a program and are not interested to know who is the aunt or grandmother of an object and also do not want th know what is the name of an object which knows an object which knows a programmer.

Xforms provides the GUI designer "fdesign". With ist, it is possible to design the surface of your program. fdesign also can create the basic stuff of your program by generating the basic c-code files.

If you do not know Xforms: our homepage provides some informations and links to this project.

Pult also requires a running **rk\*\_server** .

For proper work, server V 5.10 or higher is required.

#### Installation of pult2

1. Unpack the compressed file in a subdirectory
2. Copy the files "rk7\_client.o" and "rk7\_client.h" from your rk\*-Server-directory into the./src directory.  
This is necessary to attach the right version (32/64-Bit, Inel or ARM)  
You need to compile.
3. In your ./src- directory ther are also the files "s5types\_32.o","s5types\_64.o" and "s5types\_ARMv6.o". select the rihgt one and copy it to s5types.o.
4.  
( These files are part of our library "convert\_lib", the source code is only deliverd for payment.)
5. Compile the application: "make clean" and then "make"
6. finished.

## 4. Programm call and first Start

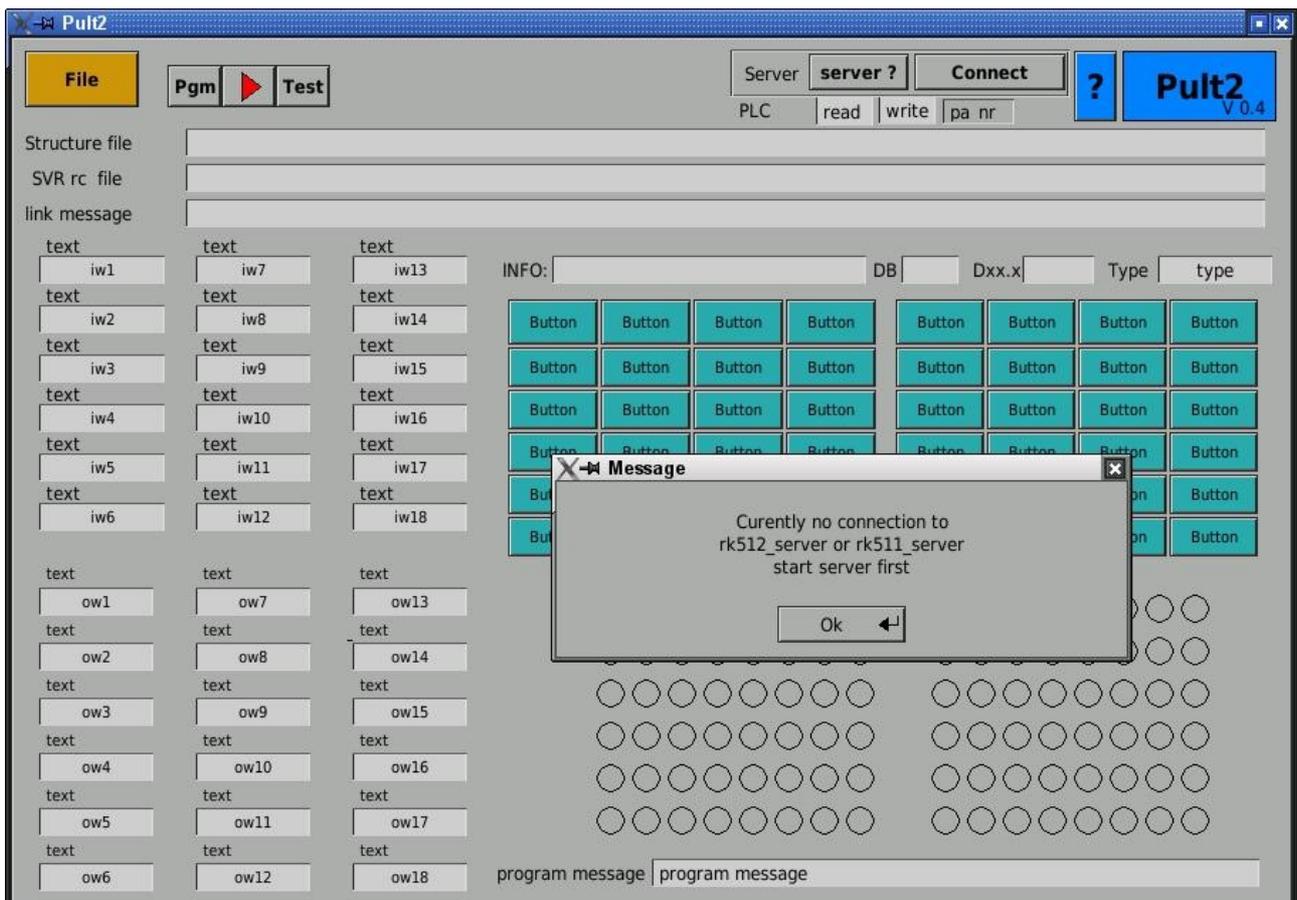
```
pult <rk512_rc_file> // old method
o:
NEW:
pult [-r <rk512_rc_file> ] [-s <struct_file>]
while:
  [-r <rk512_rc_file>] : rk512-rc-file
  [-s <stru_file>]    : data structure file
```

Normally only the <stru\_file> is defined.

Parameters:

- h : dirisplay help (Usage) .
- s <stru\_file> : Normally all necessary is in this file. Of course need to exist.
- r <rk512\_rc\_file> : rk512-rc-file, normally inside the <stru\_file> if this option is used it has an higher precedence like this named inside the <stru\_file> .

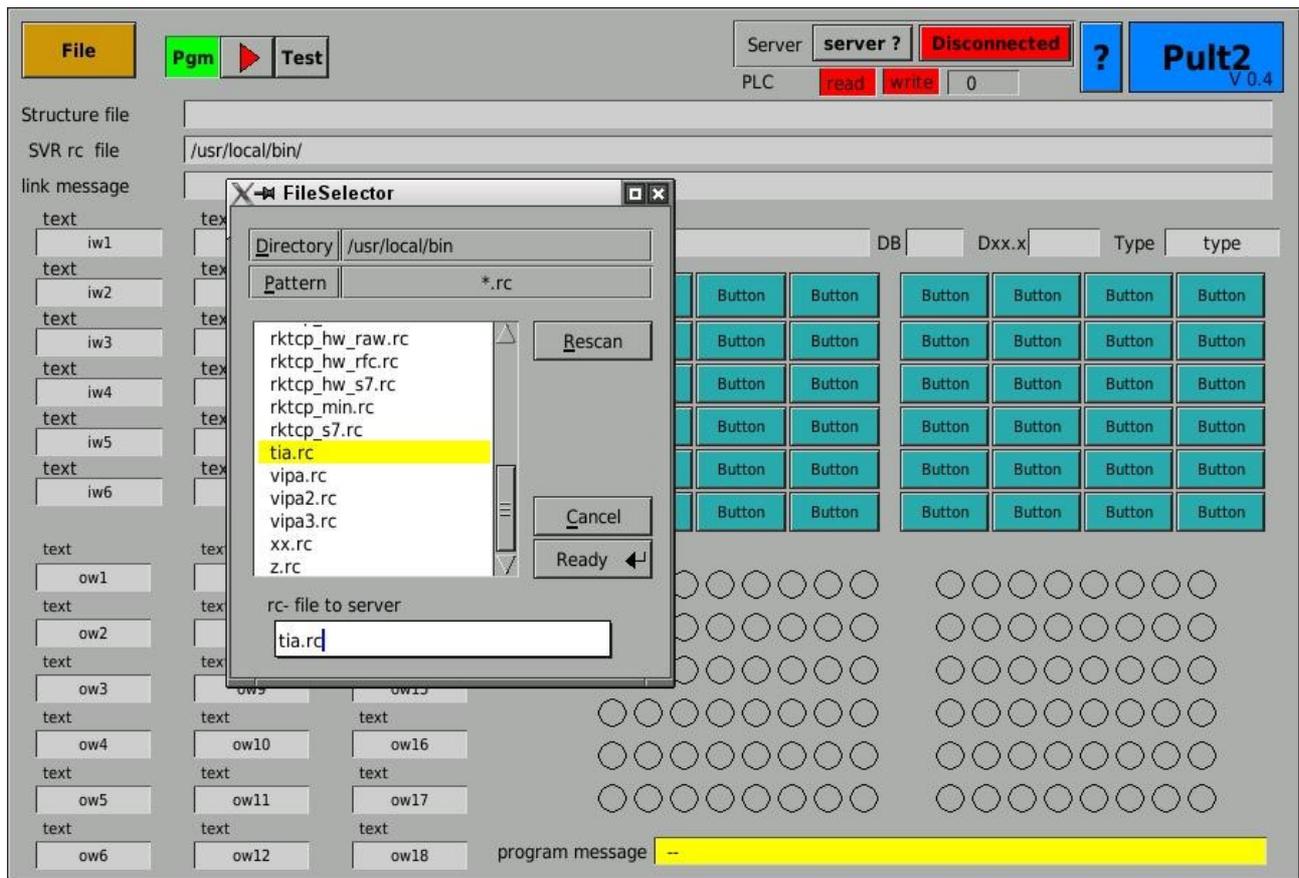
**First Start:**



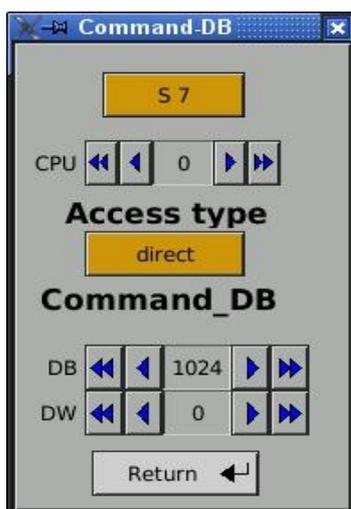
It is useful, look for the connection to the plc: The rc-file.

FILE-> "load Server rc file"

Select the rc-file, which also is used for the server configuration. :



Use FILE-> "define Simatic" to define the plc:



"S7" and "S5" are selectable: die S7 is byte orientated while the S5 is word orientated.

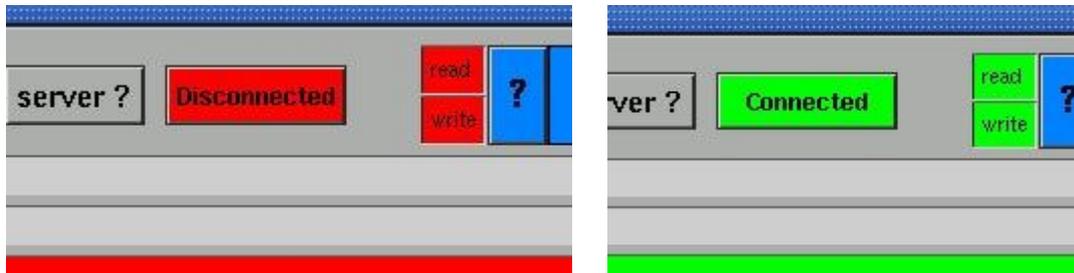
Select the number of the CPU according the number defined inside the rc-file. Normally "0".

"Access Type" : for first start sufficient: "direct".

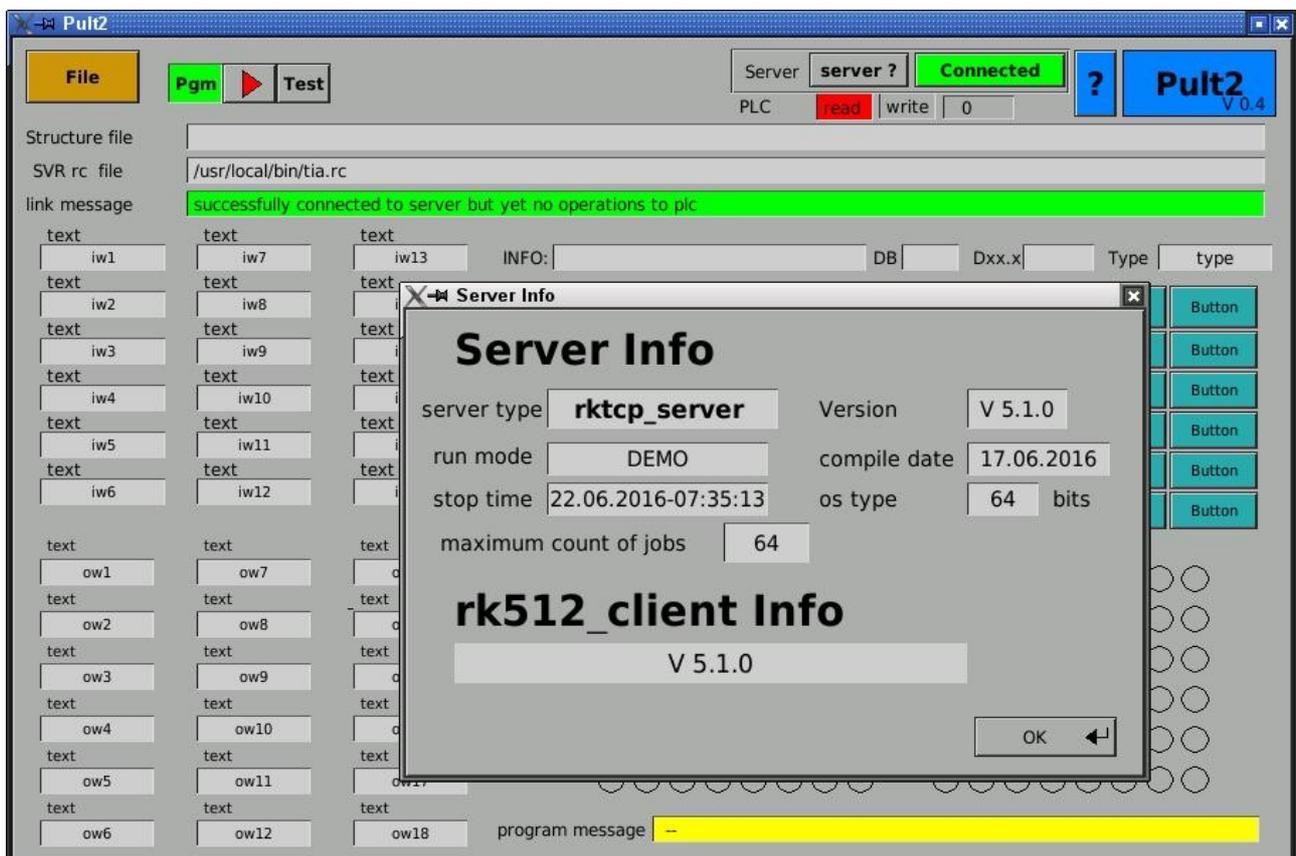
The mode with command db will be explained later.

finished.

Now connect to the server.



Using the Button "server ?" you can see informations about the attached server and the us4ed rk7\_client.o as well.

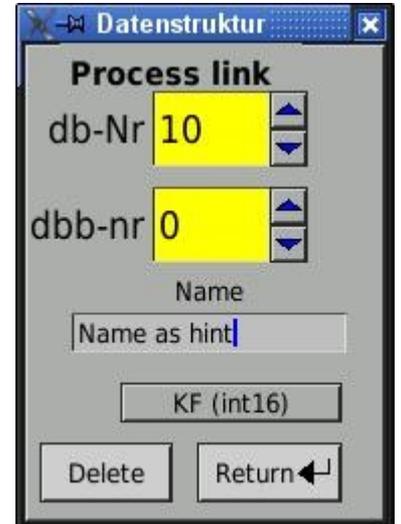
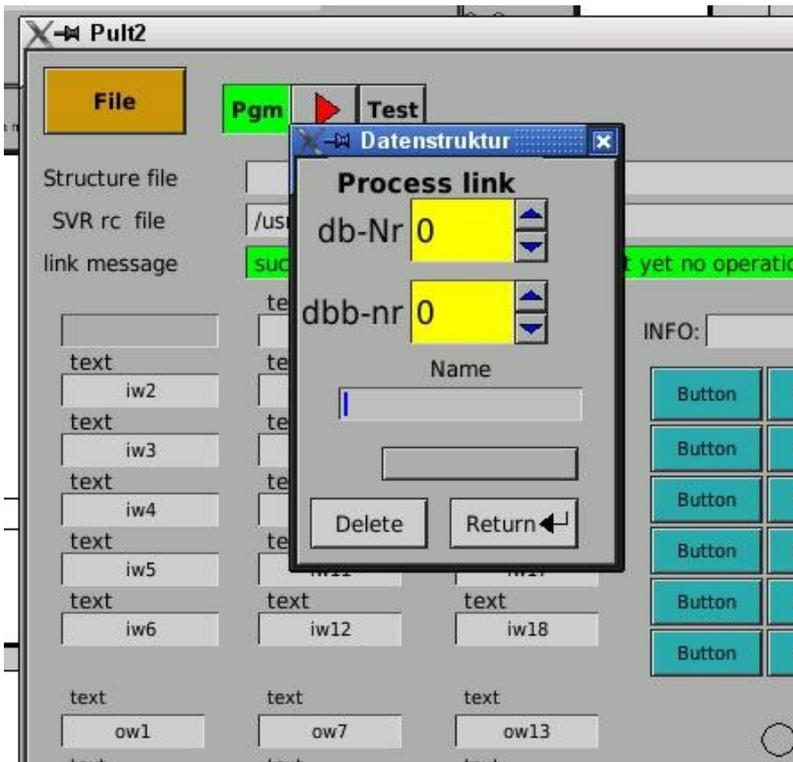


As the next, we define the variables, we are interested in..

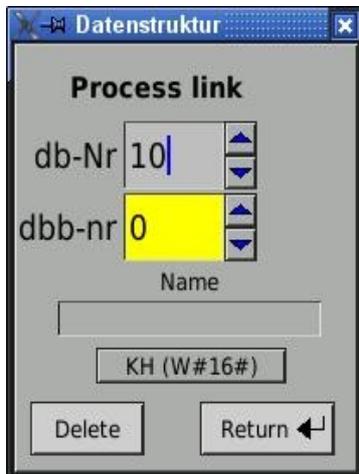
ANALOG-INPUTS:

Click to one of the input fields ( the block left side, above)

Select the DB, the start address and the data format..

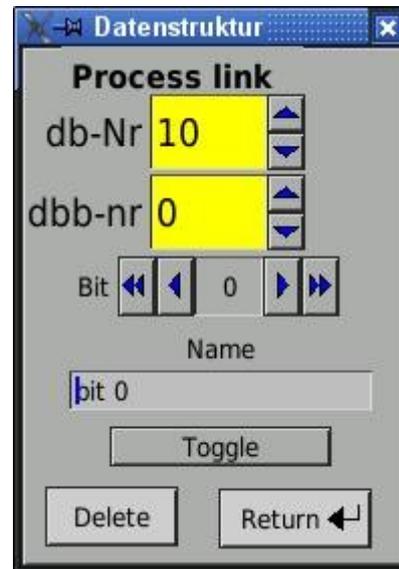


Also select one of the analog outputs (the block left side below)



Also select one or more bit inputs.

As mode is seletable: Set bit, Reset bit, toggle bit.

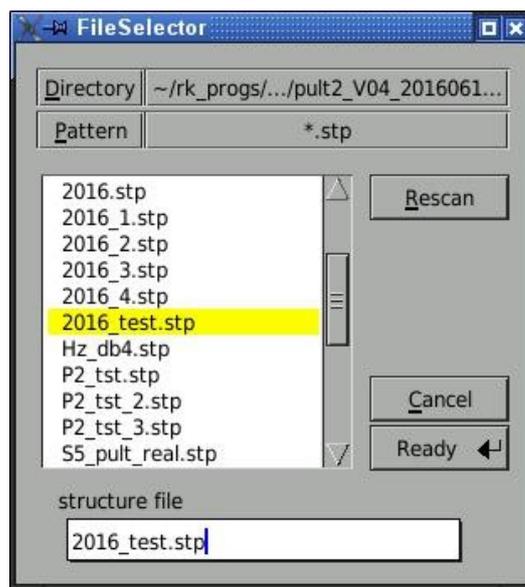


Output bits are selected the same way, of course without a function, only active or not.

Now it is a good idea, to save the changes::

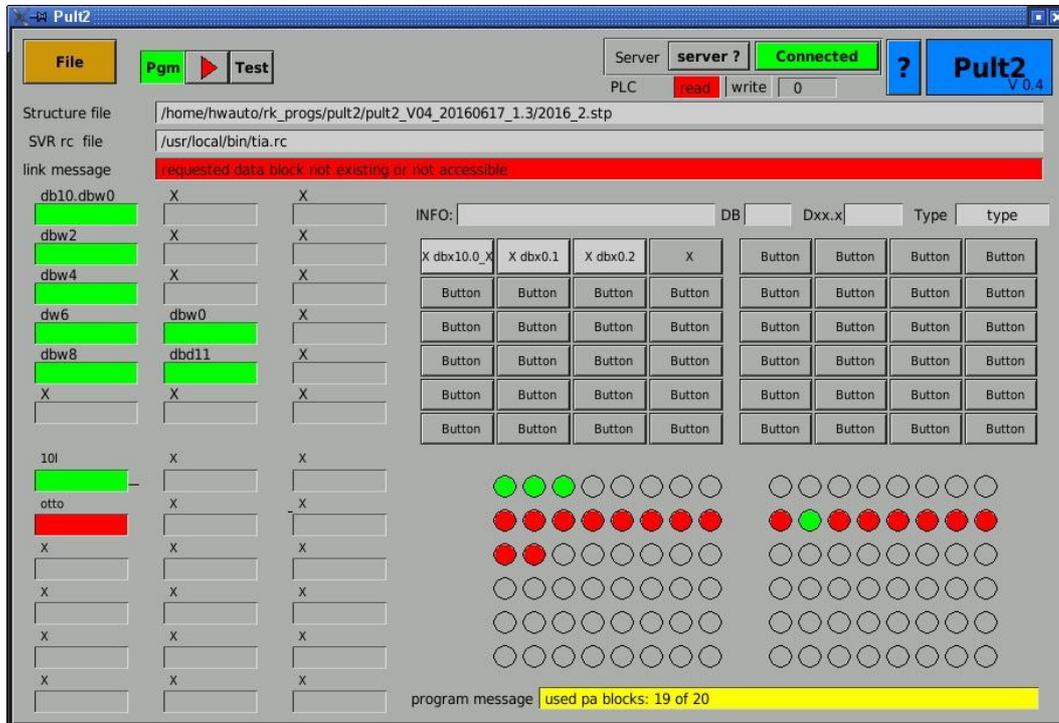
"FILE" -> "store structure" -> navigate to the destination directory and save the structure file.

The file name extention will be generated automatically.



Now test, if the variable definitions have been correct, say: the addresses exist inside the plc.  
 To Test press "Test". After finished, Mode returns to "PGM"

Example:



The defined and accessible variables are shown green, the faulty ones red.

**Start:**

Start the operation with the play-button.

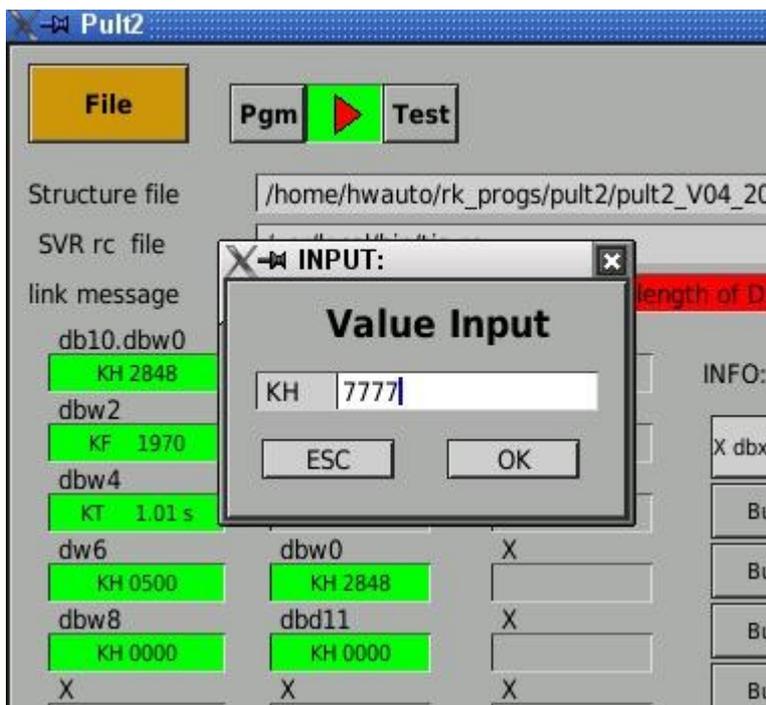


The data will be actualized..

**Operate inputs:**

The function of the button (Set/Reset/toggle) will be activated by pressing the button.

Input fields analog: On click with left mouse button,, a input window opens:

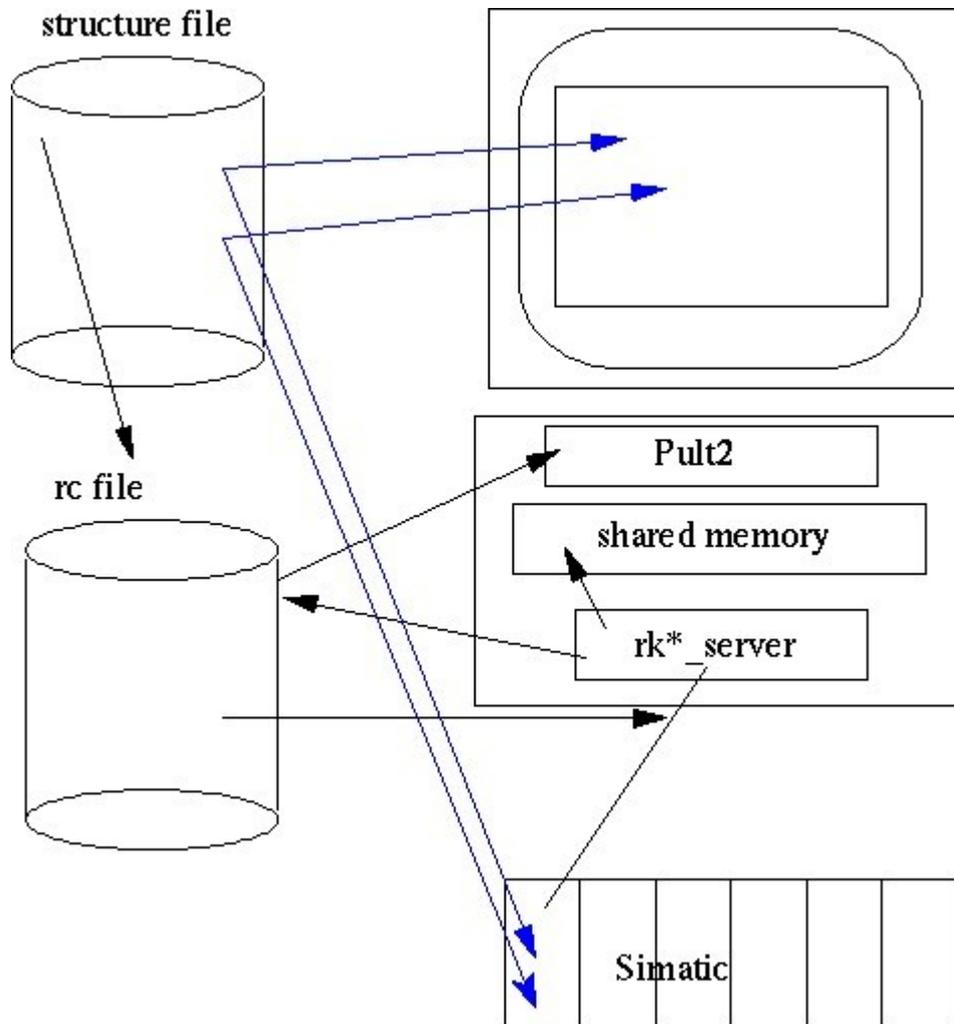
**INFO:**

Display the name and the address of a variable::

On output variables: always on click.

On input variables and buttons: on click with the right mouse button.

## 5. Components playing together



### How to go to the Simatic ?

On server start, the rc file knows to handle the connection to the simatic. It also defines the name of the shared memory which is the connection between server and rk7\_client, say the application.

## 6. Data consistency: Direkt Mode, Command-DB Mode

### Background:

No data link method can manipulate data variables until down to the bit level without corrupting the data consistency, if no interpreter is used in the plc, because for standard protocols ( RK511,RK512,Profibus,Ethernet) the smallest unit is a word.

Some visualization use this way ,to manipulate a bit:

Fetch the word into the visualization system, manipulate the bit, write the word back. Therefore, the data consistency is corrupted, because all bits in the word, which have been changed meanwhile (by plc, operation panel or other visualization system) will be overwritten with the old value.

To pretend the user from data inconsistencies while using \*Pult\* a other method is used:  
A FB ( S7: FC ) evaluates a command ( i.e. Set D 4.5 in DB 45) and executes the command.

For S5 or S7 there is one FB/FC and a command-DB (6 DW/ DBW).

The numbers are changeable.

The FB/FC and the DB only have to be installed and called in OB1. The FB/FC has one an that is the DB.

\*Pult2\* is able to collect different commands and send them one by one to the command DB.  
The FB/FC executes one command per cycle..

!!!! Hint for S5:

!!!! The S5-command-FB does not test, if the target address is existing.

!!!! If there is a write access to a non existing DB this will stop the plc.

!!!! Therefore the S5-command-FB is not allowed in running/working systems, it is only for

!!!! test of programs.

Hint to the command DB:

Because the RK511 (S5) or TCP (S7) transfer is asynchronous to the plc cycle,  
there is a check word at the end of the telegram, to ensure that the telegram  
is complete.

The command FB/FC only executes the command, if the last and the least word of the telegram  
are equal.

## 7. *Hints to the XForms Library*

Hints concerning XForms Library

The term XForms is an abbreviation for XForms Library, A Graphical User Interface Toolkit for X. XForms is a very lean graphics library. Developed several years ago by T.C.Zhao and Mark Overmars, it still offers a good base for application development under X11.

Part of Xforms is a real fine documentation and a set of many small example programs which enable even beginners a quick application development.

Xforms is highly portable.

The following sentence from the documentation says enough about portability and the fitness for systems that do not have KDE or Gnome.

*The library uses only the services provided by the Xlib and should run on all workstations that have X installed on them.*

Paying attention to downward compatibility is strictly rule to the further development of Xforms. For that, Xforms still is used in much university research projects.

Unfortunately, nowadays some distributions do not contain XForms any more.

The XForms Homepage "<http://xforms-toolkit.org>" contains some interesting informations, as well you can find there some screen shots of applications from science and industrial automation.

The actual maintainer is Jens Thoms Törning, PhD, who is maintaining the library practically alone. With a lot of bug fixes, increasing the functionality and limits, he has improved the project massively.

Generally: Xforms is easy to install:

- Download the latest version from the XForms download page  
["http://savannah.nongnu.org/projects/xforms"](http://savannah.nongnu.org/projects/xforms)

Chose the newest xforms version..

**Hint:** It is surely a good idea to download the documentation file "xforms.pdf".

**Hint:** Xforms needs some additional libraries like **libXpm-devel** and **libjpeg-devel**

These are part of each distribution.

Unpack the archive into a directory and change into it. Then:

```
./configure
```

```
make
```

The next commands need **root** privileges:

```
make install
```

```
ldconfig
```

Thereafter the Xforms libraries are installed, also the GUI designer program "fdesign".

"fdesign" can be found in /usr/local/bin.

While linking of xforms applications maybe you will need the option -lXpm.