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## Preface

“Development is from primitive to complicated to simple (smart) solutions” (Werner von Braun)  
 If the program is complicated, testing takes a lot of times and others might have problem, to follow the code. Robust Software and simple structure are reliable and easy to modify.

To avoid going the wrong way in Software and reduce effort, present the Software from time to time to professionals (Siemens Wuerzburg can do that) to get some hints.

My experience was that each commissioning made me more resilient, and I am grateful for that. But don't go beyond your personal limits, ask better for support. Ensure that you can sleep well and you have enough time in the evening for “shut down”. If you are always tensed, it could be critical. What helped me is social contact in the evening and meditation in the morning. But everybody has its own medicine.

## Available Add-ons (Apps) and where to get it?

- In the Internet [www.braumat.de](http://www.braumat.de) you can find a lot of additional Tools for Braumat.
- There is a Tool “Template\_EOPs\_eng\_BR\_V7.xls” for to generate Step7-code automatic from an Excel-Matrix. See Info-Tab for more and MakroSetup for the basic settings. For new Units this Tool should be used for to save engineering-time (see extra Dokumentation).
- There is a Tool to calculate the according Braumat-addresses.
- There is a Tool “csm\_BRToolipp” for to put the Tooltips in position.
- There are several more documents concerning programmers guide etc.

- There is a Tool FC2715.awl to call all running DFM automatic. This was in Braumat previously as FB715, but get lost.

### On youtube you find the following Videos about Engineering with Braumat

1. Braumat: Auto generate Code by Excel: <https://youtu.be/FVQxlSiJqk0>
2. Braumat Tools for Tanks and Cellar: <https://youtu.be/OtH5DItCntY>
3. Braumat Doku and Tools for Programmers: <https://youtu.be/iMaV0BYd64I>
4. Braumat more Apps and Tools: [https://youtu.be/k\\_wiFw3c0n8](https://youtu.be/k_wiFw3c0n8)
5. Programming one Unit: <https://youtu.be/IHjm6UUmWFM>
6. Saving energy with Braumat: load-shedding, and universal functions: <https://youtu.be/-El2V5hvMcQ>
7. Braumat free brew-report, filtration-report and Tank-protocoll: <https://youtu.be/Ov60yfwIFnM>
8. Braumat\_Programming\_and\_Engineering\_part1 <https://youtu.be/HAK8ryIiTbw>
9. Braumat\_Programming\_and\_Engineering\_part2 <https://youtu.be/7Hk9QGXF1g0>

### Tools

Freeware Notepad++ is excellent for to mark columns and change. And for “replace in files” change a lot

```

2      DB 3498 HCIP13_EXT HCIP3_EXT
3      DB 3499 HCIP14_EXT HCIP4_EXT
4      DB 4298 HCIP13_USER HCIP13_USER
5      DB 4299 HCIP14_USER HCIP14_USER
6      DB 3102 HCIP13-DB-CTRL HCIP13-DB-CTRL
7      DB 3103 HCIP14-DB-CTRL HCIP14-DB-CTRL
8      FC 1425 HCIP13_SELECT_TANK
9      FC 1426 HCIP13_PHASE      HOT CIP 11 PHASE CHANGE
10     FC 1427 HCIP13_ACID_CRIC   TANK CIP TANK
11     FC 1428 HCIP13-POST_FLUSH_PREP User interface EOP0098
12     FC 1429 HCIP13-POST_RUN_PREP User interface EOP0099
13     FC 1430 HCIP13_CALENTAMIENTO CALENTAMIENTO
14     FC 1431 HCIP13_CON_INI    CONDICIONES INICIALES
15     FC 1432 HCIP13_PRE-FLUSH  PRE-FLUSH
16     FC 1433 HCIP13_EMPUJE     EMPUJE CON CAUSTICA
17     FC 1434 HCIP13_CIRCULACION CIRCULACION CON CAUSTICA
18     FC 1435 HCIP13_SPARE
19     FC 1436 HCIP13_ENJUAGUE  HOTCIP END
20     FC 1437 HCIP13_FLUSH_INI
21     FC 1438 HCIP13_FLUSH_EMP

```

in many files e.g. in the process-images.

Freeware Irfanview is an excellent viewer for pictures with a preview and Thumbnail-view, also for to resize.

Shareware Total-commander is an excellent Filemanager (the best on the planet) including an Addon for dBase-file viewer and editor (Braumat has a lot of dBase-files)

Freeware Libre-office is an excellent editor which can handle Excel and dBase-files. It is free for industrial purposes as well.

## Engineering

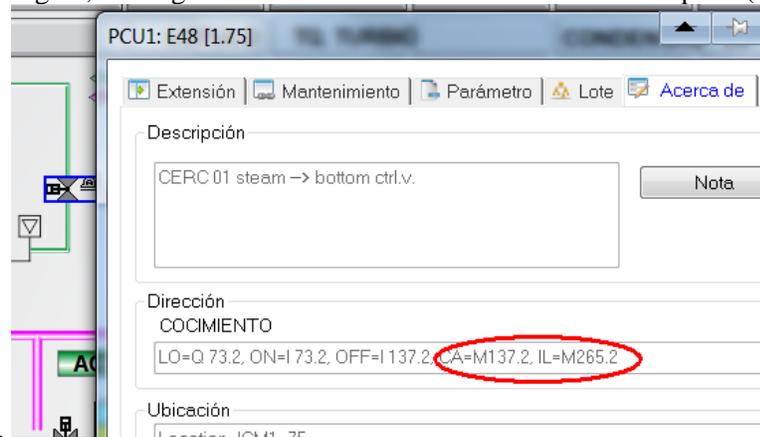
- Make a strategy and define the necessary Units in your project (Brewhouse: each vessel one unit and CIP, in cellar each tank, in filtration each vessel). You can use the Excel-File Param\_PCU001\_0.xls Tab “Sequences” for that. There you see the predefined EOPs and DFMs and you can adapt the list to your configuration.
- On [www.braumat.de/ Symbolic\\_generation.zip](http://www.braumat.de/Symbolic_generation.zip) you can download an additional tab for easy generation of the Symbolic-list for Simatic-Manager and you save a lot of work.
- There is a recommendation as well for the according EOPs and DFM.
- Supply this file as well with the necessary Data of the Client concerning **ICM** (check I/O-Adress, check Feedback on or off or 2 feedbacks etc.). For all Outputs an ICM could be defined, including Horn etc, **Analogue Input** (check I-Adress and check range for that), **Analogue Output** (check O-Adress and check range for that), **Digital Inputs** ((check I-Adress for that). All Inputs which are not ICM-feedback should be linked to a Timer (Digital Faceplate).
- Fill the Excel-Tab SEQU or SEQUENCER with the Unit-names. Often the manual group-Nr is the same like the Unit-number.
- Based on that above information the pictures can be designed. You can use elements from the Picture-library or Corel-Draw for the background-image. Size the picture to the according Displays.
- Link the above elements of ICM, AIN, AOUT, PID to the according manual group (HZUO). Maybe the process-images could help?
- If all elements are filled in the Excel-Sheet, go to the tab “Symbol” and fill in the top-line the extensions you want. You can copy this “Symbol”-Tab in your existing Excel-file, but you need to remove the Link to the original file by “Replace String”.
- Export this file sheet to a Text.file. Rename this textfile to name.**seq**.
- Open the Simatic-Manager, Symbolic and import that file. Keep in mind that if you made changes already concerning ICM, Analog, Digital, Messages, PID they will be overwritten. If you want to avoid that copy only part of the Symbol-list in Excel to an extra Excel-Sheet and export that to a text file.
- Export the ICM-parameters, AIN, AOUT, Timer etc. to Braumat. For that you need to start the file macro.xls prior to that.
- If you want to use the **productivity Tool Excel-generator**, make for each Unit an Excel-Sheet, according the template “Template\_EOPs...”.
- Copy the according elements of ICM and Digital (below) in the folder “Reference”.

- Fill the EOP-Number, Step-names, selected ICM and Transition for each Step in the Tab “Matrix”.
- Fill the EOPs according to the Excel-list Tab “sequencer” in the Code-generator Tab Matrix Column B.
- Fill the necessary information in the Tab Unit\_FB and generate the Unit\_FB in the TAB “Unit\_FB”
- Start the Macro and copy paste the code to Simatic-Manager Sources (Make an STL-Source). Switch to English Mnemonics.
  - For the elements where you have no Flag, you can take a flag in the according Unit-DB (DBxxx4 for Unit 4 etc).
  - Translate and download all new blocks
  - Write in DB701, DBW 10”AFFE” to have all ICM in Simulation.
- For each Unit you can generate a DB300x with the Symbolic name DB\_Unit\_x
- In the EOPs it is best to have only the activation-signals for the ICM. All others should be in the interlock. Interlock for to protect human, the machine, the product (mixing!) is mandatory. Operators don’t like too many interlocks!
- For transition it is not always necessary to check all feedbacks. Only the crucial ones (pump running etc).
- Use always the DFM-Interface-flags or Decoder-flags, or AIN-flags etc. for transparency.
- For the Limit-values for min min and max max you can use the AIN-Limits with Hysteresis. The value can be changed directly from the faceplate.
- For more Analogue-Limits you can use the MVC and VMON, whereas the VMON is better, because you have 4 Limits (but no hysteresis) and a delay.
- If the VMON is not working, you need to go to scheduler and Input that Data

	Name	D.T..	A. Type	Value	Comment
1	TimeSlice	U...	SYS	9	Time slice number
2	ExecType	ENUM	SYS	Tec-FB, u-copy	Execution type
3	Function	INT	SYS	750	Function number
4	DataBlockFirst	INT	SYS	750	(Instance) datablock
5	DataBlockLast	INT	SYS	0	(Instance) datablock
6	Parameter	WORD	SYS	W#16#0000	Optional parameter
7	UsedTime	INT	RT	1	Elapsed time [msec]

- The messages can be in the Unit-FB linked with the Unit-running-flag, M 102.1.
- The counting-pulse has to be programmed in fast FB’s like FB1222 or FB1224 (100 ms).
- All Flags in a Step-block should be reset at the end, at set again in the next step.

- Jumps in the step could generate unpredictable status of flags, because it might not be clear whether the flag is on or off at the end. Operator has no chance to reset a flag!
- Try to put all code in the EOP-FC and not calling other FCs and other. Testing is easier if all is in one Block.
- If some functions are used several times, it can be implemented in the Unit-FB 100x and activated by a flag from the EOP.
- The flags for ICM, Digital signal, Analogue switches can be extracted from the faceplate (last



tab) in the Process-Image.  
ICM-Adresses



Digital-addresses

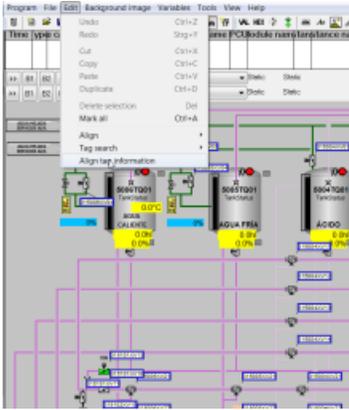


PID-YNF-flag



Analogue-flags

- **Reset with hold:** In order to ensure the switch of all elements, with hold you can reset all ICM of the Unit that at the end of FB100x with the flag DB725.DBX 110.1 or another one.
- **Ensure that all Tag-Info** in the process-images of ICM, AIN and digital are switched on. To align the Tag-Info switch to Tag-Info and mark all and select edit, Align Tag info



- In the Unit-FB's the call of the Trending-FB has to be implemented for triggering of the curves  
`CALL "TRIGG_CURVE_GR_FC"`  
`boRUN :=M 102.1 //sequ is running`  
`boACTSEQ :=M 102.1`  
`iID :=16 //the group-ID in most of the cases the Unit-number`  
`iSEQID :=0`  
`byRECCAT :=B#16#0`  
`byYEAR :=B#16#0`  
`iORDER_NO:=0`  
`iBATCH_NO:=0`  
`iRECIP_NO:=0`
- The logo of the company could serve to switch to plant overview. Siemens logo / Braumat should be present as well.
- Each Step (EOP) should have only its specific DFM for more transparency, not all DFM in all steps!
- Instead of "ICM3".au[27].xFbk1 the real with Input with Tag-name and comment should be used.
- The Symbolic file should be exported from time to time to Braumat to \\Windcs\PCU.001\Texte
- Try to put your DFM and Sequence-Information in the Excel-parameterization-Tool and fill the Tabs DFM, SEQU, epe.ini, epar.ini. Mark them with your specific color if necessary. Note: DFM Type 1 = Timer; DFM Type 4 = Analog Setpoint with a Source Analogue Input (you find the source in the picture?); DFM Type 7 =is a Decoder, linked with a text-file (make a new one or use existing user.txt.  
[EPE.ini: copy / paste EOP-names and link with according DFMs of the steps](#)  
[EPAR.ini: define the units, decimal-point etc.](#)
- Each ICM, AIN, PID, Sensor should be linked to the according unit in Parameterization. For ICM the manual group could correspond to the Unit-number.

Name	D.T.	A. Type	Value	Comment
1 Sequence	ENUM	ENG	51_CCAU TQ-01	Assigned unit 1
2 ManualGroup	U...	ENG	0	0: none, 1-128: manual group, >128 alwa...
3 Type	U...	ENG	51	Type 9..13,16..21,32..38,48..53,128=locked
4 MonTmSv	U...	ENG	10	Monitoring time start value [sec]
5 MsgLock	BOOL	ENG	FALSE	Disable messages
6 DelayOnSv	INT	ENG	0	Delay on
7 DelayOffSv	INT	ENG	0	Setpoint delay off
8 InvertCtrl	BOOL	ENG	FALSE	Inverted load output
9 NoFbIdAvailable	BOOL	ENG	FALSE	ICM without reply
10 StartingAlarm	BOOL	ENG	FALSE	Enable starting alarm
11 BypassInterlock	BOOL	ENG	FALSE	bypass interlock
12 SimFbk	BOOL	ENG	FALSE	FeedBack simulation
13 FaultTimeSv	U...	ENG	0	Fault time [sec]

- The fault time serves to avoid feedback-faults by double-seat valves during Seat-flushing. 2 sec is a good value.
- To input the proper monitoring time for the EOPs (first column), take an existing Step-Protocol, check the running time and input that time + 20 % as the monitoring-time.
- Export the AIN-Tags, PID-Tags, ICM-Tags using Symbolic-synchronizer (Menu, Engineering, S7-Symbols synch) in order to get the proper switches and flags in the symbolic-list in Simatic-Manager.
- Use the 2 flags from Analogue in (M 1144.0/ M 1176.0) for Alarms, Interlock. They can be changed from the faceplate.
- In the last network of EOPs (Transition), there should be clear statements (DFM etc) for the transition, because the operator can look there.
- Does Route-control-Error really need to set all to Hold? It will not go in the next step if condition is not ok, so maybe leave the route active to see what is wrong?
- By switching from one Tank to the other take care that never all valves are closed! Overlapping is necessary to avoid damage.
- You can generate a dummy-flag (e.g. M 1999.7) in Step 7 in order to find places where you need to make program-changes later on.
- You can make a Test-FC and call it in FB1220-FB1224. In there you can simulate Inputs for the program and force Outputs to be reset in any case (security by testing etc) and overwrite the program.
- The special values (Main-Menu, Archive) could be used for timer-values or other Setpoints outside the Recipe-system in order to change them for operators.
- If the actual-value is very unstable, a filter is available in the AIN-block.
- For longer averages the “Average”-Block (Add-on) can be used
- To generate an Alarm if a Measured value is outside a specific range you can use the VMON very is with 4 Hysteresis, that means 2 Tolerances above and below. To activate it you can directly input the according flag in the Dataset (e.g.A DB3009.DBX10.0)
- For to avoid the call of each DFM, the Block FC 2715 (Add on) can be used.

- For to the check the empty / full signal of a specific tank (for CIP) the FC4000 (Add-on) can be used.
- To ensure for CIP that you don't lose too much expensive medium (Caustic, Acid etc), make a delay of x sec for the switch-over by conductivity in the return line, because sometimes there is air or a mixture of water and conductivity changes shortly but still medium is coming, which should return in the Tank and not in the Drain.
- When running CIP always be sure that something is coming back after a certain time (1-2 minutes?) with the flow-switch or flow-measurement. If not Stop and make Alarm, because then the medium is going somewhere else!
- For the flushing-quantities depending from the Tanks you can make a table using the Braumat Poly (for 10 Tanks) or make a FC with a table (example available).
- You can leave a list for the operators for the Open Issues, or you can install Libre office and they can write it on the computer. By a batch-file you can copy the file to all IOS, so it doesn't matter on which station they write it.
- Change of a Process-Image PCUx to another PCU y: Replace in the Bik-File PCU,2,x -> PCU,2,y
- There should be a Tank-Overview-picture to see all relevant Data. You can use the Tank-faceplate for that.
- There could be a sequence-overview picture as well to see all relevant Sequences of that area.
- There could be an extra nice process-picture to see relevant telephone-numbers of people to support and some more Information about Hardware and advertisement (Hotline etc).

<b>Operator-Info</b>	<b>Info for Electrician</b>	Muchas gracias por su cooperación en este proyecto!
<a href="#">Operator-Manual</a>	<b>PCU1 Hardware</b>	En caso de necesitar ayuda:
<b>Additional Info</b>	<b>PCU1 Symbolic</b>	LLamar a Braumat-Support Hotline (Gratis)
<b>List of open Issues</b>	<b>PCU2 Hardware</b>	<a href="http://www.siemens.de/automation/support-request">www.siemens.de/automation/support-request</a>
<b>Notes</b>	<b>PCU2 Symbolic</b>	<a href="mailto:ad.support@siemens.com">ad.support@siemens.com</a>
<b>Tabels</b>	<b>PCU3 Hardware</b>	<a href="http://support.automation.siemens.com">http://support.automation.siemens.com</a>
<b>More Info</b>	<b>PCU3 Symbolic</b>	o tel. 0049 911 895 7000
<b>Info for Braumat-Admin</b>	<b>PCU4 Hardware</b>	o
<b>Programmers Guide</b>	<b>PCU4 Symbolic</b>	Stefan Schrammer
<b>Tips and Tricks</b>	<b>Hardware-Info</b>	Tel. 0049 15254690448
<b>Braumat Calculator</b>	<b>More...</b>	<a href="mailto:StefanSchrammer@yahoo.de">StefanSchrammer@yahoo.de</a>
<b>All Parameters PCU1</b>	<b>Braumat-Features</b>	Rubén Esteban Eransus
<b>All Parameters PCU2</b>	<a href="http://www.braumat.">www.braumat.</a>	Tel. 0034 915106444
<b>All Parameters PCU3</b>	<a href="#">Synchronize Documents</a>	<a href="mailto:ruben.esteban@Premium-Tec.com">ruben.esteban@Premium-Tec.com</a>
<b>All Parameters PCU4</b>	<a href="#">Copy Password from PCU1</a>	Jorge Perelló
		Tel. 670 929237
		<a href="mailto:Jorge.Perello@siemens.com">Jorge.Perello@siemens.com</a>
		Braumat online: <a href="http://www.braumat.de">www.braumat.de</a>
		Your
		Siemens-Team

## Ensure smooth start of a Unit

In order to have the active Alarms corresponding to the Unit reset at Start of the Sequence, program like this at the end of the according Unit-FB 100x (after EOP-processing):

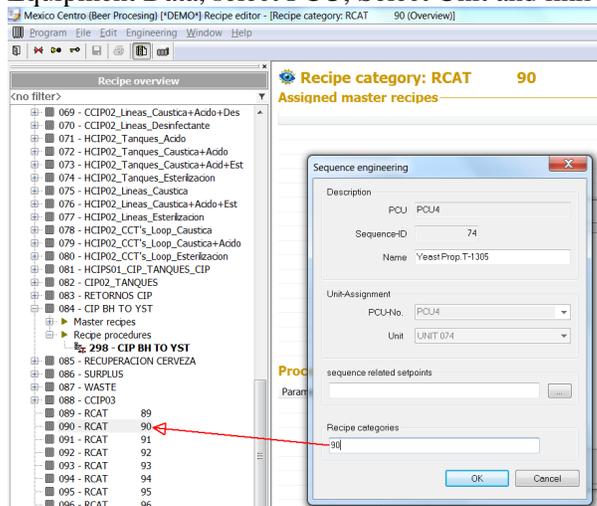
```
A M 102.4 // "SEQU_Start"
R M 888.0 //Alarm x
```

With this you also reset the flashing Alarm-Symbols of the Unit PID in Version >= 7:

```
A M 102.4 // "SEQU_Start"
R DB725.DBX 601.4 // "SEQ".au[1].STATUS.boMsgError
R DB725.DBX 601.5 // "SEQ".au[1].STATUS.boMsgProc
R DB725.DBX 601.6 // "SEQ".au[1].STATUS.boMsgRCS
R DB725.DBX 603.2 // "SEQ".au[1].STATUS.boMan
R DB725.DBX 603.5 // "SEQ".au[1].STATUS.boMsgSystem
R DB725.DBX 603.6 // "SEQ".au[1].STATUS.boMsgWarning
R DB725.DBX 603.7 // "SEQ".au[1].STATUS.boMsgOperating
```

## Make a new Recipe in Braumat

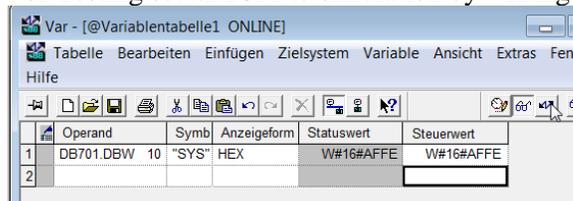
After you exported the Parameters EPE.ini, EPAR.ini open the recipe, Menu Project Planing, Equipment Data, select PCU, Select Unit and link it to the proper Recipe-Category.



Then name the new Recipe-category, make a new Master-recipe, new recipe, select the relevant unit and append all the Steps.

Transfer DB709, DB 724-750 and DB 2105-2109 (DFM5-9) from IOS to PCU.

For Testing set all ICM to simulation by writing "AFFE" to DB709.DBW10



## Shared Equipment in Braumat (one pump for 2 Units)

You put the CA-flag (to start the pump) in (any) Unit-FB. Then you take auxiliary-flags from the Steps (EOPs), to start this shared Pump. You can use the activation-Flags for interlocks (waiting....)

Example:

```
O  "Unit-2 DB".Shared_Equipm_ICM_1_30
O  "Unit-3 DB".Shared_Equipm_ICM_1_30
=  "ICM1.030_CA"
```

## How to make a monitoring-function?

In order to switch on ICM from several Units ore making Sub-operations you can program in FB 100x like that:

```
A  "Unit106 DB".Bool48      //activation-flag
JCN end4

A  "DFM8.171"
=  "312322XV07-CMD"        //action

end4: AN  "Unit106 DB".Bool48      //reset at the end
FP  "Unit106 DB".Bool108      //reset by pulse
R   "312322XV07-CMD"
```

That means in this way the output and flags can be activated from different Units.

## Concerning Hold

Hold and Resume is by A-; The flag A- M 102.0 can be triggered as well by other functions. Why they often use other flags?

Disable transition is by Standard-Flag M 101.5 “add. Device”.

M102.0 should be used to stop the monitoring-time and waiting-time for the Unit.

It should be as simple as possible! Here one example at the end of the Unit-FB. So you program it only once and that’s it.

The FC 4001 ISA88 seems to come from Ex-PCS7-programmers but I don’t understand the sense and benefit. Maybe it is also possible to simplify that.

In the Brewery production is highest priority! Any stop is annoying. In Pharma or Chemical security is the highest priority.

Last Network of FB100x

```

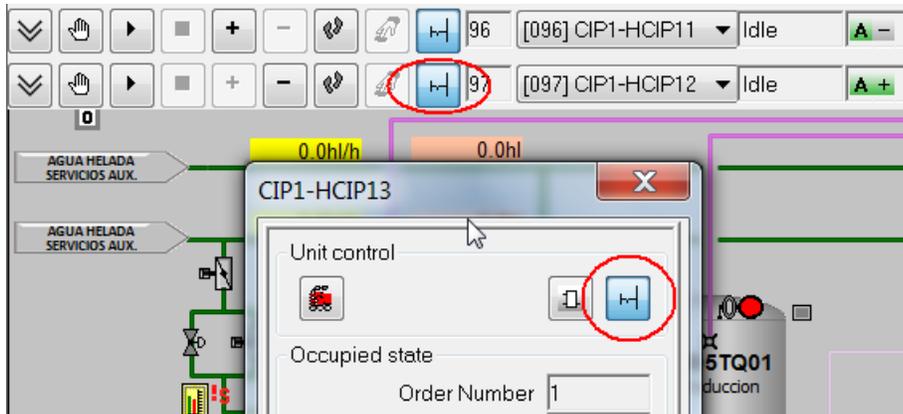
R  "Unit70 DB".one_Cycle_Unit_YPT_to_He //for other Units to go to hold as well
AN "AutomaticStepChange"
FP "Unit70 DB".Pulse_Unit_YPT_to_Held
=  "Unit70 DB".one_Cycle_Unit_YPT_to_He
SET
R  "Unit70 DB".Cycle_Unit_YPT_finish_He //for other Units to go to finish hold as well
A  "AutomaticStepChange"
FP "Unit70 DB".Pulse_Unit_YPT_finish_He
=  "Unit70 DB".Cycle_Unit_YPT_finish_He
A  "Unit76 DB".Cycle_Unit_YPL_to_Held //trigger Held by User
R  "AutomaticStepChange" //M 102.0
A  "AddDeviceOn" //M 101.5
A  "SEQ".u.CTRL.xCmdHold // DB725.DBX 110.1
=  "SEQ".u.CTRL.xCmdRestart // DB725.DBX 110.2
AN "AddDeviceOn" //M 101.5
=  "SEQ".u.CTRL.xCmdHold // DB725.DBX 110.1
AN "AutomaticStepChange" //M 102.0
R  "311301XV04-CMD"
R  "311301XV05-CMD"

```

Here all relevant ICM of the Unit reset with Hold

It might be good to show by a blinking symbol the Hold-Status!

Or you can use the User-flag from the faceplate M 101.5 for Hold. But you should stop the Time and Monitoring time when hold is active.



Any other incident can Reset that the flag "SEQ".u.STATUS.boUserBit by an Impulse which means hold!

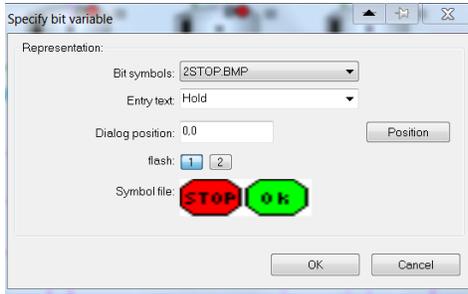
At the beginning of the sequence, the Hold flag has to be on to start the Process like that in the Unit-FB.

```

A  "SequenceStartPulse"
S  "AddDeviceOn"

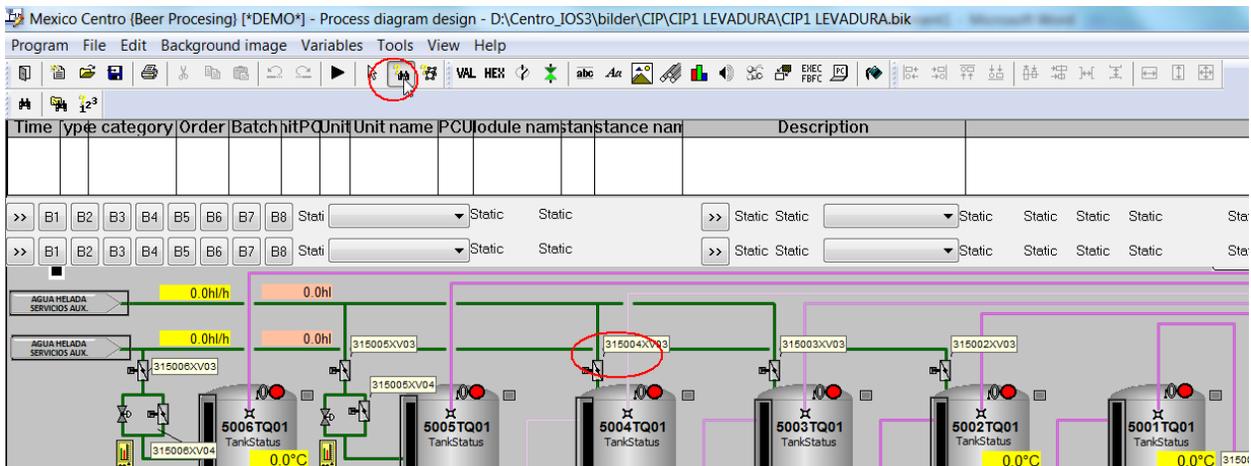
```

Flashing Hold-flag in the picture

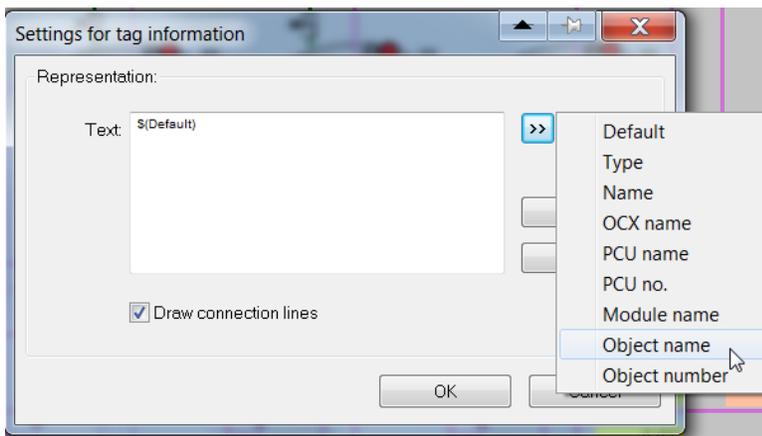


## Show and align Tooltip

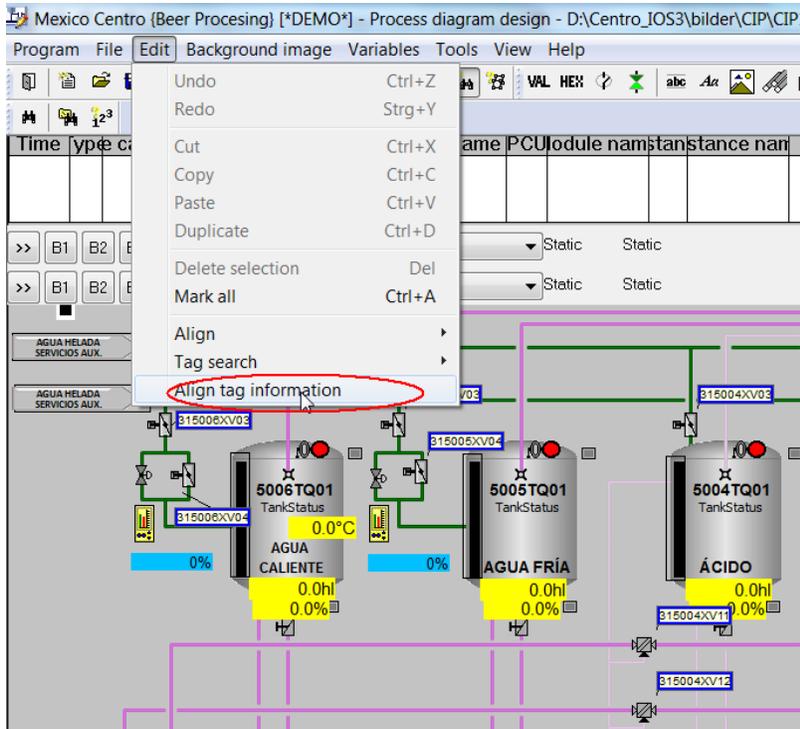
Open image design, select this button and click on all ICM, Analog and Digital-Faceplate to switch it on.



Right click on Tooltip and select Object name and set as default (adjust Font size before).



Select all Tooltip by Ctrl + A and align Tag-Info to bring it in position



### Flow monitoring for CIP-Return

```

A "VMON".au[10].boValOutLow2 //Flow -Alarm
S "MSG100-Signal"
A "MSG100-Signal"
FP "Unit41 DB".Pulse_flow_Alarm
R "AddDeviceOn"
R "SEQ".u.STATUS.boUserBit

A "AckIcmError"
R "MSG100-Signal"

```

Name	D. Type	A. Type	Value	Comment
1 Setpoint	REAL	ENG	120.000	Setpoint
2 HYSUPP1	REAL	ENG	150.000	Hysteresis upper limit 1
3 HYSUPP2	REAL	ENG	150.000	Hysteresis upper limit 2
4 HYSLOW1	REAL	ENG	150.000	Hysteresis lower limit 1
5 HYSLOW2	REAL	ENG	150.000	Hysteresis lower limit 2
6 DelTiMonSp	INT	ENG	120	Setpoint delay time for monitoring
7 DelTiUpp1Sp	INT	ENG	10	Setpoint delay time for upper limit 1
8 DelTiUpp2Sp	INT	ENG	10	Setpoint delay time for upper limit 2
9 DelTiLow1Sp	INT	ENG	10	Setpoint delay time for lower limit 1
10 DelTiLow2Sp	INT	ENG	10	Setpoint delay time for lower limit 2
11 SourceSP	REF	ENG	DFM6,127,Setpoint	Source of setpoint
12 SourceAV	REF	ENG	AIN, 62, ProcValAct	Source for actual value
13 Activate	STEP	ENG	A DB 748.DBX 15677.6	Activate monitoring
14 NoSpVal	ENUM	ENG	Setpoint	Compare actual value to: 0=Setpoint, 1=Limit

## Parameters

### Auto-generateStep7-symbolic

- On [www.braumat.de/ Symbolic\\_generation.zip](http://www.braumat.de/Symbolic_generation.zip) you can download an additional tab for easy generation of the Symbolic-list for Simatic-Manager and you save a lot of work.
- There is a new Tab in the Excel-Sheet which generates automatic the Symbolic, from the other Tabs like ICM-Signals, ICM input (the real one) and Output, AIN-Signals, Sequ-Flags, MVC-flags, PID-flags and more.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P		
1	This is the symbolic-file for Simatic-Manager; it will be updated automatic!					Below are the extensions!					AIN Upper L	Low Level	Sequence	Sequence	SEQS	DFM	
2	-CMD	-LOCK	_ON	_OFF	_QL	_FC	_FB	-Start	-OutPos	-OutNeg	-UpperLimit	-LowerLimit	-PermCnd	-isRunning	-Man	-Result	-Sig
3	Procedure: Copy all lines from column A4 till D4 (only!) and paste all lines to a Text-file name:seq. Import to Simatic-Manager; ignore the errors, the symbolic will pop up. Mnemonics has to be English in Simatic Manager																
4	after copy this Sheet from the Source, replace "[Param_PCU001_1_V7_symb.xls]" by nothing (delete the String)																
5	x	x	x	x	Route Control: Configuration												
6	DB 100	RC_CFG															
7	DB 450	BmXc.JobStartup	comment														
8	DB 451	BmXcPvt01	comment														
9	DB 452	BmXcPvt02	comment														
10	DB 453	BmXcPvt03	comment														
11	DB 454	BmXcPvt04	comment														
12	DB 455	BmXcPvt05	comment														
13	DB 456	BmXcPvt06	comment														
14	DB 457	BmXcPvt07	comment														
15	DB 458	BmXcPvt08	comment														
16	DB 459	BmXcPvt09	comment														
17	DB 460	BmXcPvt10	comment														
18	DB 461	BmXcPvt11	comment														
19	DB 462	BmXcPvt12	comment														
20	DB 463	BmXcPvt13	comment														
21	DB 464	BmXcPvt14	comment														
22	DB 465	BmXcPvt15	comment														
23	DB 466	BmXcPvt16	comment														
24	DB 467	BmXcPvt17	comment														
25	DB 468	BmXcPvt18	comment														
26	DB 469	BmXcPvt19	comment														
27	DB 470	BmXcPvt20	comment														
28	DB 471	BmXcPvt21	comment														
29	DB 472	BmXcPvt22	comment														
30	DB 473	BmXcPvt23	comment														
31	DB 474	BmXcPvt24	comment														
32	DB 475	BmXcPvt25	comment														
33	DB 476	BmXcPvt26	comment														
34	DB 477	BmXcPvt27	comment														
35	DB 478	BmXcPvt28	comment														

- How to export? Make a new Excel-file, put 4 "X" in the first 4 columns to ensure that the first (empty) column is not deleted and copy paste all relevant lines.

- Save it as a text-file with Tabs-Separation and import that file to Symbolic of Simatic-Manager. By importing that it will overwrite the old ones.
- Copy/paste the comment for the ICM and Analog to the column “Description” of the Excel-File ICM, AIN etc. By that the symbolic and comment will be generated automatic in the last Tab and by export the text will pop-up in the face-plates.

	Desc		
Location	Description	Activation	Feedback ON
TQ01	Description_ICM1 226	Q 92.1	I 92
TQ01	Description_ICM1 227	Q 92.2	I 92
TQ01	Description_ICM1 228	Q 92.3	I 92
TQ01	Description_ICM1 229	Q 92.4	I 92
TQ01	Description_ICM1 230	Q 92.5	I 92
TQ01	Description_ICM1 231	Q 92.6	I 92
TQ01	Description_ICM1 232	Q 92.7	I 92
TQ01	Description_ICM1 233	Q 93.0	I 93

Here copy the comment for the ICM and AIN, AOUT. Then it will appear in the ICM-faceplate and Step7-symbolic.

### Following Interlocks are mandatory

Put all interlocks in FB1226-1229, that they are active in manual and auto. Then in EOP, Unit-FBs or Route control these interlocks are not necessary.

- Pumps must have one open way (Inlet is more important than Outlet), to avoid running dry.
- Check empty sensor in the vessel for the pump.
- Steam-valves must have liquid in the vessel or in the pipe to avoid overheating. No Steam-Heat-Exchanger on, if the Pump is not running.
- Close all inlet-valves if the tank is full
- Door-Switches, safety switches interlock all relevant elements that can harm.
- Switch from one Tank to the other an overlapping of the valves is mandatory. Otherwise the cooler can be destroyed.
- Interlock of Production and CIP.
- Protection of product going to the Drain
- Protection that after hot water or caustic not any cold Agent is going to the Tank.
- Switch Valves delayed of if there is a pump for to avoid Pipe-noise.
- CIP: Switch next Step with conductivity delayed because it drops sometimes and raises again.
- CIP Return: Go to Drain if the Tanks are full
- Check that in Return CIP after a certain time the Agent is coming back. Otherwise switch off and generate Alarm.
- Check that if the pump is running, that there is a flow > x hl/h after lets say 30 sec. You can use the VMON for that

- If a hot liquid is in the vessel, ensure that operators are warned before they open the door.
- All other Interlocks according to FDS-description.

### How to avoid Vacuum in the Tank?

- If there is a upper pressure sensor, Vacuum can be detected by Software!
- Reduce the speed of the pump if possible.
- Pulse the pump by emptying after x min.
- Increase the capacity of the vacuum-valve.
- Ensure enough back-pressure for the pump (reduce flow by hand valve?)

### Multi-Engineering with Braumat

Works nice with Braumat on one PCU if you follow some rules

- Use the Excel-Engineering-Sheet (d:\WINDCS\EXCEL\Param\_PCU001\_BH1.xls) to reserve DFM's, FIXV, MULT, MEKO etc. for each Unit.
- Also reserve Timer (SE\_Timer for Inputs) for each part.
- Reserve Special-values for Setpoints and Timer-Values for each Part within a PCU. All Operator-Settings outside the recipe should be here, not in FIXV! Here you have a comment for each Setpoint etc. You can copy the text of Special values at the end in the Symbolic-List of Simatic-Manager.
- Reserve EOP's (Steps) for each Unit.
- We use one DB for each Unit for all the Flags, Integer etc. You avoid by this using the Symbolic-Table (which is global). But for most cases it is possible without using the symbolic file e.g. for to trigger the timers a flag in a DB can be used.
- Interlock-FB'S FB1226... are global FB. You can upload these from the PLC prior to change by one user.
- If needed we changed the Symbolic-File direct in the Master-Project.
- Everybody changes direct at the system online! Then all have the same database. It is very difficult to merge recipe from different Sources!!
- Clients change Data always on both Servers, so don't worry about Picture-Changes and recipe-changes.
- We synchronized our changes every evening in the Master-Project, and everybody took this the next day as basic for programming.
- In this way 3 people had been able to work in one PCU at the same time! Trigger for Status can not be increased unfortunately in Simatic-Manager. But you can see the Status also with Braumat (the flags direct or the blocks!).
- By the way, you can process the Symbolic-List in Excel if you export it to a .seq-File and drag and drop to Excel. Insert a fist line and input x in the first column, to avoid to be removed by saving.

### How to improve the Performance of engineering

Engineering-costs are a very sensitive issue. May be some of these hints help to improve the speed of engineering.

### Change files directly

Braumat is based on many text-files and Dbase-Files, which can be edited manually very easy.

**BUT** open this file afterwards in Braumat-Textparameterization and save to have the right format and for to synchronize on the other Server.

### Change of dBase-Files

For the Dbase-Files you can use Excel, or the Total-Commander-plugin “dbaseview.zip” (Freeware, also change the file with that).

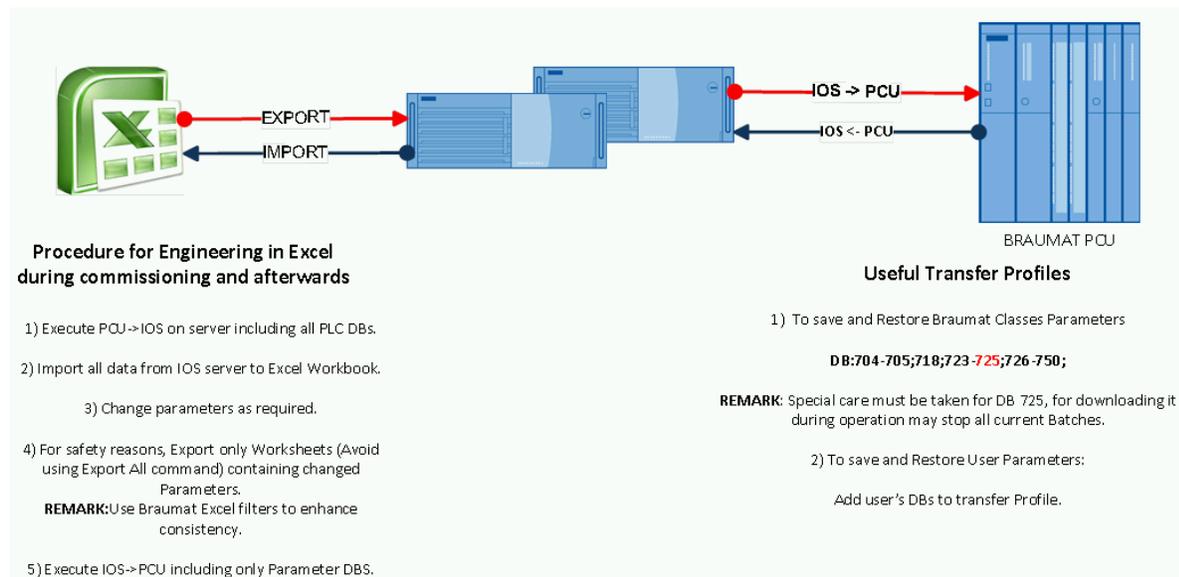
If you change with **Excel** (possible) take care not to change the column-width (you destroy the file). And to extend, only insert new lines but not append!

### Which files are used for what?

For recipe-Editing a lot of files are in \WINDCS\PCU.00x\recipe\. Or you change something in the recipe or another application, and check with Total-Commander “search file”, extended, not older than 1 minute...;

Also the Text-Files in \WINDCS\PCU.00x\texte can be edited externally, but to get them to the right format open them in Braumat and just save them. In this case the Format will be checked.

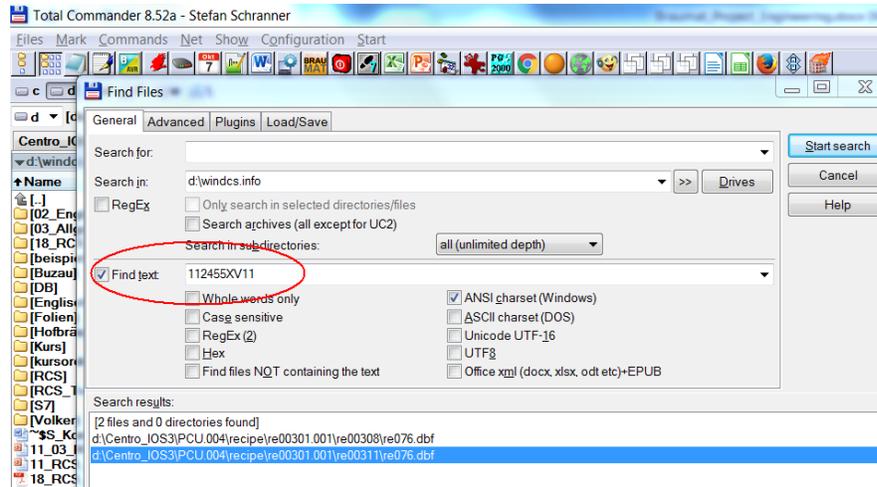
If several programmers are working on a project, it helps also to synchronize the Data if each Sequence has its own DB for necessary fags.



Especially in big plants, a lot of time is wasted to search Signals or elements in the different machines. This process can be speed up by exporting all Symbolic files of Simatic-manager to one folder, sorted by PCU.

In the same folder there could be the Export of all relevant FB1001-1128 and FB1220-1229 and FC1001...FC2999 and maybe if used other User-FC.

Now by searching for a text-string (Total-commander Alt +F7) very fast it is possible to verify the adress and the relevant PCU.



### Prevent CPU going to stop

make sure all OBs are loaded to prevent that! Some OBs have a content, some don't have.

OB80	CYCL_FLT	146	28.05.2014 16:03:06	—	Interrupt error
OB81	PS_FLT	54	28.05.2014 16:03:07	—	Power supply Fault
OB82	I/O_FLT1	386	28.05.2014 16:03:08	—	IO-Interface-Diagn-Int..
OB83	I/O_FLT2	134	28.05.2014 16:03:09	—	IO-Interface-Card Fault
OB84	CPU_FLT	38	28.05.2014 16:03:10	—	CPU-Hardware Fault
OB85	OBNL_FLT	38	28.05.2014 16:03:12	—	Program Error
OB86	RACK_FLT	38	28.05.2014 16:03:13	—	Rack Fault
OB87	COMM_FLT	38	28.05.2014 16:03:14	—	Communication Fault

### Tools for BRAUMAT for the cold Block (Fermentation-Tanks) in a Brewery

- Using Route-control for better engineering and visualization.
- Usage of line-recipes for to speed up engineering and necessary changes.
- Using an Add-on for Tank-cooling for 8 zones with a pre-stop-Temperature, Hysteresis etc.
- Automatic selection of the proper Sensor-Probe and Zone depending from the Tank-Level.
- Using an Add-on for intelligent cooling by switching of temperature-zones by a strategy.
- Using an Add-on for intelligent cooling by a Temperature-Ramp.
- Using an Add-on for Data-Management in the Tanks for the last x Tanks (which Brews, which Batch-Nr, Order-number, date etc.)

- Using an Add-on for the Quantity-calculation based on the Inlet and Outlet-counter.
- Using the Standard-Braumat Faceplate for Tank-visualization.
- Using the Standard-Braumat Tool for Tank Management (which Tanks are empty, cleaned, specific Brand etc.)
- Using Process-Image-Templates available in Wuerzburg
- Using existing run-time recipes with actual values to speed up commissioning
- Using a productivity Tool by Excel to speed up Engineering and Transparency for the CIP-Plant drastically.
- Using a Tank-overview-template with all the necessary data in one picture.
- Using the Braumat-Standard-faceplate for to display the double-seat valve.
- Using an Add-on for the pulses for cleaning of the double-seat-valve.
- Using a strategy for blending of Tanks in one batch
- Using a strategy for to switch over of Tanks during filling or emptying if full or empty in one batch. This can be done by RCS-functionality or other strategies.
- Using a tool to Input additional manual information to the tanks (about Status etc.).
- Having a backup-strategy if Tank-Data (which brand etc.) get lost.
- Optional using the advanced free protocol for daily reports.

## Clone a Unit

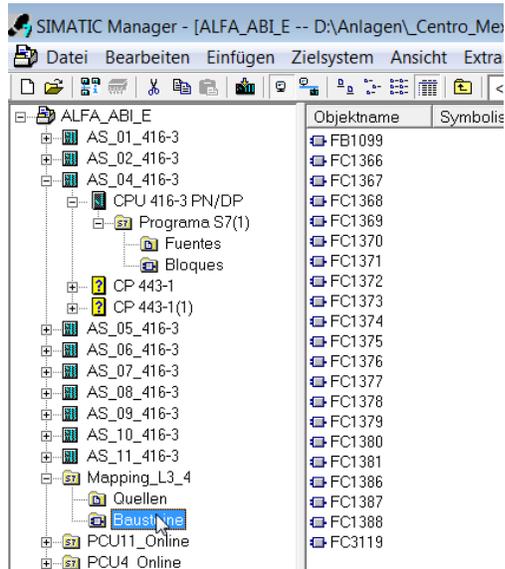
To clone a Unit an Excel-Mapping-Table helps a lot and in Simatic-Manager the function Rewire. For easier clone, prepare the Symbolic in that way, that the last extension is e.g. \_1 for Tank 1 and \_2 for Tank 2 etc.

Prepare an Excel-Table for the mapping-table with columns Unit 1 and cloned Unit 2

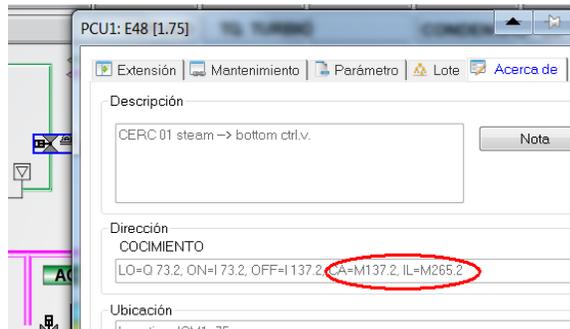
	Line 1	Line 2	Line 3	Line 4
Return valve	M 138.1	M 138.3	M 138.1	M 138.7
Drain valve	M 138.2	M 138.4	M 138.2	M 139.0
Agua cliente	M 137.4	M 137.5	M 137.4	M 137.7
Aqua fria	M 136.5	M 136.6	M 136.5	M 137.0
Line valve	M 135.6	M 135.7	M 135.6	M 136.1

Copy all relevant Blocks to an extra folder including symbolic  
Rename all blocks to the new Block-number manually

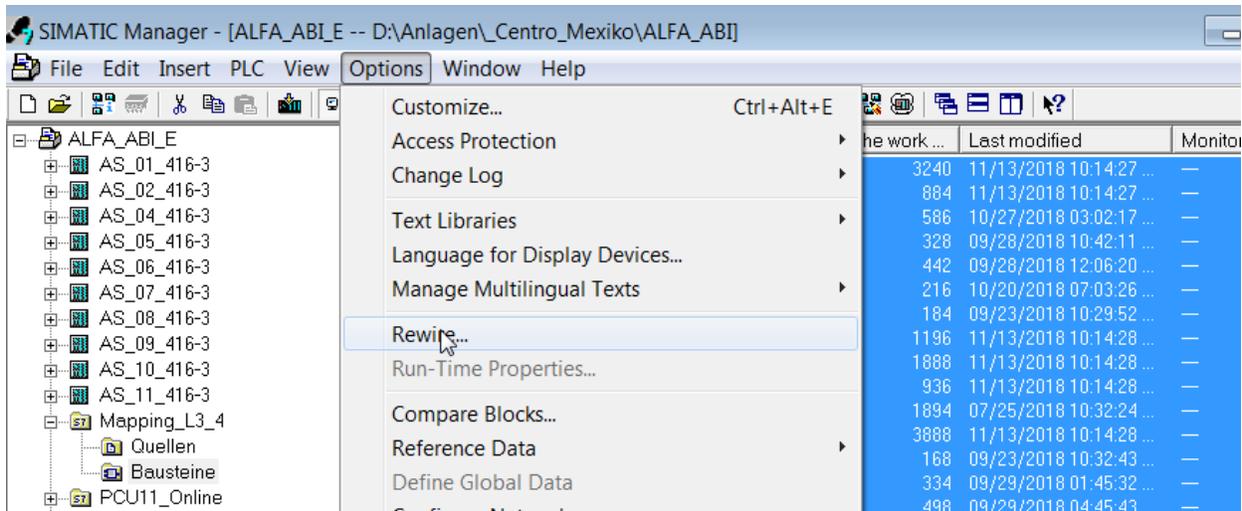
Generate a reference-list.



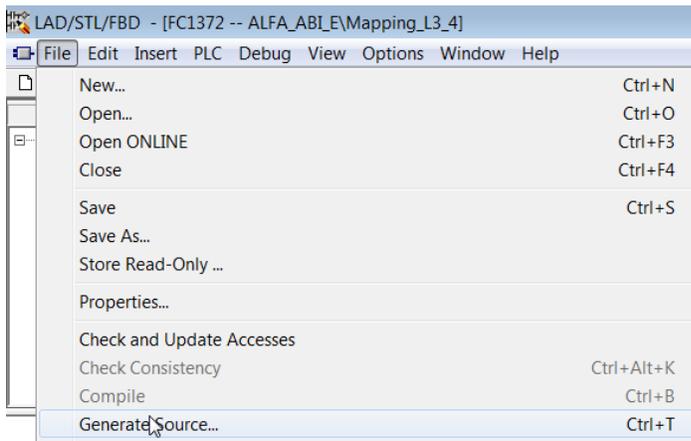
Now define for all flags and elements the corresponding new flag or elements (PID, AIN, ICM, message etc). For ICM you could use the flags showed in the screen:



All absolute Addresses can now be transferred to the new addresses by using Simatic-Manager-function "rewire".



Copy all the blocks back to the original folder.  
 Generate a Source with all new blocks with symbolic addresses.



Open the file and replace the symbolic-elements in the mapping table like

```
replace all DFM-call CALLs "BmDfmCallFC" (// UNIT CIP
iDfmType:= 2
iDfm           := 24);
```

by Call FC 2715

and the following Elements  
 (left original, right cloned)

```
"AIN".au[46]="AIN".au[47]
PID.au[11]=PID.au[12]
PID11=PID12
"DFM0".au[1]="DFM0".au[2]
"DFM6".au[7]="DFM6".au[8]
DFM0.128=DFM0.129
"VMON".au[25]="VMON".au[26]
```

"SEQ".au[96="SEQ".au[97  
TANK.au[96=TANK.au[97  
"TIMER1.440-Start"="TIMER1.441-Start"  
"TIMER1".au[440="TIMER1".au[441  
"TIMER1.440="TIMER1.441  
MSG562-Signal=MSG582-Signal  
MSG862-Signal=BmMsgCmd.abo[1362] if higher than 1024 (DB615)  
"DB\_Tank\_1"=DB3003 or use absolute name on the left!  
FC 3119=FC 3120  
M 4.5=M 14.5 (2 blancs!)  
ICM1".au[12=ICM1".au[13

In order to change absolute addresses (e.g. DB3001.DBX130.0) generate the Source with absolute-addresses and use the replace-function.

You can use a Word-macro replace.doc to make all immediately. Place a replacement-list in C:\Temp\replace.txt and call the Word-Macro.

Now you need to input in Braumat the new elements according to the mapping-table. The best is first to upload all DB. Then to import all in the Excel-Import/Export-Tools. Now you can copy / paste the existing Dataset to a new one.

Use the Tab EPE.ini and input the new steps (EOPs) with the according DFM. The rest could be done in the Recipe-System.

If you have a running system, upload the DB again, export only the new Datasets and download. If not you can export all and download to PCU.

### **How to make a recipe duplicate with a different unit**

- With Libre-office you can process dBase-files, it is freeware and no license-Problem for companies.
- Notepad ++ is an excellent freeware editor, and he supports to mark and change columns (with Alt+mark). I useitveryoften, also formytodos...;

First open the recipe that you want to duplicate. Click on File – Save as with creation of new recipe.

Mexico Centro (Beer Processing) Recipe editor - [Recipe procedure: CCIPS01]

Program File Edit View Project planning Window Help

Recipe overview

10 filter>

- 034 - MULTI LINE CCT2
- 035 - RCAT 35
- 036 - RCAT 36
- 037 - LINEA DE MOSTO CCT2
- 038 - LINEA DE MOSTO CCT1
- 039 - SUMINISTRO AIRE CCT1
- 040 - SUMINISTRO CO2 CCT1
- 041 - SUMINISTRO AIRE CCT2
- 042 - SUMINISTRO CO2 CCT2
- 043 - RCAT 43
- 044 - RCAT 44
- 045 - RCAT 45
- 046 - ACIDO FOSFORICO
- 047 - AMACOL
- 048 - SOSA CAUSTICA
- 049 - CARAMEL COLOR
- 050 - IODO
- 051 - STABILON
- 052 - GLYCOL
- 053 - RCAT 53
- 054 - RCAT 54
- 055 - RCAT 55
- 056 - RCAT 56
- 057 - RCAT 57
- 058 - RCAT 58
- 059 - RCAT 59
- 060 - RCAT 60
- 061 - RCAT 61
- 062 - RCAT 62
- 063 - CCIP02\_CCT's\_Acido
- 064 - CCIP02\_CCT's\_Caustica+Acido
- 065 - CCIP02\_CCT's\_Caustica+Acido+Des
- 066 - CCIP02\_CCT's\_Esterilizante
- 067 - CCIP02\_Lineas\_Caustica
- Master recipes
- Recipe procedures
  - 121 - CCIPS01
  - 153 - CCIPS02
  - 154 - CCIPS03

51\_CCIPS01 (R) 51\_CCIPS01 [8.39]

51\_STR CO2 01 (R) 51\_STR CO2 01 [5.31]

51\_ST (R) 51\_STI STR\_LAI

1 Start

2 Inicio CIP Ln

3 >SELEC. LINEA

4 Arranque Linea

Alter.10

6 Espera 2 FC1318(318) START CONDITIONS 2 FC1306(306) START C

Synch.10

8 Pre-Flush Ln 4 FC1319(319) CIP 4 FC1307(307)

9 Caustica->Agua Ln

10 Recuperacion

11 Circ. CF Ln

12 Agua->CF Ln

13 Recuperacion

14 Drenado

15 Enjuague Ln

Synch.20

17 Espera 6 FC1324

Synch.30

19 Liberacion 8 FC1325

Save as recipe procedure

Recipe procedure

Name

099 CIP - RETORNO LINEA\*

100 HCIPS01

101 HCIPS01

102 HCIPS01

103 RP\_103

104 HCIPS02

105 HCIPS02

106 HCIPS02

107 RP\_107

108 RP\_108

109 RP\_109

110 RP\_110

111 RP\_111

112 RP\_112

113 HCIPS01

114 HCIPS02

115 RP\_115

116 RP\_116

117 HCIPS01

118 HCIPS02

119 RP\_119

120 EP\_120

121 CCIPS01

122 CCIPS03

OK

Cancel

New

Step	EOP ID	Name/ROP ID	Time
1		Start	
2	881	Inicio CIP Ln	Time
3			
5			00:00:00

BF(00000000) 0.0 0.0

Assign new recipe to your recipe category. It might be that even if you select different recipe category, new recipe will be created in the recipe category of the original recipe. Just go to the header recipe and

Recipe procedure header

Recipe procedure

Name: CCIP02\_Lineas\_Caustica1

No: 317

Batchsize

Minimum: 100

Maximum: 100

nominal: 100

Recipe category assignment

NEW\_CIP\_RECIPES\_PCU6

Change

Start recipe unit procedure

Unit not defined

Status

not complete

Cycle

Time: 01:00:00

Creation

Name:

Date: 23.11.18

Time: 09:35:50

Last change

Name:

Date: 23.11.18

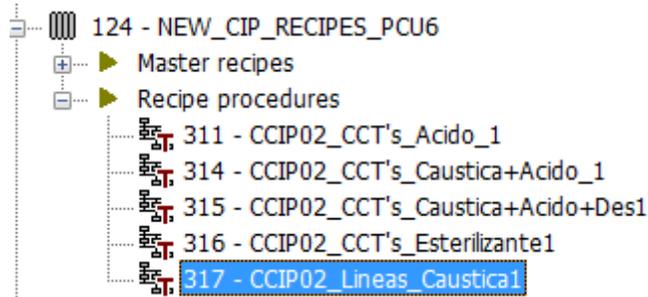
Time: 09:35:50

OK

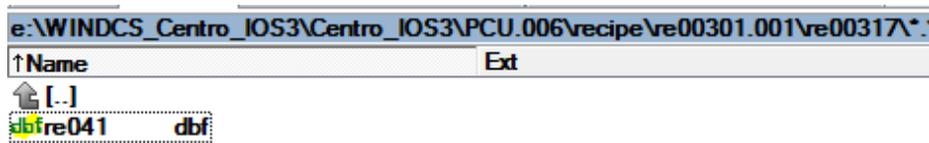
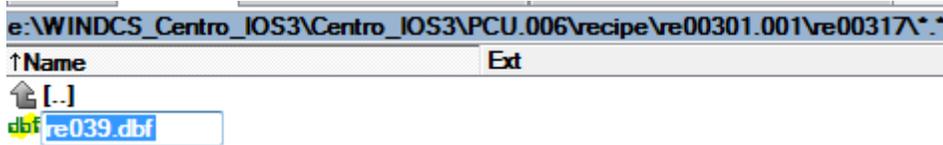
Cancel

change it again.

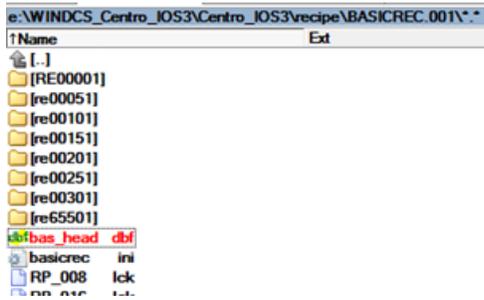
The new recipe will appear under your recipe category. Notice that each recipe has a number in front of name (317 in our example).



With this number you can locate .dbf files of your recipe. Go to the “recipe” folder of your PCU and look after folder re00xxx (re00317) in our example. For changing the unit, rename .dbf file of that unit you want to change.



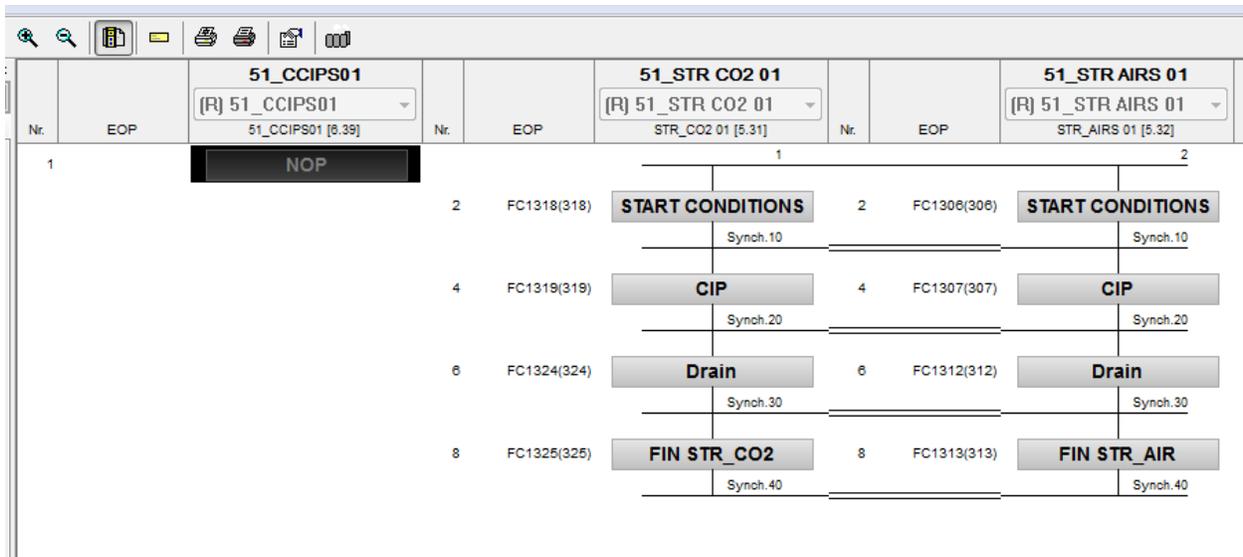
After that, go to main recipe folder (project root) and look at bas\_head.dbf file.



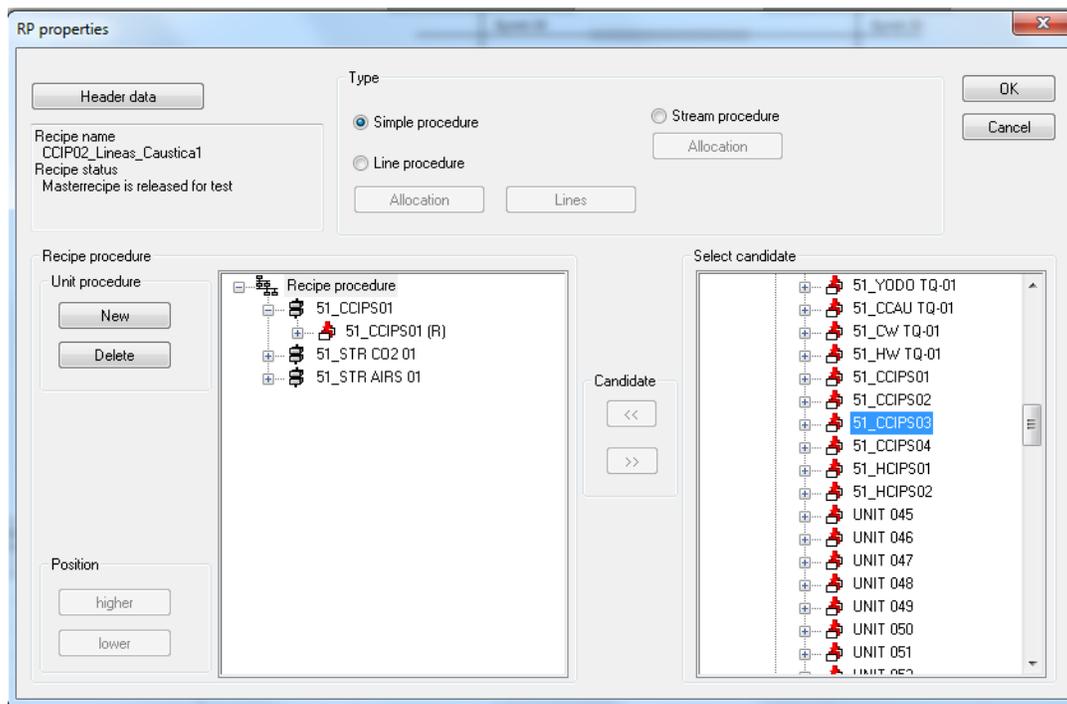
Open this file in Excel and find your recipe there. In column K you will see unit number – change it to new one (41 in this example).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	
286	285	YPL-HCAU/ACID/ESTRL	0	t	119	100.000	100.000	100.000	3600	4	97	27	10	13:58:43			
287	286	RP_286	0	w	0	100.000	100.000	100.000	3600	1	1	12	10	10:57:20	12	10	14:11:05
288	287	YPL-ESTRL	0	t	120	100.000	100.000	100.000	3600	4	97	27	10	13:58:04	12	10	14:11:05
289	288	YST02	0	t	103	100.000	100.000	100.000	3600	4	22	15	11	09:10:20	13	10	14:11:05
290	289	HARVEST_02	0	w	0	100.000	100.000	100.000	3600	1	1	22	11	11:00:30	13	10	14:11:05
291	290	SURPLUS_02	0	w	0	100.000	100.000	100.000	3600	4	38	22	11	10:59:25	13	10	14:11:05
292	291	RP_291	0	w	88	100.000	100.000	100.000	3600	1	1	13	10	14:26:13	13	10	14:11:05
293	292	PITCHING_02	0	t	104	100.000	100.000	100.000	3600	4	35	27	10	07:16:55	13	10	14:11:05
294	293	HARVEST_02	0	w	104	100.000	100.000	100.000	3600	1	1	13	10	14:27:23	13	10	14:11:05
295	294	SURPLUS_02	0	w	104	100.000	100.000	100.000	3600	1	1	13	10	14:27:46	13	10	14:11:05
296	295	GAS_SKID_02	0	t	103	100.000	100.000	100.000	3600	4	33	16	10	19:47:36	16	10	14:11:05
297	296	CO2 SUM 02 PROD	0	t	40	100.000	100.000	100.000	3600	5	49	18	10	18:31:35	17	10	14:11:05
298	297	CO2 ESTERIL 02	0	t	40	100.000	100.000	100.000	3600	5	49	18	10	19:52:15	18	10	14:11:05
299	298	CIP BH TO YST	8	t	84	100.000	100.000	100.000	3600	4	120	20	10	21:47:59	20	10	14:11:05
300	299	YHL-ESTRL	0	t	120	100.000	100.000	100.000	3600	4	97	30	10	19:12:16	30	10	14:11:05
301	300	YST03	0	t	103	100.000	100.000	100.000	3600	4	23	06	11	20:53:15	02	11	14:11:05
302	301	YST04	0	t	103	100.000	100.000	100.000	3600	4	24	06	11	20:53:00	02	11	14:11:05
303	302	TDA_05	0	t	103	100.000	100.000	100.000	3600	4	21	02	11	03:10:29	02	11	14:11:05
304	303	Cip de Filtro 01	0	w	30	100.000	100.000	100.000	3600	8	70	06	11	02:31:48	06	11	14:11:05
305	305	CIP03	0	w	88	100.000	100.000	100.000	3600	6	41	17	11	10:03:58	17	11	14:11:05
306	306	HCIP3_TANQUES_ACIDO_ESTRL	0	w	122	100.000	100.000	100.000	3600	4	98	22	11	11:32:27	22	11	14:11:05
307	307	HCIP3_TANQUES_CAUSTICA+ACIDO	0	w	122	100.000	100.000	100.000	3600	4	98	22	11	11:33:08	22	11	14:11:05
308	308	HCIP3_TANQUES_CAUSTICA+ACIDO	0	w	122	100.000	100.000	100.000	3600	4	98	22	11	11:33:37	22	11	14:11:05
309	309	PCU6	0	w	0	100.000	100.000	100.000	3600	1	1	22	11	11:50:58	22	11	14:11:05
310	310	Test	0	t	0	100.000	100.000	100.000	3600	6	39	22	11	12:11:19	22	11	14:11:05
311	311	CCIP02_CCT's_Acido_1	0	t	124	100.000	100.000	100.000	3600	6	41	22	11	15:56:04	22	11	14:11:05
312	312	CCIP02_CCT's_Acido_2	0	t	0	100.000	100.000	100.000	3600	6	40	22	11	14:30:34	22	11	14:11:05
313	313	Susi	0	t	89	100.000	100.000	100.000	3600	6	39	22	11	15:57:03	22	11	14:11:05
314	314	CCIP02_CCT's_Caustica+Acido_1	0	t	124	100.000	100.000	100.000	3600	6	41	22	11	16:26:06	22	11	14:11:05
315	315	CCIP02_CCT's_Caustica+Acido+Des1	0	t	124	100.000	100.000	100.000	3600	6	41	23	11	08:48:37	22	11	14:11:05
316	316	CCIP02_CCT's_Esterilizante1	0	t	124	100.000	100.000	100.000	3600	6	41	23	11	09:06:46	23	11	14:11:05
317	317	CCIP02_Lineas_Caustica1	0	t	124	100.000	100.000	100.000	3600	6	39	23	11	09:37:15	23	11	14:11:05
318																	

After doing this, your unit will disappear in the recipe.



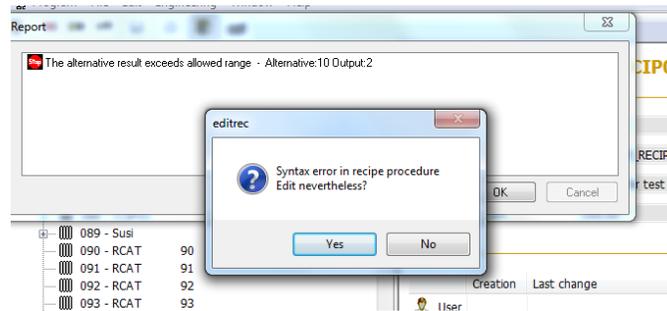
To retrieve it, go to recipe procedure Properties and replace the old unit (candidate) with a new one. Click OK.



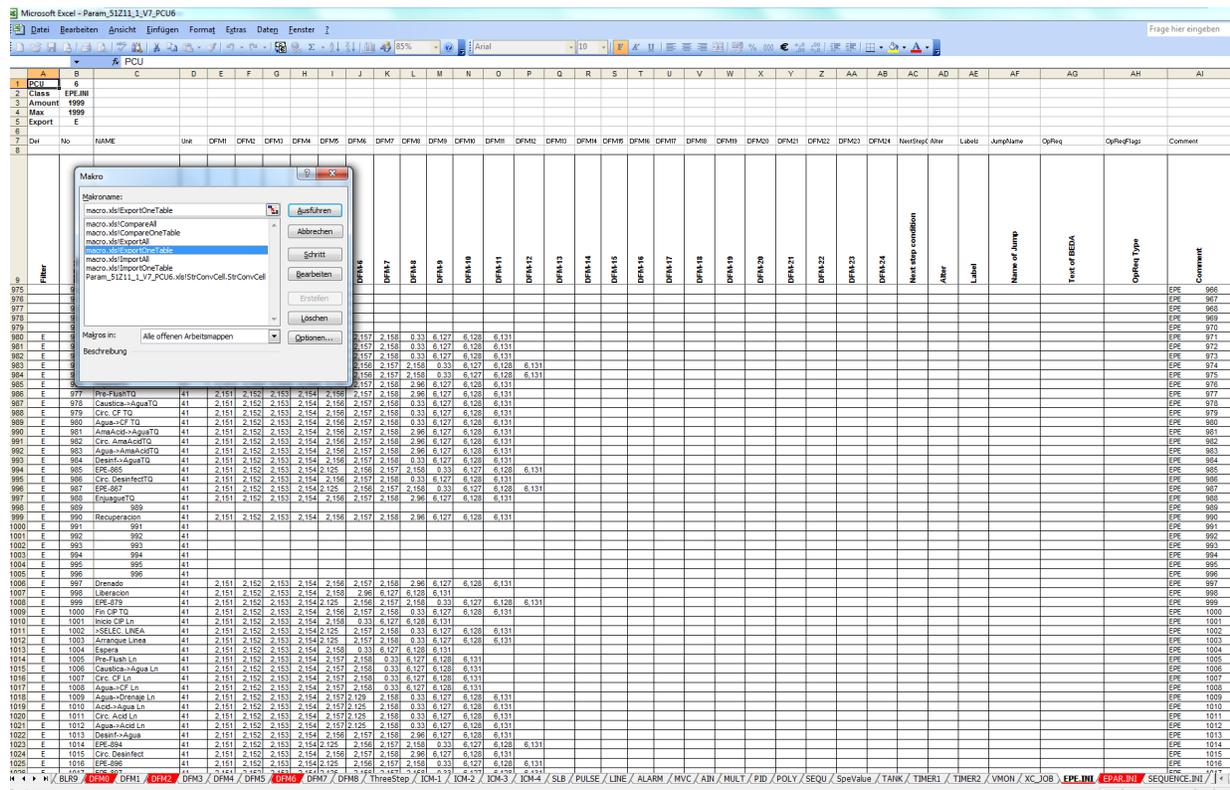
Unit will reappear in the recipe. Alternative producer EOP might change to ROP and you will get error. Assign EOP back to Alternative producer.



Save the file and open the recipe. You might get an error for Alternative producer again (change as described above).



Do the ExportOneTable for EPE.ini in order to assign proper DFM-s to your steps (otherwise old DFM-s from previous recipe will remain).



At the end, adjust the values of the setpoints since they will be set to 0 after all of this. You can do this in .dbf file. Just copy the values from .dbf file of the original recipe.

Step	EOP ID	Name/ROP ID	Time	Setpoint 1	Setpoint 2	Setpoint 3	Setpoint 4	Setpoint 5	Setpoint 6	Setpoint 7	Setpoint 8	Setpoint 9
1		Start										
2	1001	Inicio CIP Ln	Time	Opciones [-]	Tiempo Min. [Min.]	Tiempo Max. [Min.]	Tiempo Circ. [Min.]	Tiempo PV<>SP [...]	Volumen S103 [hl]	Flujo [hl/hr]	Conduc. Retorno [...]	Temp. Retorno [...]
	5		00:00:00	BF(00000000)	0.0	0.0	0.0	0	0	0.0	0.0	0.0
3	1002	>SELEC. LINEA	Time	Opciones [-]	Tiempo Min. [Min.]	Tiempo Max. [Min.]	Tiempo Circ. [Min.]	Destino [-]	Tipo de CIP [-]	Tiempo PV<>SP [...]	Volumen S103 [hl]	Flujo [hl/hr]
	6		00:00:00	BF(00000000)	0.0	0.0	0.0	<undefined>	<undefined>	0	0	0.0
4	1003	Arranque Linea	Time	Opciones [-]	Tiempo Min. [Min.]	Tiempo Max. [Min.]	Tiempo Circ. [Min.]	Destino [-]	Tipo de CIP [-]	Tiempo PV<>SP [...]	Volumen S103 [hl]	Flujo [hl/hr]
	7		00:00:00	BF(00000000)	0.0	0.0	0.0	#	<undefined>	0	0	0.0
5		Alternative	Number									
	24		10									
6	1004	Espera	Time	Opciones [-]	Tiempo Min. [Min.]	Tiempo Max. [Min.]	Tiempo Circ. [Min.]	Tiempo PV<>SP [...]	Volumen S103 [hl]	Flujo [hl/hr]	Conduc. Retorno [...]	Temp. Retorno [...]
	8		00:00:00	BF(00000000)	0.0	0.0	0.0	0	0	0.0	0.0	0.0
7		Synchronization	Number									
	33		10									
8	1005	Pre-Flush Ln	Time	Opciones [-]	Tiempo Min. [Min.]	Tiempo Max. [Min.]	Tiempo Circ. [Min.]	Tipo de CIP [-]	Tiempo PV<>SP [...]	Volumen S103 [hl]	Flujo [hl/hr]	Conduc. Retorno [...]
	9		00:00:00	BF(00000000)	0.0	0.0	0.0	<undefined>	0	0	0.0	0.0
9	1006	Cautica->Agua Ln	Time	Opciones [-]	Tiempo Min. [Min.]	Tiempo Max. [Min.]	Tiempo Circ. [Min.]	Tipo de CIP [-]	Tiempo PV<>SP [...]	Volumen S103 [hl]	Flujo [hl/hr]	Conduc. Retorno [...]
	10		00:00:00	BF(00000000)	0.0	0.0	0.0	<undefined>	0	0	0.0	0.0

### Clone a Recipe (new Unit, new EOPs, new DFM but same structure and Set points)

- Open the according Excel-Parameters-Sheet.
- Import in the folder EPE.ini the actual recipe-parameters from Braumat.
- Copy / paste the EOPs of the existing Unit to the new EOPs.
- Change the name and the DFMs according to a Mapping-Table.
- For proper Export to another IOS put E (=Export) in the first column only in the rows which should be exported.
- Export the selected rows to IOS.

	319		0									
	320	CON INI DOSI 02	121									
	321	DOSIFICACION 02	121	3.73	3.74							
	322	PAUSA DOSIFICACION 02	121	3.73	3.74							
	323		0									
E	324	HCIP13 FIN_CIP	98	2.23	2.68	2.68	2.36					
E	325	HCIP13 SELECCION TANQUE	98	2.23								
E	326	HCIP13 CAMBIO FASE	98									
E	327	HCIP13 ACID_CIRC	98	6.32	2.37	2.36	2.79					
E	328	HCIP13 POST_F_PREP	98	6.29	6.30	2.87	2.79					
E	329	HCIP13 POST_RUN_PREP	98	6.30	2.87	2.79						
E	330	HCIP13 CALENTAMIENTO	98	6.29	2.87	2.79						
E	331	HCIP13 CON INI	98									
E	332	HCIP13 PRE-FLUSH	98	6.32	2.68	2.69	2.83	2.79	2.87			
E	333	HCIP13 EMPUJE	98	6.30	6.31	6.29	2.68	2.69	2.79	2.87	6.32	
E	334	HCIP13 CIRCULACION	98	2.68	2.69	2.37	2.79	2.87	6.30			
E	335	HCIP13 EMP_CIP	98	6.30	6.31	2.68	2.69					
E	336	HCIP13 ENJUAGUE	98	6.30	6.31	6.29	2.68	2.69	6.32	2.36	2.79	2.87
E	337	HCIP13 F_INI	98									
E	338	HCIP13 F_EMP	98	2.79								
E	339	HCIP13 F_DREN	98	2.36	2.79							
E	340	HCIP13 F_AGUA	98	2.37	2.36	2.68	2.79					
	341	HCIP13 FINAL	98	6.11	6.10	2.77	2.85					
	342	EOP 0342	0									
	343	EOP 0343	0									
	344	EOP 0344	0									

- Open the Tabs DFM 0 ... DFM 8 and copy paste the source DFMs to new DFMs and change name and addresses (AIN-source etc).
- Export (only the new lines?) DFMs to IOS-Server

- Open EPAR.ini and import the Data.
- Copy / Paste the Unit and decimal-points of Source-DFM to the new DFM.
- Export to IOS.

### Make a new recipe with one step

Make a new recipe-category, a new Master-Recipe and give the new name and save it.

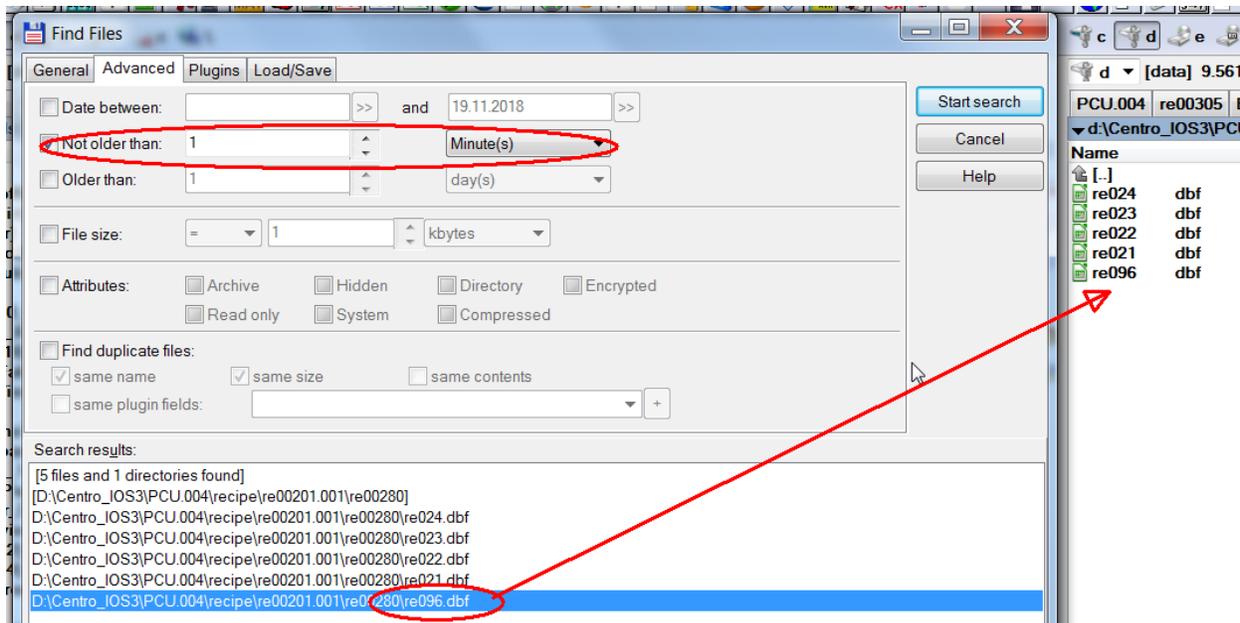
Press “New” to generate a new Recipe-procedure and link it to the appropriate recipe-Category.

Input the new recipe-name and select the relevant Unit on the right side.

Now save that recipe with only 1 step and close it.

Open the **source Recipe** change a bit (monitoring time) and save it.

Search with total commander at PCU.00x\recipe for the file which changed last minute and jump there.



- Take this file as source (e.g. re096.dbf) and copy to the destination folder. You find the destination-folder as well by search by time..
- Delete the destination dbf with only one step (e.g. re098.dbf)
- Copy the source file to the destination-file-name (e.g. re096.dbf to re098.dbf) but keep the Source-file (re096.dbf).
- Open the file with Excel 2003 (newer versions are not able to handle dBase-Files) or Libre Office or with Total-commander with the plugin dBaseview or MS-Access.

- Change the old EOP-Number to the new EOP-number and close the file.

Lister (baseview) - [D:\Centro\_IOS3\PCU.004\recipe\re00201.001\re00280\re096.dbf]

STEP	GOP_TYPE	GOP_NR	GOP_NAME	GOP_ID	SETP_QUANT	TIME
1	G	32700	Start	1	0	
2	A	95	HCIP11_SELECCION_TANQUE	72	1	
3	G	32703	Alternative	73	0	
4	G	101	HCIP11_CON_INI	4	0	
5	G	32702	Synchronization	9	0	
6	G	103	HCIP11_EMPUJE	47	8	
7	G	104	HCIP11_CIRCULACION	54	6	
8	G	32702	Synchronization	56	0	
9	G	96	HCIP11_CAMBIO_FASE	58	0	
10	G	32702	Synchronization	109	0	
11	G	32722	NOP	107	0	
12	G	32702	Synchronization	70	0	
13	G	94	HCIP11_FIN_CIP	108	4	
14	G	32701	End	43	0	

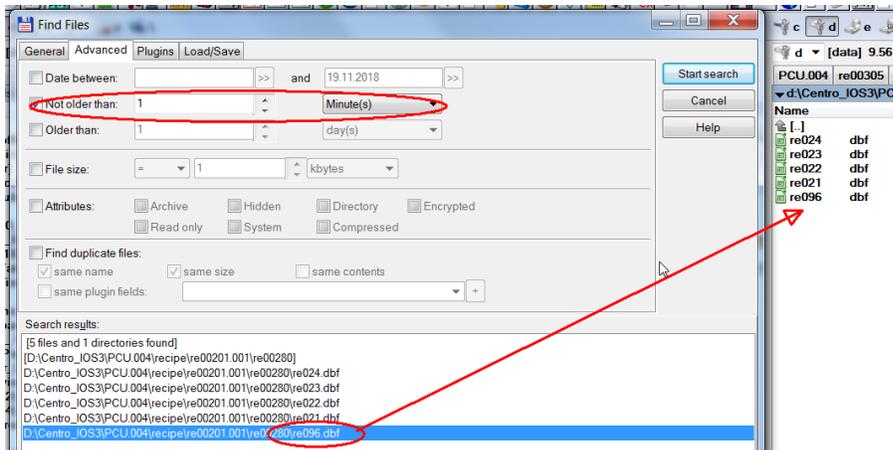
- Open the new recipe now in Braumat and the new EOP-numbers appear.
- Select Edit, update and all the new DFM appear, but all the Set point-values are set to “0”.
- Save the recipe and open Source-dbf and Destination-dbf (re096.dbf and re098.dbf) with dBase-Editor (see above).
- Copy the values of column SETP1\_VAL, SETP2\_VAL etc. from Source to destination.

### Export one recipe and import

- Open the according Excel-Parameters-Sheet.
- Open EPE.ini, EPAR.ini and Sequence.ini and import the Data.



- Export the according dBase-Files. You can find them by changing the recipe, save and check (with total commander) for the changes in last minute.



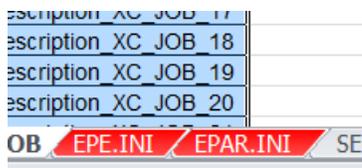
- Make a new recipe-category, a new Master-Recipe and give the new name and save it.
- Press “New” to generate a new Recipe-procedure and link it to the appropriate recipe-Category. Input the new recipe-name and select the relevant Unit on the right side. Now save that recipe with only 1 step and close it.
- Try to find the according folder (by the procedure like above with the date) and copy to the Backup-files to the destination folder.
- Open EPE.ini, EPAR.ini and Sequence.ini of the Excel-file and Export the Data. Make sure prior to export to mark (first column with “E”) only the new lines of the selected recipe.
- Open the imported recipe and make update to ensure all data are correct.

### Remote-Engineering, Integration in the System Braumat

It is possible to do remote-Engineering by following some agreements to used different Sequences, EOPs, DFM, DBs etc.

Following elements need to be transferred.

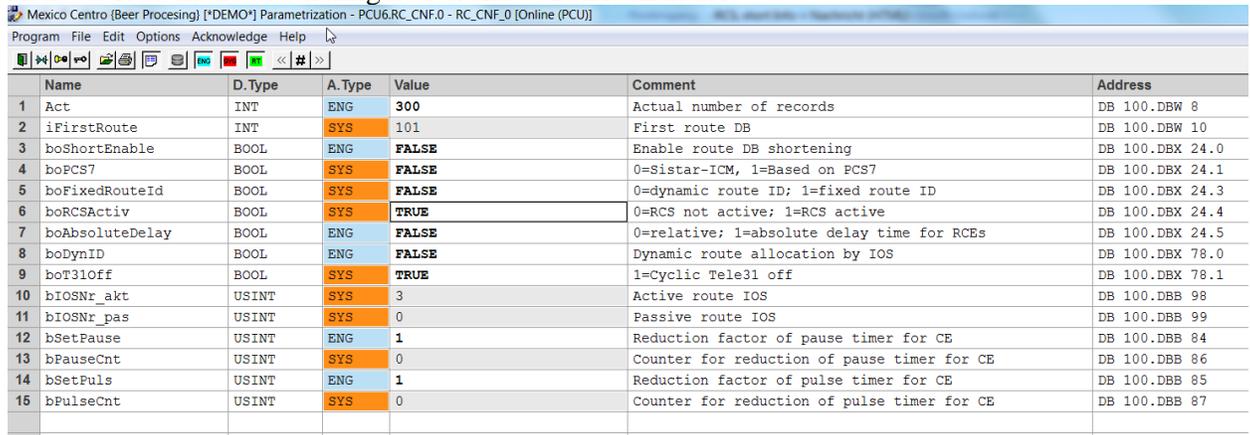
- Copy the Step7-blocks to the according PCU in the project and download.
- Import the Symbolic-File in Step7-Symbolic-Editor.
- Export from Param\_PCUx.xls the marked Tabs to Braumat. That includes the parts of the recipe-system as well.



In the first column is a Filter for Export, (E=Export, the rest not). So only the relevant Dataset are marked, but not the rest.



Activate RCS in the Site-konfiguration and switch it on in here:



	Name	D.Type	A.Type	Value	Comment	Address
1	Act	INT	ENG	300	Actual number of records	DB 100.DBW 8
2	iFirstRoute	INT	SYS	101	First route DB	DB 100.DBW 10
3	boShortEnable	BOOL	ENG	FALSE	Enable route DB shortening	DB 100.DBX 24.0
4	boPCS7	BOOL	SYS	FALSE	0=Sistar-ICM, 1=Based on PCS7	DB 100.DBX 24.1
5	boFixedRouteId	BOOL	SYS	FALSE	0=dynamic route ID; 1=fixed route ID	DB 100.DBX 24.3
6	boRCSActiv	BOOL	SYS	TRUE	0=RCS not active; 1=RCS active	DB 100.DBX 24.4
7	boAbsoluteDelay	BOOL	ENG	FALSE	0=relative; 1=absolute delay time for RCEs	DB 100.DBX 24.5
8	boDynID	BOOL	ENG	FALSE	Dynamic route allocation by IOS	DB 100.DBX 78.0
9	boT31off	BOOL	SYS	TRUE	1=Cyclic Tele31 off	DB 100.DBX 78.1
10	bIOSNr akt	USINT	SYS	3	Active route IOS	DB 100.DBB 98
11	bIOSNr pas	USINT	SYS	0	Passive route IOS	DB 100.DBB 99
12	bSetPause	USINT	ENG	1	Reduction factor of pause timer for CE	DB 100.DBB 84
13	bPauseCnt	USINT	SYS	0	Counter for reduction of pause timer for CE	DB 100.DBB 86
14	bSetPuls	USINT	ENG	1	Reduction factor of pulse timer for CE	DB 100.DBB 85
15	bPulseCnt	USINT	SYS	0	Counter for reduction of pulse timer for CE	DB 100.DBB 87

- To get the proper elements for Route-Control, the process-images could easily supply the proper address and in Simatic-manager with that address the symbolic and ICM-number is available for RCS or programming.
- You can import Braumat-ICM to RCS but not the sensors.
- A Level-Sensor (of the Tank) can be checked in RCS and the result transferred to Step7.
- But normally all sensors are linked to Braumat-timers (which is the standard) and copy the file timer\_01.txt or timer\_02.txt to rcs\_se.txt, which belongs to route control and transfer the Bits to DB 1098. Senor-Elements need to be transferred in the DB1098.

**Parameter element (PE)** are used for setpoint specification

With **Link elements** it is possible to include information regarding materials in the route search.

**Locations** are the "nodes" of the pipe-network.

**VIA:** By specifying plant points as via parameters, the route search can be restricted to certain partial routes.

**Mode-Table:** The path search can be restricted by specifying the ID of a mod table, since then only partial paths within this mode table are used for the path search. By specifying 0, all partial paths of the database are taken into account for the route search.

**MATERIAL:** If link elements are used as storage for the transported material, it is possible to check by specifying a Material ID during the route request whether the desired subsequent material is permitted as a material successor for the last material.

### Functions-IDs

They serve to allow that two routes can use the same way (with the same function-ID > 300). But this case is more the exception. Normally they should have different Function-IDs below 300.

### Entity-Concept

An entity is defined as a closed unit and is limited by two investment points. But what is a closed unit? To do this, you have to mentally de-control all elements of a plant. If one would introduce water

into the relevant pipe sections, all elements that come into contact with water would be assigned to an entity. The start or end point is to be equated with a plant point, which is designated by a distinctive point (e.g. shut-off valve or tank). This procedure has to be repeated until no new entities can be found.

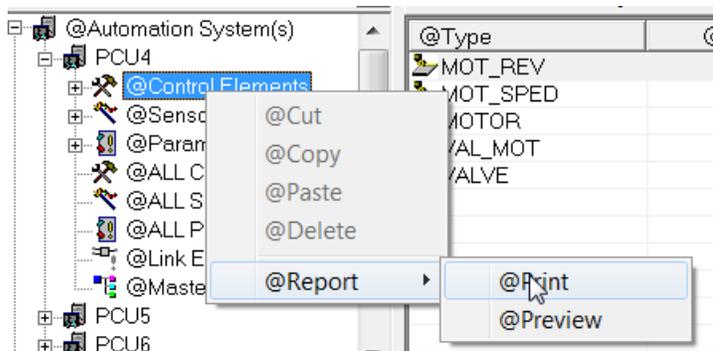
First define locations, e.g. tank outlet, crossing-points...; Name + ID

Then partial routes: which ICM is involved? From which location to which...; set priority for the selection of the best route (lowest priority=1);

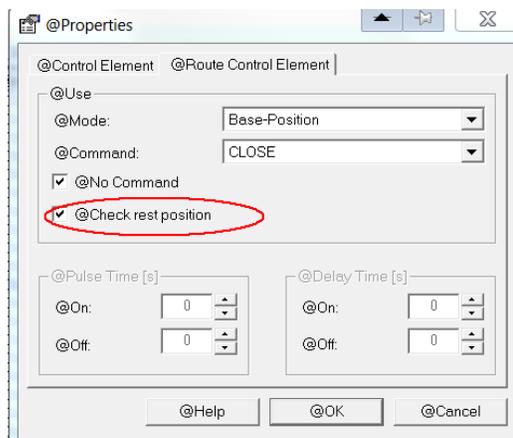
Pull ICM from PCU above down, then right mouse function=index; only query = no control;

Parameter element: Analog Setpoint, actual value goes back (up to 24 setpoints/actuals)

- Use the PN&D and the Process-images (if all is inside and correct) to get the according elements and addresses (from the faceplate), and Input the address in Simatic-Manager. From there you get the according symbol and input it in Route-control. Keep in mind that in the process-images not all rails are displayed.
- To speed up RCS-engineering, you can export the ICM-names and according number by right click Automation Systems, PCUx, Control-element, Report, Print.

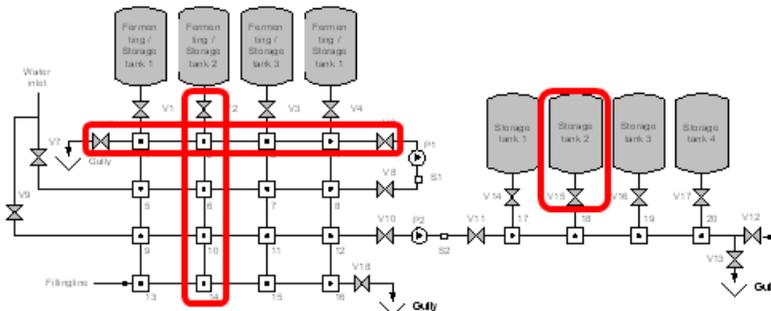


The check rest position bit decides whether the element should be monitored to be off or on.



- For CIP you can make one Route to the Tank (2 Locations CIP Prerun and Tank). And one route back (Tank to CIP-Return).

- Make all Tanks for one CIP-Program in one Mode-Table.
- The drain and circulation-valve might be used in specific steps. So these valves have to be out of the basic condition for route ok.
- RCS: It can be designed according to the entity-concept.



One CM ( valve, motor ) can belong at least to one but not more than to two *entities*.

But we made successful plants without entities but making complete routes to the Tank, from the Tank etc.

RCS	Entity-concept	making complete routes	comment
Transparency	1	5	(5 is best)
Easy copy/paste	1	5	
time for searching locations in RCS	1	5	
integration of new remote-engineered routes	0	5	
clear understanding of routes	0	5	
size of the Database	5	1	
integrating new elements for x-Tanks	5	1	max. 30 minutes for 20 Tanks
Limitation of IDs	1	5	
RCS-performance	5	5	
finding alternative routes	5	1	this is not necessary in Cellar areas
Volume calculation	5	2	can be done by a table
Multi-engineering	1	5	because the other has no idea what the locations mean
finding errors	2	5	
in high complex configurations	1	5	you easy get lot about all the location-names and lose overview
<b>Summary advantages</b>	<b>33</b>	<b>55</b>	
<b>Annotation</b>			
The Cellar is not like the routing of a car, that you have several options to go to a destination.			
You can mix both concepts easily			
for the transfer between tanks, there are endless combinations, where a Entity-concept might be good!			

These are the relevant elements.

**Locations** are used for structuring the plant and as a start- and end – point of a partial routes. (Entity = Location).

**Example for locations:** 1; Tank01, CIP Station RV, CIP Station Tank RR, Word Panel 1748HV2, Word Paneel 1748HV28 etc. all Valves! Yeast pipe V01HV244, Beer pipe V01HV243, ZKT Paneel 1751HV31, ZKT Paneel 1751HV32 etc.

**Modes:** Open Source, Drain, Open Destination, Pump, Open Water

**Proposal: Locations :** Take the unit or control module name

**Proposal: Partial route:** “<start\_location\_name>\_<end\_location\_name>”

A **partial route** is the logical connection between two locations. Partial route = connection of two Entities.

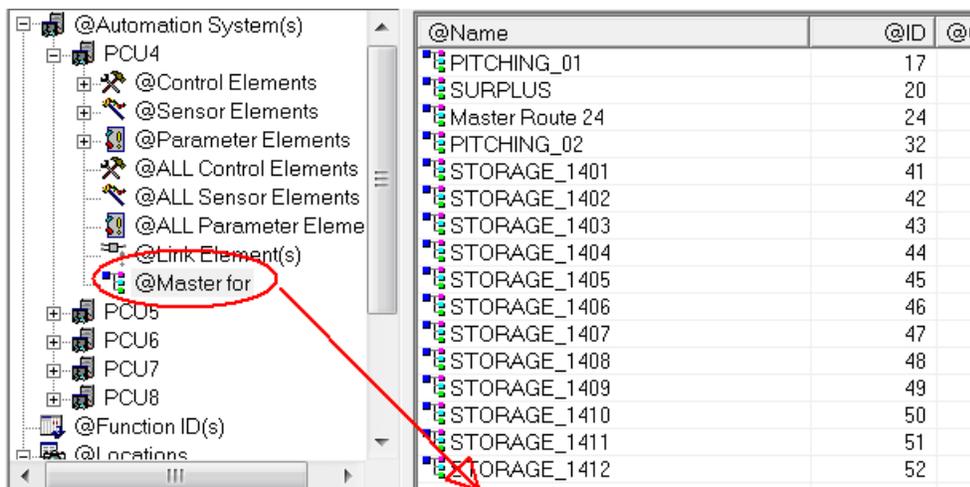
We do not only switch on the complete route. We have to follow a defined sequence. This sequence could be realized with the **Mode Table** and the 32 Modes

Mode Table(s)\Transfer_1		
Mode	No.	Comment
Base position	1	Base position of valves and motors
Set path	2	Activate valves/motors for transfer
Open source	3	Activate valves at source tank
Open water valve	4	Activate valves for water distribution
Open destination	5	Activate valves to destination tank
Open gully valve	6	Activate valves to gully
Start pump	7	Activate transfer pump

A mixture of both strategies is making the common elements in one Partial route the other Routes for each Tank extra. This simplifies changes in the “common elements” if in the future many changes will take place.

Input the route-ID, which is necessary for activation of the route in here.

It is free but maybe corresponds to the according Unit-number? This number is used in the Software with “Route-ID”.



In RCS you can define names for the function-ID

The purpose of the Func\_ID is to let 2 routes use the same Valves (same ID) or not (different ID). In the Software this free number (starting from 300..) corresponding to the Route-ID (Route-ID + 300?) is used.

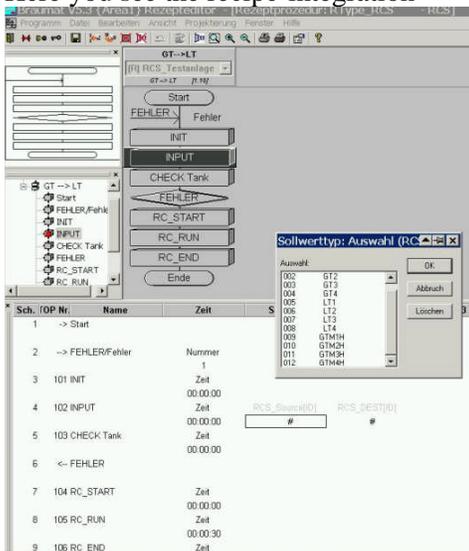
- You can export RCS to Excel, to speed up engineering, especially if the Routes are alike. But when exporting partial Locations also partial routes with elements. Otherwise by importing the

database is corrupt.



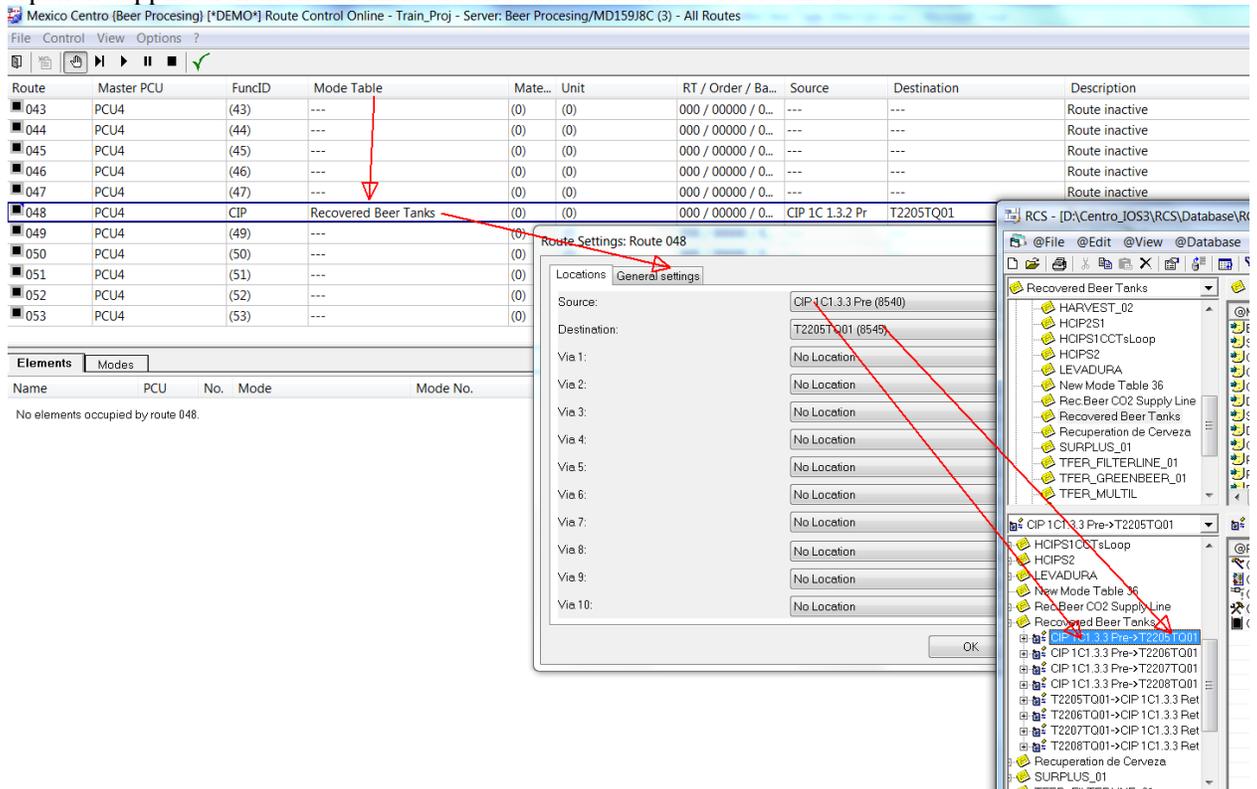
Use the **Route-Tester** to prevent undesired combinations.

Here you see the recipe-integration



Then you can use RCS online to test the route

Open the application in the Main menu and select the mode-Table and routes.



## Programming Templates for RCS

```
// Modetable
L 47 //Mode-Table according to RCS
T "SEQ".uRCS.MODE_TBL
// Route ID
L 70 //Route-ID (route-DB) according to RCS PCU4 Master for...
T "SEQ".u.iROUT_ID // Route function ID
L 305 //Func_ID to let 2 routes use the same Valves (same ID) or not (different ID)
T "SEQ".uRCS.FUNC_ID // Func_Id
// Route source and destination
L 8540 //source according to RCS or by DFM
T "SEQ".uRCS.SOURCE
L 8545 // destination according to RCS or by DFM
T "SEQ".uRCS.DEST
//Start route
A "Unit70 DB".RCS_activate
= "SEQ".uRCS.REQ
= "SEQ".uRCS.RON
//RCS Modes
L 0 // Reset all Modes
T DB725.DBD 400
//Mode 1
A "Unit70 DB".RCS_activate
A "SEQ".uRCS.QON
A "Unit70 DB".Mode_1
```

```

A(
AN  "Unit70 DB".Mode_6      //open Drain?
A   "SEQ".uRCS.QMODE_08    //Drain closed
O   "Unit70 DB".Mode_6      //open Drain?
)
=   "SEQ".uRCS.MODE_01      //Mode x activate
//Mode 2 valves on if mode 1 is ok
A   "Unit70 DB".RCS_activate
A   "SEQ".uRCS.QON
A   "SEQ".uRCS.QMODE_01     //Mode x activate; if Base position ok valves on, same step
A   "Unit70 DB".Mode_2
=   "SEQ".uRCS.MODE_02      //Mode x activate
//Mode 7 pump on if mode 2 valves is ok
A   "Unit70 DB".RCS_activate
A   "SEQ".uRCS.QON
A   "Unit70 DB".Mode_7
A   "SEQ".uRCS.QMODE_02     //Mode x activate //if valves on, start Pump , can be in the same
step
=   "SEQ".uRCS.MODE_07      //Mode x activate
//Mode 6 Drain open
A   "Unit70 DB".RCS_activate
A   "SEQ".uRCS.QON
A   "Unit70 DB".Mode_6
=   "SEQ".uRCS.MODE_06      //Mode x activate
//reset Route
AN  "Unit70 DB".RCS_activate
JCN a001
L   0
T   "SEQ".uRCS.SOURCE
T   "SEQ".uRCS.DEST
T   DB725.DBD 468          //all modes
T   "SEQ".uRCS.QREQ_RC
SET
R   "SEQ".uRCS.REQ
R   "SEQ".uRCS.RON
R   "SEQ".uRCS.QERR
R   "SEQ".uRCS.SOLID
R   "SEQ".uRCS.IGN_ERR
R   "SEQ".uRCS.SET_MAT
L   0
T   "SEQ".uRCS.VIA_1
T   "SEQ".uRCS.VIA_2
T   "SEQ".uRCS.VIA_3
T   "SEQ".uRCS.VIA_4
T   "SEQ".uRCS.VIA_5
T   "SEQ".uRCS.VIA_6
T   "SEQ".uRCS.VIA_7
T   "SEQ".uRCS.VIA_8
T   "SEQ".uRCS.VIA_9
T   "SEQ".uRCS.VIA_10
T   "SEQ".uRCS.MODE_TBL
T   "SEQ".uRCS.MATERIAL

```



## **Switch-over Tank-Valves during Filling or emptying Tanks with RCS**

There are two main use cases in which overlapping paths are used

- Switching from a source Tank to another when the first tank is empty
- switching from one Tank to another destination when the first Tank is full

The goal is a smooth switching without loss of time.

This can be solved with overlapping routes. Practically there are two routes with the same function ID. The second route in the AS is active without the mode for the Inlet-valve before switching from the first to the second Tank.

Two Routes involved

- have different ways IDs (fixed or dynamically) and
- have the same function identifier (FUNC\_ID).

### **Filling**

Route 1 : Source->Destination Tank 1 (mode open Inlet / Outlet active)

Route 2 : Source->Destination Tank 2 (mode open Inlet / Outlet inactive).

### **Switch-Over**

Route 1 : Source->Destination Tank 1 (mode open Inlet / Outlet active)

Route 2 : Source->Destination Tank 2 (mode open Inlet / Outlet active).

### **Finish delayed**

Route 1 : Source->Destination Tank 1 (mode open Inlet / Outlet inactive)

Route 2 : Source->Destination Tank 2 (mode open Inlet / Outlet active).

Access to RCS by the Sequence-Interface can not be used in this Case.

From Braumat V7.5 onwards, one unit can manage 2 Routes.

## **Interlock of Routes**

By designing RCS the routes, we activated the valves we need and checked the other valves to be closed. But in that way, there might be routes which are not interlock!

### **Example:**

If one Tank is filled by the green-beer line, and it goes to fault the according valves are closed. Now for the same line a CIP-program is started, checking all valves are closed (there is no "active" valve of the other route involved) and is starting, although the line is "in use" already for the green-beer, filled with green Beer. That's a disaster!

**Solution:** The design of Route-Control must be that specific valves like the tank 2 which is in the same pipe are switched by RCS to be closed (command close) instead of checking only the feedback. In that way the route is "occupied" and the other (CIP-)routes cannot start. But Double-Seat-valves can not be

used, as they allow two flow directions. Ensure that in the line which should be blocked that are active elements (switch on or off) which block the other routes. This can be the valve outlet of the Tank.

### **Another Solution**

The situation could be easily solved by inserting a RCS element type Link element RSC-LE in both CIP and Green beer line route.

In that case we wanted that wort line X could not be selected by both brew houses (1&2) at the same time, the current case sounds to be same situation.

The Link Element RCS-LE works in this case as an interlock token

So, RCS validate that a route will not be selected if it is already selected or in use by another process in RCS and a error message will be given by RCS

Create 2 new Link Elements , one per green beer line call them Green beer 1 and 2., insert it in the main partial routes either for Cip and production partial route

### **How to make Braumat-extensions**

Braumat-functions are mainly built up by a DB and a FC or FB.

- There are Templates for a Framework of Braumat-Tools (Open Source) you can use.
- In d:\windcs\_V7\pcu.001\Paramusr.pcu you can define your own description according to existing ones (see other Braumat-Apps) or consult the manual.

In the picture based on dBase-File you can create Input-masks linked to a specific Dataset

### **Clean-up of the program**

Generate the cross-reference and make sure Timer (SE T, SD T etc) and Impulses are not used several times.

All Flags, Timers etc should have a comment!

The DFMs should be commented what they do and this should be in the last network of the EOPs, that the operator can see what is the transition.

Make sure mainly “=” Flag is used prior to S Flag and R Flag.

Ensure “= Flag” is not implemented several times, if there is a chance that it runs at the same time. I can be used in the same Unit several times, that’s not the problem.

In Braumat in all Steps **all** should be Reset with Flag AN M 102.3, because immediately after that Braumat is going to the next step. When the Sequence is cancelled, never any flag should remain on! Please ensure that!

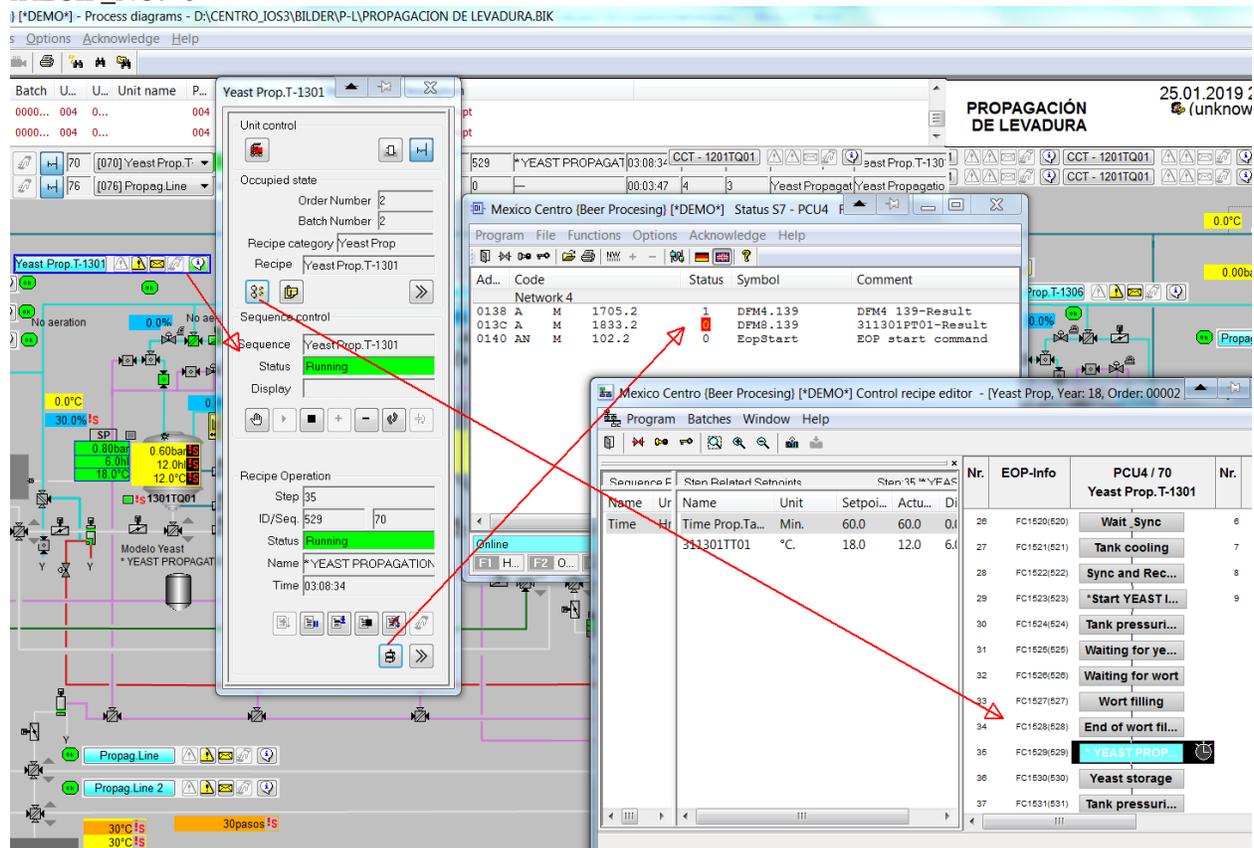
Calling of the Trending FC695 might be like that. These jumps are obsolete!

```
CALL "TRIGG_CURVE_GR_FC //FC695
```

```

boRUN :=M 102.1 //sequ is running "SEQU_Run" M 102.1
boACTSEQ :=TRUE
iID :=8 //this number must be according to Measurement-description-list; best Unit-Nr=group-Nr
iSEQID :=0 //all the rest can be "0"
byRECCAT :=B#16#0
byYEAR :=B#16#0
iORDER_NO:=0
iBATCH_NO:=0
iRECIP_NO:=0

```



Here you can see the Transition with color, very useful!

In order to have to Display of the missing condition for the Transition or Interlock by color you have to set in status.ini

[Settings]

;Change Color for Negativ-Status

SetColorText\_Neg=1

And you can call the graphical recipe as well.

### More Hints

- For Step7-Pulses operation „FP“ the flag should be used only once. The only exception could be in the same Unit as only one Step is active! But it is not right to use it in different Blocks which might run at the same time!
- Step7 Times operation SE T or SV T the Time should be used only once. The only example could be in the same Unit as only one Step is active! But it is not right to use it in different Blocks which might run at the same time!

- In Braumat in the last network, there should be visible the Transition-condition (DFM...), because this is visible by button from the faceplate. Avoid too many unnecessary Transition-conditions (RCS etc).

```
O "CMD_BFL06".SECS.Ps01 // Paso 01
O "CMD_BFL06".SECS.Ps02 // Paso 02
AN "EopStop"
// = "SEQ".uRCS.MODE_14 //xxXV02 CANCELED by "Buchan"
CLR //take care to make this if you "/" something.
```

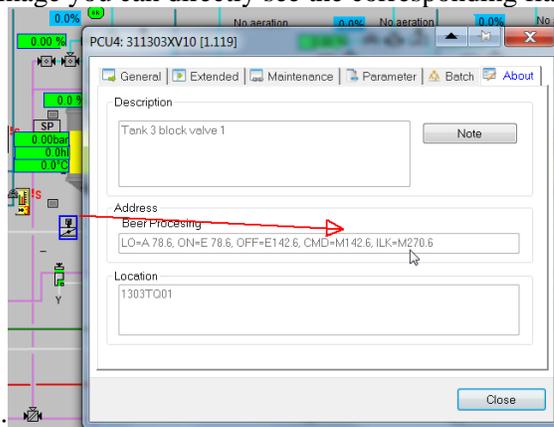
Ensure to Reset all Flags at the end of the Step!!

- = Flag x.y is better programming than Set and Reset
- Jumps should be avoided. If necessary, ensure that all flags will be reset before going to the Jumper:  
AN M 102.3 //last cycle  
R M x.y  
  
or at least  
O M 102.2 //first cycle  
O M 102.3 //last cycle  
R M x.y
- Reset DFM actual values are not necessary. If there is a value in the recipe, it will be reset.
- In order to see the feedback of the Seat Lifting-Block in the picture, a simulation is necessary:  
//511201XV13-ICM1,4  
A "511201XV13-FBK0" // A I 1026.4  
O "511201XV13-LSL" // O Q 1026.7  
= "511201XV13-SLB" // M 3000.0 this goes to Parameter SLB Feedback Seat-Lift low  
or up  
But maybe you can take a DB for the Signal.
- Check for undocumented flags and make a comment. By reference-list you can see that easily.
- Remove rubbish carefully in the Software. Keep in mind, it is a running system!
- Avoid making pointers. If necessary, ensure that there is no limit-violation and the pointer go somewhere.
- Keep the Software as simple as possible, to ensure that others understand it.
- If you upload a Block from online to offline, the comments might be a little bit removed.
- Use the Excel-Code-Generator to generate a transparent Braumat-Code
- You know this?  
X "CMD\_BFL06".SECS.BBT82 It is a Exclusive Or  
XN "SEQ".uRCS.QMODE\_13 it is a Exclusive Or Not

**In the attachment are recommendations for changes, to avoid unpredictable situations and more transparency. Please try to correct it. This information is send only to you.**

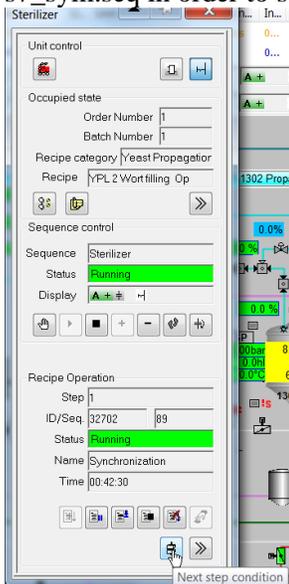
Now the most challenging part of a project takes place, commissioning. As it is a producing system, we have to be careful. Some impulses

- We made always a daily backup of PCU and IOS (maybe only Bilder, PCU and recipe-folder?)
- I recommend not making interlocks (empty-level of the pump) in RCS but in FB1226-1229 exclusively! Also not on the EOPs!
- In Simatic-manager after changing the code, with CTRL + S you can save and CTRL + L download.
- If you are in the Code and press CTRL + ALT + Q you directly get the reference.
- With key Alt + Return you can edit the Symbol.
- Before using any new flag, check with cross-reference (Ctrl + Alt + Q) that it is not used already. In the process-image you can directly see the corresponding flag for to search in the Software

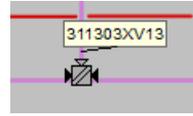


where it is used:

- I have a notepad (notepad ++ is excellent) or a paper to write down all changes I want to do. It is Documentation as well.
- We have Total-commander on the Server now (!!!Transfer), the most genius Software on the planet.
- You should export now the Symbolic-file of Simatic-Manager to Braumat \PCU.004\texte\s7\_sym.seq in order to see the code and comment if you press Transition-button







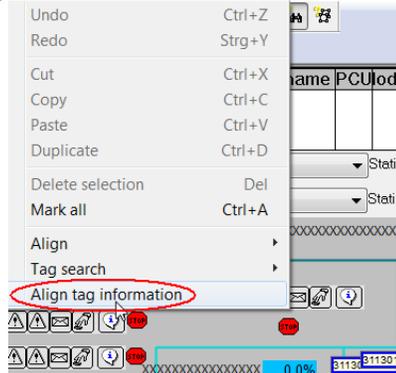
- Tooltips are very useful and they should be switched on.

For that go to Image



design, select the

and click on ICM and AIN. Mark all, and align the Tag-



Info:

- In order to switch on ICM from several Units ore making Sub-operations you can program in FB 100x like that:

```
A "Unit106 DB".Bool48 //activation-flag
JCN end4 //If then.....
  A "DFM8.171" //or Set
  = "312322XV07-CMD" //action
end4: AN "Unit106 DB".Bool48 //reset at the end
FP "Unit106 DB".Bool108 //reset by pulse
R "312322XV07-CMD"
```

- Often a delay-time is used to switch on something delayed etc. Braumat is shipped with a delay-Unit for each unit or to have a minimum Time for a Step.

```
L 3 //Time in sec
T DB725.DBW 184 // "SEQ".u.iSPDlyTm Setpoint Time
L DB725.DBW 184 // "SEQ".u.iSPDlyTm
L DB725.DBW 186 // "SEQ".u.iDlyTm //actual value Time
>=I
```

Concerning transition Transparency for Programmer and Operator could be by using a DFM as Bit-field linked to a Text-file and mark all conditions for Transition.

Transition YP... 2  
BF(00000000) 3

Time Prop.Ta... 3 Edit text (bitfield): Transition YPT 6

#

Time Prop.Ta... 3

#

Time Prop.Ta... 3

#

Transition YP...  
BF(00000000)

Time Prop.Ta... 3

0.5

Time Prop.Ta... 3

15.0

Time Prop.Ta... 1

0.3

**LOWWORD** 1 0 **HIWORD**

Bit	Description	Bit	Description
<input type="checkbox"/> 00	(Bit00)	<input type="checkbox"/> 16	(Bit16)
<input type="checkbox"/> 01	AND/OR	<input type="checkbox"/> 17	(Bit17)
<input type="checkbox"/> 02	Solicitud del operador	<input type="checkbox"/> 18	(Bit18)
<input type="checkbox"/> 03	Siguiente paso a tiempo	<input type="checkbox"/> 19	(Bit19)
<input type="checkbox"/> 04	Cantidad hl	<input type="checkbox"/> 20	(Bit20)
<input type="checkbox"/> 05	Temperatura	<input type="checkbox"/> 21	(Bit21)
<input type="checkbox"/> 06	Vacio	<input type="checkbox"/> 22	(Bit22)
<input type="checkbox"/> 07	Parada con tiempo máximo	<input type="checkbox"/> 23	(Bit23)
<input type="checkbox"/> 08	wait Signal CIP	<input type="checkbox"/> 24	(Bit24)
<input type="checkbox"/> 09	Wait Signal CCT	<input type="checkbox"/> 25	(Bit25)
<input type="checkbox"/> 10	Wait Signal WSTLine	<input type="checkbox"/> 26	(Bit26)
<input type="checkbox"/> 11	wait Signal Glycol	<input type="checkbox"/> 27	(Bit27)
<input type="checkbox"/> 12	wait Signal Air	<input type="checkbox"/> 28	(Bit28)
<input type="checkbox"/> 13	Wait Signal YTL	<input type="checkbox"/> 29	(Bit29)
<input type="checkbox"/> 14	(Bit14)	<input type="checkbox"/> 30	(Bit30)
<input type="checkbox"/> 15	(Bit15)	<input type="checkbox"/> 31	(Bit31)

Transition YP...  
BF(00000000)

Time Prop.Ta... #

Time Prop.Ta... #

Time Prop.Ta... #

Transition YP...  
BF(00000000)

Time Prop.Ta... 0.5

Time Prop.Ta... 15.0

Time Prop.Ta...

**Edit setpoint definition**

PCU 4 - PCU4

DFM 4.222

Name Transition YPT 6

Unit -

Comment -

Type Text (Bitfield) DINT

Offset 0

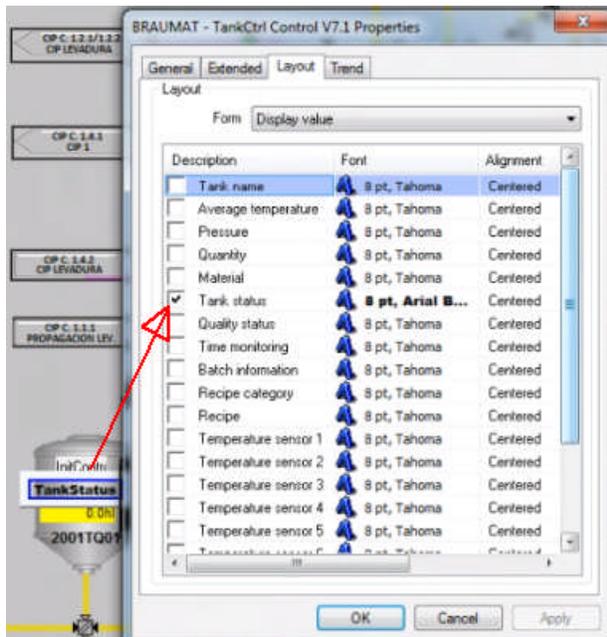
Maximum -

Decimal point 0

File YPT6

OK Cancel

## TANK STATUS



In this way the status of the Tank is displayed in the process-image and by click more details are coming up.

```
L 1 //Status of the Tank according to the List..
T "TANK".au[x].iTankStPv
SET
= "TANK".au[x].xMonQualityOp //starting according Monitoring-Times, but the tank needs to be in
that Status!
R "TANK".au[x].xMonCleanOp
R "TANK".au[x].xMonSterileOp
```

The according Status can be found in d:\Windcs\texte.x\TankStatus.txt

- 1 Clean
- 2 Sterile
- 3 Filling
- 4 Filled
- 5 CO2 preloading
- 6 Emptying
- 7 CO2 preloaded
- 8 Empty
- 9 CIP
- 10 Ready to fill
- 11 Ready to empty
- 12 Ready for CIP

More

= "TANK".au[112].rQuantityTotal // Correct Total Tank quantity

= "TANK".au[112].xSetMat // Set Material value and Transfer Material-Number to Source

= "TANK".au[110].xReset //Reset all

Only if line 9 and 14 are equal and it is Approved the Quality-Time will be started

9	TankStatusAct	ENUM	RT	Estéril	Tank status
10	QualityStatusAct	ENUM	RT	Approved	Quality status
11	MaterialAct	DINT	RT	0	Material ID
12	FullDetectorRef	GRES	ENG	TIMER_01,33,In	Full detector
13	EmptyDetectorRef	GRES	ENG	TIMER_01,33,In	Empty detector
14	MonTankStatus1	ENUM	ENG	Estéril	Tank status comparison value 1 (Operator/quality t...

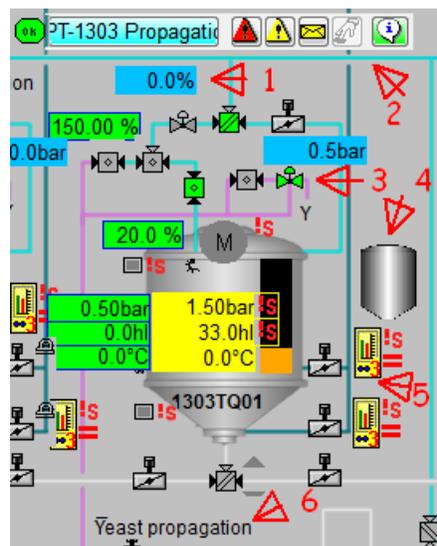
Example for Parameters

8		39	TANK 039	0	0	1	1	1	0	10.000	60	(NULL)	(NULL)	(NULL)	1	2	
9		40	TANK 040	0	0	1	1	1	0	10.000	60	(NULL)	(NULL)	(NULL)	1	2	
10	E	41	Yeast Prop. T.1	1	0	11	2	0	0	5.000	60	(NULL)	TIMER_01,33,In	TIMER_01,33,In	1	2	
11	E	42	Yeast Prop. T.2	0	0	1	1	1	0	10.000	60	(NULL)	(NULL)	(NULL)	1	2	
12	E	43	Yeast Prop. T.3	0	0	1	1	1	0	10.000	60	(NULL)	(NULL)	(NULL)	1	2	

Some more hints

- Activation of output can be direct in EOP
- Jumps in Steps only if really necessary
- All used flags need to have a symbol and comment.
- For many purpose pulses can be used!

One Template for visualization of a Tank



- 1: Analog Output
- 2: Unit-Control
- 3: green if Regulation valve open
- 4: Tank-Status control with monitoring times
- 5: Regulation valve
- 6: EOP-Name of the actual Step

Especially for the tank you can show the EOP-name, which reflects the Status of the Tank in or next to the Tank: Text-File in D:\Centro\_IOS3\PCU.004\TEXTE\EPE.TXT; Linked to Unit EOP\_No

I attached one Template in the Attachment. Maybe you can take a look. Do as much as possible direct in the EOP!

### Not enough decoders?

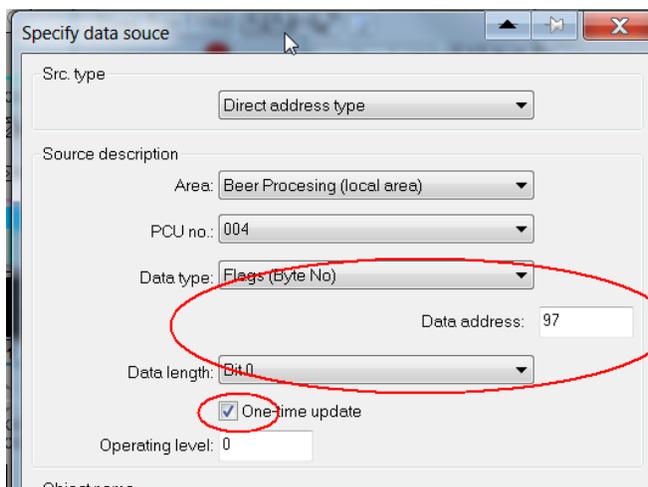
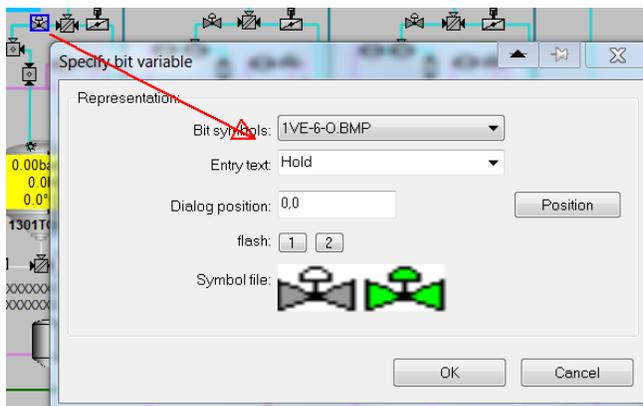
Especially if Matrix function is used, decoders might not be enough. In that case it helps to multiplex the Decoder that means to use the same Decoder-number in parameters and to call FC 636 with the according DFM directly before using the Decoder-flags.

### Copy / Paste in Parameters

Is possible, if it is the same Datatype!

### In order to show a regulation-valve

use a Bit-symbol and link it to Flag M 97.0 with one-time update, to speed up the system.



## **Integrated delay-Time in EOP**

Often a delay-time is used to switch on something delayed etc. Braumat is shipped with a delay-Unit for each unit or to have a minimum Time for a Step.

Start delay time:

L 3 //Time in sec

T DB725.DBW 184 // "SEQ".u.iSPDlyTm Setpoint Time

L DB725.DBW 186 // "SEQ".u.iDlyTm //actual value Time

L DB725.DBW 184 // "SEQ".u.iSPDlyTm

>=I

## **Recipe-System: Release a Unit and resume later on**

Two batches require subsystem 3 (e.g. heater) several times at different times in their sequence.

Subsystem 3 can be released and used by subsystem 2, although it will be in recipe subsystem 1 again at a later point in time and is required by it. Subsystem 2 does not have to wait for Unit occupied in a different recipe

enable this function in the file "<proj-path\recipe\project\plant.ini":

[ReleasePlantSection]

Enable=1

A release Unit step must be inserted in the basic recipe editor.

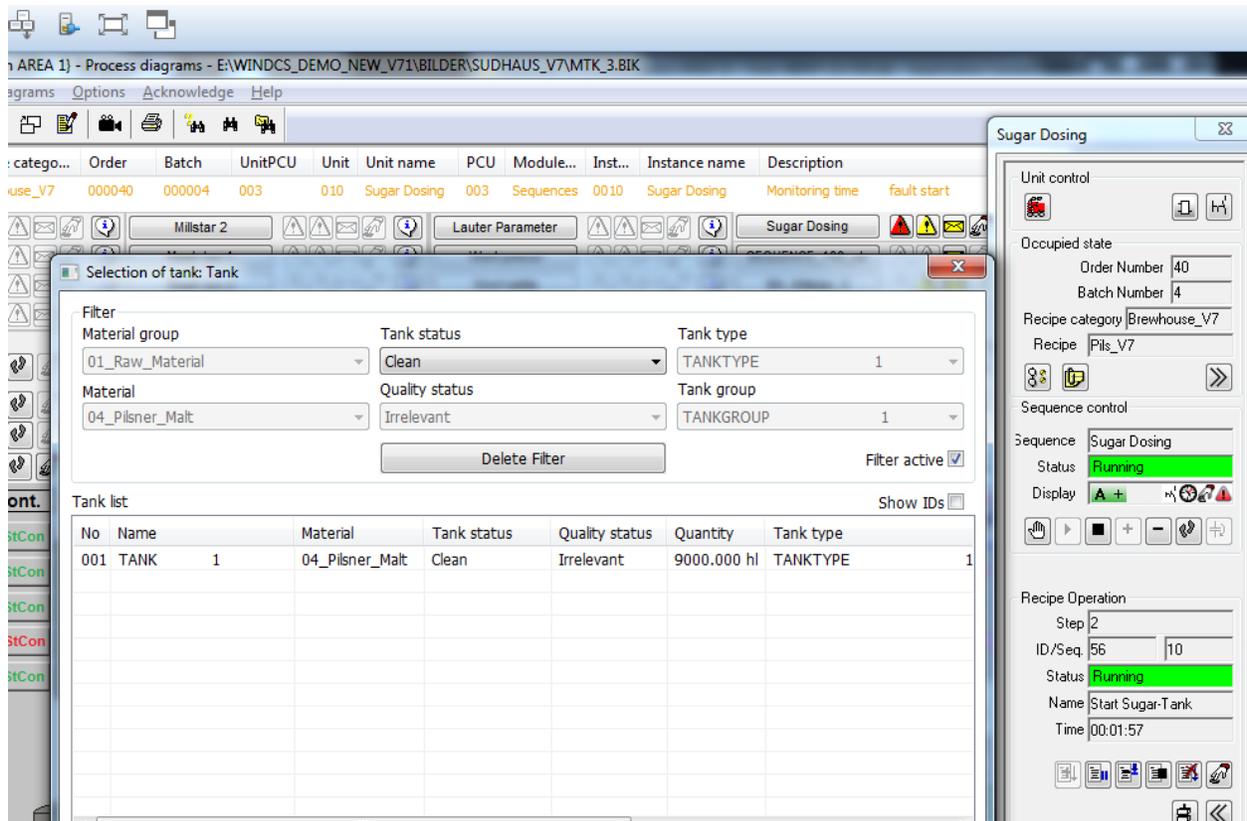
The release of a plant section is only possible in two cases:

- There is a synchronization before and after the release.
- Before the release there is a recipe operation and after the release there is a synchronization with Type AND.

OR synchronization are not allowed before and after a release Unit.

## **Identify correct Main-Tank and Spare-Tank for filling / emptying based on the brand-number.**

Manual Tank selection



If in a recipe a Tank-DFM is defined this query-window will be available to select specific tank (Clean, empty etc.)

### Automatic selection of Tanks

This Block checks for a Main-Tank that fits the Brand-Nr and a Spare-Tank close by.

Interface:

Brand: Brand-number

Main-Tank

Spare-Tank

Copy FC4010 and DB4010 to your project

Transfer in FC4010 Network 1 according Brand-number.

Call FC 4010 anywhere or in FB 1225.

L	11	//only for testing	DB4	0	0	11	3e9
T	"Tank_Select".Brand		DB4	0	0	11	3e9
L	"Tank_Select".Tank_1	//only for testing	DB4	0	0	13	1
L	"Tank_Select".Tank_2		DB4	0	0	11	1
L	"Tank_Select".Tank_3		DB4	0	0	18	1
L	"Tank_Select".Tank_4		DB4	0	0	13	12
L	"Tank_Select".Tank_5		DB4	0	0	11	1
L	"Tank_Select".Tank_6		DB4	0	0	11	1
L	"Tank_Select".Tank_7		DB4	0	0	13	1
L	"Tank_Select".Tank_8		DB4	0	0	11	1
CALL	FC 4010						
	Brand	:= "Tank_Select".Brand	DB4				
	Main_Tank	:= "Tank_Select".Main_Tank	DB4				
	Spare_Tank	:= "Tank_Select".spare_Tank	DB4				
				IN		OUT	
					11		
							2
							5

Here you see the Brand-number 11 is compared with the Brands in the Tank. And the first Tank 2 and 5 is selected. The tanks with are as close as possible.

If Tank-number or Spare-Tank-number is "0" there was no tank available.

There is another output available "Not\_used\_Tank" if the brand-number is "0" and it can be used for any brand.

Each Tank can be disabled by Disabled\_Tank\_x if they are not ready.

### Tank-Level

This FC 305 checks the level (full or empty) of a specific tank and transfers the result to Output "Tank-Level".

Prepared for 31 Tanks

Call it anywhere!

### Tank-Quantity

This FC 307 checks the Quantity of a specific tank and transfers the Quantity for the specific Tank to the Output. So for each Tank specific flushing-quantities can be defined.

Prepared for 31 Tanks

Call it anywhere!

### Switch-over of Tanks

Normally there is one Main-Tank and one Spare-Tank with the same brand. This could be identified by the above function.

When the tank is almost finished / full (delay-time is necessary!), the second Tank switches to the next step filling / emptying, whereas the first tank goes to the next stop "close outlet" **delayed**.

The spare tank has to be prepared already for waiting for the signal to go to the next Step from the Signal, "selected Main-tank is empty". The Brand-number has to be transferred as well, and needs to be double-checked, to ensure no mixture of brands. An Alarm-Message should be generated.

### Transition

L Brand-number from main-Tank

L Brand-number from actual-Tank

==I

A “Selected Tank is empty”

Concerning RCS there are two interfaces in the Unit so 2 routes could be active at the same time.

**An overlap of Inlet/Outlet-valves are mandatory (2-3 seconds)!**

### **More Tools concerning Tank-Farm**

- **Tank-cooling with different strategies**
- **Tank-Data to Transfer the correct Batches and Order-number and Date and time to the Tank**
- **Tank-Overview: List view of all necessary Tank-data in a process-image**
- **Tank-Quantity: calculation of Tank-Quantity based on a DFM and Inlet/Outlet-valve by +/- calculation. Correction by Full/Empty-Sensor.**

### **Simatic-Manager by Network**

Working with Step7-Project over the network is sometimes almost impossible.

To ensure fast Multi-engineering copy the latest version of the project locally and work with that. Copy all your changed blocks back to the server in the evening.

Clarify with others what Blocks you are using or what Area you work to avoid overwriting. But normally everybody works in a different area so it should work.

Shared Block like Interlock can be changed direct at the engineering-station.

Opening symbolic over the network is very slow, so change it direct at the engineering-station. But better use a DB for your flags.

### **Timers**

Timers are very useful for lot of different purposes. In order to give the opportunity, to adapt it later on, if you load the Timer-value from DB709. Then in Braumat Main-Menu at Archives, “special values” you can input that value. There a description must be done (double-click on comment) and the value has to be input (F4).

If any other Setpoint should be available for the Operators outside of the recipe, special values can be used as well. But please not FIXV etc.

### **Strategies for Tank-Farms or other**

#### **Making a Standard**

For specific functions a DB can be generated with the Working area and datasets with the different parameters, like in Braumat. Then the Parameters are copied in the working area, processed and copied back. There are Templates for that.

But for Process-control, it should be possible to find with cross-reference the source of the flag, where it is set etc. Indirect actions also by pointer make it difficult for others to find problems.

Before calling the EOP in the Unit-FB copy all specific data to Temporary flags and dataword and then all EOP works with the same flag and datawords. But in that way Braumat will not

show the correct status of the Transition. A lot of transfers are necessary before the EOP and after.

Put all relevant Data in a specific Unit-DB and access in the EOP only this DB and search and replace in the relevant EOPs only that DB.

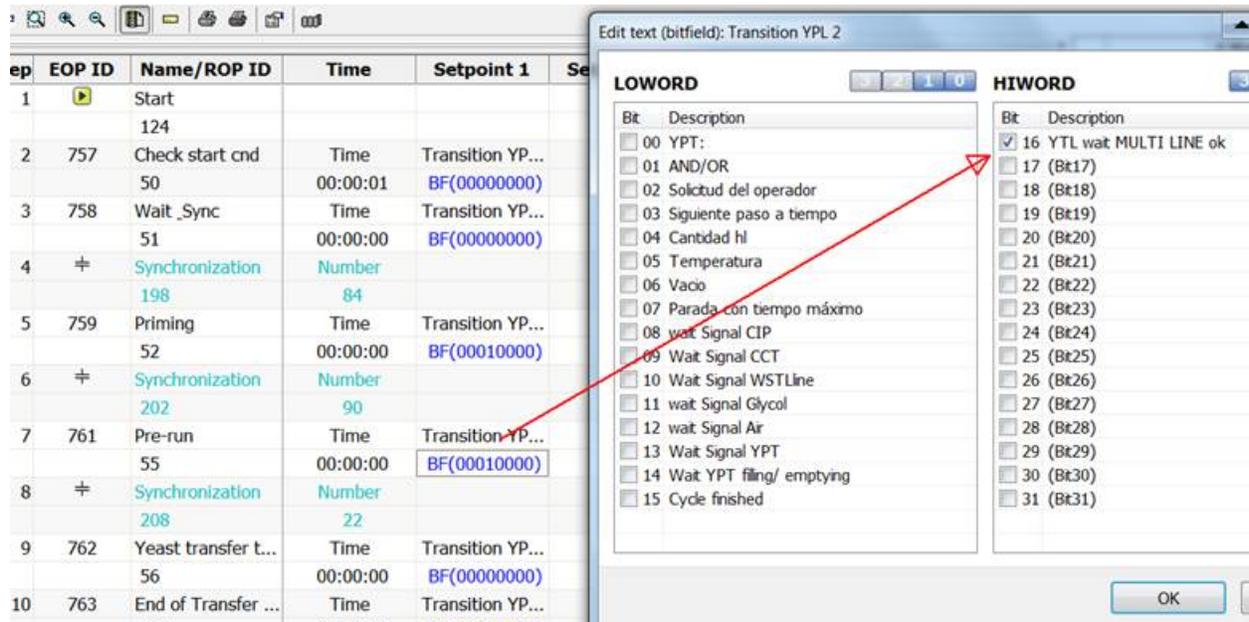
You have “Master EOPs” where you can program all and maybe in Excel generate from that the other EOPs and then search and replace DBx to DBy and maybe more by a table. A macro on Excel could help for replacements by list.

## Transparency of Transitions

The Software should be very easy for the operators to handle. We and the operator need to know what are the transition. It is a crucial part of one EOP. There are several ways to ensure that.

### 1. Transition by Bitfield

Maybe it helps to make a bitfield-DFM at the end of relevant steps and make a text-file with information about the transitions and functions? Also for commissioning it is much easier.



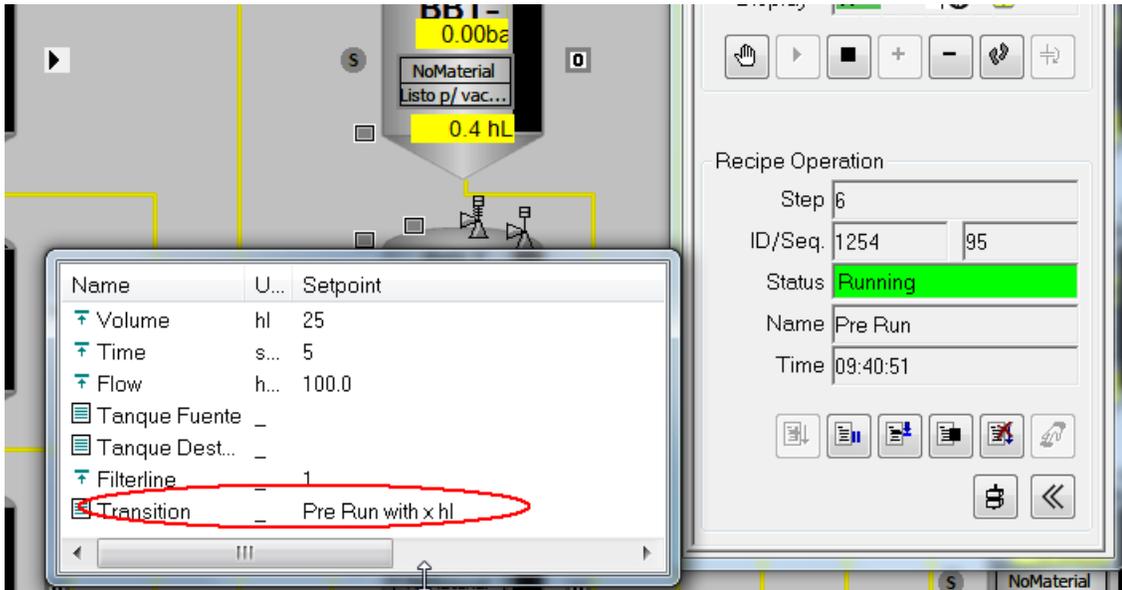
### Transition by Text-File

➔ Making a textile with all the necessary information linked to the EOP-number. Showing one Textline in the Screen with the according information.

Tank 6 532 YPL 01->31\_YPT\_YEAST TRANSFER Pressure DFM8.139 ; The Tank-number is selectable.

But there is often not enough space in the pictures for all Units.

Making an extra DFM on each EOP linked to a Text-file.



There is quite a long text possible. You need to define a Text-DFM linked to a textfile e.g. "epe-trans" in each EOP (maybe at the end?). But it doesn't need to be activated by FC636.

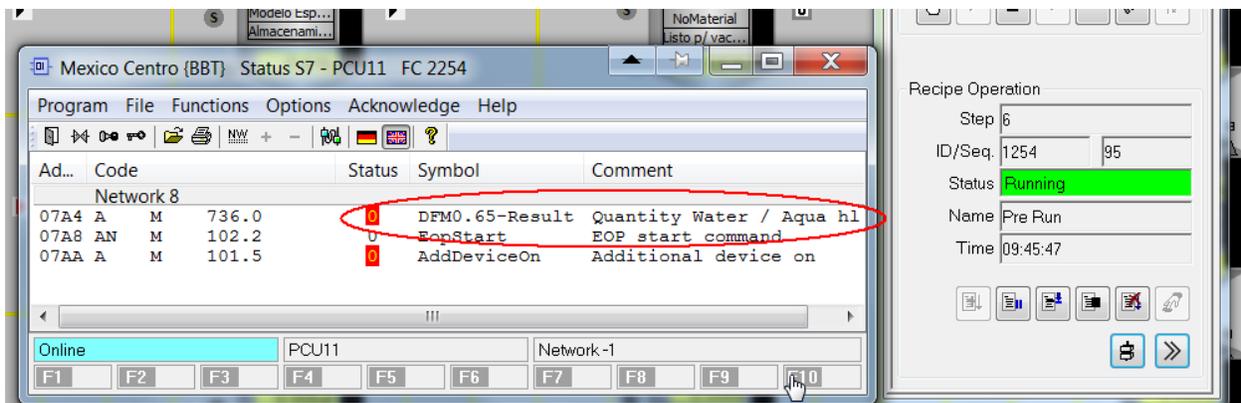
This can be copied to all Unit-FB with the relevant DFM

```
L "SEQ".u.iEop
L 10
/1
T "DFM4".au[197].diValueSP
```

But this has the disadvantage that you don't see what is really going on.

Using the Standard-version by Braumat (not working on S7-1500)

→ The standard is that in the last network there are the transition-conditions in a readable way. Then you have a good documentation of the program and you see the status.



In the Faceplate the conditions which are not valid will be displayed with color, so the programmer and operator can understand easily what is missing. That requires using direct the

DFM or a flag, but not flags from a Datablock (DB.DBX), because they cannot be visualized. Therefore these DB.DBX have to be transferred to Dummy-flags with comments (maybe Symbol for Programmer, comments for Operator).

### Implementing without interference existing Software

To interfere as few as possible it is possible to transfer all relevant conditions to flags and display it in the last network.

A new network previous to the last one can be used to transfer DB.DBX to flags.

Then finish with a CLR-order (mayb 10 times or more).

And after that having the Transitions as they have been before.

A M 736.0 DFM0.65 Quantity water //true information for the operator

CLR //to have a gap at the Status-window.

CLR

CLR

A DB3008.DBX 12.6 //active cryptic statements with no information for the operator

Maybe in a running system the last version is the most save one!

### Attachment

Templates

FUNCTION\_BLOCK "Yeast Prop.T-1301\_1"

TITLE =Sequencer user interface

AUTHOR : SIEMENS

FAMILY : BRAUMAT

VERSION : 7.0

BEGIN

NETWORK

TITLE =Provide permanent condition

// =====

SET ;

= "SEQ1-PermCond";

A "SequenceIsRunning";

= "SEQ".u.CTRL.boTime\_Rel; //Enable Step-Time

NETWORK

TITLE =Sequence Running Condition (Permanent condition)

AN "SequenceIsRunning"; //to ensure A+ when starting

S "AutomaticStepChange";

A "SequenceStartPulse";

S "AddDeviceOn"; //no hold when start Unit

R "SetManGroup1"; //in Auto

R "SEQ".u.STATUS.boMan;

R "SEQ".u.STATUS.boMsgWarning; //Reset Alarms

R "SEQ".u.STATUS.boMsgProc;

R "SEQ".u.STATUS.boMsgRCS;

R "SEQ".u.STATUS.boMsgSystem;

```

R  "SEQ".u.STATUS.boMsgWarning;
R  "SEQ".u.STATUS.boMsgOperating;
R  "ThreeStep".au[1].xModeManual; //set controller to External and Auto
R  "ThreeStep".au[1].xInternalSetpoint;
R  "ThreeStep".au[2].xModeManual;
R  "ThreeStep".au[2].xInternalSetpoint;

```

NETWORK

TITLE =You might want to exit if sequence is not running

```

// =====
//
AN  "SequenceIsRunning";
BEC ;

```

NETWORK

TITLE =Action before EOP is executed

```

// =====
A   "SeqFbCalledAfterEop";
JC  AFTE;

```

NETWORK

TITLE =Monitoring Time

```

A   "SequenceIsRunning";
A   "AutomaticStepChange"; //Hold
AN  "DFM4.139";
//NOTE: each Unit could have it's own DB for all flags
=   "YPT1 DB".Bool64; //monitoring time Unit

```

NETWORK

TITLE =DFM-Calls

CALL "DFM-call" (/in this Case DFMs are only working in EOP when DFM is in recipe, but that should be the case!

```

Result      := "YPT1 DB".Bool63);

```

CALL "BmDfmCallFC" (/or like that

```

iDfmType := 8,
iDfm     := 139);

```

NETWORK

TITLE =ALARM MSG ACTIVATION

//---Tank pressure high high---

```

A   "YPT1 DB".Bool71;
A   "AIN-65_UL";
=   "BmMsgCmd".abo[1540]; //critical Alarm can be made with "S" and Reset with flag M 107.2
AcknErro

```

//---Tank temperature high high---

```

A   "YPT1 DB".Bool72;
A   "AIN-66_UL"; //Analog-Switches can be changed in the picture
=   "BmMsgCmd".abo[1541];

```

```
//---Tank temperature low low---
  A  "YPT1 DB".Bool73;
A  "AIN-66_LL";
  =  "BmMsgCmd".abo[1542]; //Specify Alarm and Error in Message-Parameters

//---Tank level high high---
  A  "YPT1 DB".Bool74;
A  "AIN-73_UL";
  =  "BmMsgCmd".abo[1543];

//---Max level in CIP---
  A  "YPT1 DB".Bool75;
  A  "MVC30-Limit1";
  =  "BmMsgCmd".abo[1544];

//---Tank pressure high---
// SP + deviation
  A  "YPT1 DB".Bool76;
  A  "VMON".au[65].boValOutUpp1; //VMON analog-switch with delay
  =  "BmMsgCmd".abo[1545];

//---Tank pressure low---
// SP - deviation
  A  "YPT1 DB".Bool77;
  A  "VMON".au[65].boValOutLow1;
  =  "BmMsgCmd".abo[1546];

//---Tank pressurisation---
  A  "YPT1 DB".Bool78;
  A  "VMON".au[66].boValOutLow1;
  =  "BmMsgCmd".abo[1547];

//---Tank depressurisation---
  A  "YPT1 DB".Bool79;
  A  "VMON".au[67].boValOutUpp1;
  =  "BmMsgCmd".abo[1548];

//---Tank temperature high---
// SP + deviation
  A  "YPT1 DB".Bool80;
  A  "VMON".au[68].boValOutUpp1;
  =  "BmMsgCmd".abo[1549];

//---Tank temperature low---
// SP - deviation
  A  "YPT1 DB".Bool81;
  A  "VMON".au[68].boValOutLow1;
  =  "BmMsgCmd".abo[1550];
NETWORK
TITLE =SO226,01,02
//SO226,01,02 - CIP FLIP SEQUENCE
//
```

```

//activation of sobroutine SO226,01,02
  AN  "YPT1 DB".Bool18;
  =   "PULSE".au[50].xCmdReset; //Reset when not active

  A   "YPT1 DB".Bool18;
  =   "PULSE".au[50].xCmdActivate;
  JCN  S002;

//---PULSE 1
  A   "PULSE".au[50].rgPulseData[1].xPulseSignal;
  =   "311301XV07-CMD";

//---PULSE 2
  A   "PULSE".au[50].rgPulseData[3].xPulseSignal;
  =   "311301XV04-CMD";
  =   "311301XV06-CMD";

  L   0.000000e+000; //SP Reg.Valve
T   "DFM8".au[160].rValueSP;

//---PULSE 3
A   "PULSE".au[50].rgPulseData[5].xPulseSignal;
  =   "311301XV05-CMD";
  =   "311301XV06-CMD";
  =   "311301XV01-CMD";
  =   "YPT1 DB".Bool26;
  JCN  s000;
  L   1.000000e+002; //Reg.Valve fully open
  T   "DFM8".au[160].rValueSP; //but normally use YNF-Flag and MULT!
s000: NOP 0;

S002: ON  "YPT1 DB".Bool18; //Reset all with Pulse
  O   "PULSE".au[50].xDone;
  FP  "YPT1 DB".PulseReset_CIP;
  R   "PULSE".au[50].xDone;
  R   "311301XV07-CMD";
  R   "311301XV06-CMD";
  R   "311301XV05-CMD";
  R   "311301XV04-CMD";
  R   "311301XV01-CMD";
  R   "YPT1 DB".Bool26; // go 100%
  JCN  s005;
  L   0.000000e+000; //Reg.Valve to "0"
T   "DFM8".au[160].rValueSP;
s005: NOP 0;

NETWORK
TITLE =PID 002-YNF
  ON  "ICM4".au[160].xFbk1; //311301XV02
  =   "PID-YNF_2"; //set PID to "0"

```

NETWORK

TITLE =SO226,01,04

//SO226,01,04 - TANK PRESSURISATION Example for one monitoring function

//

//activation of sobroutine SO226,01,04

A "YPT1 DB".Bool20;  
JCN S004;  
AN "DFM8.139"; //pressure  
= "311301XV01-CMD";  
= "311301XV02-CMD";

S004: ON "YPT1 DB".Bool20;

FP "YPT1 DB".Bool90;  
R "311301XV01-CMD";  
R "311301XV02-CMD";

NETWORK

NETWORK

TITLE =SO226,01,06

//SO226,01,06 - COOLING - LOWER JACKET

//

//activation of sobroutine SO226,01,06

/\*\* A "Unit70 DB".Bool22

// A "DFM8.140"

// A "DFM8.141" //0.5hl

A "YPT1 DB".Bool12;

JCN S006;

A "YPT1 DB".Bool48; ///??

SET ;

= "ThreeStep".au[1].xControllerActive; //PID???ON-OFF

A "ThreeStep".au[1].xCtrlOn;

A "ThreeStep1-Timer";

AN "311301LSL01-Pos";

= "311301XV09-CMD"; //PID???ON-OFF

S006: ON "YPT1 DB".Bool22;

ON "DFM8.140";

ON "DFM8.141"; //0.5hl

ON "YPT1 DB".Bool12;

FP "YPT1 DB".Bool92;

R "ThreeStep".au[1].xControllerActive;

R "311301XV09-CMD"; //PID???ON-OFF

NETWORK

TITLE =SO226,01,07

//SO226,01,06 - COOLING - UPPER JACKET; can be done by Tank-cooling as well!

//activation of sobroutine SO226,01,07

// A "Unit70 DB".Bool23

// A "DFM8.141" // 2hl

A "YPT1 DB".Bool12;

```
JCN S007;

A "YPT1 DB".Bool48;
SET ;
= "ThreeStep".au[2].xControllerActive; //On-OFF
```

```
A "ThreeStep".au[2].xCtrlOn;
A "ThreeStep2-Timer";
AN "AIN-73_LL";
= "311301XV08-CMD"; //PIOn-OFF
```

```
S007: ON "YPT1 DB".Bool23;
ON "DFM8".au[141].xResult; // 2hl
ON "YPT1 DB".Bool12;
FP "YPT1 DB".Bool93;
R "ThreeStep".au[2].xControllerActive; //PID On-OFF
R "311301XV08-CMD"; //PID on-OFF
```

#### NETWORK

```
TITLE =SO226,01,08
//SO226,01,08 - YEAST AERATION
//activation of sobroutine SO226,01,08
A "YPT1 DB".Bool24;
A "PROPAG_GAS_SKID".YPTXX_READY_AIR;
A "YPT1 DB".Bool10;
JCN S008;
SET ;
= "311301XV04-CMD";
= "311301XV02-CMD";
= "YPT1 DB".Bool26; //PID Just P controller or on-off??(ThreeStep?)
```

```
S008: ON "YPT1 DB".Bool24;
ON "PROPAG_GAS_SKID".YPTXX_READY_AIR;
ON "YPT1 DB".Bool10;
FP "YPT1 DB".Bool94;
R "311301XV04-CMD";
R "311301XV02-CMD";
R "YPT1 DB".Bool26;
```

#### NETWORK

```
TITLE =Display Reg-Valve open
```

```
//---311301FCV01_animation---
L "AOUT".au[13].rSetpoint;
L 1.000000e-001;
>R ;
= "YPT1 DB".Bool128571;
```

```
//---311301PCV01_animation---
L "AOUT".au[14].rSetpoint;
L 1.000000e-001;
>R ;
```

= "YPT1 DB".Bool1285815;

NETWORK

TITLE =Trending

//

```
CALL "BmTriggerCurveGroupUsrFC" (  
    Run           := "SequenceIsRunning",  
BatchInfoFromSeq := TRUE,  
CurveGroupID := 1, //mostly like EOP-Number  
SeqNo := 0,  
RecCatNo := B#16#0,  
BatchYear := B#16#0,  
OrderNo := 0,  
BatchNo := 0,  
RecipeNo := 0);
```

NETWORK

TITLE =Action after EOP was executed

// =====

```
BEU ;  
AFTE: AN "SeqFbCalledAfterEop";  
BEC ;
```

NETWORK

TITLE =Reset by hold

```
SET ;  
R "YPT1 DB".one_Cycle_Unit_YPT_to_He; //for other Units to go to A- as well  
AN "AutomaticStepChange";  
FP "YPT1 DB".Pulse_Unit_YPT_to_Held;  
= "YPT1 DB".one_Cycle_Unit_YPT_to_He;  
  
SET ;  
R "YPT1 DB".Cycle_Unit_YPT_finish_He; //for other Units to go to finish A- as well  
A "AutomaticStepChange";  
FP "YPT1 DB".Pulse_Unit_YPT_finish_He;  
= "YPT1 DB".Cycle_Unit_YPT_finish_He;  
  
A "YPL1 DB".Cycle_Unit_YPL_to_Held; //go to A- from other Unit  
R "AutomaticStepChange";  
  
A "AddDeviceOn"; //Restart with Button  
A "SEQ".u.CTRL.xCmdHold;  
= "SEQ".u.CTRL.xCmdRestart;  
  
AN "AddDeviceOn";  
= "SEQ".u.CTRL.xCmdHold;  
  
AN "AutomaticStepChange"; //Reset all relevant ICM with hold at least Pumps  
R "YPT1 DB".Bool64; //Monitoring time Unit or Use M 102.0 in Unit as enable monitoring time  
R "YPT1 DB".Bool64;
```

```

R  "311301XV04-CMD";
R  "311301XV05-CMD";
R  "311301XV06-CMD";
R  "311301XV07-CMD";
R  "311301XV01-CMD";
R  "311301XV02-CMD";
R  "311301XV08-CMD";
R  "311301XV09-CMD";
R  "311301XV11-CMD";
R  "311301XV13-CMD";

R  "YPT1 DB".Bool18; //Subroutines as well
R  "YPT1 DB".Bool19;
R  "YPT1 DB".Bool20;
R  "YPT1 DB".Bool21;
R  "YPT1 DB".Bool22;
R  "YPT1 DB".Bool23;
R  "YPT1 DB".Bool24;
END_FUNCTION_BLOCK

FUNCTION "EOP-Template" : VOID
TITLE =Sequ-Name:Wort filling
//History:
//
//Date      Name      Revision
//-----
//9/2/2019   S.Schranner V1.0
//This is an output of the EOP-Generator by Excel

AUTHOR : SIEMENS
FAMILY : SISTARS7
NAME : choose
VERSION : 5.3

BEGIN
NETWORK
TITLE = GOP 1527 Activate Output
//activate Output
  AN  "EopStop"; //always do this to ensure Reset at the end of the Step!
  =   "311302XV11-CMD"; //you can directly activate the Valve-CMD-flag. Hold is managed by
Unit-FB

  AN  "EopStop";
  =   "YPT2 DB".Bool1; //abs CMD_31_YPT 01->ALL_RUNNING

  AN  "EopStop";
  =   "YPT2 DB".Bool6; //abs CMD_31_YPT 01->31_YPL 01_READY FOR FILLING

  AN  "EopStop";
  R   "YPT2 DB".Bool7; //abs CMD_31_YPT 01->31_YPL 01_END OF FILLING

  AN  "EopStop";

```

```

= "YPT2 DB".Bool10; //abs CMD_31_YPT 01->31_GSK 01_AIR REQUEST

AN "EopStop";
= "YPT2 DB".Bool12; //abs CMD_31_YPT 01->31_GLY 01_GLYCOL REQUEST

AN "EopStop";
= "YPT2 DB".Bool20; //abs SO226,01,04 - TANK PRESSURISATION

AN "EopStop";
= "YPT2 DB".Bool21; //abs SO226,01,05 - TANK EXHAUST

AN "EopStop";
= "YPT2 DB".Bool22; //abs SO226,01,06 - COOLING - LOWER JACKET

AN "EopStop";
= "YPT2 DB".Bool23; //abs SO226,01,07 - COOLING - UPPER JACKET

AN "EopStop";
= "YPT2 DB".Bool65; //abs 31_YPT 01-A-201 Suspended from 31_YPL 01
AN "EopStop";
= "YPT2 DB".Bool71; //abs 31_YPT 01-A-301 Tank pressure high high
AN "EopStop";
= "YPT2 DB".Bool72; //abs 31_YPT 01-A-302 Tank temperature high high
AN "EopStop";
= "YPT2 DB".Bool73; //abs 31_YPT 01-A-303 Tank temperature low low
AN "EopStop";
= "YPT2 DB".Bool74; //abs 31_YPT 01-A-304 Tank level high high
AN "EopStop";
= "YPT2 DB".Bool76; //abs 31_YPT 01-W-201 Tank pressure high
AN "EopStop";
= "YPT2 DB".Bool77; //abs 31_YPT 01-W-202 Tank pressure low
AN "EopStop";
= "YPT2 DB".Bool80; //abs 31_YPT 01-W-205 Tank temperature high
AN "EopStop";
= "YPT2 DB".Bool115; //abs 31_YPT 01-I-3 311301XV02 interlocked by procedure CIP
AN "EopStop";
= "YPT2 DB".Bool116; //abs 31_YPT 01-I-4 311301XV08 interlocked by procedure CIP
AN "EopStop";
= "YPT2 DB".Bool117; //abs 31_YPT 01-I-5 311301XV09 interlocked by procedure CIP
AN "EopStop";
= "YPT2 DB".Bool118; //abs 31_YPT 01-I-6 311301XV06 interlocked by procedure
PRODUCTION
AN "EopStop";
= "YPT2 DB".Bool119; //abs 31_YPT 01-I-7 311301XV07 interlocked by procedure
PRODUCTION
AN "EopStop";
= "YPT2 DB".Bool120; //abs 31_YPT 01-I-8 311301XV13 interlocked by procedure
PRODUCTION

NETWORK
TITLE =Jump

```

```

L 0;
T "SEQ".u.byAlterResult;

AN "YPL1 DB".Bool7; //_YPL 01->31_YPT 01_WORT FILLING
JCN a001;
L 5;
T "SEQ".u.byAlterResult;
a001: NOP 0;
NETWORK
TITLE =Delay Step or min.Time Step

L 3; //Time in sec
T "SEQ".u.iSPDlyTm; //Setpoint Time

L "SEQ".u.iDlyTm; // actual value Time
L 3; // "SEQ".u.iSPDlyTm
>=I ;
= "YPT2 DB".Delay_Time_finished; //Unit-DB

```

```

NETWORK
TITLE = release DFM Time

```

```

AN "EopStop"; //first cycle
AN "DFM4.142"; //DFM Time finished
= "YPT2 DB".Bool64; //release DFM-Time

```

```

NETWORK
TITLE = Transition
//but all EOP-conditions in the last network
O "311302LSH01-Pos"; //Timer1 32
O "DFM8.144"; //311301WG01
AN "EopStart"; //one cycle delay for DFM to be valid
A "YPT2 DB".Delay_Time_finished;
END_FUNCTION

```

### RCS-Interfaces

```
// Actual Tankstatus to RouteExtPE
```

```

L "TANK".au[103].iTankStatusAct
DTR
T MD 2080 // ACT_VAL
CALL "RC_IF_PE" // Tank Status CCT03
ID :=31
FACTOR :=1.000000e+000
DIS_ACTV:=FALSE
ACT_VAL :=MD2080
DEF_VAL :=MD2084
EN_DEF :=TRUE
QRET_VAL:=MW2092
QVALUE_I:=MW2094
QVALUE_D:=MD2096

```

```

QVALUE_R:=MD3000
QINDEX :=MB3004
  QEXT :=M3005.0
QSUMMED :=M3005.1
  QERR :=M3005.2
  QBA_ID :=MD3006
QROUTE :=MW3008
  QFUNC_ID:=MW3010
  QMODE_NO:=MW3012
// Actual Material to RouteExtPE
L  "TANK".au[103].diMatIDAct
  DTR
  T  MD 2080          // ACT_VAL
CALL "RC_IF_PE"      // Material CCT03
  ID :=32
FACTOR :=1.000000e+000
  DIS_ACTV:=FALSE
  ACT_VAL :=MD2080
  DEF_VAL :=MD2084
EN_DEF :=TRUE
  QRET_VAL:=MW2092
QVALUE_I:=MW2094
  QVALUE_D:=MD2096
QVALUE_R:=MD3000
QINDEX :=MB3004
  QEXT :=M3005.0
QSUMMED :=M3005.1
  QERR :=M3005.2
  QBA_ID :=MD3006
QROUTE :=MW3008
  QFUNC_ID:=MW3010
  QMODE_NO:=MW3012
// Actual Quantity to RouteExtPE
L  "TANK".au[103].rQuantityTotal
//DTR
  T  MD 2080          // ACT_VAL
CALL "RC_IF_PE"      // Quantity CCT03
  ID :=33
FACTOR :=1.000000e+000
  DIS_ACTV:=FALSE
  ACT_VAL :=MD2080
  DEF_VAL :=MD2084
EN_DEF :=TRUE
  QRET_VAL:=MW2092
QVALUE_I:=MW2094
  QVALUE_D:=MD2096
QVALUE_R:=MD3000
QINDEX :=MB3004
  QEXT :=M3005.0
QSUMMED :=M3005.1
  QERR :=M3005.2
  QBA_ID :=MD3006

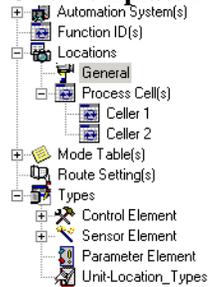
```

```

QROUTE :=MW3008
QFUNC_ID:=MW3010
QMODE_NO:=MW3012
// Actual Empty - Sensor
L 0.000000e+000
UN "TANK".au[103].xEmptyDetector
SPB NOE3
L 1.000000e+000
NOE3: T MD 2080
CALL "RC_IF_PE" // Empty CCT03
ID :=34
FACTOR :=1.000000e+000
DIS_ACTV:=FALSE
ACT_VAL :=MD2080
DEF_VAL :=MD2084
EN_DEF :=TRUE
QRET_VAL:=MW2092
QVALUE_I:=MW2094
QVALUE_D:=MD2096
QVALUE_R:=MD3000
QINDEX :=MB3004
QEXT :=M3005.0
QSUMMED :=M3005.1
QERR :=M3005.2
QBA_ID :=MD3006
QROUTE :=MW3008
QFUNC_ID:=MW3010
QMODE_NO:=MW3012

```

**One Template for RCS for the Cellar**



Location	ID
CCT 40	1
CCT 41	2
CCT 42	3
CCT 43	4
CCT 44	5
CCT 45	6
CCT 46	7
CCT 47	8
CCT 48	9
CCT 49	10
CCT 50	11
CCT 51	12
CCT 52	13
CCT 53	14
CCT 54	15
CCT 55	16
CCT 56	17
CCT 57	18
CCT 58	19
CCT 59	20
YeastTank61	21
YeastTank62	22
CO2FoamTrap	23
AirFoamTrap	24
Remove Trub Line CE2	25
YDT CE2	26
Yeast Dosing Tank	27
Reserve 28	28
Reserve 29	29
CCT CIP_R_Route1	30
XV5309_RT_DRAIN	31
Wort Line CE2	32
BH2_CE2	33
Beer Line CE2	34
Mahru Cellar CE2	35

Matur Cellar CE2	35
Yeast Line CE2	36
Yeast Tank 61	37
Yeast Tank 62	38
No Selection CE2	39
Yeast Scrap CE2	40
Yeast Hrv toCE1	41
CIP L1 Prerun CE2	50
CIP L1 Return CE2	51
CIP L1 No Selection CE2	52
CIP L3 Prerun CE2	75
CIP L3 Return CE2	76
CIP L3 No Selection CE2	77
CO2 SupLine CE2	78
CO2 RecLine CE2	79
BeerLine CE2	80
CIPL3 FreeAirLine CE2	81
Yeast Harvest Line CE2	82
Yeast Pitching Line CE2	83
Yeast Scrapping Line CE2	84

### Locations

Partial Route	ID	Source	Variant	Destination	Priority	Bi...
Wort Line ... CCT59	340	Wort Line CE2		CCT59	1	Fa...
Wort Line ... CCT58	339	Wort Line CE2		CCT58	1	Fa...
Wort Line ... CCT57	338	Wort Line CE2		CCT57	1	Fa...
Wort Line ... CCT56	337	Wort Line CE2		CCT56	1	Fa...
Wort Line ... CCT55	336	Wort Line CE2		CCT55	1	Fa...
Wort Line ... CCT54	335	Wort Line CE2		CCT54	1	Fa...
Wort Line ... CCT53	334	Wort Line CE2		CCT53	1	Fa...
Wort Line ... CCT52	333	Wort Line CE2		CCT52	1	Fa...
Wort Line ... CCT51	332	Wort Line CE2		CCT51	1	Fa...
Wort Line ... CCT50	331	Wort Line CE2		CCT50	1	Fa...

**Filling:** This is filling with all the Word-lines to the Tanks 1...x

Partial Route	ID	Source	Variant	Destination	Priority	Bi...
CCT59 ... Beer Line	197	CCT59		Beer Line...	1	True
CCT58 ... Beer Line	193	CCT58		Beer Line...	1	Fa...
CCT57 ... Beer Line	189	CCT57		Beer Line...	1	Fa...
CCT56 ... Beer Line	185	CCT56		Beer Line...	1	Fa...
CCT55 ... Beer Line	181	CCT55		Beer Line...	1	Fa...
CCT54 ... Beer Line	177	CCT54		Beer Line...	1	Fa...
CCT53 ... Beer Line	173	CCT53		Beer Line...	1	Fa...
CCT52 ... Beer Line	169	CCT52		Beer Line...	1	Fa...
CCT51 ... Beer Line	165	CCT51		Beer Line...	1	Fa...
CCT50 ... Beer Line	161	CCT50		Beer Line...	1	Fa...
CCT49 ... Beer Line	157	CCT49		Beer Line...	1	Fa...
CCT48 ... Beer Line	153	CCT48		Beer Line...	1	Fa...
CCT47 ... Beer Line	149	CCT47		Beer Line...	1	Fa...
CCT46 ... Beer Line	145	CCT46		Beer Line...	1	Fa...
CCT45 ... Beer Line	141	CCT45		Beer Line...	1	Fa...
CCT44 ... Beer Line	137	CCT44		Beer Line...	1	Fa...
CCT43 ... Beer Line	133	CCT43		Beer Line...	1	Fa...
CCT42 ... Beer Line	129	CCT42		Beer Line...	1	Fa...
CCT41 ... Beer Line	125	CCT41		Beer Line...	1	Fa...
CCT40 ... Beer Line	121	CCT40		Beer Line...	1	Fa...
Beer Line ... Maturation Cellar	2	Beer Line CE2		Matur Cell...	1	True

Transfer CCT->Beerline;

04_CE2_Yeast Harvest		04_CE2_Yeast Harvest						
Partial Route		ID	Source	Variant	Destination	Priority	Bl...	C
01_CE2_Wort Line	Yeast Line Matrix3 --- Yeast Line	491	Yeast Line CE1 Matrix3		Yeast Lin...	1	Fa...	
02_CE2	Yeast Line Matrix2 --- Yeast Line	490	Yeast Line CE1 Matrix2		Yeast Lin...	1	Fa...	
03_CE2_Beer Line	CCT22 --- Yeast Line Matrix3	489	CCT22		Yeast Lin...	1	Fa...	
04_CE2_Yeast Harvest	CCT21 --- Yeast Line Matrix3	488	CCT21		Yeast Lin...	1	Fa...	
05_CE2_Yeast TK Scrap	CCT20 --- Yeast Line Matrix3	487	CCT20		Yeast Lin...	1	Fa...	
06_CE2_Remove Trub	CCT19 --- Yeast Line Matrix2	486	CCT19		Yeast Lin...	1	Fa...	
07_CE2_YPT2 Transfer	CCT18 --- Yeast Line Matrix3	485	CCT18		Yeast Lin...	1	Fa...	
08_CE2	CCT17 --- Yeast Line Matrix3	484	CCT17		Yeast Lin...	1	Fa...	
09_CE2	CCT16 --- Yeast Line Matrix2	483	CCT16		Yeast Lin...	1	Fa...	
10_CE2_CIP Line 1 TK	CCT15 --- Yeast Line Matrix2	482	CCT15		Yeast Lin...	1	Fa...	
11_CE2_CIP Line 2 WL	CCT14 --- Yeast Line Matrix1	481	CCT14		Yeast Lin...	1	Fa...	
12_CE2_CIP Line 3 L	CCT13 --- Yeast Line Matrix1	480	CCT13		Yeast Lin...	1	Fa...	
13_CE2	CCT12 --- Yeast Line Matrix1	479	CCT12		Yeast Lin...	1	Fa...	
14_CE2	CCT11 --- Yeast Line Matrix1	478	CCT11		Yeast Lin...	1	Fa...	
15_CE2	CCT10 --- Yeast Line Matrix2	477	CCT10		Yeast Lin...	1	Fa...	
16_CE1	CCT09 --- Yeast Line Matrix2	476	CCT09		Yeast Lin...	1	Fa...	
17_CE1	CCT08 --- Yeast Line Matrix3	475	CCT08		Yeast Lin...	1	Fa...	
18_CE1	CCT07 --- Yeast Line Matrix3	474	CCT07		Yeast Lin...	1	Fa...	
19_CE1_YPT2 Transfer	CCT06 --- Yeast Line Matrix3	473	CCT06		Yeast Lin...	1	Fa...	
20_CE1_Wort Line	CCT05 --- Yeast Line Matrix3	472	CCT05		Yeast Lin...	1	Fa...	
21_CE1_Racking	CCT04 --- Yeast Line Matrix2	471	CCT04		Yeast Lin...	1	Fa...	
22_CE1_Beer Line	CCT03 --- Yeast Line Matrix2	470	CCT03		Yeast Lin...	1	Fa...	
23_CE1_Yeast Harvest	CCT02 --- Yeast Line Matrix1	469	CCT02		Yeast Lin...	1	Fa...	
24_CE1_Yeast TK Scrap	Yeast Line Matrix1 --- Yeast Line	468	Yeast Line CE1 Matrix1		Yeast Lin...	1	Fa...	
25_CE1_Remove Trub	CCT01 --- Yeast Line Matrix1	467	CCT01		Yeast Lin...	1	Fa...	
26_CE1_CIP Line 1 WL	Yeast Line --- Yeast Tank 2	372	Yeast Line CE2		Yeast Ta...	1	True	
27_CE1_CIP Line 2 TK	Yeast Line --- Yeast Tank 1	371	Yeast Line CE2		Yeast Ta...	1	True	
28_CE1_CIP Line 3 L	Yeast Line --- Yeast Scrap	370	Yeast Line CE2		Yeast Scr...	1	True	
29_CE1	Yeast Line --- Yeast Harvest to CE1	369	Yeast Line CE2		Yeast Hrv...	1	True	
30_CE1	CCT59 --- Yeast Line	200	CCT59		Yeast Lin...	1	True	
	CCT58 --- Yeast Line	196	CCT58		Yeast Lin...	1	Fa...	
	CCT57 --- Yeast Line	192	CCT57		Yeast Lin...	1	Fa...	
	CCT56 --- Yeast Line	188	CCT56		Yeast Lin...	1	Fa...	
	CCT55 --- Yeast Line	184	CCT55		Yeast Lin...	1	Fa...	
	CCT54 --- Yeast Line	180	CCT54		Yeast Lin...	1	Fa...	
	CCT53 --- Yeast Line	176	CCT53		Yeast Lin...	1	Fa...	
	CCT52 --- Yeast Line	172	CCT52		Yeast Lin...	1	Fa...	
	CCT51 --- Yeast Line	168	CCT51		Yeast Lin...	1	Fa...	

### Yeast Harvest

04_CE2_Yeast Harvest		04_CE2_Yeast Harvest						
Partial Route		ID	Source	Variant	Destination	Priority	Bl...	C
01_CE2_Wort Line	CIP R Route 1 --- XV5909	271	CCT CIP_R_Route1		XV5909_...	1	True	
02_CE2	CCT59 --- CIP R Route 1	199	CCT59		CCT CIP_...	1	True	
03_CE2_Beer Line	CCT58 --- CIP R Route 1	195	CCT58		CCT CIP_...	1	Fa...	
04_CE2_Yeast Harvest	CCT57 --- CIP R Route 1	191	CCT57		CCT CIP_...	1	Fa...	
05_CE2_Yeast TK Scrap	CCT56 --- CIP R Route 1	187	CCT56		CCT CIP_...	1	Fa...	
06_CE2_Remove Trub	CCT55 --- CIP R Route 1	183	CCT55		CCT CIP_...	1	Fa...	
07_CE2_YPT2 Transfer	CCT54 --- CIP R Route 1	179	CCT54		CCT CIP_...	1	Fa...	
08_CE2	CCT53 --- CIP R Route 1	175	CCT53		CCT CIP_...	1	Fa...	
09_CE2	CCT52 --- CIP R Route 1	171	CCT52		CCT CIP_...	1	Fa...	
10_CE2_CIP Line 1 TK	CCT51 --- CIP R Route 1	167	CCT51		CCT CIP_...	1	Fa...	
11_CE2_CIP Line 2 WL	CCT50 --- CIP R Route 1	163	CCT50		CCT CIP_...	1	Fa...	
12_CE2_CIP Line 3 L	CCT49 --- CIP R Route 1	159	CCT49		CCT CIP_...	1	Fa...	
13_CE2	CCT48 --- CIP R Route 1	155	CCT48		CCT CIP_...	1	Fa...	
14_CE2	CCT47 --- CIP R Route 1	151	CCT47		CCT CIP_...	1	Fa...	
15_CE2	CCT46 --- CIP R Route 1	147	CCT46		CCT CIP_...	1	Fa...	
16_CE1	CCT45 --- CIP R Route 1	143	CCT45		CCT CIP_...	1	Fa...	
17_CE1	CCT44 --- CIP R Route 1	139	CCT44		CCT CIP_...	1	Fa...	
18_CE1	CCT43 --- CIP R Route 1	135	CCT43		CCT CIP_...	1	Fa...	
19_CE1_YPT2 Transfer	CCT42 --- CIP R Route 1	131	CCT42		CCT CIP_...	1	Fa...	
20_CE1_Wort Line	CCT41 --- CIP R Route 1	127	CCT41		CCT CIP_...	1	Fa...	
21_CE1_Racking	CCT40 --- CIP R Route 1	123	CCT40		CCT CIP_...	1	Fa...	
22_CE1_Beer Line								
23_CE1_Yeast Harvest								
24_CE1_Yeast TK Scrap								

### Remove Trub

- 01\_CE2\_Wort Line
- 02\_CE2
- 03\_CE2\_Beer Line
- 04\_CE2\_Yeast Harvest
- 05\_CE2\_Yeast TK Scrap
- 06\_CE2\_Remove Trub
- 07\_CE2\_YPT2 Transfer
- 08\_CE2
- 09\_CE2
- 10\_CE2\_CIP Line 1 TK
- 11\_CE2\_CIP Line 2 WL
- 12\_CE2\_CIP Line 3 L
- 13\_CE2
- 14\_CE2
- 15\_CE2
- 16\_CE1
- 17\_CE1
- 18\_CE1
- 19\_CE1\_YPT2 Transfer
- 20\_CE1\_Wort Line
- 21\_CE1\_Racking
- 22\_CE1\_Beer Line
- 23\_CE1\_Yeast Harvest
- 24\_CE1\_Yeast TK Scrap
- 25\_CE1\_Remove Trub

Partial Route	ID	Source	Variant	Destination	Priority	Bi...	Cc
YPT2 --- YPT2 Wort Line	444	YPT2		Wort Line...	1	Fa...	
YPT2 Wort Line --- CCT59	443	Wort Line CE2		CCT59	1	Fa...	
YPT2 Wort Line --- CCT58	442	Wort Line CE2		CCT58	1	Fa...	
YPT2 Wort Line --- CCT57	441	Wort Line CE2		CCT57	1	Fa...	
YPT2 Wort Line --- CCT56	440	Wort Line CE2		CCT56	1	Fa...	
YPT2 Wort Line --- CCT55	439	Wort Line CE2		CCT55	1	Fa...	
YPT2 Wort Line --- CCT54	438	Wort Line CE2		CCT54	1	Fa...	
YPT2 Wort Line --- CCT53	437	Wort Line CE2		CCT53	1	Fa...	
YPT2 Wort Line --- CCT52	436	Wort Line CE2		CCT52	1	Fa...	
YPT2 Wort Line --- CCT51	435	Wort Line CE2		CCT51	1	Fa...	
YPT2 Wort Line --- CCT50	434	Wort Line CE2		CCT50	1	Fa...	
YPT2 Wort Line --- CCT49	433	Wort Line CE2		CCT49	1	Fa...	
YPT2 Wort Line --- CCT48	432	Wort Line CE2		CCT48	1	Fa...	
YPT2 Wort Line --- CCT47	431	Wort Line CE2		CCT47	1	Fa...	
YPT2 Wort Line --- CCT46	430	Wort Line CE2		CCT46	1	Fa...	
YPT2 Wort Line --- CCT45	429	Wort Line CE2		CCT45	1	Fa...	
YPT2 Wort Line --- CCT44	428	Wort Line CE2		CCT44	1	Fa...	
YPT2 Wort Line --- CCT43	427	Wort Line CE2		CCT43	1	Fa...	
YPT2 Wort Line --- CCT42	426	Wort Line CE2		CCT42	1	Fa...	
YPT2 Wort Line --- CCT41	425	Wort Line CE2		CCT41	1	Fa...	
YPT2 Wort Line --- CCT40	424	Wort Line CE2		CCT40	1	Fa...	

### YPT2-Transfer

- 01\_CE2\_Wort Line
- 02\_CE2
- 03\_CE2\_Beer Line
- 04\_CE2\_Yeast Harvest
- 05\_CE2\_Yeast TK Scrap
- 06\_CE2\_Remove Trub
- 07\_CE2\_YPT2 Transfer
- 08\_CE2
- 09\_CE2
- 10\_CE2\_CIP Line 1 TK
- 11\_CE2\_CIP Line 2 WL
- 12\_CE2\_CIP Line 3 L
- 13\_CE2
- 14\_CE2
- 15\_CE2
- 16\_CE1
- 17\_CE1
- 18\_CE1
- 19\_CE1\_YPT2 Transfer
- 20\_CE1\_Wort Line
- 21\_CE1\_Racking
- 22\_CE1\_Beer Line
- 23\_CE1\_Yeast Harvest
- 24\_CE1\_Yeast TK Scrap
- 25\_CE1\_Remove Trub
- 26\_CE1\_CIP Line 1 WL
- 27\_CE1\_CIP Line 2 TK
- 28\_CE1\_CIP Line 3 L
- 29\_CE1
- 30\_CE1

Partial Route	ID	Source	Variant	Destination	Priority	Bi...	Cc
CIP L1 Prerun --- CCT55	217	CIP L1 Prerun CE2		CCT55	1	Fa...	
CIP L1 Prerun --- CCT54	216	CIP L1 Prerun CE2		CCT54	1	Fa...	
CIP L1 Prerun --- CCT53	215	CIP L1 Prerun CE2		CCT53	1	Fa...	
CIP L1 Prerun --- CCT52	214	CIP L1 Prerun CE2		CCT52	1	Fa...	
CIP L1 Prerun --- CCT51	213	CIP L1 Prerun CE2		CCT51	1	Fa...	
CIP L1 Prerun --- CCT50	212	CIP L1 Prerun CE2		CCT50	1	Fa...	
CIP L1 Prerun --- CCT49	211	CIP L1 Prerun CE2		CCT49	1	Fa...	
CIP L1 Prerun --- CCT48	210	CIP L1 Prerun CE2		CCT48	1	Fa...	
CIP L1 Prerun --- CCT47	209	CIP L1 Prerun CE2		CCT47	1	Fa...	
CIP L1 Prerun --- CCT46	208	CIP L1 Prerun CE2		CCT46	1	Fa...	
CIP L1 Prerun --- CCT45	207	CIP L1 Prerun CE2		CCT45	1	Fa...	
CIP L1 Prerun --- CCT44	206	CIP L1 Prerun CE2		CCT44	1	Fa...	
CIP L1 Prerun --- CCT43	205	CIP L1 Prerun CE2		CCT43	1	Fa...	
CIP L1 Prerun --- CCT42	204	CIP L1 Prerun CE2		CCT42	1	Fa...	
CIP L1 Prerun --- CCT41	203	CIP L1 Prerun CE2		CCT41	1	Fa...	
CIP L1 Prerun --- CCT40	202	CIP L1 Prerun CE2		CCT40	1	Fa...	
CIP L1 Prerun --- Air Foam Trap	201	CIP L1 Prerun CE2		AirFoamT...	1	Fa...	
CCT59 --- CIP L1 Return	198	CCT59		CIP L1 R...	1	Fa...	
CCT58 --- CIP L1 Return	194	CCT58		CIP L1 R...	1	Fa...	
CCT57 --- CIP L1 Return	190	CCT57		CIP L1 R...	1	Fa...	
CCT56 --- CIP L1 Return	186	CCT56		CIP L1 R...	1	Fa...	
CCT55 --- CIP L1 Return	182	CCT55		CIP L1 R...	1	Fa...	
CCT54 --- CIP L1 Return	178	CCT54		CIP L1 R...	1	Fa...	
CCT53 --- CIP L1 Return	174	CCT53		CIP L1 R...	1	Fa...	
CCT52 --- CIP L1 Return	170	CCT52		CIP L1 R...	1	Fa...	
CCT51 --- CIP L1 Return	166	CCT51		CIP L1 R...	1	Fa...	
CCT50 --- CIP L1 Return	162	CCT50		CIP L1 R...	1	Fa...	
CCT49 --- CIP L1 Return	158	CCT49		CIP L1 R...	1	Fa...	
CCT48 --- CIP L1 Return	154	CCT48		CIP L1 R...	1	Fa...	
CCT47 --- CIP L1 Return	150	CCT47		CIP L1 R...	1	Fa...	
CCT46 --- CIP L1 Return	146	CCT46		CIP L1 R...	1	Fa...	
CCT45 --- CIP L1 Return	142	CCT45		CIP L1 R...	1	Fa...	
CCT44 --- CIP L1 Return	138	CCT44		CIP L1 R...	1	Fa...	
CCT43 --- CIP L1 Return	134	CCT43		CIP L1 R...	1	Fa...	
CCT42 --- CIP L1 Return	130	CCT42		CIP L1 R...	1	Fa...	
CCT41 --- CIP L1 Return	126	CCT41		CIP L1 R...	1	Fa...	
CCT40 --- CIP L1 Return	122	CCT40		CIP L1 R...	1	Fa...	
Air Foam Trap --- CIP L1 Return	1	AirFoamTrap		CIP L1 R...	1	Fa...	

### CIP Line x