ESO - EUROPEAN SOUTHERN OBSERVATORY

EUROPEAN SOUTHERN OBSERVATORY
Organisation Européenne pour des Recherches Astronomiques dans l'Hémisphère Austral
Europäische Organisation für astronomische Forschung in der südlichen Hemisphäre

VERY LARGE TELESCOPE

Design of the PRIMA Metrology Laser Interlock System Technical Manual

Doc. No.: VLT-SPE-ESO-15735-4544

Issue: draft

Date: 01/04/08

Prepared:	A. Jost	01. April 2008	
	Name	Date	Signature
Approved:	S. Leveque		
	Name	Date	Signature
Released:	Toomas Erm		
	Name	Date	Signature

CHANGE RECORD

Issue	Date	Affected Paragraphs(s)	Reason/Initiation/Remarks
Draft	01.04.2008	All	Draft

TABLE OF CONTENTS

1 SCOPE

The Purpose of this document is to

- Describe the PRIMA Metrology Laser Interlock System from the technical perspective
- Provide information for maintenance, troubleshooting and updates

2 APPLICABLE AND REFERENCE DOCUMENTS

Ref	Document Number	Issue	Date	Title
AD 1	VLT-SAF-INS-ESO-00000-3444	1	10/10/2006	Safety conformity assessment procedure
AD 2	VLT-SPE-ESO-10000-0015	6	8/12/2005	Electronic Design Specifications
AD 3	VLT-TRE-ESO-15730-4546	1	02/04/2008	Prima Metrology Safety and Reliability Analysis
AD 4	VLT-SPE-ESO-15735-4557	1	21/04/2008	PRIMA Metrology Laser Interlock System Acceptance Test

3 LIST OF ABBREVIATIONS/ACRONYMS

BOM Bill Of Materials
FBD Function Block Diagram (Step 7)
IL Interlock
MMC Micro Memory Card
OPC OLE for Process Control
PLC Programmable Logic Controller
PLD Programmable Logic Devices
UT Unit Telescope

4 PURPOSE

The purpose of the PRIMA Laser Interlock System is to avoid/eliminate hazardous conditions to staff in conjunction with the Class III laser used for the system. The laser interlock system monitors the access to rooms where the laser propagates in free space. Furthermore there is a lock out switch located at each UT lock out station to interlock the laser during work in the Nasmyth adaptor or in the Coude optical train.

The doors of the 4x Coude Rooms (located in the UTs), the Storage Room entrance (location of laser) and the Ante Chamber access door are equipped with safety door sensors.

While the laser is in operation, there are only 2 ways to enter these rooms without triggering the interlock system:

- type a CODE into a keypad at the entrance door
- somebody from inside the room disarms the interlock by pressing an override button and opens the door

In case the interlock system is triggered, the laser is disabled and has to be restarted after the interlock condition has been removed.
For more information concerning access and exact location of the Interlock System hardware described in the following chapter see also [AD 3].

5 WHY HAS THE INTERLOCK SYSTEM BEEN REALISED WITH PLC HARDWARE

The interlock system could have been realized in various hardware implementations using relays or PLD. Due to the distance between the UTs and the VLTI control room a bus based system with fibre links has an advantage over hardwired long cable distributions.

Interlock System Requirements:

- Interlock system connections over long distances up to 300m
- Highly reliable / no downtime
- Long product lifetime for spare parts >10 years
- Easily extendable – supervision of additional rooms or additional functions
- Remote monitoring possible
- Interface to LCU
- Limited installation effort / preferably no new cables across the VLTs
- Fail safe system

The ProfiSafe based PLC solution fulfills all these requirements. The system modules can be linked via Ethernet over fibre or copper. Multimode fibres allow distances between CPU and distributed I/O units up to 3km. The fibres provide galvanic isolation between the stations → no ground loops. Existing fibre links between VLTI, UTx and the VLT control room can be used. This reduces installation effort to a minimum. The distributed I/Os can be connected via fibre over standard SCP Part Bs to the VLT control room from any location on the VLT site.

Safety PLC features:

- Distributed I/O system can be connected over distances of 3km with multimode fibre
- PLC are highly reliable, modules can be hot-swopped without reboot of the system (in case a module failed)
- Spare part deliveries are guaranteed for 10 years from the date the part is declared obsolete
- Easily extendable due to Ethernet based PROFINET bus system and modularized distributed I/O units (or additional CPU with I/Os)
- Remote monitoring/debugging/upgrade of the system possible via Ethernet interface
- Interface to LCU can be established via I/O function (VME MEN modules) or direct Ethernet connection via a OPC Server (not yet supported by VLT software)
- System monitors links to all distributed I/O, system switches to defined safe mode in case of link failure or other failures
- PROFISAFE software comes with libraries for safety applications certified by authorities as i.e. TUEV

Another reason for the choice of ProfiSafe for the interlock system was to demonstrate the capabilities of this new ESO standard.

6 SYSTEM OVERVIEW

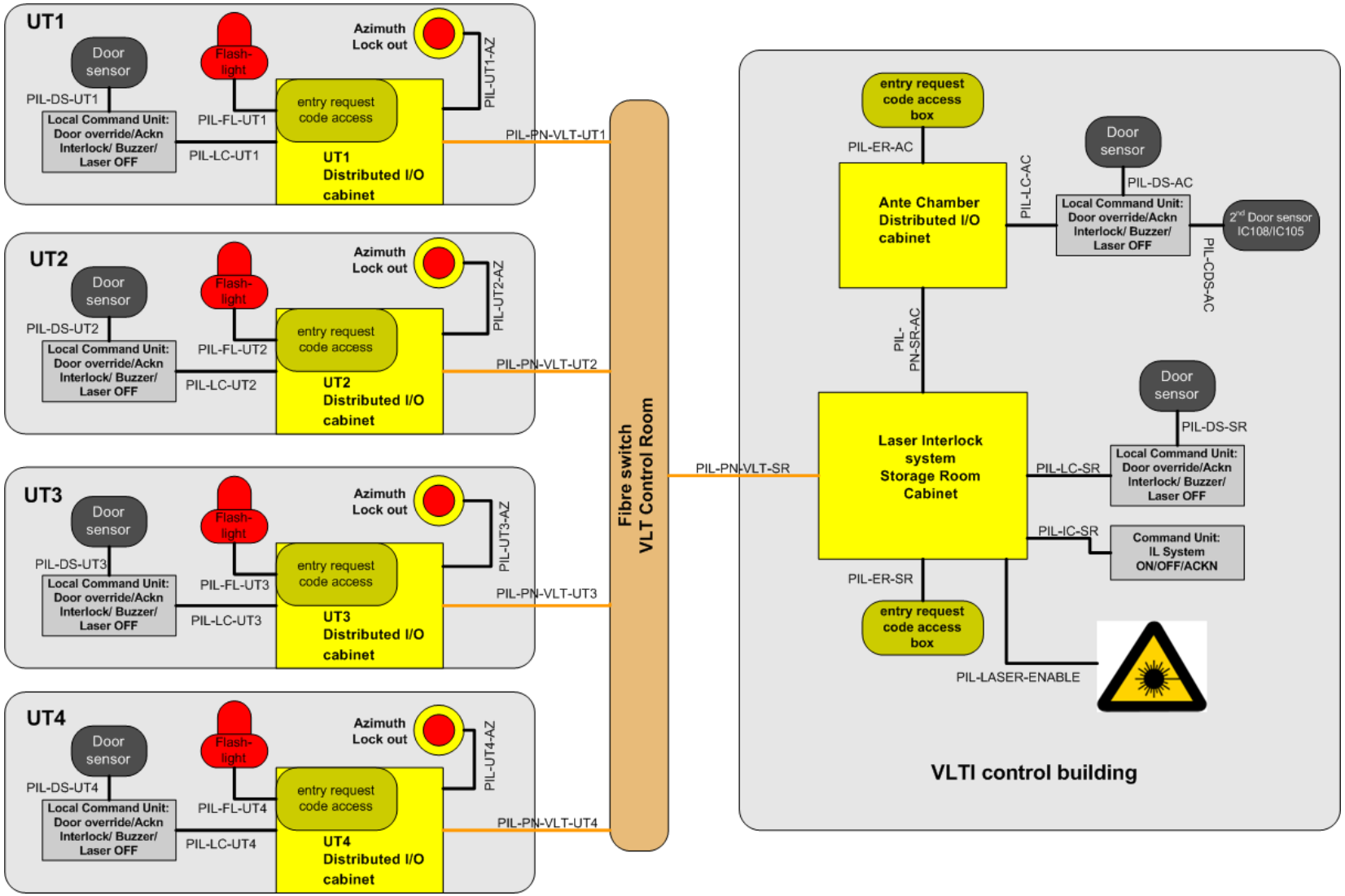


Figure 1 Laser Interlock System overview with cable labeling

The laser interlock system consists of 6 cabinets. The cabinet in the storage room contains the CPU and an interlock monitor display. The other 5 cabinets are from a functional point of view identical. Each cabinet includes an ET200S distributed I/O unit which can monitor a door interlock, an entry key code access, one additional interlock button (lockout station azimuth platform) and a command unit (door override/ Ackn IL/ Buzzer/ Laser OFF IL). In case of the Ante chamber, the interlock interface azimuth platform is used to monitor a second door which is normally closed. The 5 distributed I/O systems are connected via Ethernet to the central CPU located in the storage room. The Ante Chamber distributed I/O is directly connected via a copper Ethernet link to the CPU, the other 4 units are connected via a fibre switch located in the VLT control room.

The individual units of the system are described in the following chapters. The headings refer to the names shown in the block diagram in Figure 1. Where applicable, a schematic can be found in the appendix showing the detailed implementation of the blocks shown above. One schematic page might include the function of one or more blocks. The schematic page titles reflect the names given in the block in Figure 1. The appendix shows moreover also sketches of the cabinet layouts for convenience. All complete list of the PLC code in provided in the appendix for convenience.

6.1 Hardware

6.1.1 Laser Interlock System Storage Room Cabinet

Figure 2

The laser Interlock system with Interlock display shown in Figure 2 is installed in the Storage Room. This cabinet contains the S7 317F CPU (Failsafe CPU) including one ET200S distributed I/O system. The interlock display integrated in the cabinet has 10 LEDs indicating interlocks, laser status and system failure. The "Door Code" can be set inside the cabinet with 4 BCD switches (see Figure 3). The Interlock System Command Unit "IL System ON/OFF/ACKN" shown in Figure 3is located near the Interlock system cabinet. This unit turns the IL system ON/ OFF and allows to acknowledge IL which have occurred. The IL system can only be turned on via the green ON button, when all triggered door interlocks have been acknowledged by pressing the ACKN IL button. The red Laser IL System OFF button turns the IL system OFF. In this state, the laser is disabled. The laser can only be turned on, when the IL system is "ON" and no interlock is triggered. If the interlock system is "ON", a relays contact closes the enable/disable input of the actual laser unit (not shown in this paper).

Figure 3 Door Code

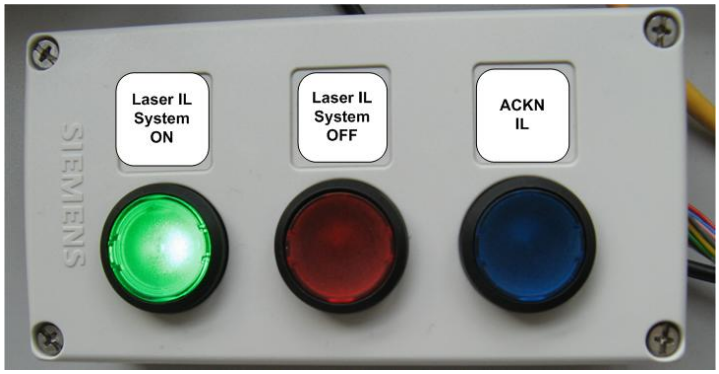


Figure 4 IL System ON/OFF/ACKN

6.1.2 Interlock monitor display

	LED green	LED red	LED orange
Interlock UTx	Flashing -> door override active	Interlock triggered, door or red mushroom button	Lock-out button activated at Azimuth platform
Interlock Ante Chamber	flashing -> door override active	Interlock triggered, door or red mushroom button	Interlock activated at "door normally locked"
Interlock Storage Room	Flashing -> door override active	Interlock triggered, door or red mushroom button	-
Laser ON	Laser Interlock System ON	-	-
System Failure	-	System failure	-
Laser Interlock	-	Interlock triggered	-
Laser OFF	Laser Interlock System OFF	Laser Interlock System OFF, Interlock triggered	

Table 1 Interlock Display

The table above shows the meaning of the LEDs displayed on the interlock system cabinet.

6.1.3 Local Command Unit

A Local Interlock Command unit "Door override/ACKN Interlock/Buzzer/Laser OFF Interlock" is installed in all 4x UT Coude Rooms, Storage Room and Ante Chamber close to the exit door. Table 2 shows the functions of the local interlock command unit.

Figure 5 Local Command Unit

Door override	To override the door interlock in case of exiting the room or to let somebody in from the outside without triggering the laser interlock
Ackn IL	To acknowledge the local door interlock when it has been triggered
Buzzer	Invalid code (@ keypad outside): 2x short Door override active: interval 0.6Hz for the period the door override is active Door interlock triggered: interval 5Hz for 10seconds Laser interlock system ON: x short Entry request: 3sec permanent
Laser OFF Interlock	To lock a laser interlock for e.g. maintenance ; can only be key released

Table 2 Function of the local command unit

The local interlock button is self locking and can only be released by a key. The key-fob shown in Figure 6 can either be taken away with the key or hang over the red mushroom button once the interlock button is locked to inform other staff that the interlock is not to be released.

Figure 6 Key for interlock button release

6.1.4 Distributed I/O Cabinet

A cabinet with a distributed ET200S I/O unit and code keypad is located at each entry of the UT Coude Rooms. These units contain all the local interlock electronics connected by Ethernet via fibre to the central interlock system CPU located in the Storage Room. The keypad allows to trigger the door override via a 4 digit code (see Figure 3) to enter the room without triggering the interlock. The functions or the buttons in the box are described in Table 3.

Figure 7 Distributed I/O Cabinet

Request Entry button	Press to request entry
Request Entry LED green	Flashes when door override is activated for the door override period
Buzzer	Invalid code: 2x short Door override active: interval 0.6Hz for the period the door override is active Door interlock triggered: interval 5Hz for 10seconds Laser interlock system ON: 2x short Entry request: 3sec permanent
Keypad	Type door code to activate door override

Table 3 Door access functions

Storage Room and Ante Chamber have the distributed ET200S I/O cabinet electronics located inside the room. The functions described above are provided via the "Entry Request / Code Access box" (see Figure 8) located in front of the access door. The system works as described for the UT Coude Room electronics.

Figure 8 Entry Request / Code Access box

6.1.5 Flashing red light

A red flash light is located above each Coude Room, Ante Chamber and Storage Room door. If the laser interlock system is active, the red light is flashing. The red light does not indicate that the laser is in operation, it does only indicate that the interlock system is activated. Therefore, door override button and keypad has to be used for controlled entry access. If the red light is not flashing, the laser is definitely "OFF ".

Figure 9 Red LED flash light

6.1.6 Door sensors

Figure 10 Magnetic door sensor

Each Coude Room, Ante Chamber and Storage Room door is monitored by a magnetic sensor. These sensors are safety door sensors with antivalent magnetic switches. A magnet is fixed to the door, while the magnetic switch sensor is fixed to the door frame. When the door is opened, the magnetic switch is triggered. The switches are monitored by safety I/O modules. The safety I/O modules monitor cable break to the magnetic switches as well as monitor that the antivalent switches switch synchronously. The discrepancy time for the synchronous switching is configured to 1sec in the safety program. This means if the contact NC & NO do not switch from one state to the other synchronously within one second, the system will trigger a safety error and the interlock will be triggered.

6.1.7 PLC hardware

Detailed description/datasheets concerning PLC hardware modules can be found on the Siemens A&D webpage:

http://support.automation.siemens.com

The PLC modules used for the Interlock system are described briefly in the following chapters.

6.1.7.1 PLC CPU S7 317F-2 PN/DP

The S7 317F CPU is a safety CPU with 1x Profinet interface and 1x Profibus/MPI interface.

6.1.7.2 ET200S IM153 -3PN High Feature

The ET200S is a distributed I/O module for Profinet. It connects via Ethernet to the CPU. The name of the ET200S is stored on a MMC which allows the CPU to distinguish the module from the other ET200S on the network. Each ET200S does also have a MAC address and gets a IP address assigned. The fact that the name of the unit is stored on the MMC, allows exchanging a broken ET200S from the network without re-configuration of software. The MMC is plugged into the new ET200S. The CPU sees therefore an ET200S with the same name. If the MAC address would be used for identification, the software would have to be re-configured and new compiled.

6.1.7.3 ET200S Modules

- PME 24-48VDC/24-230VAC → Power module
- 8DO DC24V/0.5A → 8 channel digital ouput module
- 8DI DC24V SRC (input to GND → High) → 8 channel digital input module
- 4/8FDI → 4/8 channel safety input module
- 4FDI/3FDO → 4 channel safety input module / 3 channel safety output module

Note: The PME24-48V modules have 10A fuses integrated. To change the fuse the module has to be taken out of the rail. 4FDI/3FDO & 4/8FDI have DIP switches to set a specific safety address. The DIP switches can only be accessed if the modules are taken out of the rail. If a module is to be replaced, the replacement modules DIP switches must be set identically to the one of the old module. The DIP switches settings are also shown in the Step7 program/module parameters.

6.1.7.4 Scalance X101-1 Media converter

The Scalance X101-1 is a copper Ethernet to multimode fibre media converter. The signal wavelength in the multimode fibre is 1300nm. The maximum transmission distance is 3km assuming a total fibre attenuation of <1dB / km (datasheet). Fibre interface is BFOC (ST connector). The transmission rate is fast Ethernet 100Mbit/s fixed. Fibre switches must be set to this fixed rate, auto negotiation is not supported.

6.1.7.5 Scalance X204-2 Ethernet switch

The Scalance X204-2 is a Profinet Ethernet switch supporting 4 copper ports and 2 fibre ports. The switch is managed an can be accessed/configured via internet explorer. For more details consult the manual.

6.1.7.6 230V / 24V PSU

- SITOP Smart DC 24V / 5A → DIN 35mm mountable PSU
- PS 307 DC 24V /5 A → S7 Rail mountable PSU

6.1.7.7 Micro Memory Card

- 512 kB used for CPU317F
- 64kB used for all ET200S

The Micro Memory cards are formatted with a Siemens Proprietary format. Those memory cards cannot be read by off-the-shelf card readers. Once formatted under windows, the MMC cards are useless and cannot be reformatted.

To read/write MMC cards a SIMATIC USB PROMMER EUR 890.-(order no. 6ES7792-0AA00-0XA0) is required.

A MMC is not required for maintenance, but might become handy when messing about with MMC cards.

6.1.8 Keypad

The keypad is a high quality off-the-shelf unit vandalism proof from R&S, order number: 133-175

6.1.9 Keypad encoder

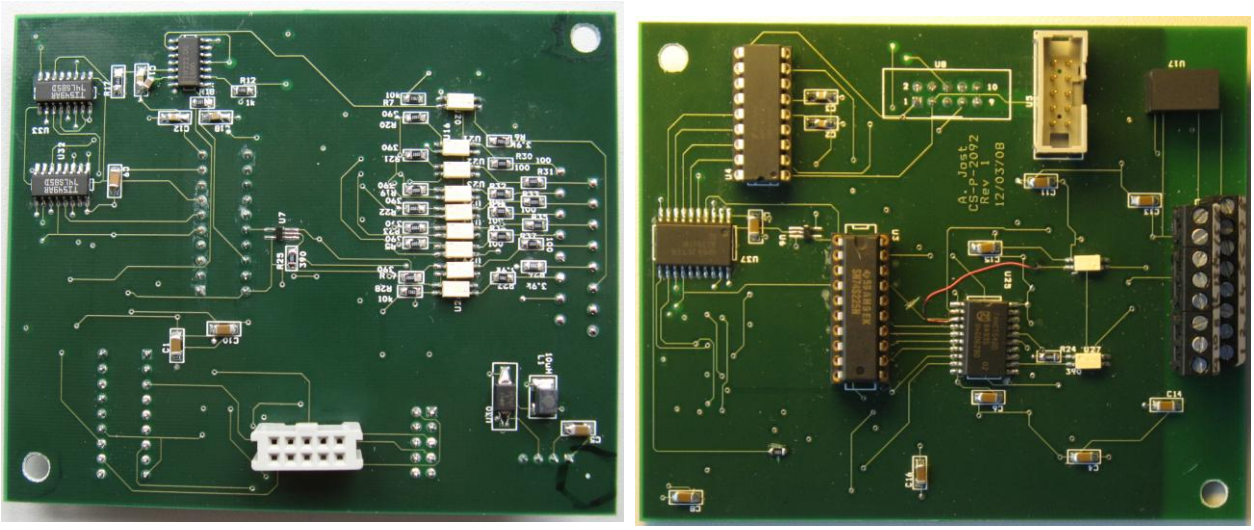


Figure 11 Keypad Encoder pcb

The keypad encoder pcb is ESO custom designed and consists in principal of a keypad encoder chip 74C922, a 4 bit shift register chip SN74S225. The pcb has furthermore two 4 bit compare chips SN74LS85. The compare chips check the key codes for the * and # button. If * is entered, the shift register is reset and all stored content deleted. The # sets a /R/S Flip

Flop to indicate that a door code has been entered. The /R/S Flip Flop (realized with a SN7400) sets the xx_KP_Data_Flag which is polled by the PLC software. If the flag is set, the PLC retrieves the data stored in the 4 bit shift register and resets the flag when the last 4 bit nibble has been read (after 5 cycles). All I/O to the keypad encoder are galvanic isolated from the PLC module I/O by opto couplers. The opto couplers provide furthermore a level conversion between PLC 24V level logic and TTL level of the keypad encoder. The keypad encoder circuit is supplied by one PLC 24V output. A DC/DC converter supplies the keypad encoder with 5V. The PLC monitors the keypad encoder 5V supply via the xx_KP_OK input. Faults of the keypad encoder 5V supply are therefore monitored by the PLC and reported as "System Failure". The PLC 24V /0.5A output limits the current to the keypad encoder to 0.5A in case of short on the pcb. The supply to the keypad encoder is turned off, if the interlock system is OFF.

The 4 bit nibble provided by the keypad encoder chip is not the BCD equivalent of the number pressed on the keypad. Table 4 shows the binary output of the keypad encoder chip corresponding to the key pressed. The decoding/comparison with the "Door code" (Figure 3) is done by software in the PLC.

Note: PLC input module 8DI SRC are 1, when the input is pulled to GND, 0 when the input is open !

Layout/Schematic/Gerber files and BOM are stored under CS-P 2092 in the ESO archive. Schematic and BOM can be found in the appendix of this document.

keypad button	Output Q0-Q3 74C922				Binary	Matrix
1	0	0	0	0	0	3+5
2	0	1	0	0	4	5+6
3	1	0	0	0	8	4+5
4	0	0	0	1	1	3+7
5	0	1	0	1	5	6+7
6	1	0	0	1	9	4+7
7	0	0	1	0	2	2+3
8	0	1	1	0	6	2+6
9	1	0	1	0	10	2+4
*	0	0	1	1	3	1+3
0	0	1	1	1	7	1+6
#	1	0	1	1	11	1+4

Table 4 Keypad encoder matrix

7 PLC SOFTWARE

7.1 Software overview

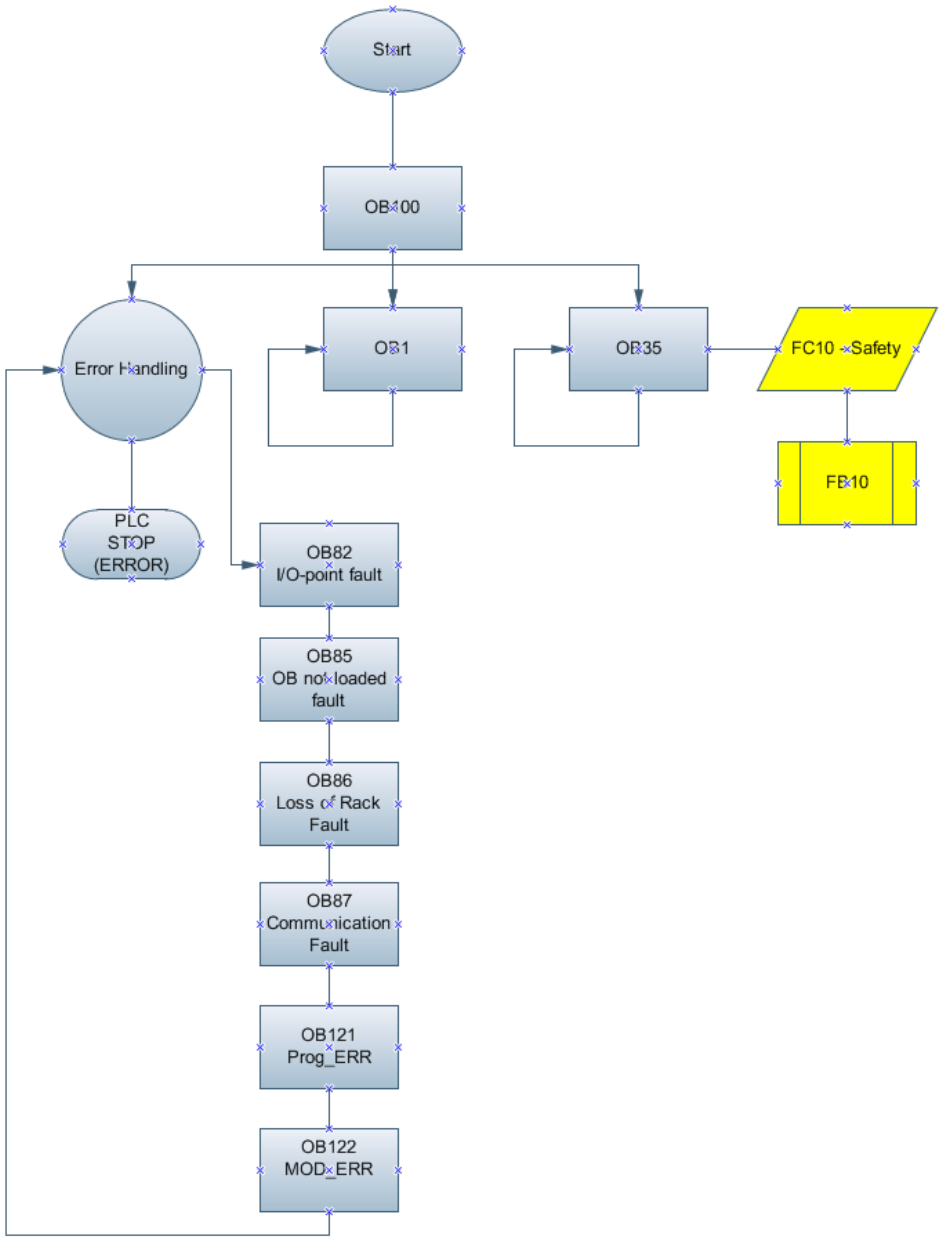


Figure 12

The plc is programmed in STEP 7. The software can be divided in safety and non safety functions. The safety function can be compiled separately from the non-safety application of the software. This is to increase the safety of the system. The safety part is marked yellow in the flow chart.

The software is processed in 3 parallel applications. OB1 is being processed in cycles. Once the end of the cycle is reached, the program starts at the beginning of OB1 again. OB35 is called every x ms. The OB35 calls the safety program. The safety program can read variables written by the standard program in OB1. OB1 can also read variables of the safety program, but is not allowed to modify safety variables.

The program has been coded in FBD. The source code can be found in the appendix.

7.1.1 Standard program

The standard program reads buttons and status of safety sensors. According to the input, LEDs and buzzers are controlled. Furthermore, it reads in the code entered in the keypad and compares it with the code set in the reference code. If the code is correct, a flag is set for the safety program to trigger the door override time.

7.1.2 Error handling

The error handling routine runs virtually in the background of the CPU. If an error is detected, the appropriate OB is called automatically. If an error OB is called, the OB sets an “OB ERROR” flag. All “OB ERROR” flags are checked in OB1. If the any error flag is high, the OB1 sets the system fault LED. The CPU goes in “STOP” if the error is severe i.e. cable break of a Profinet Ethernet connection. If the CPU goes to “STOP” mode, the interlock is triggered and the laser disabled. The system keeps operating if the error is not jeopardizing the safety system, i.e. a shortcut on a LED.

The error cause can be investigated by connecting a PC with STEP7 software to the Profinet network. In case of a severe error (i.e. network cable break), the CPU must perform a “Cold Start”. Cold Start means that the power to the CPU is turned off and on again using the power switch on the PSU the CPU is connected to. After CPU has booted, set the CPU switch from run to stop and back to run again.

7.2 OB1

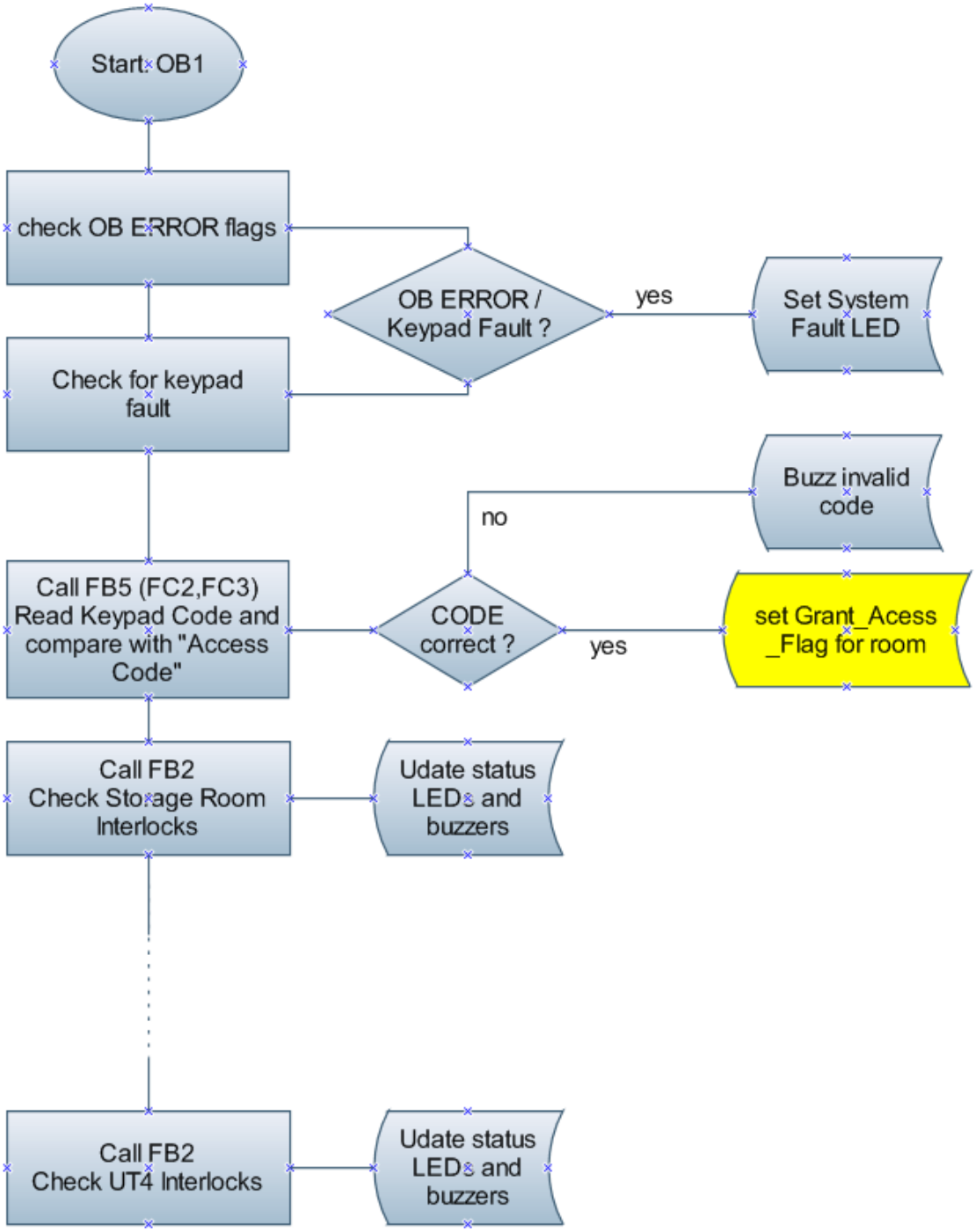


Figure 13 OB1

7.3 Safety program FC10/FB10

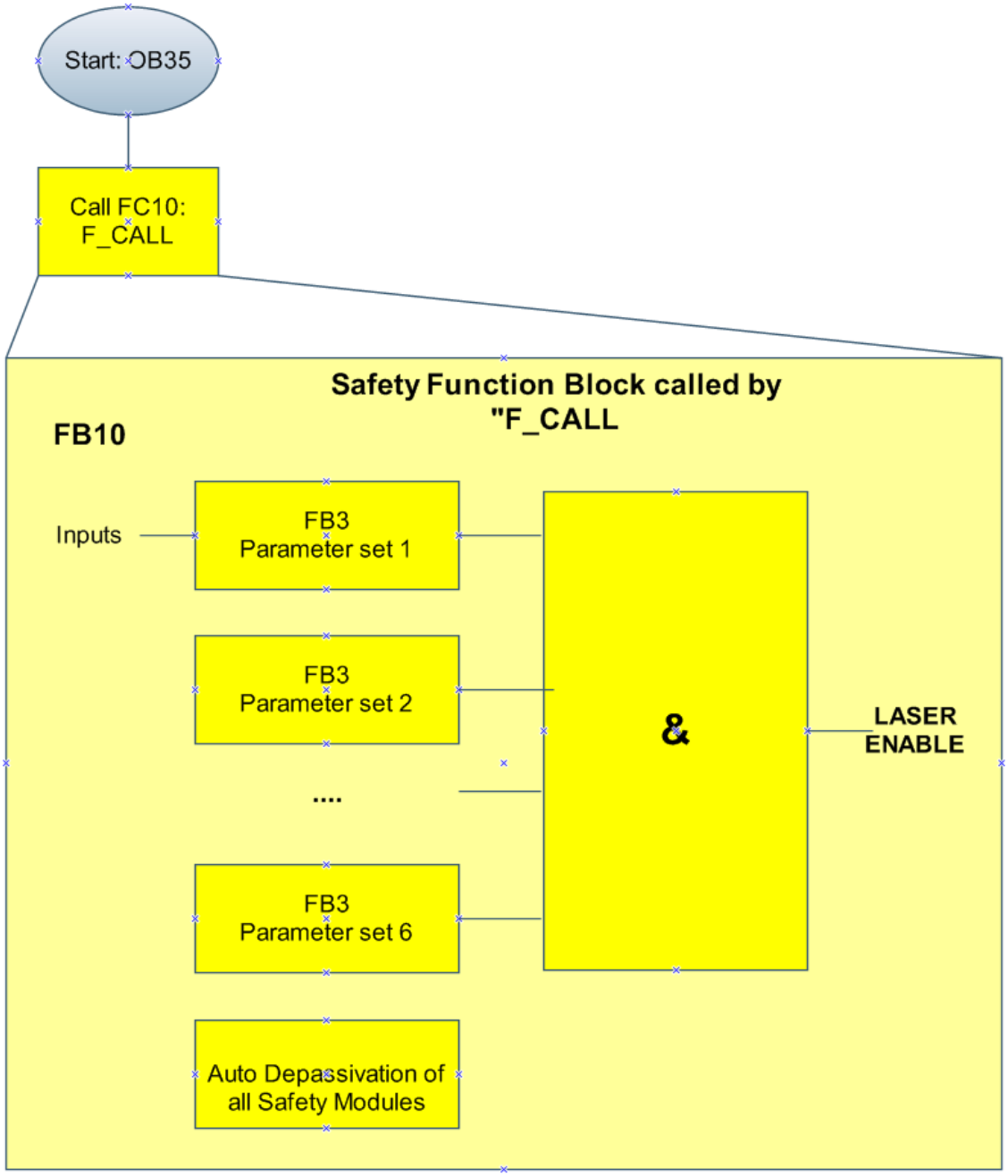


Figure 14 Safety program

7.3.1 Safety program

The safety program monitors the door sensors and reads the key-locked “Laser OFF” buttons. In case of door override, the safety program starts a timer to provide the time period for the override. If no interlock is triggered, the safety program activates 2 relays to enable the laser. The NO contacts of the relays are connected in series for safety reasons. If one relay contact sticks, the other one is still open. This provides redundancy for safety. An acknowledgement is required for any interlock triggered. The general acknowledge button for all interlocks is part of the Laser ON/OFF/ACKNOWLEDGE

command unit located in the Storage Room. Interlocks triggered by the door sensor require furthermore a local acknowledgement before the general acknowledge button can acknowledge the interlock. The local acknowledgement button is located on the DOOR OVERRIDE/ACKN/BUZZER/LASER OFF (see Figure 5) command unit located in each room (Ante Chamber, Storage Room & UTx Coude Rooms). The local acknowledgement button do not have blue LED light indicators. The acknowledge requirement of the local indicators are shown by flashing of the blue ACKN LED in the IL system command unit. The flashing blue LED & the IL LED display allows to identify the location where the acknowledgement is required. Door interlock is triggered by accident should be acknowledged immediately by pressing the local acknowledge button.

7.3.2 Step7 software version, options and password

Name	Version	Release	Release number
S7 Distributed Safety Programming	V5.4 + SP4	K5.4.4.0_3.5.0.1	K5.4.4.0
Automation License Manager Professional	V3.0 + SP1	K03.00.01.00_01.12.00.01	K03.00.01.00
PC Adapter USB	V2.0	02.00.00.00_01.08.00.01	V2.0.0.0
S7-PLCSIM Professional 2006 SR4	V5.4 + SP1	K05.04.01.00_01.07.00.01	V5.4.1.0
Primary Setup Tool	V3.2	V03.02.00.00_05.01.00.02	V03.02.00.00
S7 F ConfigurationPack	V5.5 + SP4	K5.5.4.0_6.2.0.1	K5.5.4.0
S7-GRAPH Professional 2006 SR4	V5.3 + SP5	K5.3.5.0_1.1.0.1	K5.3.5.0
S7-SCL Professional 2006 SR4	V5.3 + SP4	K05.03.04.00_01.02.00.01	K5.3.4.0
STEP 7 Professional 2006 SR4	V5.4 + SP3 + HF1	K5.4.3.1_3.4.0.1	K5.4.3.1

Table 5

The software has been programmed with the release and options shown above. The “S7 Distributed Safety Programming” is not part of the STEP 7 Professional 2006 SR4 package. This option has to be purchased separately and is mandatory to perform changes on the safety part of the software.

The password set for the safety program is:

siemens

If the password is lost, it cannot be recovered. The safety program must be re-written.

8 MAINTENANCE

8.1 Verification of Laser interlock Safety System 1x per annum

The system functionality should be checked at least once per year for safety purpose. This means, all interlock triggers should be activated, and verified that the system disables the laser after trigger of the interlock as specified in [AD4], safety functions. The door access code should be changed regularly to ensure only authorized staff can access the facilities.

8.2 Other maintenance

The safety interlock system should be principally maintenance free. All components used in the interlock system are listed with order number and manufacturer in the appendix. In case parts fail, supplier can be found in the appendix.

8.3 System upgrades and enhancements

The interlock system can be easily extended by adding more distributed I/O units to the system.

For example, to supervise another room by the interlock system, only a distributed I/O cabinet has to be copied, parts list shown in Table 8. As the software is modularized, a view block needs to be copied and variables changed to include another distributed I/O system.

9 TROUBLESHOOTING

9.1 General

Troubleshooting is done best by connecting a PC to the PLC CPU via in the storage room cabinet. The PC can be directly connected to the Ethernet switch Scalance X204-2. The PC should have Step7 software installed version as shown in Table 5 or newer.

9.2 System failure: Red LED On

In case “System Failure” is signaled, the first place to check is “Module Information”. The module information gives a rough indication where to look for the problem.

In case of a communication break in the network check the Ethernet for units which are disconnected. Select with the mouse pointer the Ethernet wire and select “Verify device name” as shown in Figure 16. All network participants will be pinged and it can be seen which ones are missing.

The Step7 debugger will have to be used for more detailed analysis if the measures described above are not successful.

To debug the safety part of the software, it is necessary to set the CPU from “Process mode” into “Test mode” as shown in Figure 17.

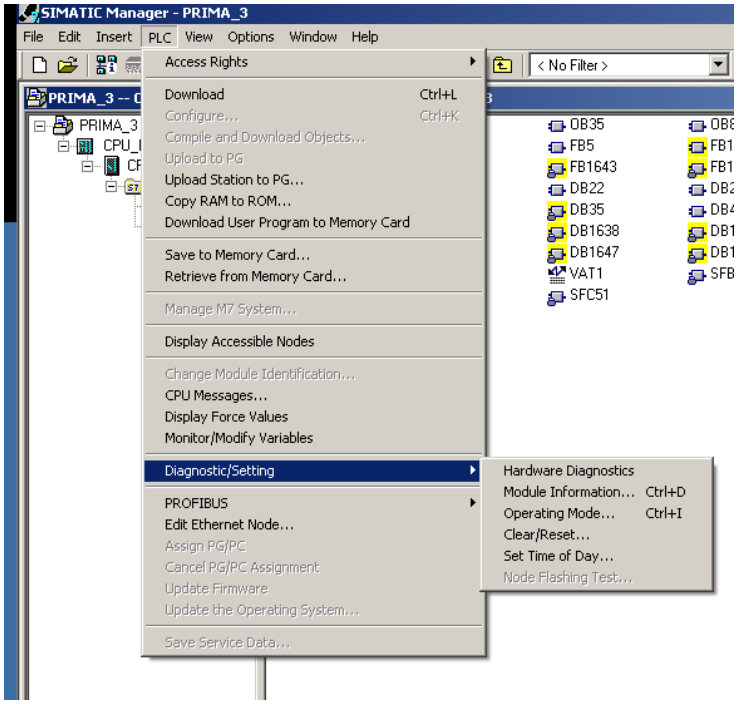


Figure 15 Module information

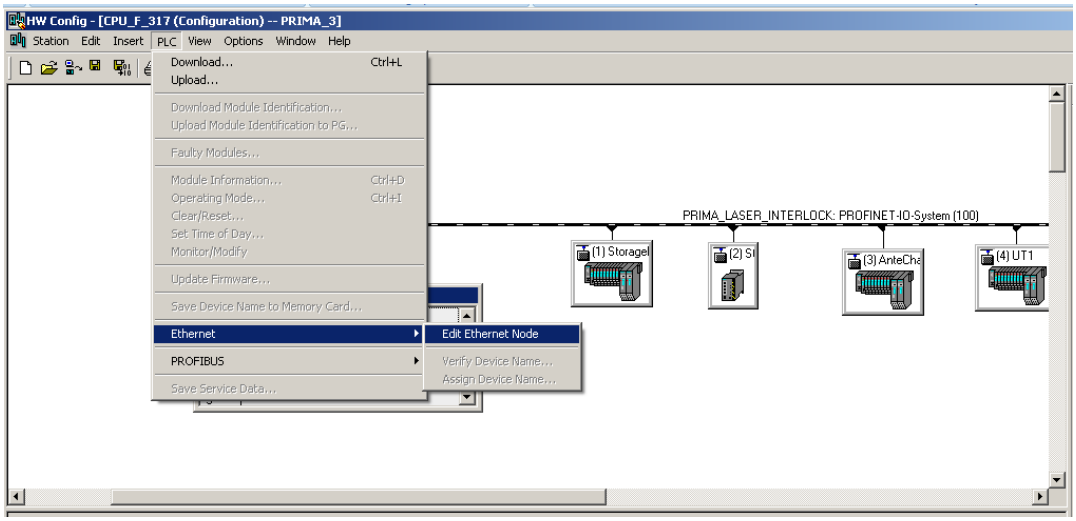


Figure 16 Check hardware connected to the network

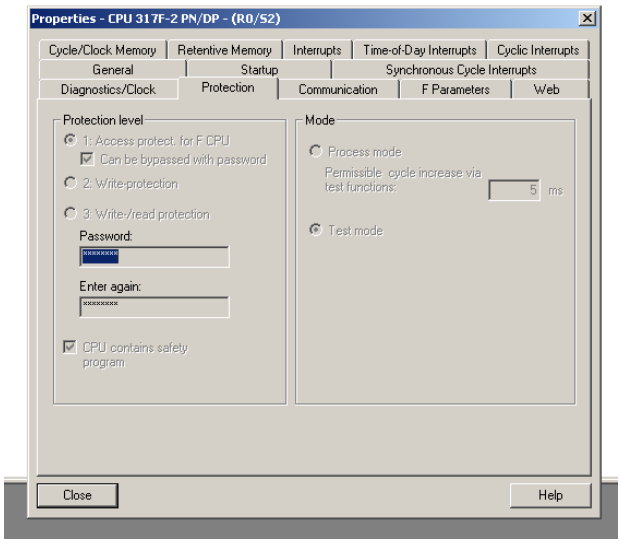


Figure 17 CPU Protection properties

9.3 Source code

The source code of the program is stored as a zip file on the memory card of the CPU for convenience.
To source code can be compared with the code executed on the CPU by uploading the program from the CPU and compare the two programs with the step7 compare function.

9.3.1 Safety program signature

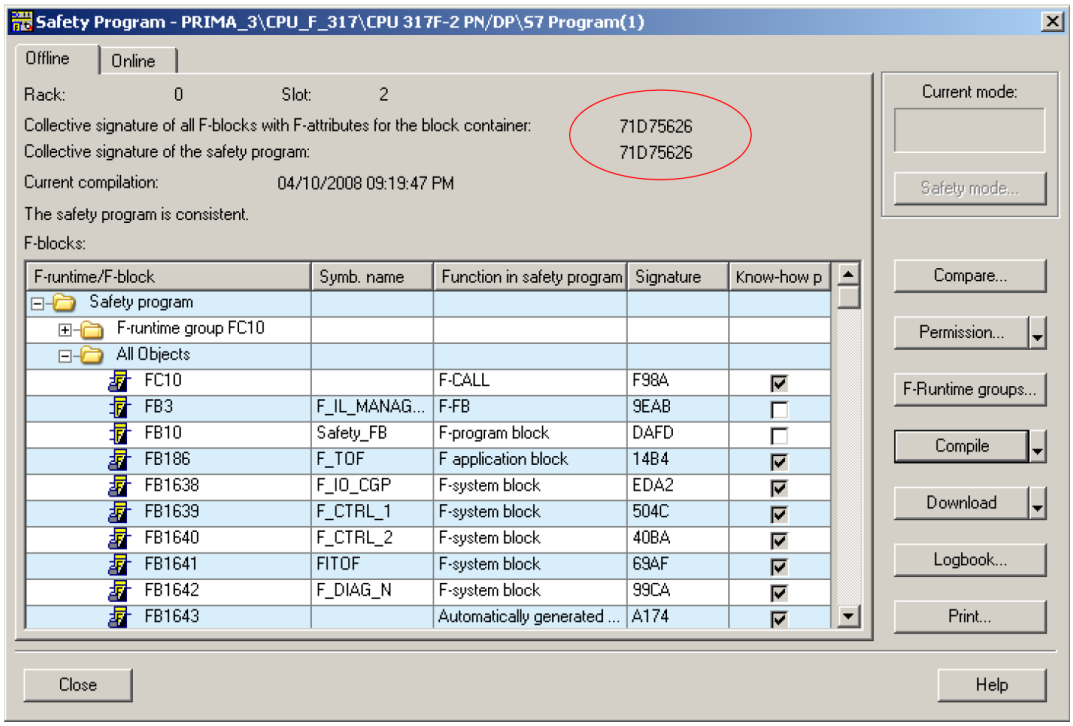


Figure 18 Safety program signature

The safety program creates a collective signature upon compilation shown in Figure 18. This signature is derived from the code in the safety program. If code is changed and recompiled, the signature changes as well. This signature should be noted down once the safety program has been tested and released for future reference. It allows maintenance stuff to check immediately if/when the software has been changed or modified. The safety program is password protected (see 7.3.2).

10 APPENDIX

10.1 Keypad Encoder BOM

Bill Of Materials	April 17,2008 11:14:01					
Item	Quantity	Reference	Part	Order number	Supplier	
1	5	C1,C4,C5,C14,C15	4.7uF			
2	1	C2	100nF			
3	2	C3,C19	1uF			
4	11	C6,C7,C8,C9,C10,C11,C12,	0.1uF			
		C13,C16,C17,C18				
5	1	L1	10uH			
6	8	R5,R19,R20,R21,R22,R23,	390			
		R24,R28				
7	3	R6,R26,R27	3.9k			
8	3	R7,R25,R29	10k			
9	4	R12,R13,R17,R18	1k			
10	8	R30,R31,R32,R33,R34,R35,	100			
		R36,R37				
11	1	U3	SN74S225	44S6950	www.buerklin.de	
12	1	U4	74C922	62S8350	www.buerklin.de	
13	2	U5,U8	keypad		IDC 10pin, Farnell	
14	2	U6,U7	74HCT1G14		http://de.farnell.com	
15	1	U14	SN7400	SMD LS00	www.reichelt.de	
16	11	U15,U16,U20,U21,U22,U23,	TL281		http://de.farnell.com or www.digikey.com	
		U24,U26,U27,U28,U29				
17	1	U17	TME2405S	26 K 1716	www.buerklin.de	
18	1	U25	SN74ACT540		http://de.farnell.com	
19	1	U30	SM6TxVy		http://de.farnell.com	
20	2	U32,U33	SN7485	62 S 8785	www.buerklin.de	
21	1	U37	SN74ACT541		http://de.farnell.com	
22	1	X1	X16	2x AKL 267-06 Klemme RM3,5 / 1x AKL 267-04 Klemme	www.reichelt.de	
23	1		Keypad 12keys	133-175	http://de.rs-online.com/web/	

Table 6 Keypad encoder bill of materials

10.2 Storage Room cabinet

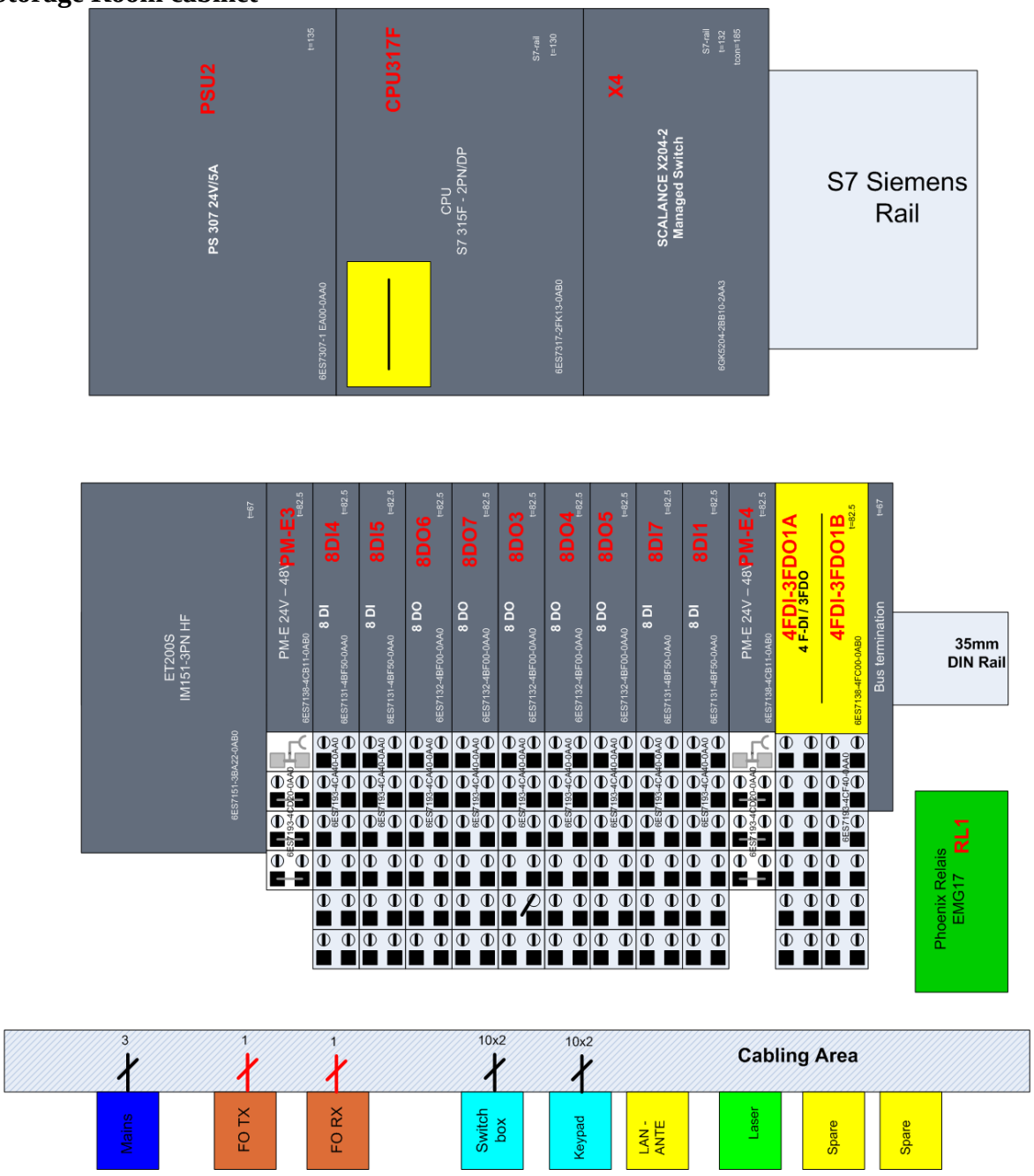


Figure 19 Storage Room cabinet (keypad, door code and entry button not shown)

BOM		Storage Room cabinet and Entry keypad box		
Quantity	**Order Number**	**Supplier**	**Description**	**Comment**
2	2940391	Schuricht / Phoenix contacts	EMG 17-REL/KSR- 24/21-21-LC	Relais for laser enable
4	211347	Schuricht	BCD switches	Door Code
1	211353	Schuricht	BCD switches side plate right	Door Code
1	211354	Schuricht	BCD switches side plate left	Door Code
10	220600	Schuricht	LED (gn/yellow/red) 9.5mm	LED Interlock display
1	300746	Schuricht	Housing for keypad (200x120x75mm)	Entry access box
2	5311 2010	LappKabel	MS-M 16x1.5	Entry access box
1	3SB32 45 -0AA41-0CC0	Siemens	Illuminated push button green	Including NO contact + green LED
1	3SB3233-7BA10	Siemens	AUDIBLE INDICATOR 24V	Buzzer, IP 65 BLACK, CONTINUOUS TONE(2.4 KHZ)
4	6ES7131-4BF50-0AA0	Siemens	8DI SRC	8 channel input module for ET200S (to GND)
5	6ES7132-4BF00-0AA0	Siemens	8 DO DC24V/0,5A	8 channel output module for ET200S
2	6ES7138-4CB11-0AB0	Siemens	PME DC24-48V, AC24-230V	POWER MODULE PM-E for ET200S
1	6ES7138-4FC00-0AB0	Siemens	4 F-DI/3 F-DO DC24V/2A	4 input / 3 output failsafe module for ET200S
1	6ES7151-3BA22-0AB0	Siemens	IM151-3 PN HF FOR ET 200S	Interface module
9	6ES7193-4CA40-0AA0	Siemens	5x UNIVERSAL TERMINAL MODULES	for 8DI/8DO modules
2	6ES7193-4CD20-0AA0	Siemens	TERMINAL MODULE	for module PME DC24-48V
1	6ES7193-4CF40-0AA0	Siemens	TERMINAL MODULE	for 4/8 F-DI and 4 input / 3 output failsafe modules
1	6GK5204-2BB10-2AA3	Siemens	SCALANCE X204-2	Managed switch 4x 10/100MBIT/S + 2x 100MBIT/S Multimode
1	6ES7953-8LJ20-0AA0	Siemens	MMC 512KB	MMC 512KB
1	6ES7307-1EA00-0AA0	Siemens	PS 307, 120/230 V AC, 24V/ 5A	S7 Rail PSU 24V/5A
1	6ES7317-2FK13-0AB0	Siemens	S7 317F CPU	PLC Failsafe CPU
1	133-175	RS	keypad 12 button	
1	ESO CS-P 2092	ESO	keypad encoder pcb	
1	AE1380.500	Rittal	cabinet	metal cabinet: 380x380x210mm
2	DK7455.010	Rittal	cable gland for fibres	
1	KL1590.000	Rittal	wall mounting kit for cabinet AE1031.500	
6	5311 2010	LappKabel	MS-M 16x1.5	cable gland
1	5311 2130	LappKabel	MSR-M 25x1.5	cable gland mains
5		Weidmueller	35mm rail earth clamps	
1	PATCHKABEL 05 GE	Reichelt	Ethernet Cat.5E cable 50cm	connection ET200S to media converter
11		Lappkabel	Engraved signs	

Table 7 Bill of materials: Storage Room

10.3 Ante Chamber cabinet layout

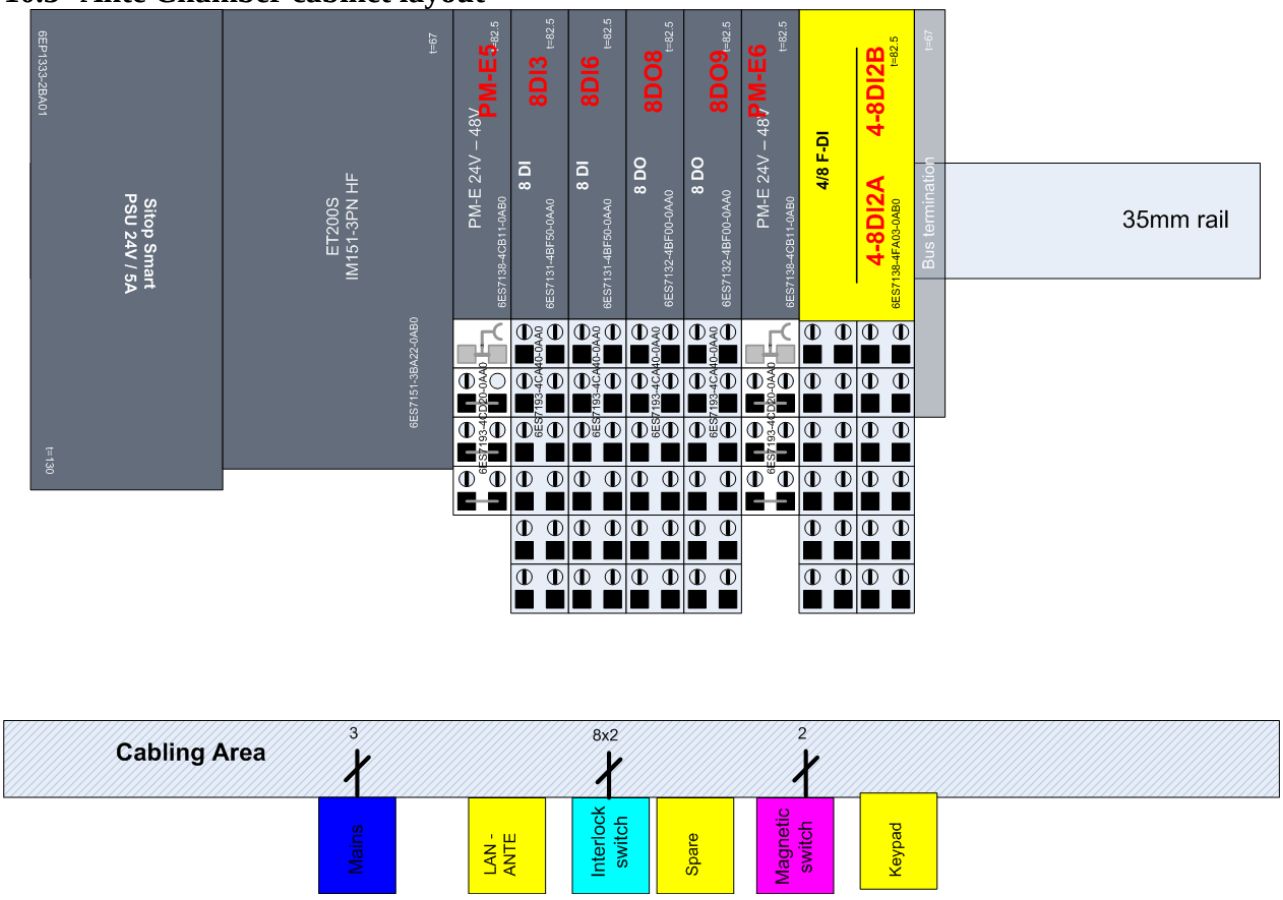


Figure 20 Ante Chamber without entry keypad box

10.4 UTx cabinet layout

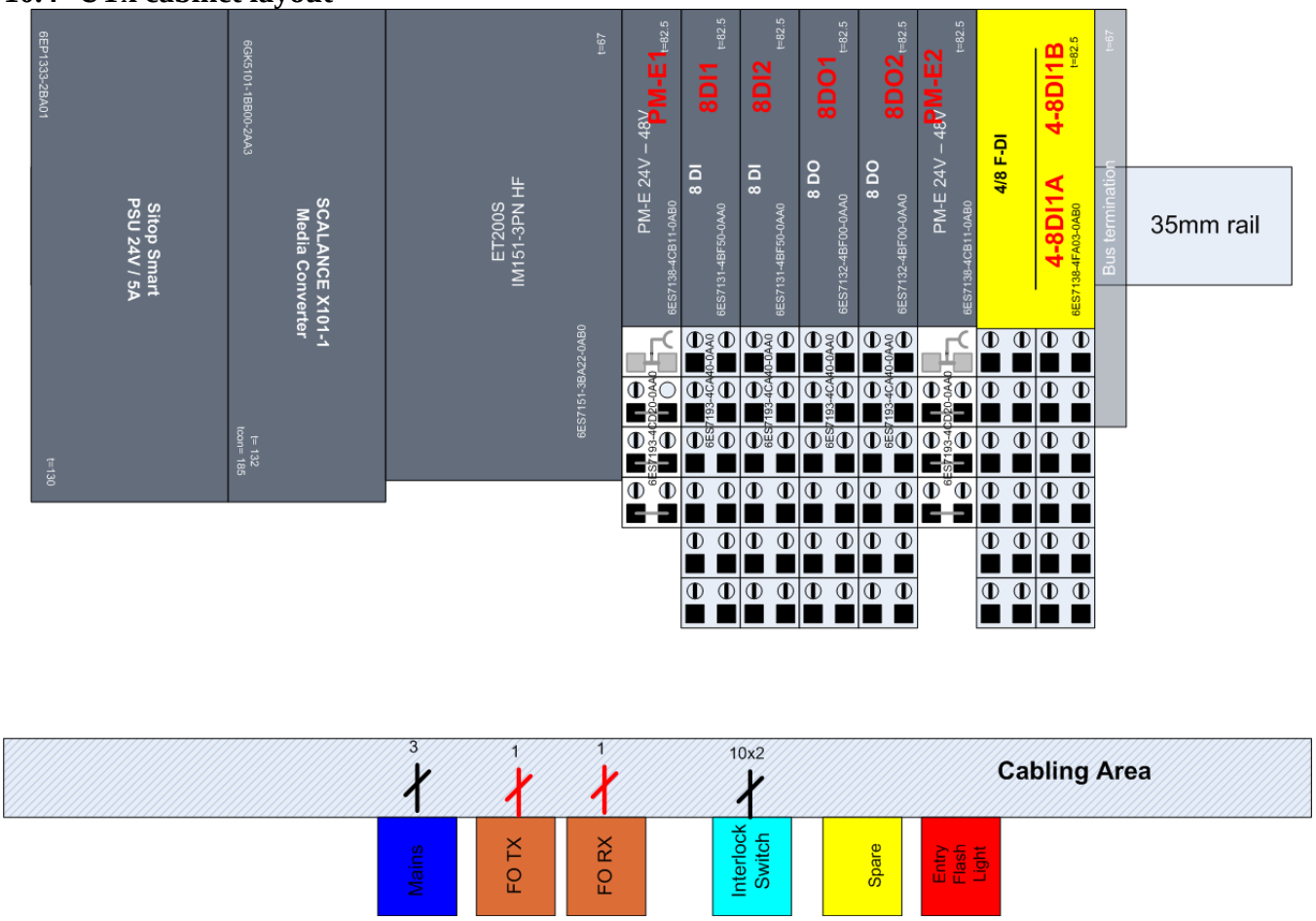


Figure 21 UTx cabinet

BOM	Utx Cabinet and Ante Chamber			
Quantity	Order Number	Supplier	Description	Comment
1	3SB32 45 -0AA41-0CC0	Siemens	Illuminated push button green	Including NO contact + green LED
1	3SB3233-7BA10	Siemens	AUDIBLE INDICATOR 24V	Buzzer, IP 65 BLACK, CONTINUOUS TONE(2.4 KHZ)
2	6ES7131-4BF50-0AA0	Siemens	8DI SRC	8 channel input module for ET200S (to GND)
2	6ES7132-4BF00-0AA0	Siemens	8 DO DC24V/0,5A	8 channel output module for ET200S
2	6ES7138-4CB11-0AB0	Siemens	PME DC24-48V, AC24-230V	POWER MODULE PM-E for ET200S
1	6ES7138-4FA03-0AB0	Siemens	4/8 F-DI PROFISAFE	USEABLE IN PROFINETNETWORK WITH IM151-3 HF
1	6ES7151-3BA22-0AB0	Siemens	IM151-3 PN HF FOR ET 200S	Interface module
4	6ES7193-4CA40-0AA0	Siemens	5x UNIVERSAL TERMINAL MODULES	for 8DI/8DO modules
2	6ES7193-4CD20-0AA0	Siemens	TERMINAL MODULE	for module PME DC24-48V
1	6ES7193-4CF40-0AA0	Siemens	TERMINAL MODULE	for 4/8 F-DI and 4 input / 3 output failsafe modules
1	6GK5101-1BB00-2AA3	Siemens	Media converter RJ45 10/100MBit/s to 100MBit/s BFOC (ST fibre)	Ethernet to fibre media converter
1	6ES7953-8LF20-0AA0	Siemens	MMC 64KB	MMC 64KB
1	6EP1333-2BA01	Siemens	SITOP SMART DC25V/5A	PSU 24V/5A for DIN Rail 35mm mounting
1	133-175	RS	keypad 12 button	
1	ESO CS-P 2092	ESO	keypad encoder pcb	
1	AE1031.500	Rittal	cabinet	metal cabinet: 380x300x210mm
2	DK7455.010	Rittal	cable gland for fibres	
1	KL1590.000	Rittal	wall mounting kit for cabinet AE1031.500	
3	5311 2010	LappKabel	MS-M 16x1.5	cable gland
1	5311 2130	LappKabel	MSR-M 25x1.5	cable gland mains
5		Weidmueller	35mm rail earth clamps	
1	PATCHKABEL 05 GE	Reichelt	Ethernet Cat.5E cable 50cm	connection ET200S to media converter
3		Lappkabel	Engraved signs	
1	300746	Schuricht	Housing for keypad (200x120x75mm)	Entry access box only required for Ante Chamber
2	5311 2010	LappKabel	MS-M 16x1.5	Entry access box only required for Ante Chamber

Table 8 Bill of materials: Distributed I/O cabinet UTx/Ante Chamber (BOM applies for 1 cabinet)

10.5 Red LED flash light

Figure 22

Red Flash light			
Quantity	**Order Number**	**Supplier**	**Description**
1	8WD5320-5BB	Siemens	red LED flash light indicator
1	560426	Schuricht	Plastic housing for red LED flash light

Table 9 Red LED flash light

10.6 Magnetic door sensor

Door Sensor	for UT x doors, Ante Chamber & Storage Room			
Quantity	Order Number	Supplier	Description	Comment
1	3RX8000-OBB42-1AL0		cable with M8 connector 10m	Preassembled cable with M8 connector for magnetic switch sensor
1	3SE6605-2BA01		MAGNETIC SWITCH sensor	Door sensor magnetic switch 1NC & 1NO WITH M8 PLUG 4-POLE
1	3SE6704-2BA		Switching magnet	Magnet required for magnetic switching sensor
1	3SX3260		Spacer	for rectangular switching magnet

Table 10 Magnetic door sensor (see Figure 10)

11 NETWORK PATCH OVERVIEW

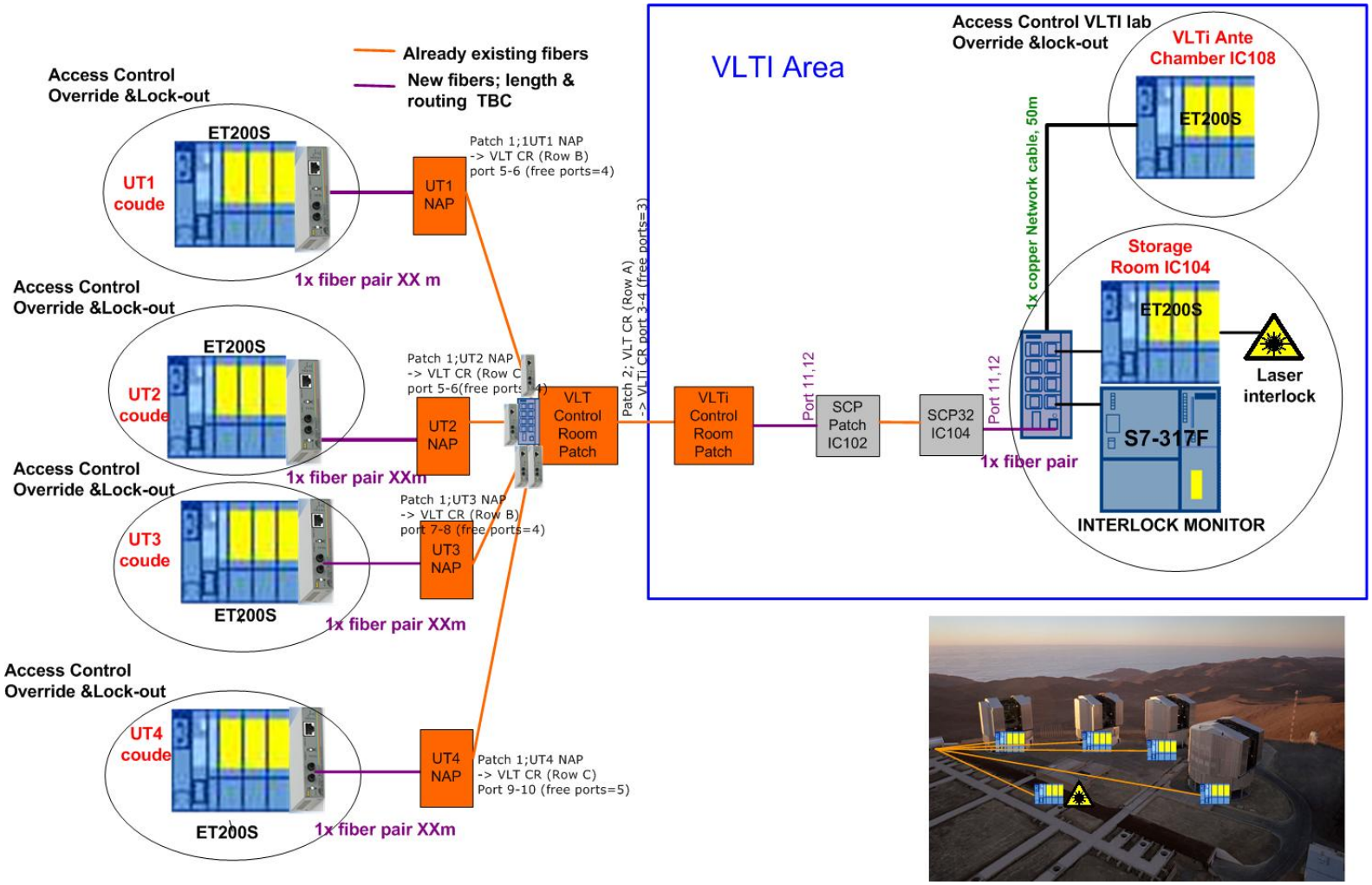
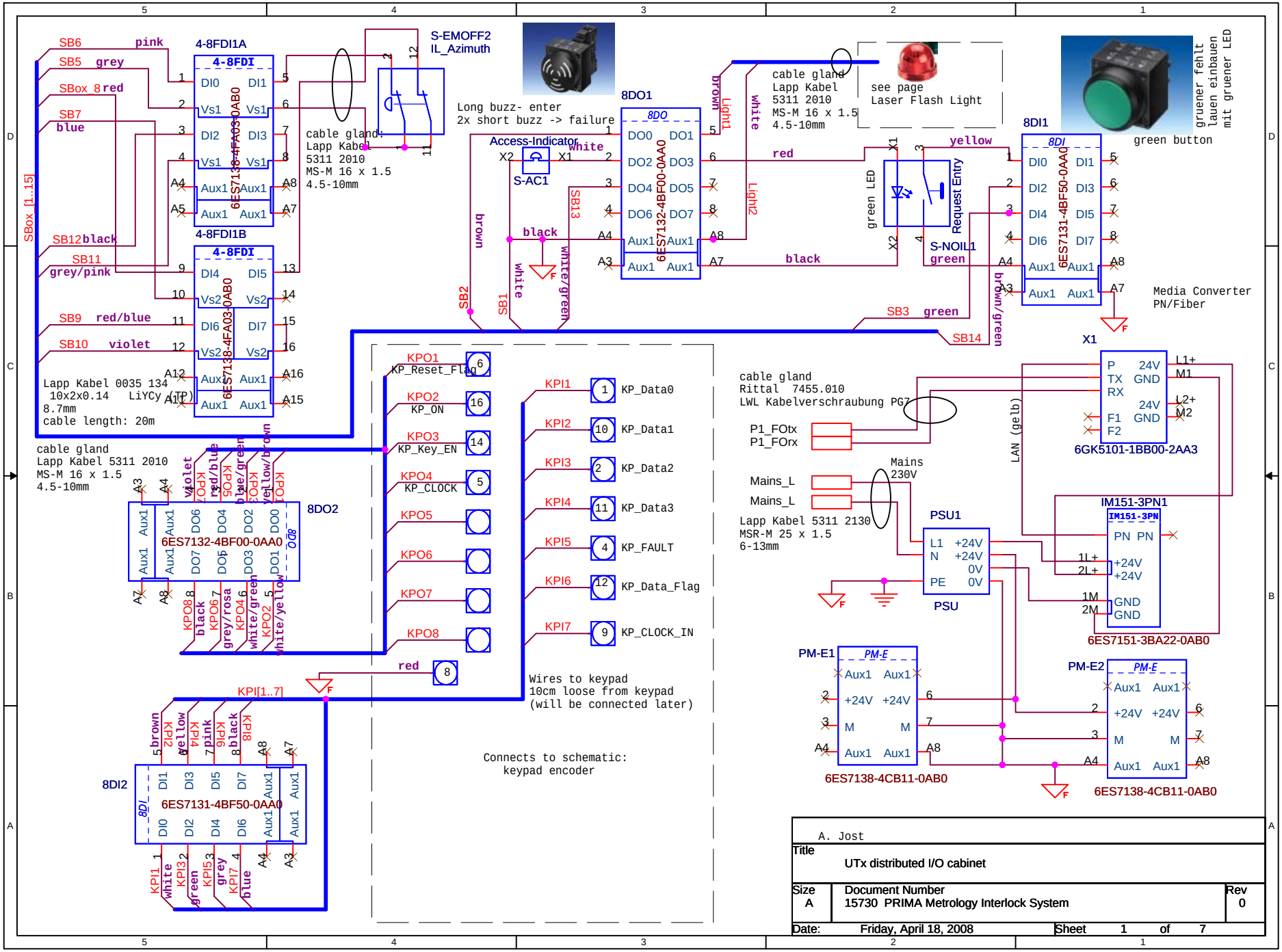
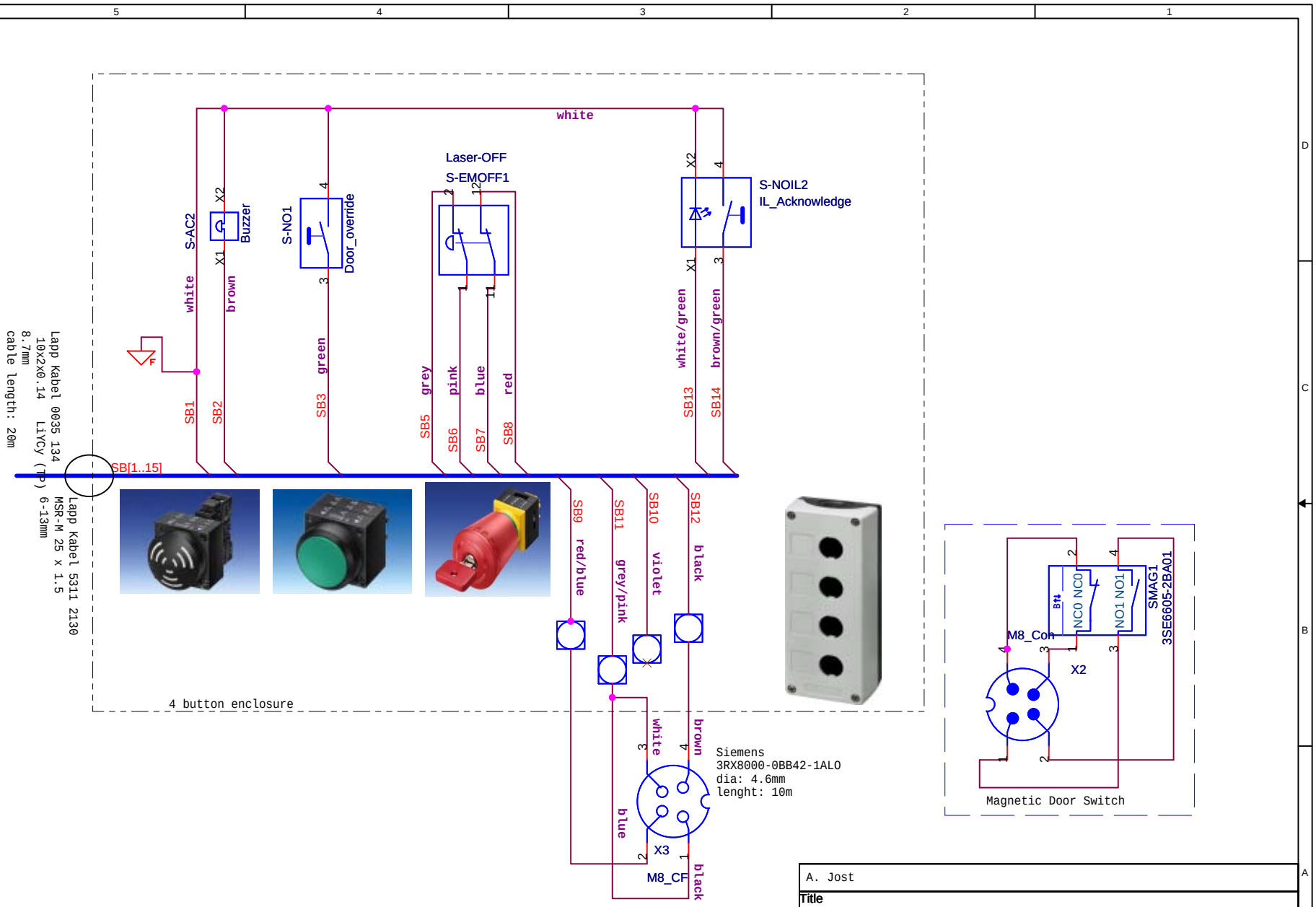


Figure 23 Network connection


SB6 pink
SB5 grey
SBox 8 red
SB7 blue
SB12 black
SB11 grey/pink
SB9 red/blue
SB10 violet
SBox [1..15]
4-8FDI1A
4-8FDI1B
6ES7138-4FA03-0AB0
Lapp Kabel 0035 134
10x2x0.14 LiYCy (TP)
8.7mm
cable length: 20m
cable gland
Lapp Kabel 5311 2010
MS-M 16 x 1.5
4.5-10mm
S-EMOFF2
IL_Azimuth
cable gland:
Lapp Kabel
5311 2010
MS-M 16 x 1.5
4.5-10mm
Long buzz- enter
2x short buzz -> failure
Access-Indicator
S-AC1
8DO1
6ES7132-4BF00-0AA0
cable gland
Lapp Kabel
5311 2010
MS-M 16 x 1.5
4.5-10mm
see page
Laser Flash Light
green button
gruener fehlt
lauen einbauen
mit gruener LED
8DI1
6ES7131-4BF50-0AA0
green LED
Request Entry
S-NOIL1
Media Converter
PN/Fiber
X1
6GK5101-1BB00-2AA3
LAN (gelb)
cable gland
Rittal 7455.010
LWL Kabelverschraubung PG7
P1_FOtx
P1_FOrx
Mains
230V
Mains_L
Mains_L
Lapp Kabel 5311 2130
MSR-M 25 x 1.5
6-13mm
PSU1
PSU
IM151-3PN1
6ES7151-3BA22-0AB0
PM-E1
6ES7138-4CB11-0AB0
PM-E2
6ES7138-4CB11-0AB0
8DO2
6ES7132-4BF00-0AA0
KPO1 KP_Reset_Flag
KPO2 KP_ON
KPO3 KP_Key_EN
KPO4 KP_CLOCK
KPO5
KPO6
KPO7
KPO8
KPI1 KP_Data0
KPI2 KP_Data1
KPI3 KP_Data2
KPI4 KP_Data3
KPI5 KP_FAULT
KPI6 KP_Data_Flag
KPI7 KP_CLOCK_IN
Wires to keypad
10cm loose from keypad
(will be connected later)
Connects to schematic:
keypad encoder
8DI2
6ES7131-4BF50-0AA0
A. Jost
Title
UTx distributed I/O cabinet
Size A
Document Number
15730 PRIMA Metrology Interlock System
Rev 0
Date: Friday, April 18, 2008
Sheet 1 of 7



A. Jost		
Title: Local Command Unit: Door override/Ackn IL / Buzzer / Laser OFF IL		
Size: A	Document Number: 15730 PRIMA Metrology Interlock System	Rev: 0
Date: Friday, April 18, 2008	Sheet 2 of 7	

Light[1..2]
Lapp Kabel 0035 800
2x2x0.25 LiYCy (TP)
dia: 7.0mm
length: 4m

white

brown

X1

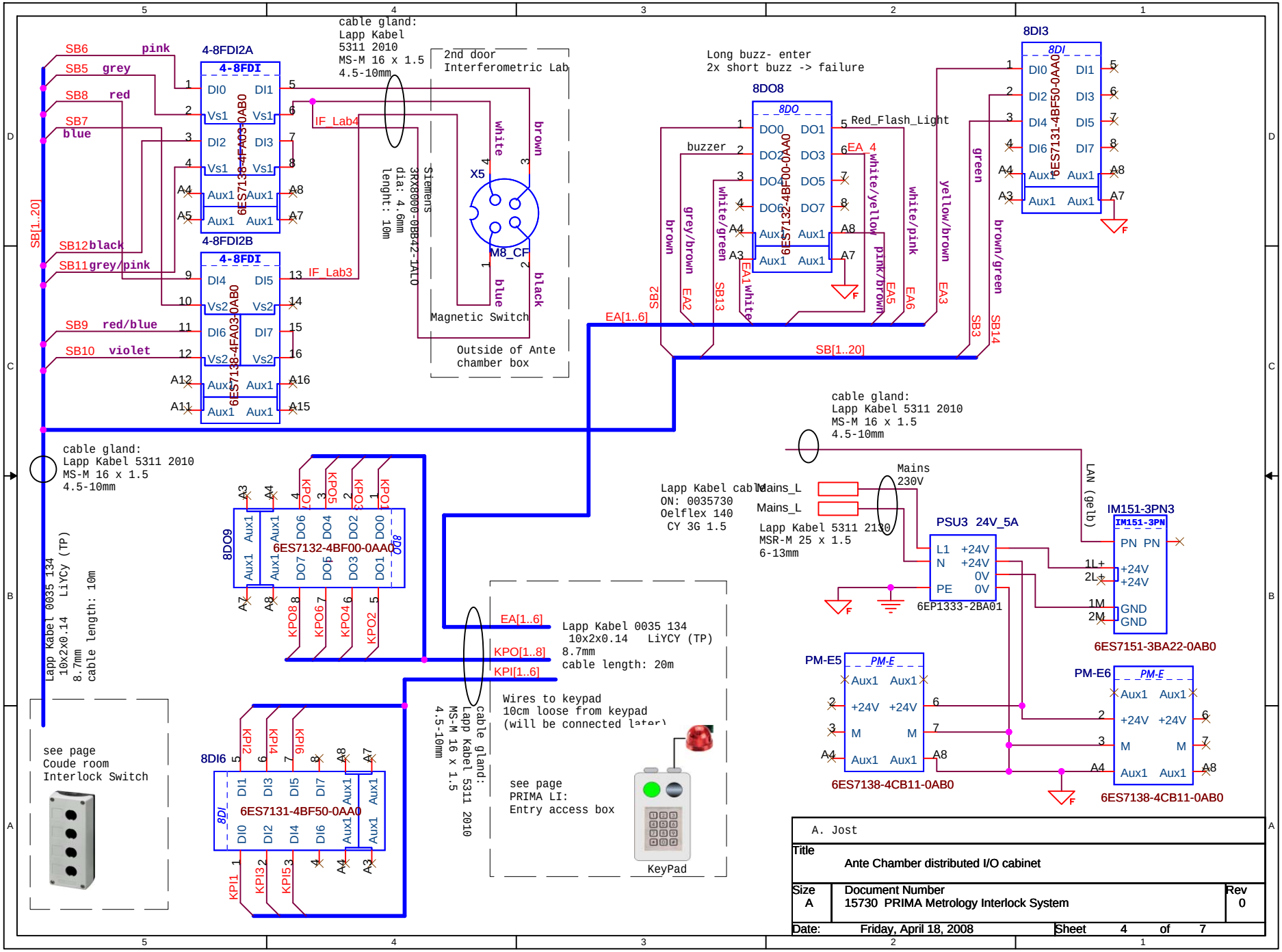
ILF1
ILF

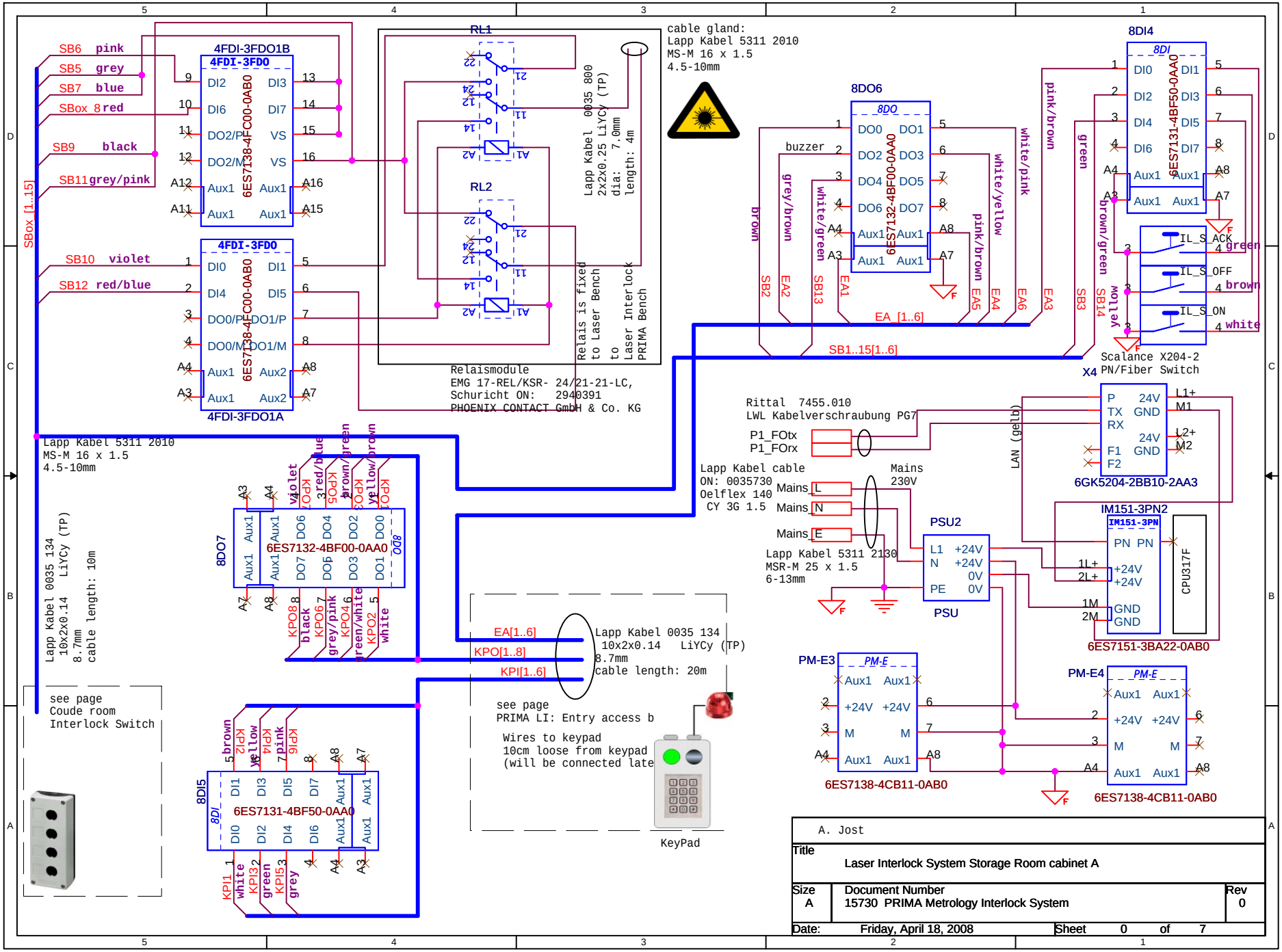
X2

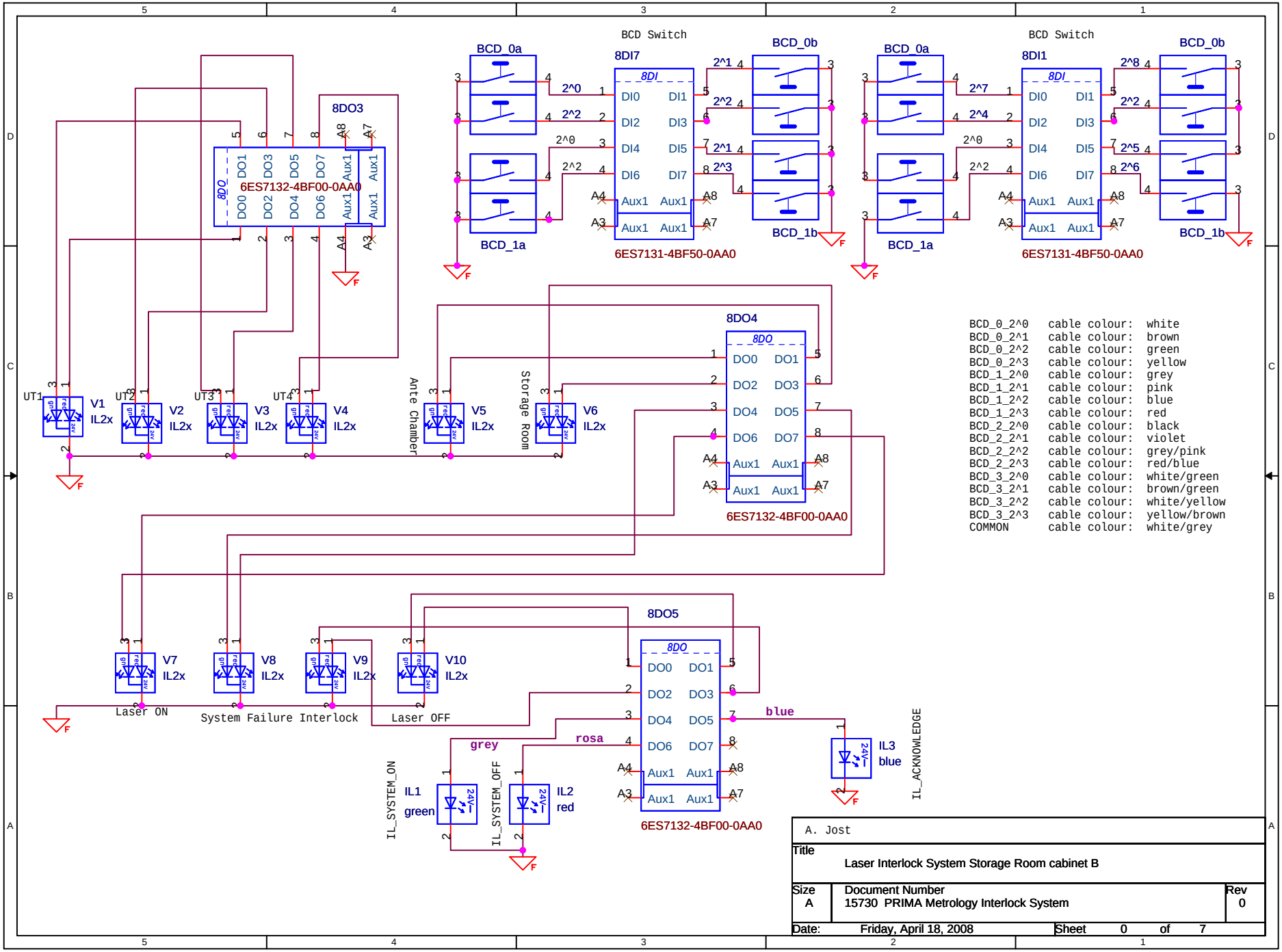
Laser Flash light
To be fitted above
"Entry Door"
to Coude Room

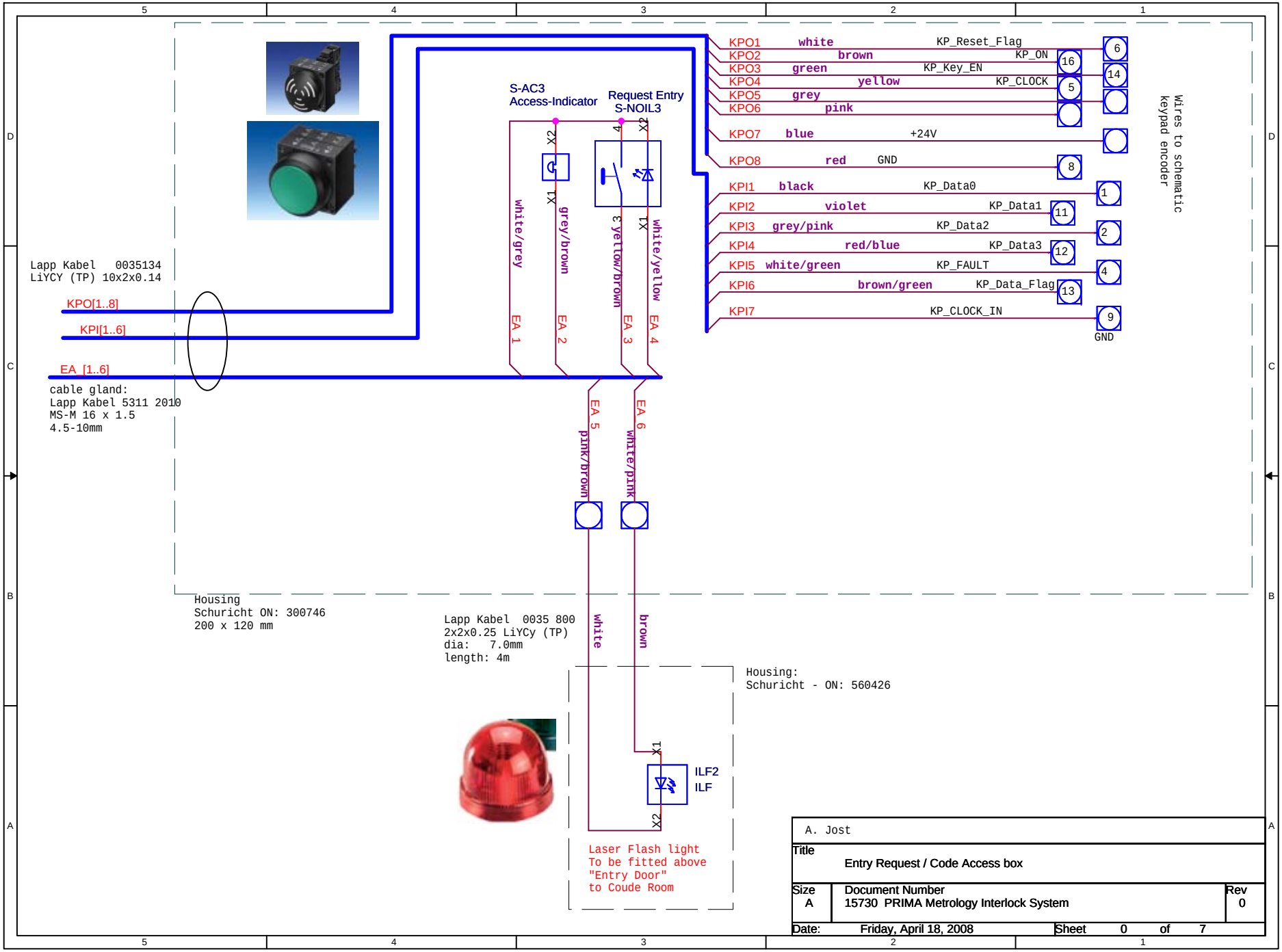
Housing:
Schuricht - ON: 560426

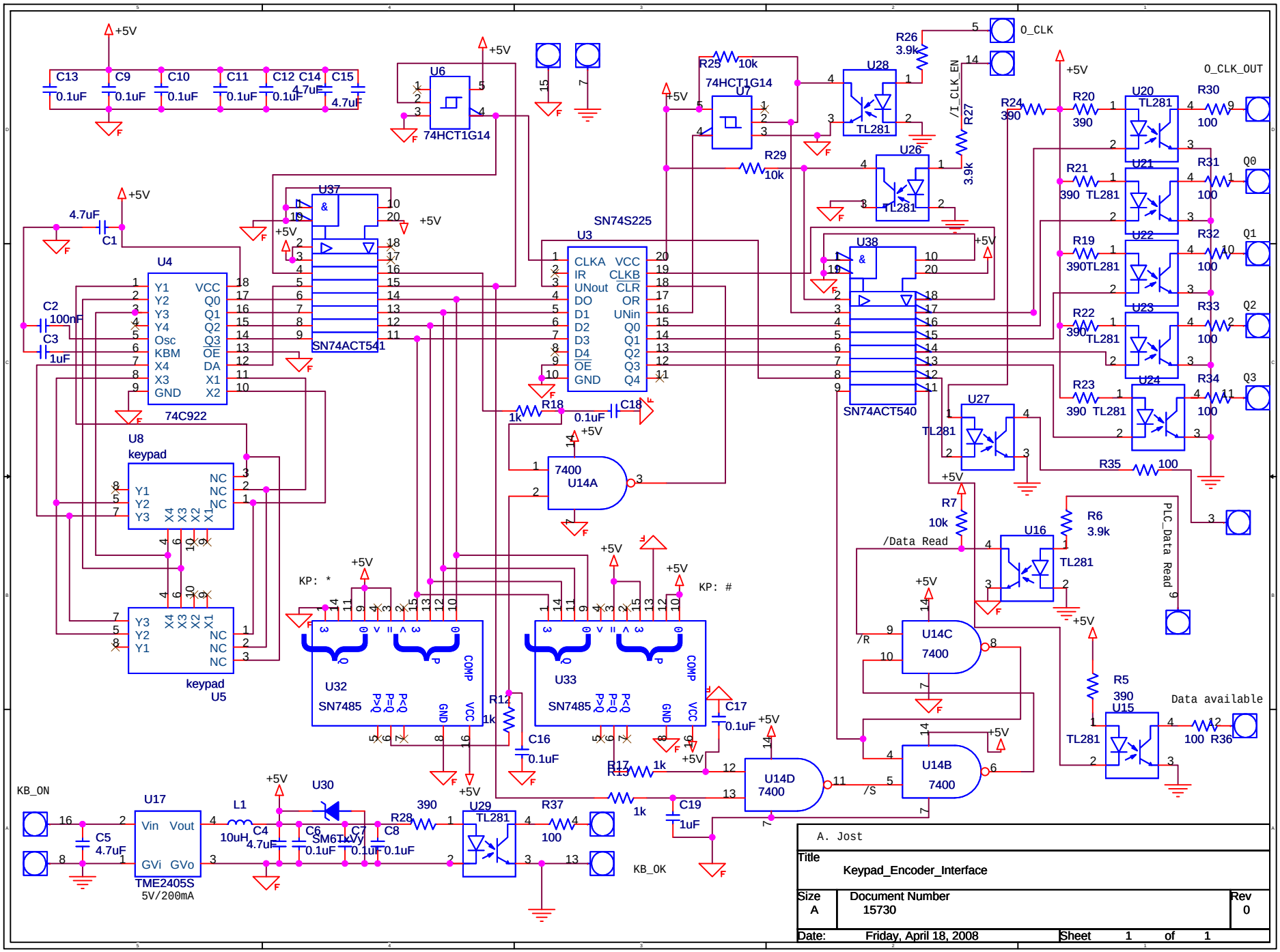
A. Jost		
Title: Red flash-light		
Size: A	Document Number: 15730 PRIMA Metrology Interlock System	Rev: 0
Date: Friday, April 18, 2008	Sheet 3 of 7	

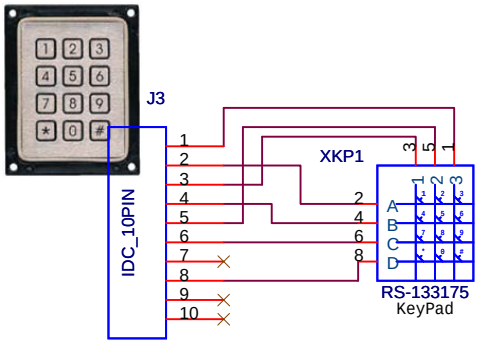

cable gland:
Lapp Kabel
5311 2010
MS-M 16 x 1.5
4.5-10mm
2nd door
Interferometric Lab
4-8FDI2A
4-8FDI2B
6ES7138-4FA03-0AB0
SB6 pink
SB5 grey
SB8 red
SB7 blue
SB12 black
SB11 grey/pink
SB9 red/blue
SB10 violet
SB[1..20]
IF_Lab4
IF_Lab3
Siemens
3RX8000-0BB42-1AL0
dia: 4.6mm
lenght: 10m
X5
M8_CF
white
brown
blue
black
Magnetic Switch
Outside of Ante
chamber box
Long buzz- enter
2x short buzz -> failure
8DO8
6ES7132-4BF00-0AA0
buzzer
Red_Flash_Light
EA_4
white/yellow
pink/brown
white/pink
yellow/brown
green
brown/green
grey/brown
white/green
white
EA1
EA2
EA3
EA5
EA6
SB13
SB14
2BS
EA[1..6]
SB[1..20]
8DI3
6ES7131-4BF50-0AA0
cable gland:
Lapp Kabel 5311 2010
MS-M 16 x 1.5
4.5-10mm
Lapp Kabel 0035 134
10x2x0.14 LiYCy (TP)
8.7mm
cable length: 10m
8DO9
6ES7132-4BF00-0AA0
KPO1
KPO2
KPO3
KPO4
KPO5
KPO6
KPO7
KPO8
Lapp Kabel cable
ON: 0035730
Oelflex 140
CY 3G 1.5
Mains_L
Mains_L
Mains
230V
Lapp Kabel 5311 2130
MSR-M 25 x 1.5
6-13mm
PSU3 24V_5A
L1 +24V
N +24V
0V
PE 0V
6EP1333-2BA01
LAN (gelb)
IM151-3PN3
IM151-3PN
PN PN
1L+
2L+
+24V
+24V
1M
2M
GND
GND
6ES7151-3BA22-0AB0
PM-E5
PM-E6
PM-E
Aux1
+24V
M
6ES7138-4CB11-0AB0
see page
Coude room
Interlock Switch
8DI6
6ES7131-4BF50-0AA0
KPI1
KPI2
KPI3
KPI4
KPI5
KPI6
EA[1..6]
KPO[1..8]
KPI[1..6]
Lapp Kabel 0035 134
10x2x0.14 LiYCY (TP)
8.7mm
cable length: 20m
Wires to keypad
10cm loose from keypad
(will be connected later)
see page
PRIMA LI:
Entry access box
KeyPad
cable gland:
Lapp Kabel 5311 2010
MS-M 16 x 1.5
4.5-10mm
A. Jost
Title
Ante Chamber distributed I/O cabinet
Size
A
Document Number
15730 PRIMA Metrology Interlock System
Rev
0
Date:
Friday, April 18, 2008
Sheet 4 of 7


4FDI-3FDO1B
4FDI-3FDO1A
6ES7138-4FC00-0AB0
SB6 pink
SB5 grey
SB7 blue
SBox 8 red
SB9 black
SB11 grey/pink
SB10 violet
SB12 red/blue
SBox [1..15]
RL1
RL2
Relaismodule
EMG 17-REL/KSR- 24/21-21-LC,
Schuricht ON: 2940391
PHOENIX CONTACT GmbH & Co. KG
Lapp Kabel 0035 800
2x2x0.25 LiYCy (TP)
dia: 7.0mm
length: 4m
Relais is fixed
to Laser Bench
to
Laser Interlock
PRIMA Bench
cable gland:
Lapp Kabel 5311 2010
MS-M 16 x 1.5
4.5-10mm
8DO6
6ES7132-4BF00-0AA0
buzzer
brown
grey/brown
white/green
white/yellow
white/pink
pink/brown
green
EA1
EA2
EA3
EA4
EA5
EA6
SB2
SB13
SB3
SB14
EA [1..6]
SB1..15[1..6]
8DI4
6ES7131-4BF50-0AA0
IL_S_ACK
IL_S_OFF
IL_S_ON
brown/green
yellow
Scalance X204-2
PN/Fiber Switch
X4
Rittal 7455.010
LWL Kabelverschraubung PG7
P1_FOtx
P1_FOrx
LAN (gelb)
6GK5204-2BB10-2AA3
Lapp Kabel cable
ON: 0035730
Oelflex 140
CY 3G 1.5
Mains
230V
Mains L
Mains N
Mains E
PSU2
PSU
Lapp Kabel 5311 2130
MSR-M 25 x 1.5
6-13mm
IM151-3PN2
CPU317F
6ES7151-3BA22-0AB0
Lapp Kabel 5311 2010
MS-M 16 x 1.5
4.5-10mm
Lapp Kabel 0035 134
10x2x0.14 LiYCy (TP)
8.7mm
cable length: 10m
8DO7
6ES7132-4BF00-0AA0
violet
red/blue
brown/green
yellow/brown
black
grey/pink
green/white
white
EA[1..6]
KPO[1..8]
KPI[1..6]
Lapp Kabel 0035 134
10x2x0.14 LiYCy (TP)
8.7mm
cable length: 20m
see page
PRIMA LI: Entry access b
Wires to keypad
10cm loose from keypad
(will be connected late
KeyPad
see page
Coude room
Interlock Switch
8DI5
6ES7131-4BF50-0AA0
brown
yellow
pink
grey
white
green
PM-E3
PM-E4
6ES7138-4CB11-0AB0
A. Jost
Title
Laser Interlock System Storage Room cabinet A
Size
A
Document Number
15730 PRIMA Metrology Interlock System
Rev
0
Date:
Friday, April 18, 2008
Sheet 0 of 7


BCD Switch
8DI7
BCD_0a
BCD_0b
BCD_1a
BCD_1b
6ES7131-4BF50-0AA0
BCD Switch
8DI1
8DO3
6ES7132-4BF00-0AA0
8DO4
8DO5
UT1
UT2
UT3
UT4
V1 IL2x
V2 IL2x
V3 IL2x
V4 IL2x
V5 IL2x
V6 IL2x
V7 IL2x
V8 IL2x
V9 IL2x
V10 IL2x
Ante Chamber
Storage Room
Laser ON
System Failure Interlock
Laser OFF
IL1 green
IL2 red
IL3 blue
IL_SYSTEM_ON
IL_SYSTEM_OFF
IL_ACKNOWLEDGE
grey
rosa
blue
BCD_0_2^0 cable colour: white
BCD_0_2^1 cable colour: brown
BCD_0_2^2 cable colour: green
BCD_0_2^3 cable colour: yellow
BCD_1_2^0 cable colour: grey
BCD_1_2^1 cable colour: pink
BCD_1_2^2 cable colour: blue
BCD_1_2^3 cable colour: red
BCD_2_2^0 cable colour: black
BCD_2_2^1 cable colour: violet
BCD_2_2^2 cable colour: grey/pink
BCD_2_2^3 cable colour: red/blue
BCD_3_2^0 cable colour: white/green
BCD_3_2^1 cable colour: brown/green
BCD_3_2^2 cable colour: white/yellow
BCD_3_2^3 cable colour: yellow/brown
COMMON cable colour: white/grey
A. Jost
Title
Laser Interlock System Storage Room cabinet B
Size A
Document Number
15730 PRIMA Metrology Interlock System
Rev 0
Date: Friday, April 18, 2008
Sheet 0 of 7


S-AC3
Access-Indicator
Request Entry
S-NOIL3
KPO1 white KP_Reset_Flag
KPO2 brown KP_ON
KPO3 green KP_Key_EN
KPO4 yellow KP_CLOCK
KPO5 grey
KPO6 pink
KPO7 blue +24V
KPO8 red GND
KPI1 black KP_Data0
KPI2 violet KP_Data1
KPI3 grey/pink KP_Data2
KPI4 red/blue KP_Data3
KPI5 white/green KP_FAULT
KPI6 brown/green KP_Data_Flag
KPI7 KP_CLOCK_IN
GND
Wires to schematic
keypad encoder
Lapp Kabel 0035134
LiYCY (TP) 10x2x0.14
KPO[1..8]
KPI[1..6]
EA_[1..6]
cable gland:
Lapp Kabel 5311 2010
MS-M 16 x 1.5
4.5-10mm
white/grey
grey/brown
yellow/brown
white/yellow
EA 1
EA 2
EA 3
EA 4
EA 5
EA 6
pink/brown
white/pink
Housing
Schuricht ON: 300746
200 x 120 mm
Lapp Kabel 0035 800
2x2x0.25 LiYCy (TP)
dia: 7.0mm
length: 4m
white
brown
ILF2
ILF
Laser Flash light
To be fitted above
"Entry Door"
to Coude Room
Housing:
Schuricht - ON: 560426
A. Jost
Title
Entry Request / Code Access box
Size
A
Document Number
15730 PRIMA Metrology Interlock System
Rev
0
Date: Friday, April 18, 2008
Sheet 0 of 7


C13 0.1uF
C9 0.1uF
C10 0.1uF
C11 0.1uF
C12 C14 0.1uF 4.7uF
C15 4.7uF
+5V
U6 74HCT1G14
R25 10k
U7 74HCT1G14
R29 10k
R26 3.9k
R27 3.9k
/I_CLK_EN
O_CLK
O_CLK_OUT
U28 TL281
U26 TL281
R24 390
R20 390
U20 TL281
R30 100
R21 390
U21 TL281
R31 100
Q0
R19 390
U22 TL281
R32 100
Q1
R22 390
U23 TL281
R33 100
Q2
R23 390
U24 TL281
R34 100
Q3
R35 100
U27 TL281
U37
SN74ACT541
U3 SN74S225
CLKA VCC
IR CLKB
UNout CLR
DO OR
D1 UNin
D2 Q0
D3 Q1
D4 Q2
OE Q3
GND Q4
U38
SN74ACT540
4.7uF C1
C2 100nF
C3 1uF
U4 74C922
Y1 Y2 Y3 Y4 Osc KBM X4 X3 GND
VCC Q0 Q1 Q2 Q3 OE DA X1 X2
R18 1k
C18 0.1uF
U14A 7400
U8 keypad
U5 keypad
NC NC NC
Y1 Y2 Y3 X4 X3 X2 X1
KP: *
KP: #
U32 SN7485
U33 SN7485
A<B A=B A>B GND VCC COMP
R12 1k
C16 0.1uF
C17 0.1uF
R13 1k
R17 1k
U14D 7400
U14C 7400
U14B 7400
/S
/R
R7 10k
/Data Read
U16 TL281
R6 3.9k
PLC_Data Read
R5 390
U15 TL281
Data available
R36 100
KB_ON
U17 TME2405S
Vin Vout GVi GVo
5V/200mA
L1 10uH
C4 4.7uF
C5 4.7uF
C6 0.1uF
C7 0.1uF
C8 0.1uF
SM6T18CY
U30
R28 390
U29 TL281
R37 100
C19 1uF
KB_OK
A. Jost
Title
Keypad_Encoder_Interface
Size A
Document Number 15730
Rev 0
Date: Friday, April 18, 2008
Sheet 1 of 1



Connects to keypad U5 on schematic
"Keypad_Encoder_Interface"

Title	PRIMA LI: Keypad	
Size A	Document Number 15730	Rev 0
Date: Friday, April 18, 2008	Sheet 1 of 1	

Properties of symbol table

Name:	Symbols
Author:	
Comment:	
Created on	03/18/2008 03:37:06 PM
Last modified on:	04/10/2008 09:10:28 PM
Last filter criterion:	All Symbols
Number of symbols:	283/283
Last Sorting:	Address Ascending

Status	Symbol	Address	Data type	Comment
	CODE_ACCESS_FLAGS	DB 1	DB 1	CONTAINS CODE ACCESS FLAGS to manage access
	DB_FB2_DOOR_MANAGE	DB 2	FB 2	DB_FB2_FOR_DOOR_MANAGEMENT_STO_ROOM
	TIMER_TIME	DB 3	DB 3	Times for timers
	SAFETY_DB_MAIN	DB 10	FB 10	
	DB_FB2_Ante_Ch	DB 21	FB 2	DB_FB2_FOR_DOOR_MANAGEMENT_ANTE_CHAMBER
	DB_FB2_UT1	DB 22	FB 2	DB_FB2_FOR_DOOR_MANAGEMENT_UT1
	DB_FB2_UT2	DB 23	FB 2	DB_FB2_FOR_DOOR_MANAGEMENT_UT2
	DB_FB2_UT3	DB 24	FB 2	DB_FB2_FOR_DOOR_MANAGEMENT_UT3
	DB_FB2_UT4	DB 25	FB 2	DB_FB2_FOR_DOOR_MANAGEMENT_UT4
	DB_FB3_STOR_R	DB 30	FB 3	Contains Safety data from FB3 for storage room
	DB_FB3_Ante_Ch	DB 31	FB 3	Contains Safety data from FB3 for Ante Chamber
	DB_FB3_UT1	DB 32	FB 3	Contains Safety data from FB3 for UT1
	DB_FB3_UT2	DB 33	FB 3	Contains Safety data from FB3 for UT2
	DB_FB3_UT3	DB 34	FB 3	Contains Safety data from FB3 for UT3
	DB_FB3_UT4	DB 35	FB 3	Contains Safety data from FB3 for UT4
	DB_FB4_UT2_CODE_CMP	DB 43	FB 4	
	DB_FB5_CODE_CMP_STO_R	DB 50	FB 5	Read Code and compare
	DB_FB5_CODE_CMP_ANTE_CH	DB 51	FB 5	Reads Code and compares with reference code
	DB_FB5_CODE_CMP_UT1	DB 52	FB 5	Reads Code and compares with reference code
	DB_FB5_CODE_CMP_UT2	DB 53	FB 5	
	DB_FB5_CODE_CMP_UT3	DB 54	FB 5	Reads Code and compares with reference code
	DB_FB5_CODE_CMP_UT4	DB 55	FB 5	Reads Code and compares with reference code
	F_GLOBDB	DB 1637	DB 1637	
	F00005_4_F_DI_3_F_DO_DC2	DB 1638	FB 1638	
	F00013_4_8_F_DI_DC24V	DB 1646	FB 1638	
	F00021_4_8_F_DI_DC24V	DB 1648	FB 1638	
	F00029_4_8_F_DI_DC24V	DB 1650	FB 1638	
	F00037_4_8_F_DI_DC24V	DB 1652	FB 1638	
	F00045_4_8_F_DI_DC24V	DB 1654	FB 1638	
	Door_Managment	FB 2	FB 2	Handels standard door I/O
	F_IL_MANAGEMENT	FB 3	FB 3	Safety_Interlock_Management
	READ_CODE_CMP	FB 5	FB 5	
	Safety_FB	FB 10	FB 10	Includes all safety relevant functions
	TIMESTMP	FB 62	FB 62	Transmit time-stamped messages of an IM153-2
	F_TOF	FB 186	FB 186	F_: Timer Switch Off Delay
	F_IO_CGP	FB 1638	FB 1638	
	F_CTRL_1	FB 1639	FB 1639	
	F_CTRL_2	FB 1640	FB 1640	
	FITOF	FB 1641	FB 1641	
	F_DIAG_N	FB 1642	FB 1642	
	COMPARE_KP_CODE	FC 1	FC 1	Compares_ONE_DIGIT
	KP_to_INT_DEC	FC 2	FC 2	Keypad_to_Integer_Decoder
	BCD_INT_DEC	FC 3	FC 3	DECODE_BCD_SWITCH_TO_INTEGER
	Stor_R_Req_Entry_BT	I 0.0	BOOL	Req_Entry_Button to trigger Room_Buzzer to request qualified entry ->
	IL_COM_ON	I 0.1	BOOL	Turns IL system ON
	Stor_R_IL_Ackn_BT	I 0.2	BOOL	Ackn_button to acknowledge an occured interlock.
	IL_COM_OFF	I 0.3	BOOL	Turns IL system OFF

Status	Symbol	Address	Data type	Comment
	Stor_R_Door_Override_BT	I 0.4	BOOL	Button to override the interlock for x seconds to allow
	IL_COM_ACKN	I 0.5	BOOL	Acknowledge ILs
	Stor_R_KP_Data0	I 1.0	BOOL	bit 0 from keypad nibble
	Stor_R_KP_Data1	I 1.1	BOOL	bit 1 from keypad nibble
	Stor_R_KP_Data2	I 1.2	BOOL	bit 2 from keypad nibble
	Stor_R_KP_Data3	I 1.3	BOOL	bit 3 from keypad nibble
	Stor_R_KP_OK	I 1.4	BOOL	Keypad feedback, checks if +5V supply is OK, 0 = OK, 1 = Fault
	Stor_R_KP_Data_Flag	I 1.5	BOOL	Flags that the CODE has been entered followed by a ""#"".
	Stor_R_KP_MON_CLOCK	I 1.7	BOOL	
	Stor_R_CODE_0_BIT0	I 2.0	BOOL	CODE_Digit_bit
	Stor_R_CODE_0_BIT1	I 2.1	BOOL	CODE_Digit_bit
	Stor_R_CODE_0_BIT2	I 2.2	BOOL	CODE_Digit_bit
	Stor_R_CODE_0_BIT3	I 2.3	BOOL	CODE_Digit_bit
	Stor_R_CODE_1_BIT0	I 2.4	BOOL	CODE_Digit_bit
	Stor_R_CODE_1_BIT1	I 2.5	BOOL	CODE_Digit_bit
	Stor_R_CODE_1_BIT2	I 2.6	BOOL	CODE_Digit_bit
	Stor_R_CODE_1_BIT3	I 2.7	BOOL	CODE_Digit_bit
	Stor_R_CODE_2_BIT0	I 3.0	BOOL	CODE_Digit_bit
	Stor_R_CODE_2_BIT1	I 3.1	BOOL	CODE_Digit_bit
	Stor_R_CODE_2_BIT2	I 3.2	BOOL	CODE_Digit_bit
	Stor_R_CODE_2_BIT3	I 3.3	BOOL	CODE_Digit_bit
	Stor_R_CODE_3_BIT0	I 3.4	BOOL	CODE_Digit_bit
	Stor_R_CODE_3_BIT1	I 3.5	BOOL	CODE_Digit_bit
	Stor_R_CODE_3_BIT2	I 3.6	BOOL	CODE_Digit_bit
	Stor_R_CODE_3_BIT3	I 3.7	BOOL	CODE_Digit_bit
	Ante_Ch_Req_Entry_BT	I 4.0	BOOL	Req_Entry_Button to trigger Room_Buzzer to request qualified entry ->
	Ante_Ch_IL_Ackn_BT	I 4.2	BOOL	Ackn_button to acknowledge an occured interlock.
	Ante_Ch_Door_Override_BT	I 4.4	BOOL	Button to override the interlock for x seconds to allow
	Stor_R_IL_Door	I 5.0	BOOL	Storage Room Door IL
	Stor_R_LASER_EN_FB	I 5.1	BOOL	Laser Enable feedback contact
	Stor_R_IL_BT	I 5.2	BOOL	Laser Interlock button inside Laser room to disable the laser.
	Ante_Ch_KP_Data0	I 12.0	BOOL	bit 0 from keypad nibble
	Ante_Ch_KP_Data1	I 12.1	BOOL	bit 1 from keypad nibble
	Ante_Ch_KP_Data2	I 12.2	BOOL	bit 2 from keypad nibble
	Ante_Ch_KP_Data3	I 12.3	BOOL	bit 3 from keypad nibble
	Ante_Ch_KP_OK	I 12.4	BOOL	Keypad feedback, checks if +5V supply is OK, 0 = OK, 1 = Fault
	Ante_Ch_KP_Data_Flag	I 12.5	BOOL	Flags that the CODE has been entered followed by a ""#"".
	Ante_Ch_KP_MON_CLOCK	I 12.7	BOOL	
	Ante_Ch_IL_BT	I 13.0	BOOL	Laser Interlock button inside Laser room to disable the laser.
	Ante_Ch_ClosedDoor_IL	I 13.1	BOOL	Storage Room ClosedDoor IL
	Ante_Ch_Door_IL	I 13.2	BOOL	Storage Room Door IL
	UT1_Req_Entry_BT	I 19.0	BOOL	Req_Entry_Button to trigger Room_Buzzer to request qualified entry ->
	UT1_IL_Ackn_BT	I 19.2	BOOL	Ackn_button to acknowledge an occured interlock.
	UT1_Door_Override_BT	I 19.4	BOOL	Button to override the interlock for x seconds to allow
	UT1_KP_Data0	I 20.0	BOOL	bit 0 from keypad nibble
	UT1_KP_Data1	I 20.1	BOOL	bit 1 from keypad nibble
	UT1_KP_Data2	I 20.2	BOOL	bit 2 from keypad nibble
	UT1_KP_Data3	I 20.3	BOOL	bit 3 from keypad nibble
	UT1_KP_OK	I 20.4	BOOL	Keypad feedback, checks if +5V supply is OK, 0 = OK, 1 = Fault
	UT1_KP_Data_Flag	I 20.5	BOOL	Flags that the CODE has been entered followed by a ""#"".
	UT1_KP_MON_CLOCK	I 20.7	BOOL	
	UT1_IL_BT	I 21.0	BOOL	Laser Interlock button inside Laser room to disable the laser.
	UT1_IL_Azimuth_BT	I 21.1	BOOL	Storage Room ClosedDoor IL
	UT1_IL_Door	I 21.2	BOOL	Storage Room Door IL
	UT2_Req_Entry_BT	I 27.0	BOOL	Req_Entry_Button to trigger Room_Buzzer to request qualified entry ->
	UT2_IL_Ackn_BT	I 27.2	BOOL	Ackn_button to acknowledge an occured interlock.

Status	Symbol	Address	Data type	Comment
	UT2_Door_Override_BT	I 27.4	BOOL	Button to override the interlock for x seconds to allow
	UT2_KP_Data0	I 28.0	BOOL	bit 0 from keypad nibble
	UT2_KP_Data1	I 28.1	BOOL	bit 1 from keypad nibble
	UT2_KP_Data2	I 28.2	BOOL	bit 2 from keypad nibble
	UT2_KP_Data3	I 28.3	BOOL	bit 3 from keypad nibble
	UT2_KP_OK	I 28.4	BOOL	Keypad feedback, checks if +5V supply is OK, 0 = OK, 1 = Fault
	UT2_KP_Data_Flag	I 28.5	BOOL	Flags that the CODE has been entered followed by a ""#"".
	UT2_KP_MON_CLOCK	I 28.7	BOOL	
	UT2_IL_BT	I 29.0	BOOL	Laser Interlock button inside Laser room to disable the laser.
	UT2_IL_Azimuth_BT	I 29.1	BOOL	Storage Room ClosedDoor IL
	UT2_IL_Door	I 29.2	BOOL	Storage Room Door IL
	UT3_Req_Entry_BT	I 35.0	BOOL	Req_Entry_Button to trigger Room_Buzzer to request qualified entry ->
	UT3_IL_Ackn_BT	I 35.2	BOOL	Ackn_button to acknowledge an occured interlock.
	UT3_Door_Override_BT	I 35.4	BOOL	Button to override the interlock for x seconds to allow
	UT3_KP_Data0	I 36.0	BOOL	bit 0 from keypad nibble
	UT3_KP_Data1	I 36.1	BOOL	bit 1 from keypad nibble
	UT3_KP_Data2	I 36.2	BOOL	bit 2 from keypad nibble
	UT3_KP_Data3	I 36.3	BOOL	bit 3 from keypad nibble
	UT3_KP_OK	I 36.4	BOOL	Keypad feedback, checks if +5V supply is OK, 0 = OK, 1 = Fault
	UT3_KP_Data_Flag	I 36.5	BOOL	Flags that the CODE has been entered followed by a ""#"".
	UT3_KP_MON_CLOCK	I 36.7	BOOL	
	UT3_IL_BT	I 37.0	BOOL	Laser Interlock button inside Laser room to disable the laser.
	UT3_IL_Azimuth_BT	I 37.1	BOOL	Storage Room ClosedDoor IL
	UT3_IL_Door	I 37.2	BOOL	Storage Room Door IL
	UT4_Req_Entry_BT	I 43.0	BOOL	Req_Entry_Button to trigger Room_Buzzer to request qualified entry ->
	UT4_IL_Ackn_BT	I 43.2	BOOL	Ackn_button to acknowledge an occured interlock.
	UT4_Door_Override_BT	I 43.4	BOOL	Button to override the interlock for x seconds to allow
	UT4_KP_Data0	I 44.0	BOOL	bit 0 from keypad nibble
	UT4_KP_Data1	I 44.1	BOOL	bit 1 from keypad nibble
	UT4_KP_Data2	I 44.2	BOOL	bit 2 from keypad nibble
	UT4_KP_Data3	I 44.3	BOOL	bit 3 from keypad nibble
	UT4_KP_OK	I 44.4	BOOL	Keypad feedback, checks if +5V supply is OK, 0 = OK, 1 = Fault
	UT4_KP_Data_Flag	I 44.5	BOOL	Flags that the CODE has been entered followed by a ""#"".
	UT4_KP_MON_CLOCK	I 44.7	BOOL	
	UT4_IL_BT	I 45.0	BOOL	Laser Interlock button inside Laser room to disable the laser.
	UT4_IL_Azimuth_BT	I 45.1	BOOL	Storage Room ClosedDoor IL
	UT4_IL_Door	I 45.2	BOOL	Storage Room Door IL
	Freq_10Hz	M 10.0	BOOL	
	Freq_5Hz	M 10.1	BOOL	
	Freq_2_5Hz	M 10.2	BOOL	
	Freq_2Hz	M 10.3	BOOL	
	Freq_1_25Hz	M 10.4	BOOL	
	Freq_1Hz	M 10.5	BOOL	
	Freq_0_625Hz	M 10.6	BOOL	
	Freq_0_5Hz	M 10.7	BOOL	
	Stor_R_GRANT_ACCESS	M 15.0	BOOL	
	ANTE_CH_GRANT_ACCESS	M 15.1	BOOL	
	UT1_GRANT_ACCESS	M 15.2	BOOL	
	UT2_GRANT_ACCESS	M 15.3	BOOL	
	UT3_GRANT_ACCESS	M 15.4	BOOL	
	UT4_GRANT_ACCESS	M 15.5	BOOL	
	IL_COM_ACKN_LED_UT1	M 30.0	BOOL	
	IL_COM_ACKN_LED_UT2	M 30.1	BOOL	
	IL_COM_ACKN_LED_UT3	M 30.2	BOOL	
	IL_COM_ACKN_LED_UT4	M 30.3	BOOL	
	IL_COM_ACKN_LED_ANTE	M 30.4	BOOL	

Status	Symbol	Address	Data type	Comment
	IL_COM_ACKN_LED_Sto_R	M 30.5	BOOL	
	DP_IL_FF	M 30.6	BOOL	
	DP_IL_OFF_FF	M 30.7	BOOL	
	DP_IL_OFF	M 31.0	BOOL	
	ERROR_OB_82	M 32.0	BOOL	
	ERROR_OB_86	M 32.1	BOOL	
	ERROR_OB_87	M 32.2	BOOL	
	ERROR_OB_121	M 32.3	BOOL	
	ERROR_OB_122	M 32.4	BOOL	
	ERROR_KEYPAD	M 32.5	BOOL	
	Routine	OB 1	OB 1	
	CYC_INT5	OB 35	OB 35	Cyclic Interrupt 5
	I/O_FLT1	OB 82	OB 82	I/O Point Fault 1
	RACK_FLT	OB 86	OB 86	Loss of Rack Fault
	COMM_FLT	OB 87	OB 87	Communication Fault
	COMPLETE RESTART	OB 100	OB 100	Complete Restart
	Error_FB	OB 121	OB 121	
	MOD_ERR	OB 122	OB 122	Module Access Error
	Stor_R_Room_Buzzer	Q 0.0	BOOL	Buzzer signals entry request from outside, warns if interlock is triggered
	Stor_R_Red_Flash_Light	Q 0.1	BOOL	Flash light above entry door, indicates that Laser is on -->
	Stor_R_Entry_Buzzer	Q 0.2	BOOL	Buzzer located at doors enabling entry to Laser rooms.
	Stor_R_Req_Entry_LED_gn	Q 0.3	BOOL	Req_Entry_Button LED - green colour.
	Stor_R_IL_Ackn_LED_blue	Q 0.4	BOOL	Ackn_LED to indicate that an acknowledge is required after an Interlock occured
	Stor_R_KP_Reset_Flag	Q 1.0	BOOL	Reset Flag, The dataFlag must be Reset after the data has been read by the PLC
	Stor_R_KP_ON	Q 1.1	BOOL	This bit switches the keypad ON/OFF - ON = 1, OFF =0
	Stor_R_KP_Key_EN	Q 1.2	BOOL	Enables/disables the keypad code storage, before the ""CODE"" is read by the PLC
	Stor_R_KP_CLOCK	Q 1.3	BOOL	Clock, to clock the 4 digit code out, one digit per clock edge
	DP_IL_UT1_LED_red	Q 2.0	BOOL	LED_red: Interlock_UT1
	DP_IL_UT1_LED_gn	Q 2.1	BOOL	LED_gn: Interlock_UT1
	DP_IL_UT2_LED_red	Q 2.2	BOOL	LED_red: Interlock_UT2
	DP_IL_UT2_LED_gn	Q 2.3	BOOL	LED_gn: Interlock_UT2
	DP_IL_UT3_LED_red	Q 2.4	BOOL	LED_red: Interlock_UT3
	DP_IL_UT3_LED_gn	Q 2.5	BOOL	LED_gn: Interlock_UT3
	DP_IL_UT4_LED_red	Q 2.6	BOOL	LED_red: Interlock_UT4
	DP_IL_UT4_LED_gn	Q 2.7	BOOL	LED_gn: Interlock_UT4
	DP_IL_Ante_Ch_LED_red	Q 3.0	BOOL	LED_red: Interlock_Ante Chamber
	DP_IL_Ante_Ch_LED_gn	Q 3.1	BOOL	LED_red: Interlock_Ante Chamber
	DP_IL_Stor_R_LED_red	Q 3.2	BOOL	LED_red: Interlock_Storage Room
	DP_IL_Stor_R_LED_gn	Q 3.3	BOOL	LED_red: Interlock_Storage Room
	DP_System_Fail_LED_red	Q 3.4	BOOL	LED_red: System_Failure
	DP_System_Failure_LED_gn	Q 3.5	BOOL	LED_gn: System_Failure
	DP_Laser_ON_LED_red	Q 3.6	BOOL	LED_red: Laser_ON
	DP_Laser_ON_LED_gn	Q 3.7	BOOL	LED_gn: Laser_ON
	DP_Laser_OFF_LED_red	Q 4.0	BOOL	LED_red: Laser_OFF
	DP_Laser_OFF_LED_gn	Q 4.1	BOOL	LED_gn: Laser_OFF
	DP_Laser_IL_LED_red	Q 4.2	BOOL	LED_red: Laser_Interlock
	DP_Laser_IL_LED_gn	Q 4.3	BOOL	LED_gn: Laser_Interlock
	IL_COM_ON_LED	Q 4.4	BOOL	IL command on button LED green
	IL_COM_ACKN_LED	Q 4.5	BOOL	IL command acknowledge button LED blue
	IL_COM_OFF_LED	Q 4.6	BOOL	IL command IL OFF button LED red
	Stor_R_LASER_ENABLE	Q 5.1	BOOL	Enable Laser
	Ante_Ch_Room_Buzzer	Q 10.0	BOOL	Buzzer signals entry request from outside, warns if interlock is triggered
	Ante_Ch_Red_Flash_Light	Q 10.1	BOOL	Flash light above entry door, indicates that Laser is on -->
	Ante_Ch_Entry_Buzzer	Q 10.2	BOOL	Buzzer located at doors enabling entry to Laser rooms.
	Ante_Ch_Req_Entry_LED_gn	Q 10.3	BOOL	Req_Entry_Button LED - green colour.
	Ante_Ch_IL_Ackn_LED_blue	Q 10.4	BOOL	Ackn_LED to indicate that an acknowledge is required after an Interlock occured

Status	Symbol	Address	Data type	Comment
	Ante_Ch_KP_Reset_Flag	Q 11.0	BOOL	Reset Flag, The dataFlag must be Reset after the data has been read by the PLC
	Ante_Ch_KP_ON	Q 11.1	BOOL	This bit switches the keypad ON/OFF - ON = 1, OFF =0
	Ante_Ch_KP_Key_EN	Q 11.2	BOOL	Enables/disables the keypad code storage, before the ""CODE"" is read by the PLC
	Ante_Ch_KP_CLOCK	Q 11.3	BOOL	Clock, to clock the 4 digit code out, one digit per clock edge
	UT1_Room_Buzzer	Q 12.0	BOOL	Buzzer signals entry request from outside, warns if interlock is triggered
	UT1_Red_Flash_Light	Q 12.1	BOOL	Flash light above entry door, indicates that Laser is on -->
	UT1_Entry_Buzzer	Q 12.2	BOOL	Buzzer located at doors enabling entry to Laser rooms.
	UT1_Req_Entry_LED_gn	Q 12.3	BOOL	Req_Entry_Button LED - green colour.
	UT1_IL_Ackn_LED_blue	Q 12.4	BOOL	Ackn_LED to indicate that an acknowledge is required after an Interlock occured
	UT1_KP_Reset_Flag	Q 17.0	BOOL	Reset Flag, The dataFlag must be Reset after the data has been read by the PLC
	UT1_KP_ON	Q 17.1	BOOL	This bit switches the keypad ON/OFF - ON = 1, OFF =0
	UT1_KP_Key_EN	Q 17.2	BOOL	Enables/disables the keypad code storage, before the ""CODE"" is read by the PLC
	UT1_KP_CLOCK	Q 17.3	BOOL	Clock, to clock the 4 digit code out, one digit per clock edge
	UT2_Room_Buzzer	Q 18.0	BOOL	Buzzer signals entry request from outside, warns if interlock is triggered
	UT2_Red_Flash_Light	Q 18.1	BOOL	Flash light above entry door, indicates that Laser is on -->
	UT2_Entry_Buzzer	Q 18.2	BOOL	Buzzer located at doors enabling entry to Laser rooms.
	UT2_Req_Entry_LED_gn	Q 18.3	BOOL	Req_Entry_Button LED - green colour.
	UT2_IL_Ackn_LED_blue	Q 18.4	BOOL	Ackn_LED to indicate that an acknowledge is required after an Interlock occured
	UT2_KP_Reset_Flag	Q 19.0	BOOL	Reset Flag, The dataFlag must be Reset after the data has been read by the PLC
	UT2_KP_ON	Q 19.1	BOOL	This bit switches the keypad ON/OFF - ON = 1, OFF =0
	UT2_KP_Key_EN	Q 19.2	BOOL	Enables/disables the keypad code storage, before the ""CODE"" is read by the PLC
	UT2_KP_CLOCK	Q 19.3	BOOL	Clock, to clock the 4 digit code out, one digit per clock edge
	UT3_Room_Buzzer	Q 20.0	BOOL	Buzzer signals entry request from outside, warns if interlock is triggered
	UT3_Red_Flash_Light	Q 20.1	BOOL	Flash light above entry door, indicates that Laser is on -->
	UT3_Entry_Buzzer	Q 20.2	BOOL	Buzzer located at doors enabling entry to Laser rooms.
	UT3_Req_Entry_LED_gn	Q 20.3	BOOL	Req_Entry_Button LED - green colour.
	UT3_IL_Ackn_LED_blue	Q 20.4	BOOL	Ackn_LED to indicate that an acknowledge is required after an Interlock occured
	UT3_KP_Reset_Flag	Q 25.0	BOOL	Reset Flag, The dataFlag must be Reset after the data has been read by the PLC
	UT3_KP_ON	Q 25.1	BOOL	This bit switches the keypad ON/OFF - ON = 1, OFF =0
	UT3_KP_Key_EN	Q 25.2	BOOL	Enables/disables the keypad code storage, before the ""CODE"" is read by the PLC
	UT3_KP_CLOCK	Q 25.3	BOOL	Clock, to clock the 4 digit code out, one digit per clock edge
	UT4_Room_Buzzer	Q 26.0	BOOL	Buzzer signals entry request from outside, warns if interlock is triggered
	UT4_Red_Flash_Light	Q 26.1	BOOL	Flash light above entry door, indicates that Laser is on -->
	UT4_Entry_Buzzer	Q 26.2	BOOL	Buzzer located at doors enabling entry to Laser rooms.
	UT4_Req_Entry_LED_gn	Q 26.3	BOOL	Req_Entry_Button LED - green colour.
	UT4_IL_Ackn_LED_blue	Q 26.4	BOOL	Ackn_LED to indicate that an acknowledge is required after an Interlock occured
	UT4_KP_Reset_Flag	Q 27.0	BOOL	Reset Flag, The dataFlag must be Reset after the data has been read by the PLC
	UT4_KP_ON	Q 27.1	BOOL	This bit switches the keypad ON/OFF - ON = 1, OFF =0
	UT4_KP_Key_EN	Q 27.2	BOOL	Enables/disables the keypad code storage, before the ""CODE"" is read by the PLC
	UT4_KP_CLOCK	Q 27.3	BOOL	Clock, to clock the 4 digit code out, one digit per clock edge
	CTU	SFB 0	SFB 0	Count Up
	TP	SFB 3	SFB 3	Generate a Pulse
	RDREC	SFB 52	SFB 52	Read a Process Data Record
	DPRD_DAT	SFC 14	SFC 14	Read Consistent Data of a Standard DP Slave
	DPWR_DAT	SFC 15	SFC 15	Write Consistent Data to a Standard DP Slave
	DIS_AIRT	SFC 41	SFC 41	Delay the Higher Priority Interrupts and Asynchronous Errors
	EN_AIRT	SFC 42	SFC 42	Enable Higher Priority Interrupts and Asynchronous Errors
	STP	SFC 46	SFC 46	Change the CPU to STOP
	RDSYSST	SFC 51	SFC 51	Read a System Status List or Partial List
	UT1_TIIMER_IL_WARNING	T 1	TIMER	
	UT2_TIIMER_IL_WARNING	T 2	TIMER	
	UT3_TIIMER_IL_WARNING	T 3	TIMER	
	UT4_TIIMER_IL_WARNING	T 4	TIMER	

Status	Symbol	Address	Data type	Comment
	Stor_R_TIIMER_IL_WARNING	T 5	TIMER	
	Ante_Ch_TIMER_IL_WARNING	T 6	TIMER	
	UT1_TIIMER_ENTRY_BU	T 7	TIMER	
	UT2_TIIMER_ENTRY_BU	T 8	TIMER	
	UT3_TIIMER_ENTRY_BU	T 9	TIMER	
	UT4_TIIMER_ENTRY_BU	T 10	TIMER	
	Stor_R_TIIMER_ENTRY_BU	T 11	TIMER	
	Ante_Ch_TIIMER_ENTRY_BU	T 12	TIMER	
	UT1_TIMER_INV_CODE	T 13	TIMER	
	UT2_TIMER_INV_CODE	T 14	TIMER	
	UT3_TIMER_INV_CODE	T 15	TIMER	
	UT4_TIMER_INV_CODE	T 16	TIMER	
	Stor_R_TIMER_INV_CODE	T 17	TIMER	
	Ante_Ch_TIMER_INV_CODE	T 18	TIMER	
	VAT1	VAT 1		

OB1 - <offline>

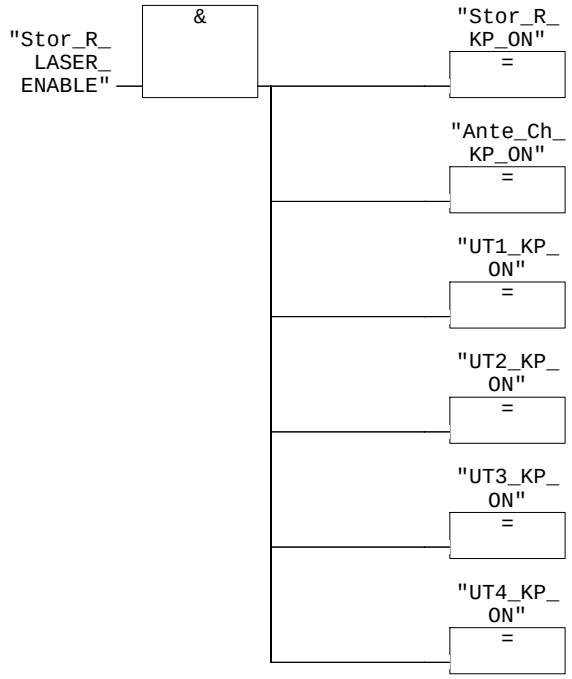
"Routine"
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/10/2008 09:28:11 PM
Interface: 02/15/1996 04:51:12 PM
Lengths (block/logic/data): 03076 02906 00028

Name	Data Type	Address	Comment
TEMP		0.0	
OB1_EV_CLASS	Byte	0.0	Bits 0-3 = 1 (Coming event), Bits 4-7 = 1 (Event class 1)
OB1_SCAN_1	Byte	1.0	1 (Cold restart scan 1 of OB 1), 3 (Scan 2-n of OB 1)
OB1_PRIORITY	Byte	2.0	Priority of OB Execution
OB1_OB_NUMBR	Byte	3.0	1 (Organization block 1, OB1)
OB1_RESERVED_1	Byte	4.0	Reserved for system
OB1_RESERVED_2	Byte	5.0	Reserved for system
OB1_PREV_CYCLE	Int	6.0	Cycle time of previous OB1 scan (milliseconds)
OB1_MIN_CYCLE	Int	8.0	Minimum cycle time of OB1 (milliseconds)
OB1_MAX_CYCLE	Int	10.0	Maximum cycle time of OB1 (milliseconds)
OB1_DATE_TIME	Date_And_Time	12.0	Date and time OB1 started

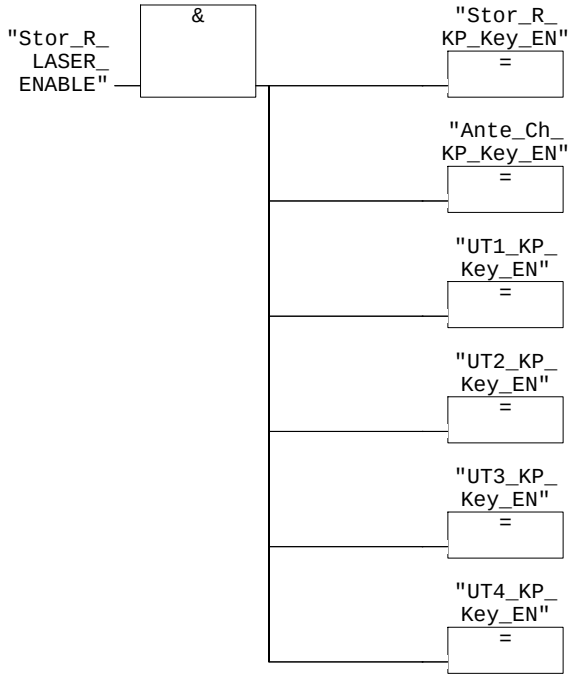
Block: OB1 "Main Program Sweep (Cycle)"

OB1 is the main programm. It consists mainly out of 6 identical blocks managing
buzzers and indicators for all 6 rooms/entry doors. Furthermore, each blocks
outputs a monitoring signal, for the Status monitor located in the storage
room.

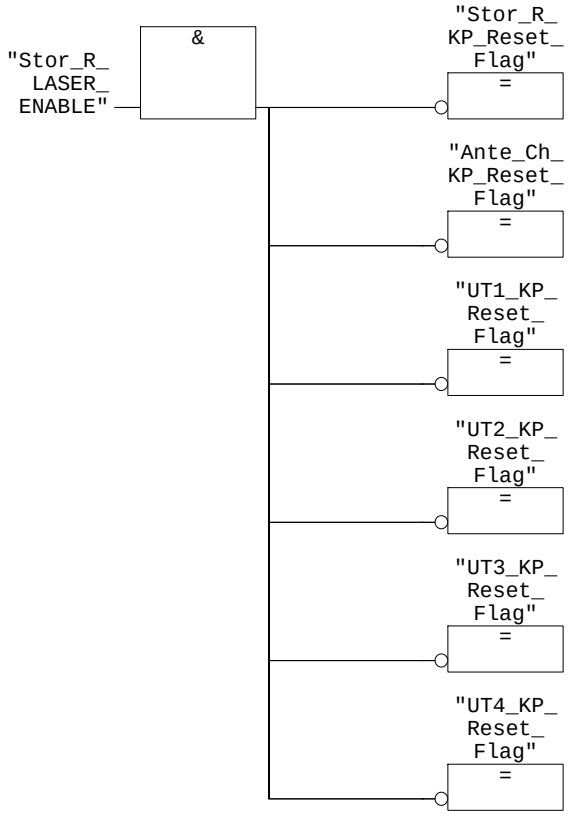
Network: 1 Enable all keypads if laser is ON



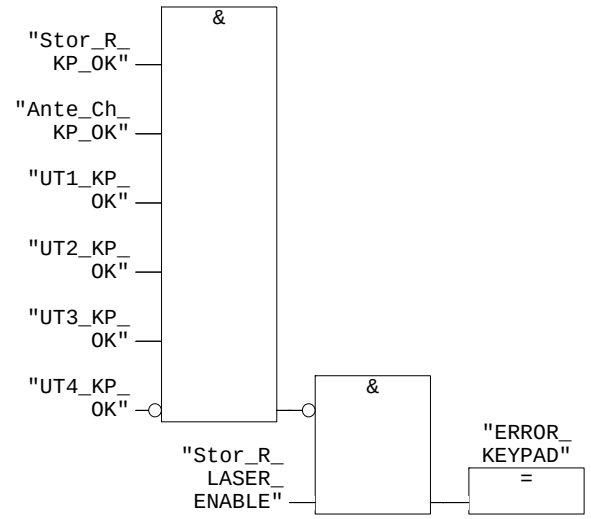
Network: 2 Enables/disables the keypad code storage, before the ""CODE"" is



Network: 3 Reset Flag, The dataFlag must be Reset after the data has been r

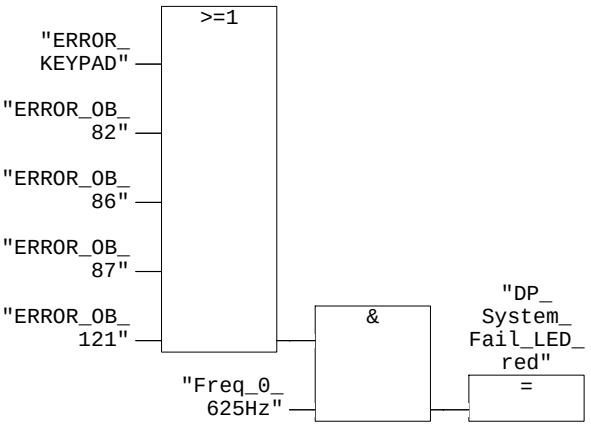


Network: 4 Check for KP fault

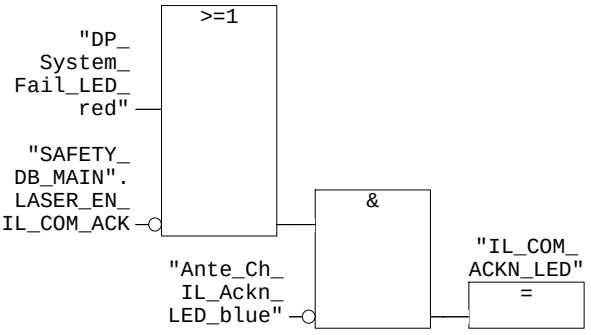


Network: 5 ERROR_MANAGEMENT

Checks the error flags set in the various OBs

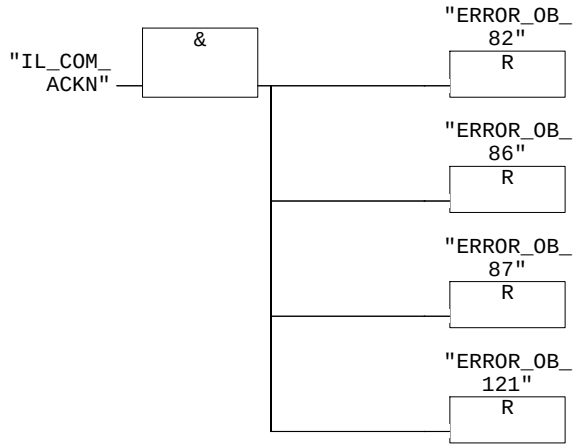


Network: 6 IL command acknowledge button LED blue

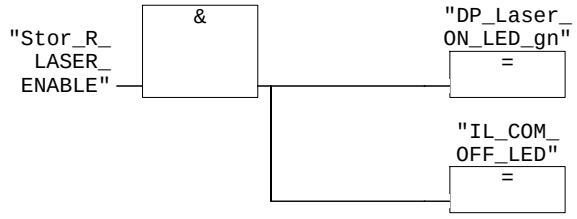


Network: 7 Error

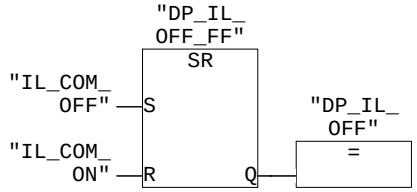
Resets error flags storage for the various OBs



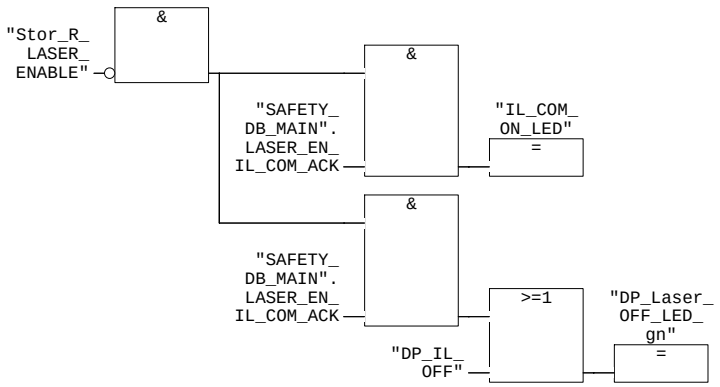
Network: 8 LED_gn: Laser_ON



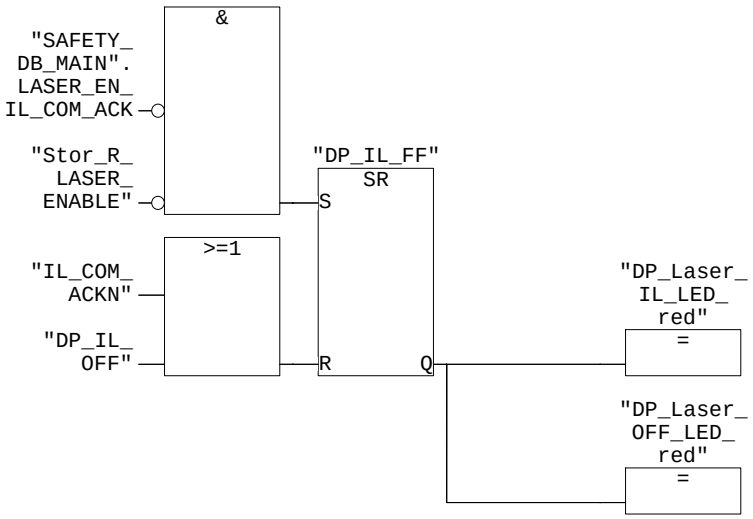
Network: 9 Store IL COM OFF



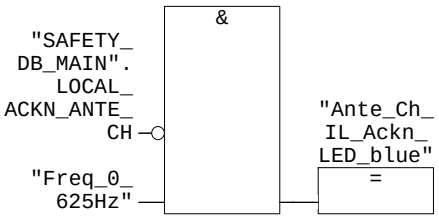
Network: 10 LED_red: Laser_ON



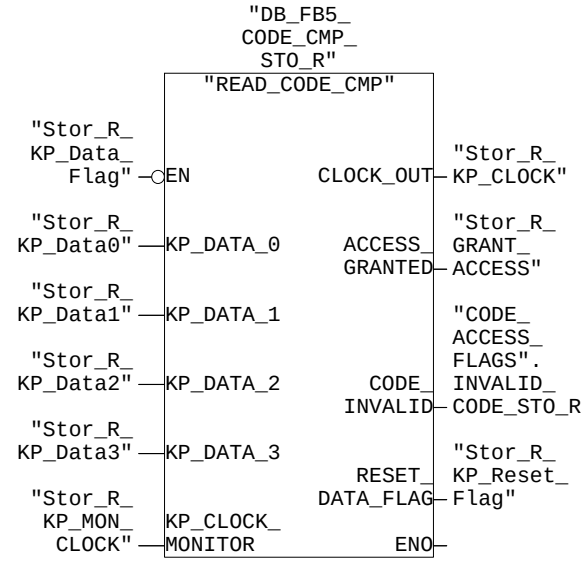
Network: 11 LED_red: Laser_OFF



Network: 12 Ackn_LED to indicate that an acknowledge is required after an In

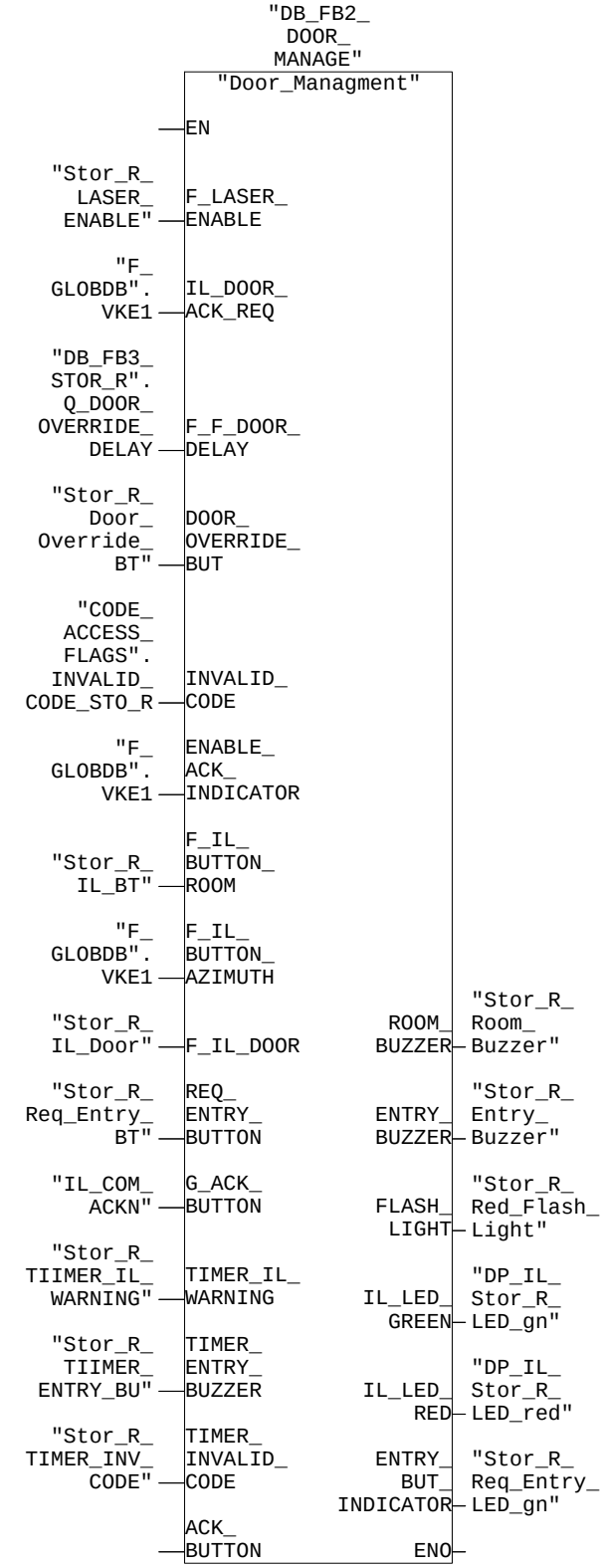


Network: 13

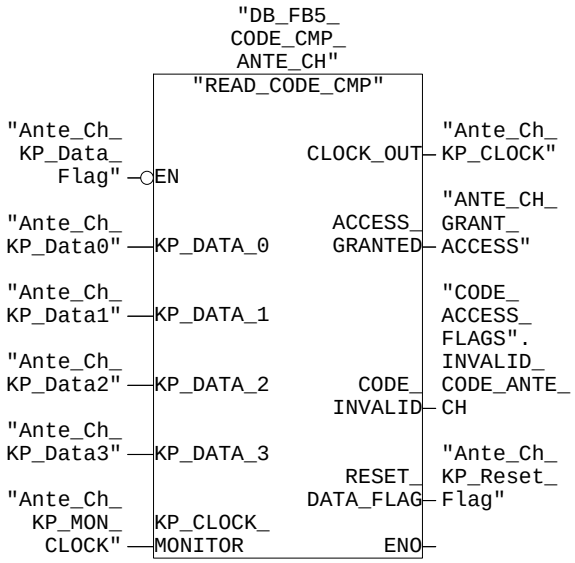


Network: 14 Storage Room I/O

Manages the standard I/O for the storage room

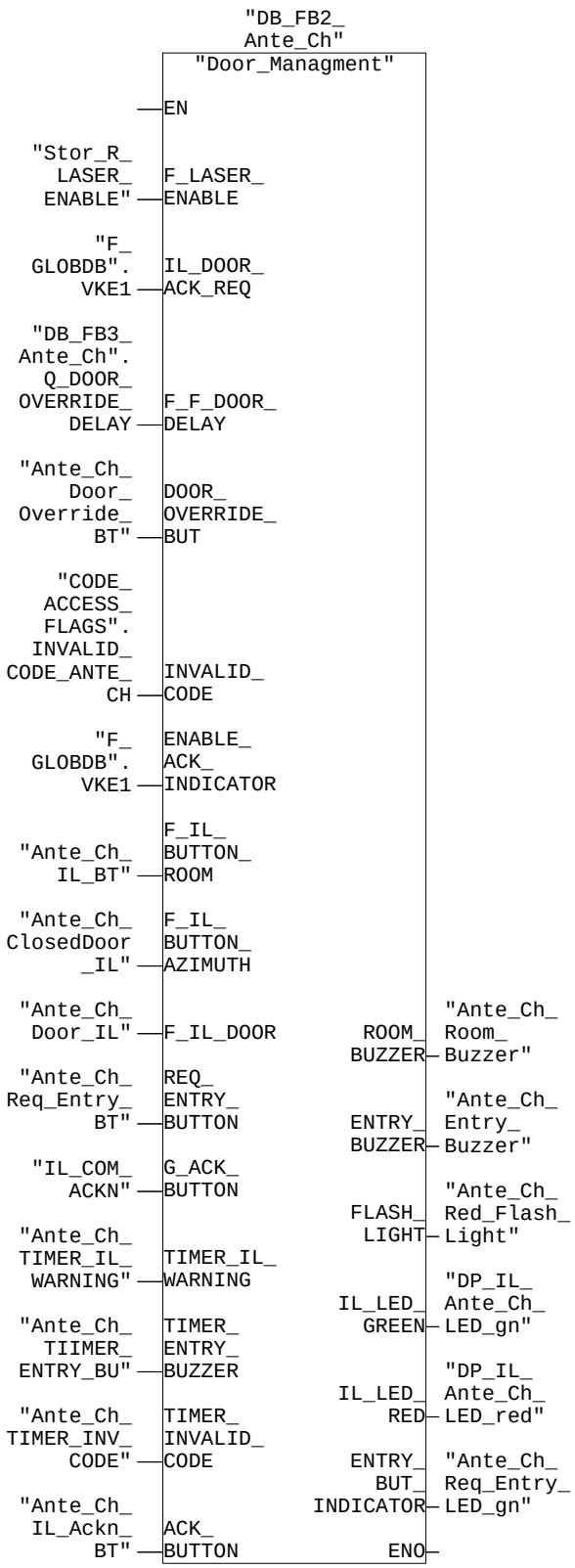


Network: 15

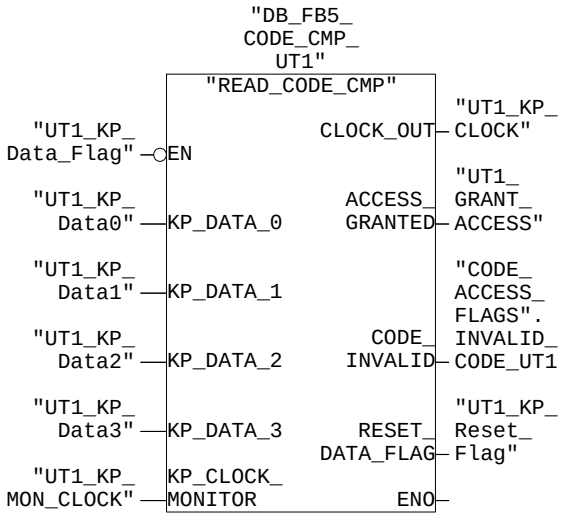

"DB_FB5_
CODE_CMP_
ANTE_CH"
"READ_CODE_CMP"
"Ante_Ch_
KP_Data_
Flag"
EN
"Ante_Ch_
KP_Data0"
KP_DATA_0
"Ante_Ch_
KP_Data1"
KP_DATA_1
"Ante_Ch_
KP_Data2"
KP_DATA_2
"Ante_Ch_
KP_Data3"
KP_DATA_3
"Ante_Ch_
KP_MON_
CLOCK"
KP_CLOCK_
MONITOR
CLOCK_OUT
ACCESS_
GRANTED
CODE_
INVALID
RESET_
DATA_FLAG
ENO
"Ante_Ch_
KP_CLOCK"
"ANTE_CH_
GRANT_
ACCESS"
"CODE_
ACCESS_
FLAGS".
INVALID_
CODE_ANTE_
CH
"Ante_Ch_
KP_Reset_
Flag"

Network: 16 Ante Chamber I/O

Manages the standard I/O for Ante Chamber

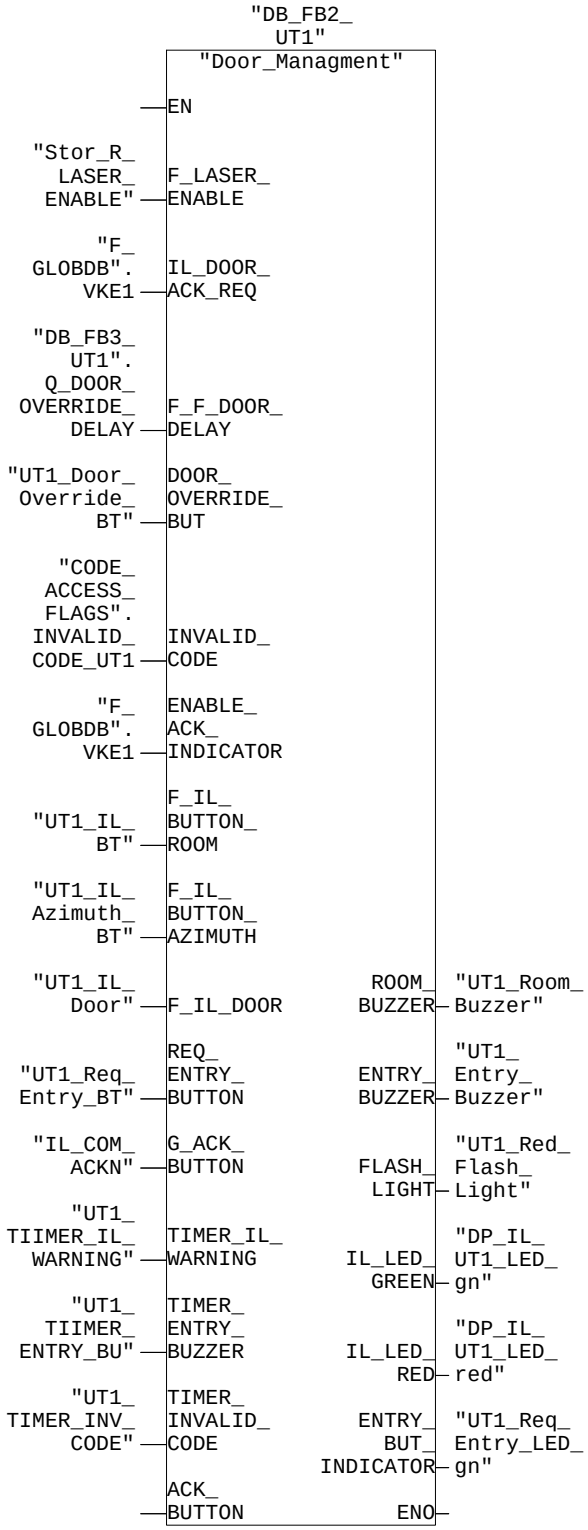


Network: 17

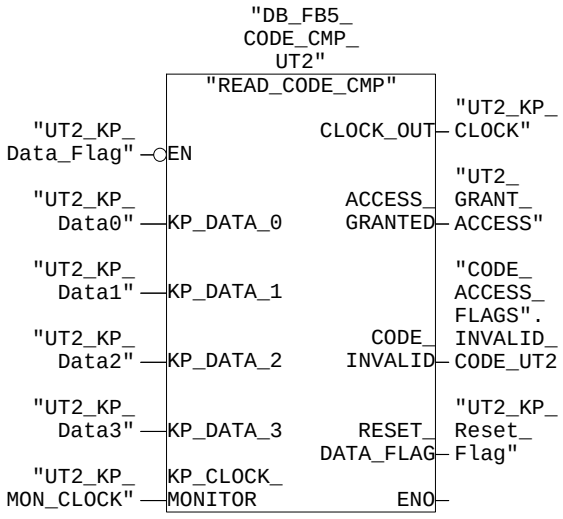

"DB_FB5_
CODE_CMP_
UT1"
"READ_CODE_CMP"
"UT1_KP_
Data_Flag"
EN
CLOCK_OUT
"UT1_KP_
CLOCK"
"UT1_KP_
Data0"
KP_DATA_0
ACCESS_
GRANTED
"UT1_
GRANT_
ACCESS"
"UT1_KP_
Data1"
KP_DATA_1
"CODE_
ACCESS_
FLAGS".
"UT1_KP_
Data2"
KP_DATA_2
CODE_
INVALID
INVALID_
CODE_UT1
"UT1_KP_
Data3"
KP_DATA_3
RESET_
DATA_FLAG
"UT1_KP_
Reset_
Flag"
"UT1_KP_
MON_CLOCK"
KP_CLOCK_
MONITOR
ENO

Network: 18 UT1 I/O

Manages the standard I/O for the UT1. (UT2, UT3, UT4 are the same, still to be programmed and tested).

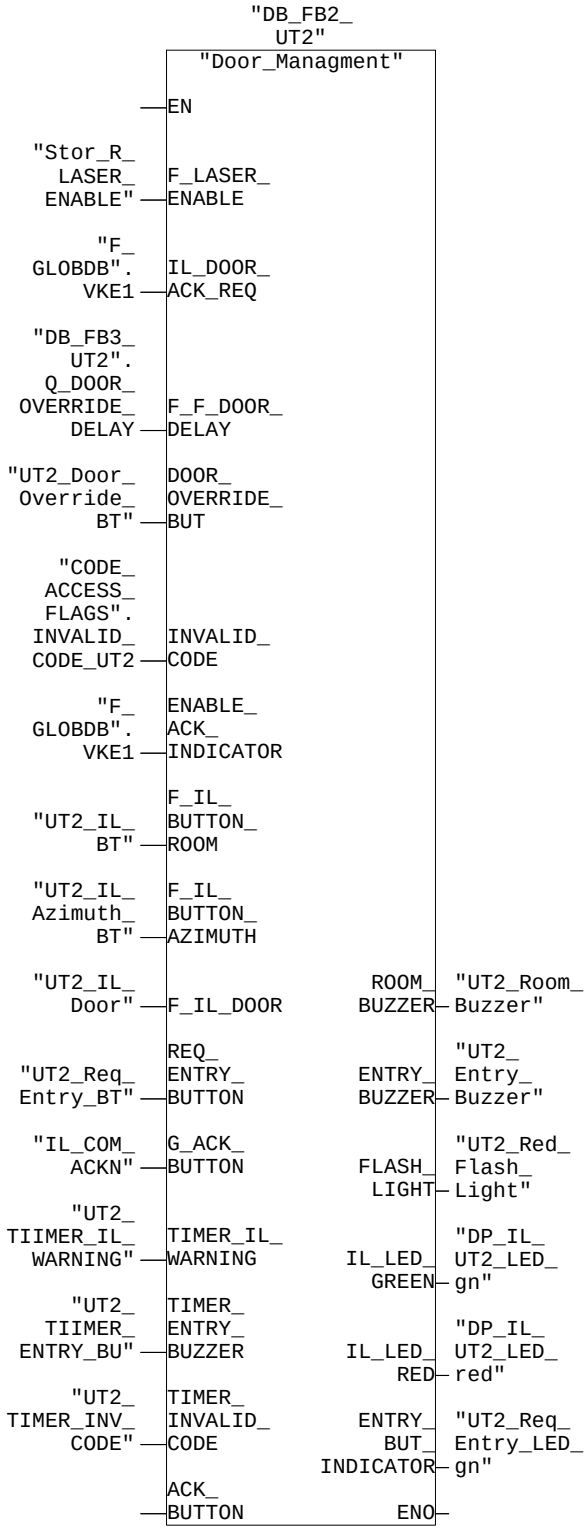


Network: 19

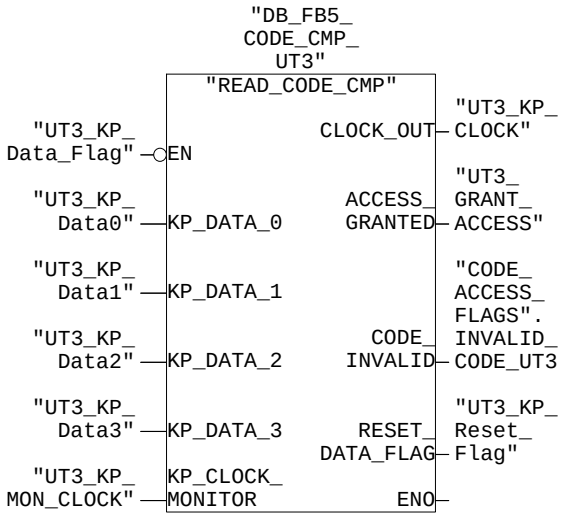

"DB_FB5_
CODE_CMP_
UT2"
"READ_CODE_CMP"
"UT2_KP_
Data_Flag"
EN
CLOCK_OUT
"UT2_KP_
CLOCK"
"UT2_KP_
Data0"
KP_DATA_0
ACCESS_
GRANTED
"UT2_
GRANT_
ACCESS"
"UT2_KP_
Data1"
KP_DATA_1
"CODE_
ACCESS_
FLAGS".
"UT2_KP_
Data2"
KP_DATA_2
CODE_
INVALID
INVALID_
CODE_UT2
"UT2_KP_
Data3"
KP_DATA_3
RESET_
DATA_FLAG
"UT2_KP_
Reset_
Flag"
"UT2_KP_
MON_CLOCK"
KP_CLOCK_
MONITOR
ENO

Network: 20 UT2 I/O

Manages the standard I/O for the UT2. (UT2, UT3, UT4 are the same, still to be programmed and tested).

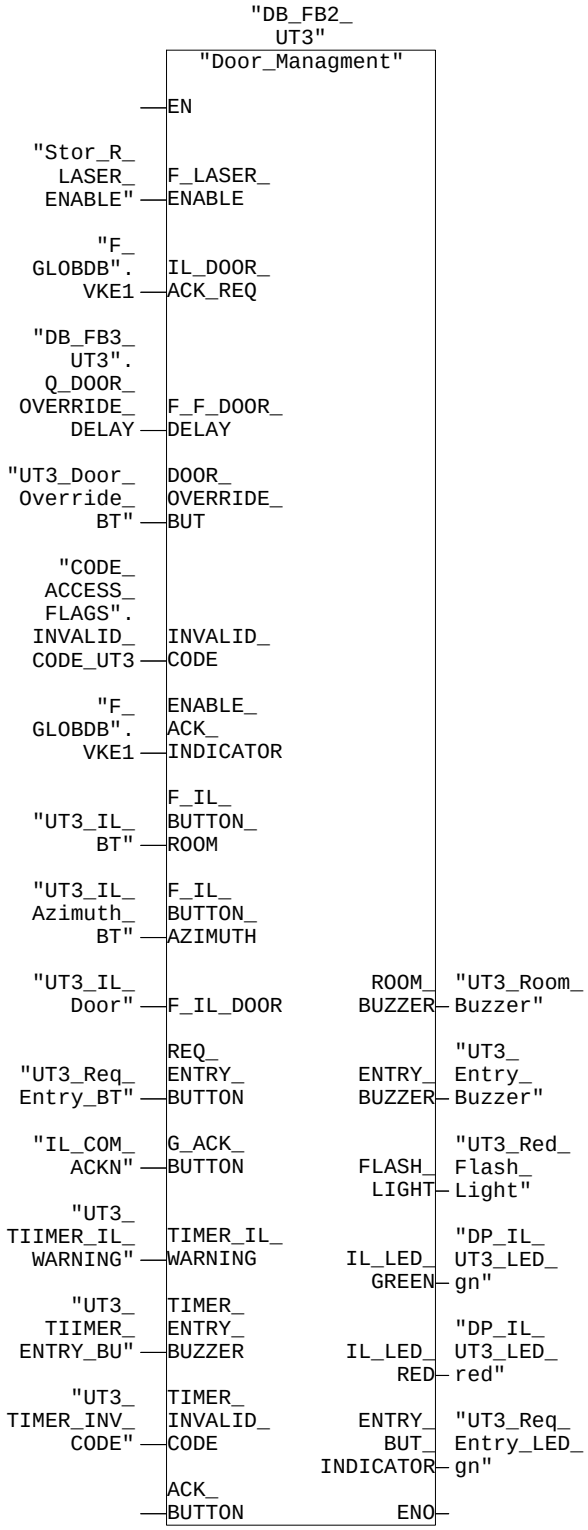


Network: 21

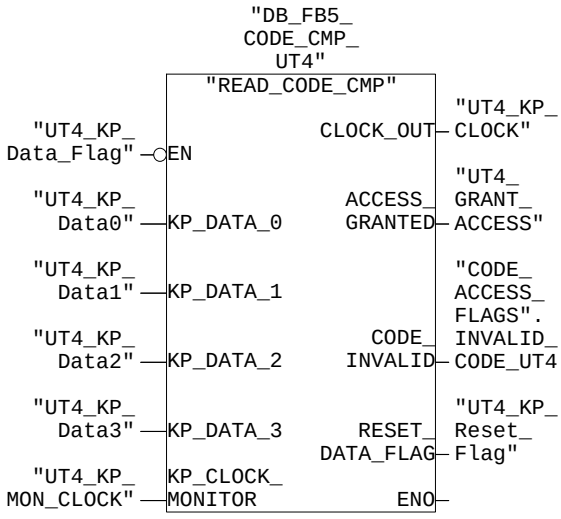

"DB_FB5_
CODE_CMP_
UT3"
"READ_CODE_CMP"
"UT3_KP_
Data_Flag"
EN
CLOCK_OUT
"UT3_KP_
CLOCK"
"UT3_KP_
Data0"
KP_DATA_0
ACCESS_
GRANTED
"UT3_
GRANT_
ACCESS"
"UT3_KP_
Data1"
KP_DATA_1
"CODE_
ACCESS_
FLAGS".
"UT3_KP_
Data2"
KP_DATA_2
CODE_
INVALID
"CODE_
INVALID_
CODE_UT3
"UT3_KP_
Data3"
KP_DATA_3
RESET_
DATA_FLAG
"UT3_KP_
Reset_
Flag"
"UT3_KP_
MON_CLOCK"
KP_CLOCK_
MONITOR
ENO

Network: 22 UT3 I/O

Manages the standard I/O for the UT3. (UT2, UT3, UT4 are the same, still to be programmed and tested).

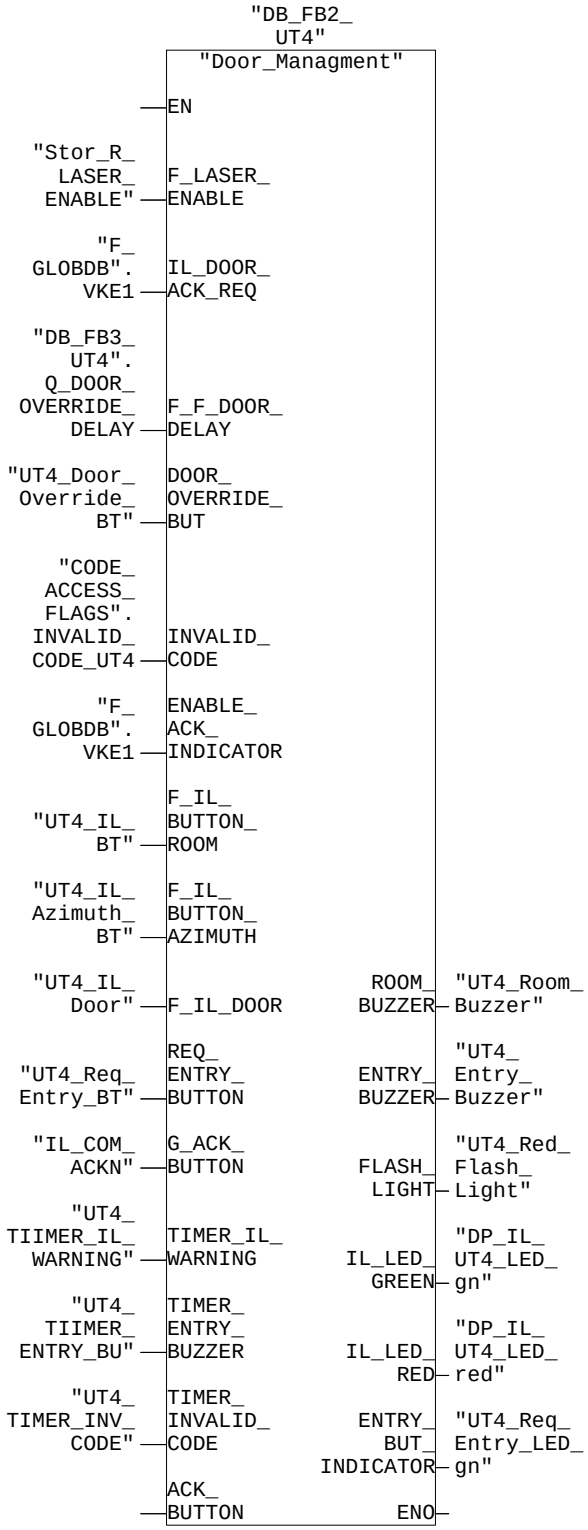


Network: 23


"DB_FB5_
CODE_CMP_
UT4"
"READ_CODE_CMP"
"UT4_KP_
Data_Flag"
EN
CLOCK_OUT
"UT4_KP_
CLOCK"
"UT4_KP_
Data0"
KP_DATA_0
ACCESS_
GRANTED
"UT4_
GRANT_
ACCESS"
"UT4_KP_
Data1"
KP_DATA_1
"CODE_
ACCESS_
FLAGS".
"UT4_KP_
Data2"
KP_DATA_2
CODE_
INVALID
INVALID_
CODE_UT4
"UT4_KP_
Data3"
KP_DATA_3
RESET_
DATA_FLAG
"UT4_KP_
Reset_
Flag"
"UT4_KP_
MON_CLOCK"
KP_CLOCK_
MONITOR
ENO

Network: 24 UT4 I/O

Manages the standard I/O for the UT4. (UT2, UT3, UT4 are the same, still to be programmed and tested).



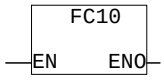
OB35 - <offline>

"CYC_INT5" Cyclic Interrupt 5
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/10/2008 09:09:40 PM
Interface: 02/15/1996 04:51:11 PM
Lengths (block/logic/data): 00130 00018 00022

Name	Data Type	Address	Comment
TEMP		0.0	
OB35_EV_CLASS	Byte	0.0	Bits 0-3 = 1 (Coming event), Bits 4-7 = 1 (Event class 1)
OB35_STRT_INF	Byte	1.0	16#36 (OB 35 has started)
OB35_PRIORITY	Byte	2.0	Priority of OB Execution
OB35_OB_NUMBR	Byte	3.0	35 (Organization block 35, OB35)
OB35_RESERVED_1	Byte	4.0	Reserved for system
OB35_RESERVED_2	Byte	5.0	Reserved for system
OB35_PHASE_OFFSET	Word	6.0	Phase offset (msec)
OB35_RESERVED_3	Int	8.0	Reserved for system
OB35_EXC_FREQ	Int	10.0	Frequency of execution (msec)
OB35_DATE_TIME	Date_And_Time	12.0	Date and time OB35 started

Block: OB35 "Cyclic Interrupt"

Network: 1 Call safety program



FB2 - <offline>

"Door_Managment" Handels standard door I/O
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/10/2008 08:49:16 PM
Interface: 04/10/2008 08:49:16 PM
Lengths (block/logic/data): 00674 00512 00010

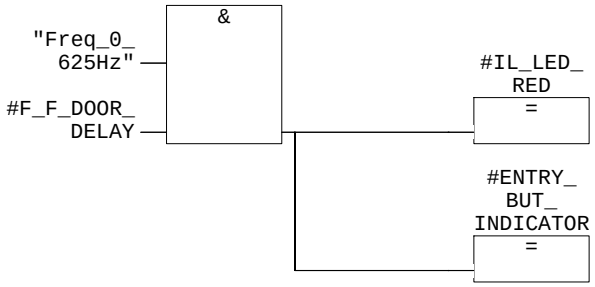
Name	Data Type	Address	Initial Value	Comment
IN		0.0		
F_LASER_ENABLE	Bool	0.0	FALSE	Safety Output, Laser Enabled =1
IL_DOOR_ACK_REQ	Bool	0.1	FALSE	Acknowledge required if door interlock has triggered Req=1
F_F_DOOR_DELAY	Bool	0.2	FALSE	Safety output, indicated when door override is active
DOOR_OVERRIDE_BUT	Bool	0.3	FALSE	Button door override
INVALID_CODE	Bool	0.4	FALSE	Keypad override input- override =1
ENABLE_ACK_INDICATOR	Bool	0.5	FALSE	Enables ACK indicator, enable =1, 0 for all UTs
F_IL_BUTTON_ROOM	Bool	0.6	FALSE	Safety IL button (mushroom), signals interlock if active =1
F_IL_BUTTON_AZIMUTH	Bool	0.7	FALSE	Safety IL button at azimuth platform, signals interlock if active =1
F_IL_DOOR	Bool	1.0	FALSE	Safety IL door, signals high if door is opened
REQ_ENTRY_BUTTON	Bool	1.1	FALSE	Req_Entry_button
G_ACK_BUTTON	Bool	1.2	FALSE	Acknowledge button
TIMER_IL_WARNING	Timer	2.0		
TIMER_ENTRY_BUZZER	Timer	4.0		
TIMER_INVALID_CODE	Timer	6.0		
ACK_BUTTON	Bool	8.0	FALSE	
OUT		0.0		
ROOM_BUZZER	Bool	10.0	FALSE	Buzzer located inside laser rooms
ENTRY_BUZZER	Bool	10.1	FALSE	Buzzer located at entry door of laser room
FLASH_LIGHT	Bool	10.2	FALSE	Flash light, located above door, flashing if laser is on
IL_LED_GREEN	Bool	10.3	FALSE	IL LED RED - signalling IL active =1
IL_LED_RED	Bool	10.4	FALSE	IL LED GREEN - signalling IL active =1, if IL GREEN & RED active = yellow
ENTRY_BUT_INDICATOR	Bool	10.5	FALSE	Indicator LED in entry button
IN_OUT		0.0		
STAT		0.0		
FF_IL_LED_RED	Bool	12.0	FALSE	
P_F_IL_DOOR	Bool	12.1	FALSE	
FF_ACK_LED_BLUE	Bool	12.2	FALSE	
FN_F_IL_DOOR	Bool	12.3	FALSE	
P_INVALID_CODE	Bool	12.4	FALSE	
F_F_BAD_SUM	Bool	12.5	FALSE	
FN_IL_TRIGGER	Bool	12.6	FALSE	
TEMP		0.0		

Block: FB2 DOOR_MANAGEMENT

This FB handles the door entry management for standard I/O for each door.
This block is common for each door

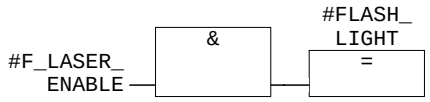
Network: 1 Door Override monitor: Overide active

When door override is initiated, the entry buzzer buzzes with x Hz

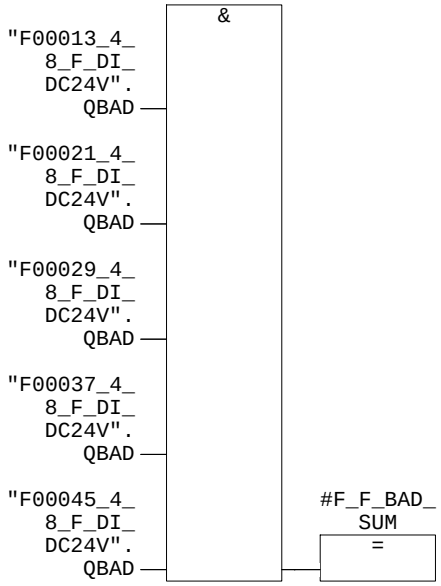


Network: 2 Flash_Light at door entry

Flash light at door entry shall ON (flash) if laser is on, OFF otherwise



Network: 3 1=FAIL-SAFE VALUES ARE OUTPUT

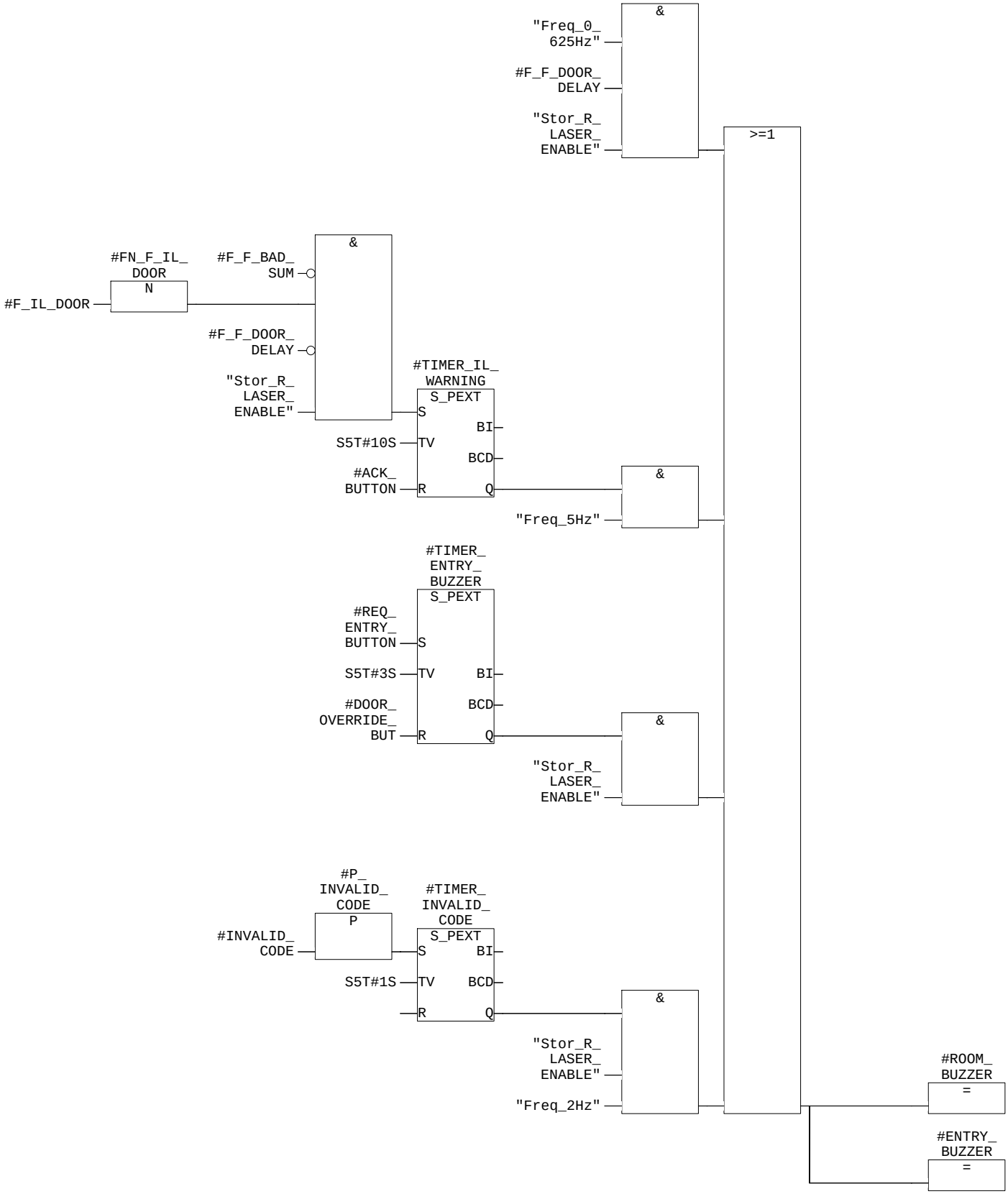


Network: 4 Entry buzzer, room buzzer and acknowledge indicator management

If the door interlock is triggered, the buzzer inside the room and the buzzer
at the entry are buzzing for x seconds

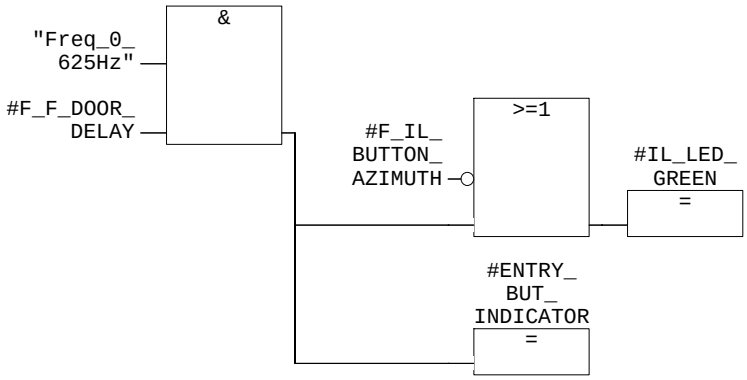
If the Req_Entry_Button is triggered, the ROOM_BUZZER and ENTRY_BUZZER shall buzz.

Acknowledge indicator shall flash if acknowledge is required and acknowledge indicator is enabled - OFF otherwise



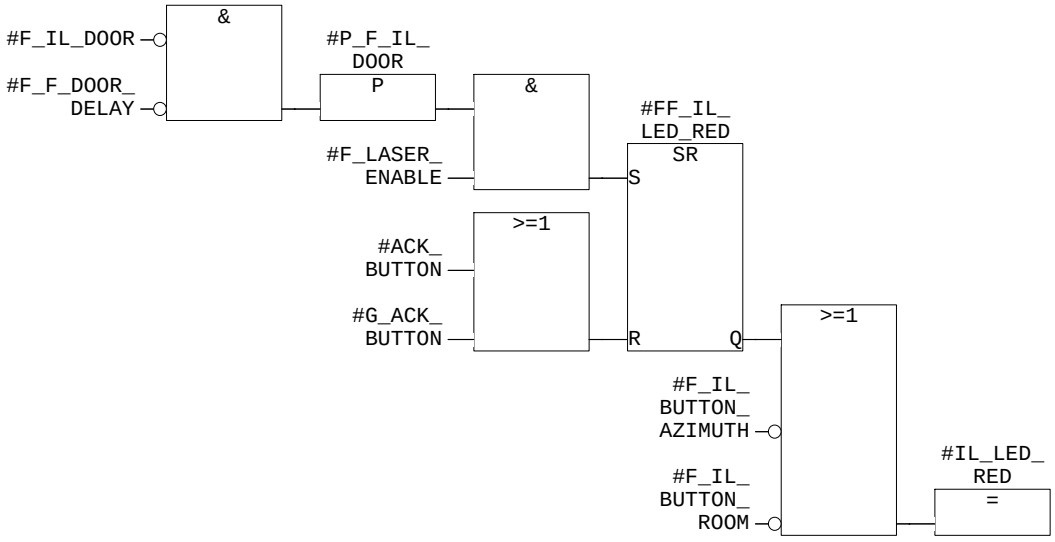
Network: 5 Interlock monitor green LED

Interlock monitor located in Storage Room, to display which interlock is triggered.



Network: 6 Interlock monitor green LED

Interlock monitor located in Storage Room, to display which interlock is triggered.



FB5 - <offline>

"READ_CODE_CMP"

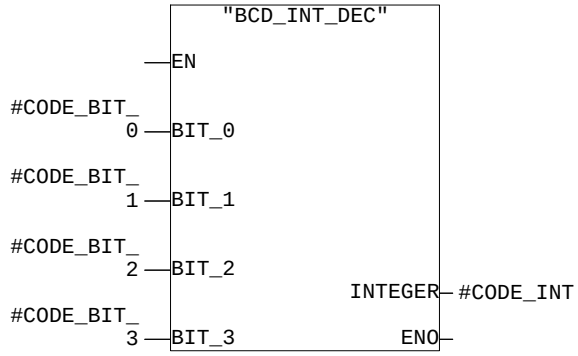
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/08/2008 07:04:42 PM
Interface: 04/08/2008 07:04:42 PM
Lengths (block/logic/data): 01226 00990 00008

Name	Data Type	Address	Initial Value	Comment
IN		0.0		
KP_DATA_0	Bool	0.0	FALSE	
KP_DATA_1	Bool	0.1	FALSE	
KP_DATA_2	Bool	0.2	FALSE	
KP_DATA_3	Bool	0.3	FALSE	
KP_CLOCK_MONITOR	Bool	0.4	FALSE	
OUT		0.0		
CLOCK_OUT	Bool	2.0	FALSE	
ACCESS_GRANTED	Bool	2.1	FALSE	
CODE_INVALID	Bool	2.2	FALSE	
RESET_DATA_FLAG	Bool	2.3	FALSE	
IN_OUT		0.0		
STAT		0.0		
KP_CODE_INT	Int	4.0	0	
REF_CODE_0	Int	6.0	0	
REF_CODE_1	Int	8.0	0	
REF_CODE_2	Int	10.0	0	
REF_CODE_3	Int	12.0	0	
COUNT_DATA	Int	14.0	0	
DIGIT_0	Bool	16.0	FALSE	
DIGIT_1	Bool	16.1	FALSE	
DIGIT_2	Bool	16.2	FALSE	
DIGIT_3	Bool	16.3	FALSE	
CTU_CLOCK	CTU	18.0		
PULSE_TIMER	TP	28.0		
COUNT_CLOCK	Int	50.0	0	
PULSE_TIMER_2	TP	52.0		
TEMP		0.0		

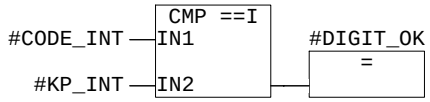
Block: FB5 Compare Keypad Entry with Reference Code and grant access

Network: 2 Get DIGIT CODE

Convert Nibble to Integer



Network: 3 COMPARE CODE with KEYPAD DIGIT



FC2 - <offline>

"KP_to_INT_DEC" Keypad_to_Integer_Decoder
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 03/31/2008 06:14:47 PM
Interface: 03/31/2008 06:14:12 PM
Lengths (block/logic/data): 00454 00312 00000

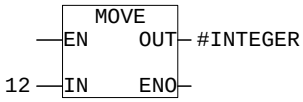
Name	Data Type	Address	Comment
IN		0.0	
BIT_0	Bool	0.0	
BIT_1	Bool	0.1	
BIT_2	Bool	0.2	
BIT_3	Bool	0.3	
OUT		0.0	
INTEGER	Int	2.0	
IN_OUT		0.0	
TEMP		0.0	
RETURN		0.0	
RET_VAL		0.0	

Block: FC2 keypad to integer decoder

This function decodes the keypad output to an integer number which corresponds
to the key pressed

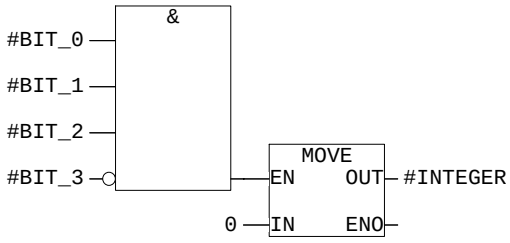
Network: 1 Nibble = Invalid number

Set INTEGER to invalid CODE number

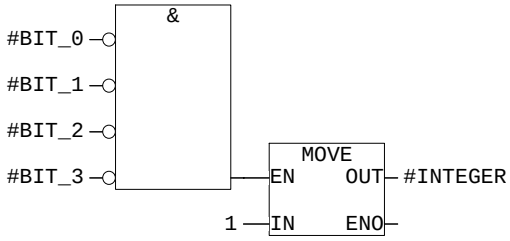


Network: 2 keypad button = 0

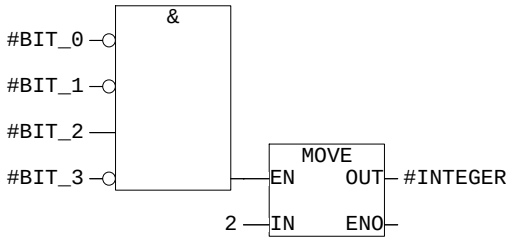
Nibble = 7 --> =^ keypad button 0



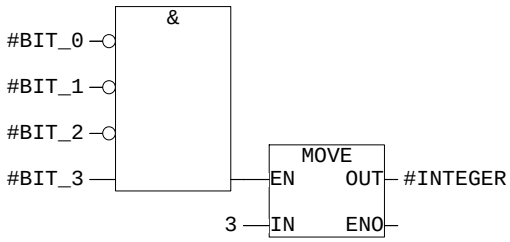
Network: 3 keypad button = 1



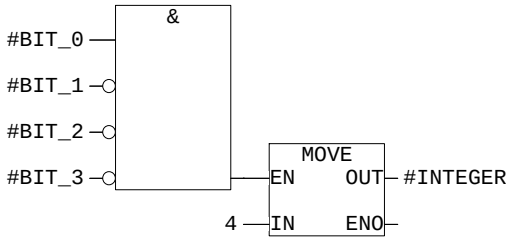
Network: 4 keypad button = 2



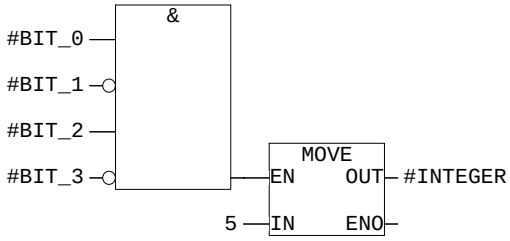
Network: 5 keypad button = 3



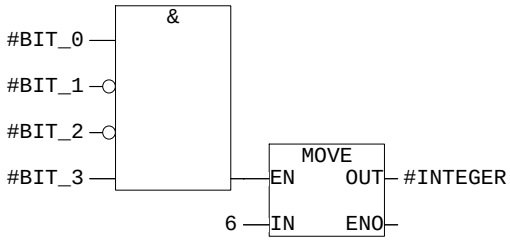
Network: 6 keypad button = 4



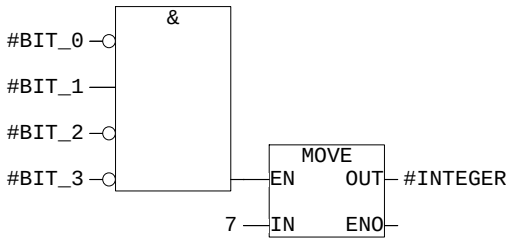
Network: 7 keypad button = 5



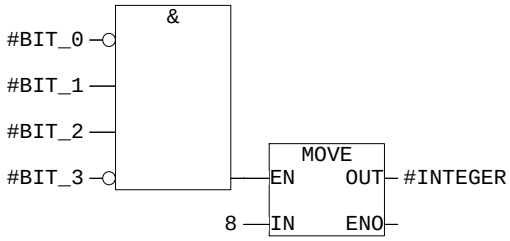
Network: 8 keypad button = 6



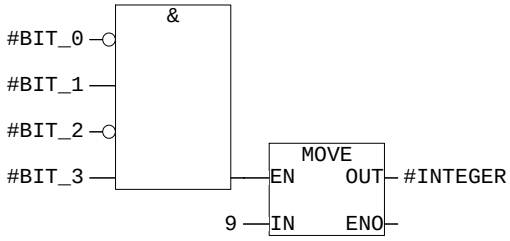
Network: 9 keypad button = 7



Network: 10 keypad button = 8



Network: 11 keypad button = 9



FC3 - <offline>

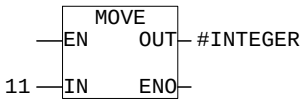
"BCD_INT_DEC" DECODE_BCD_SWITCH_TO_INTEGER
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/01/2008 09:28:23 AM
Interface: 04/01/2008 09:28:23 AM
Lengths (block/logic/data): 00454 00312 00000

Name	Data Type	Address	Comment
IN		0.0	
BIT_0	Bool	0.0	
BIT_1	Bool	0.1	
BIT_2	Bool	0.2	
BIT_3	Bool	0.3	
OUT		0.0	
INTEGER	Int	2.0	
IN_OUT		0.0	
TEMP		0.0	
RETURN		0.0	
RET_VAL		0.0	

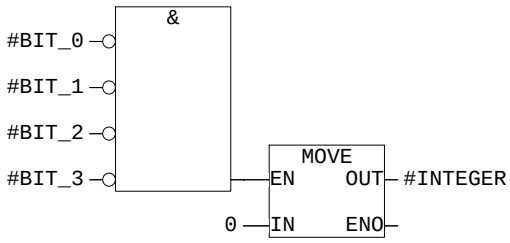
Block: FC3 CODE 4 bit BCD to INTEGER Decoder

Network: 1 Nibble = Invalid number

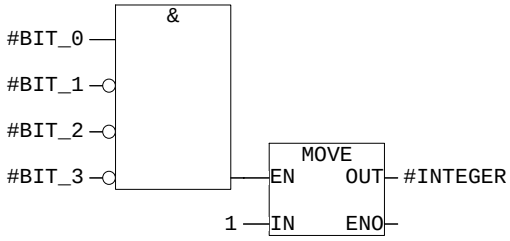
Set INTEGER to invalid CODE number



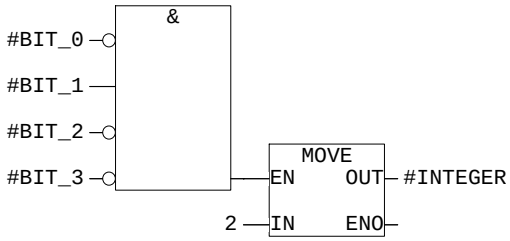
Network: 2 CODE_DIGIT = 0



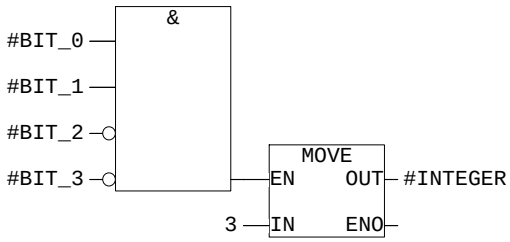
Network: 3 CODE_DIGIT = 1



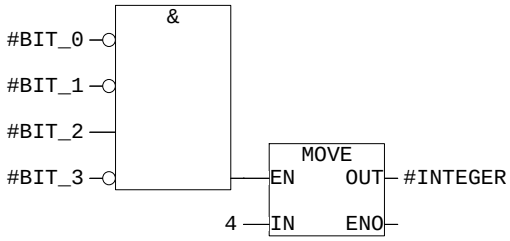
Network: 4 CODE_DIGIT = 2



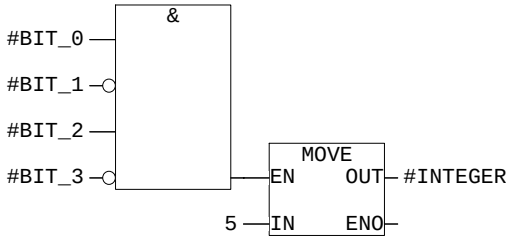
Network: 5 keypad button = 3



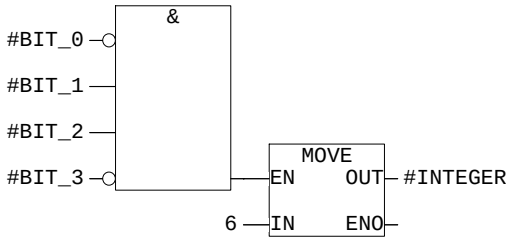
Network: 6 CODE_DIGIT = 4



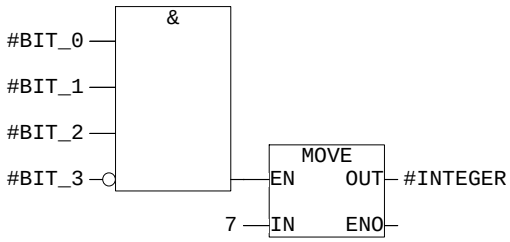
Network: 7 CODE_DIGIT = 5



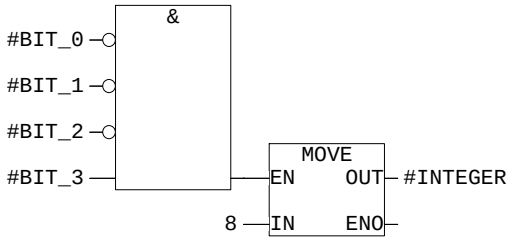
Network: 8 CODE_DIGIT = 6



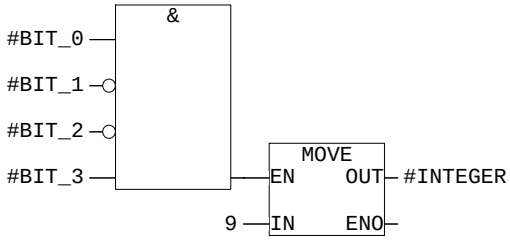
Network: 9 CODE_DIGIT = 7



Network: 10 CODE_DIGIT = 8



Network: 11 CODE_DIGIT = 9



FB10 - <offline>

"Safety_FB" Includes all safety relevant functions
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/10/2008 08:01:48 PM
Interface: 04/10/2008 07:08:07 PM
Lengths (block/logic/data): 01260 01104 00006

Name	Data Type	Address	Initial Value	Comment
IN		0.0		
OUT		0.0		
IN_OUT		0.0		
STAT		0.0		
LASER_EN_STOR_ROOM	Bool	0.0	FALSE	
LASER_EN_ANTE_CHAMBER	Bool	0.1	FALSE	
LASER_EN_UT1	Bool	0.2	FALSE	
LASER_EN_UT2	Bool	0.3	FALSE	
LASER_EN_UT3	Bool	0.4	FALSE	
LASER_EN_UT4	Bool	0.5	FALSE	
FFF_IL_SYSTEM_ON	Bool	0.6	FALSE	
F_P_IL_SYSTEM_ON	Bool	0.7	FALSE	
F_P_IL_SYSTEM_OFF	Bool	1.0	FALSE	
LASER_EN_IL_COM	Bool	1.1	FALSE	
LASER_EN_IL_COM_ACK	Bool	1.2	FALSE	
F_P_IL_SYSTEM_ACK	Bool	1.3	FALSE	
FFF_IL_SYSTEM_ACK	Bool	1.4	FALSE	
NO_INTERLOCK	Bool	1.5	FALSE	
LOCAL_ACKN_STO_R	Bool	1.6	FALSE	
LOCAL_ACKN_ANTE_CH	Bool	1.7	FALSE	
LOCAL_ACKN_UT1	Bool	2.0	FALSE	
LOCAL_ACKN_UT2	Bool	2.1	FALSE	
LOCAL_ACKN_UT3	Bool	2.2	FALSE	
LOCAL_ACKN_UT4	Bool	2.3	FALSE	
LOCAL_ACKN_OK	Bool	2.4	FALSE	
TEMP		0.0		

Block: FB10 Safety FB -> Manages all safety functions

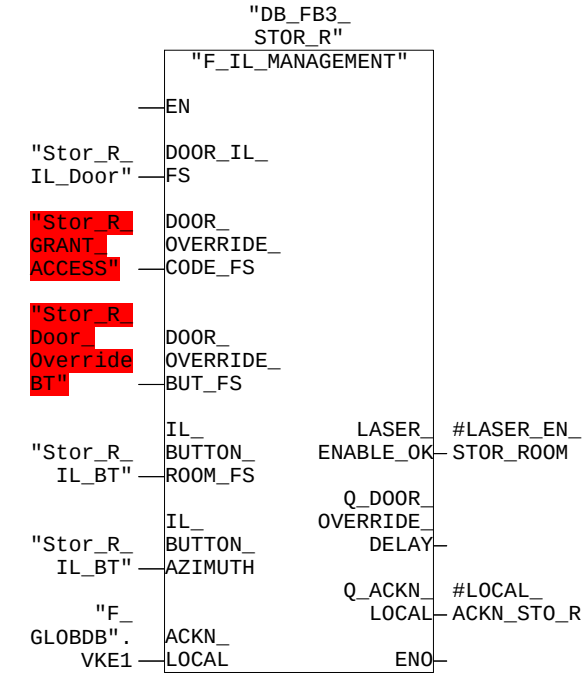
The Safety part of the PRIMA Interlock System consists of 6 indentical FBs.
Each FBs is fed with the IL inputs and switch buttons. Based on the ILs, the
block produces an output LASER_EN_xxx for the corresponding location.
The 2nd last Network "AND"s all the LASER_EN_xx and determines if the LASER
located in the "Storage Room" is Enabled or Disabled.

The last network acknowledge all triggered safety ciruits automatically.
An automatic acknowledgement is possible, as the LASER does not turn on
automatically once the Interlock system disabled the Laser once.

(The circuit to start up the laser and shut down is external to the PLC network.
The PLC proides only an enable/disable to the laser. Once the laser is
disabled,
it has to be started manually.)

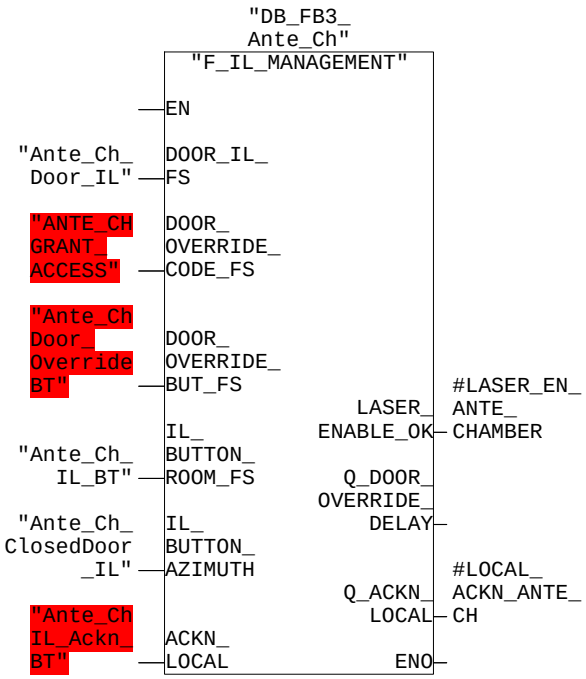
Network: 1 Storage_Room_Saftey

Laser Interlock check for storage Room



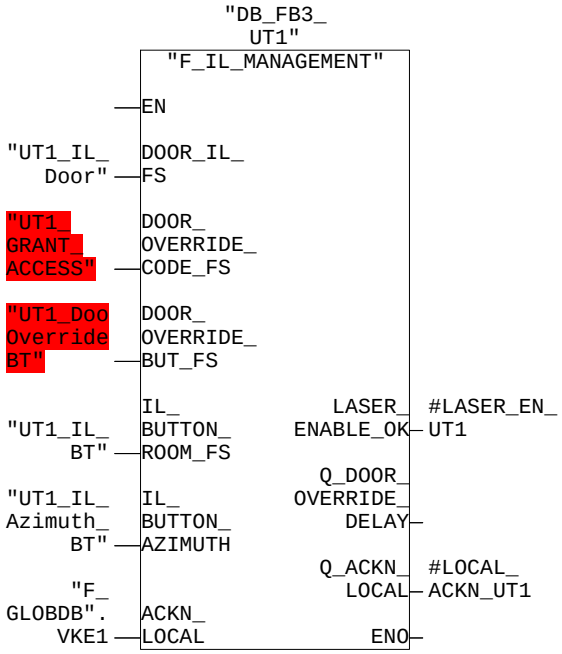
Network: 2 Ante_Chamber_Safety

Laser Interlock check for Ante Chamber



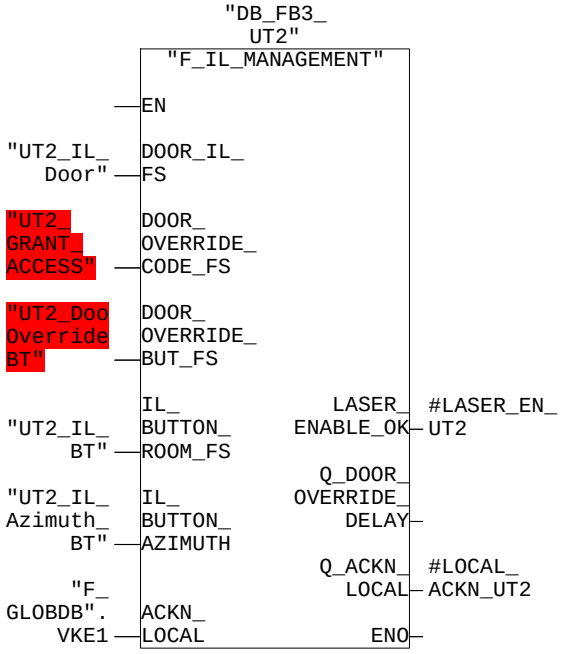
Network: 3 UT1_Safety

Laser Interlock check for UT1. (UT2, UT3, UT4 are the same, to be tested and programmed)



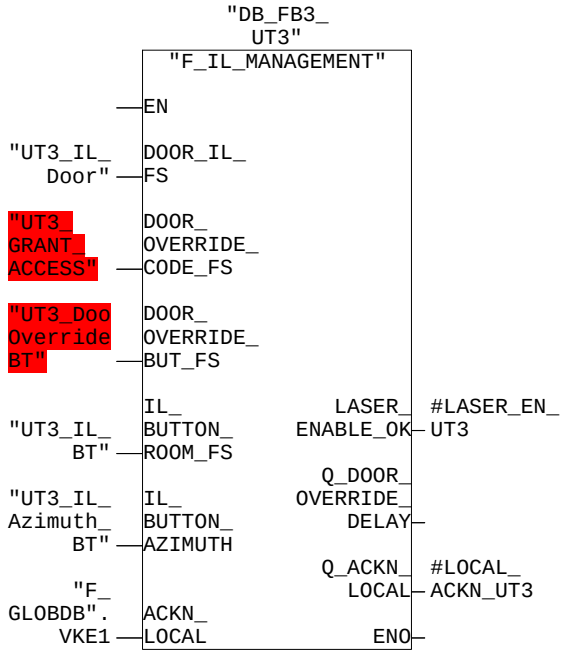
Network: 4 UT2_Safety

Laser Interlock check for UT2. (UT2, UT3, UT4 are the same, to be tested and programmed)



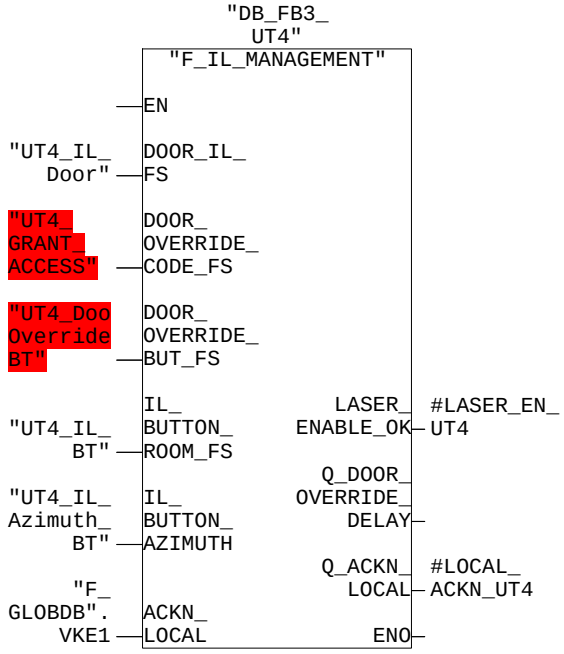
Network: 5 UT3_Safety

Laser Interlock check for UT3. (UT2, UT3, UT4 are the same, to be tested and programmed)

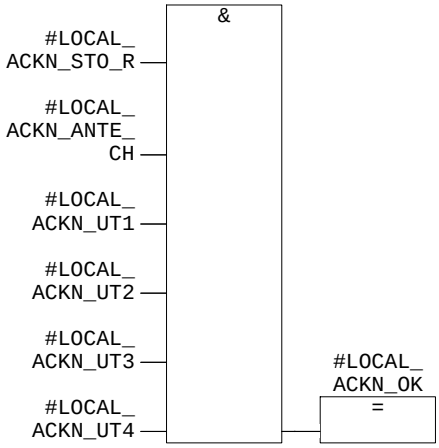


Network: 6 UT4_Safety

Laser Interlock check for UT4. (UT2, UT3, UT4 are the same, to be tested and programmed)

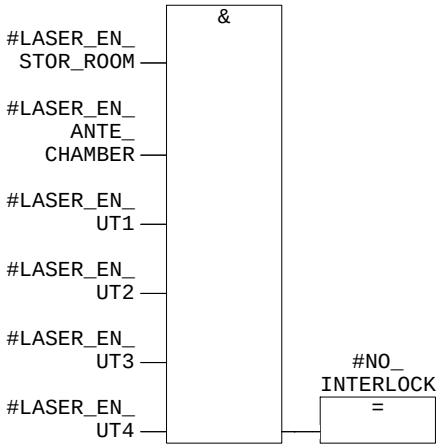


Network: 7 Check if local Acknowledge is required

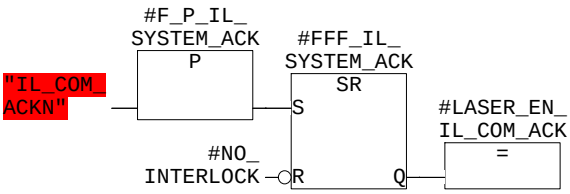


Network: 8 Collect interlock trigger

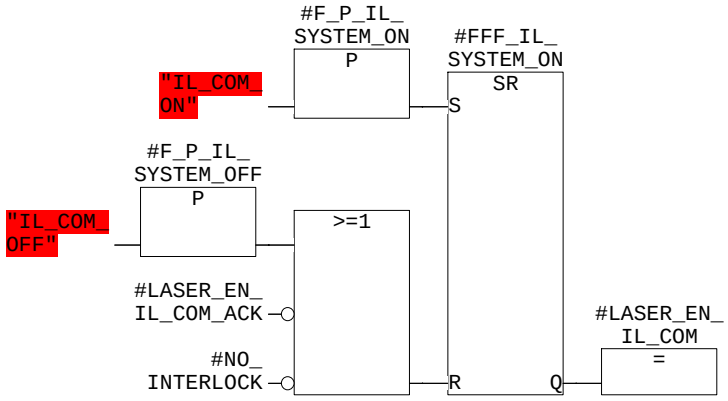
Set IL trigger if any interlock triggered



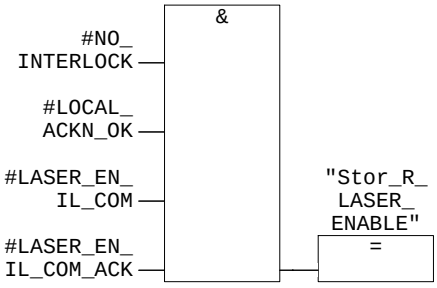
Network: 9 Request IL Acknowledge it IL is triggered



Network: 10

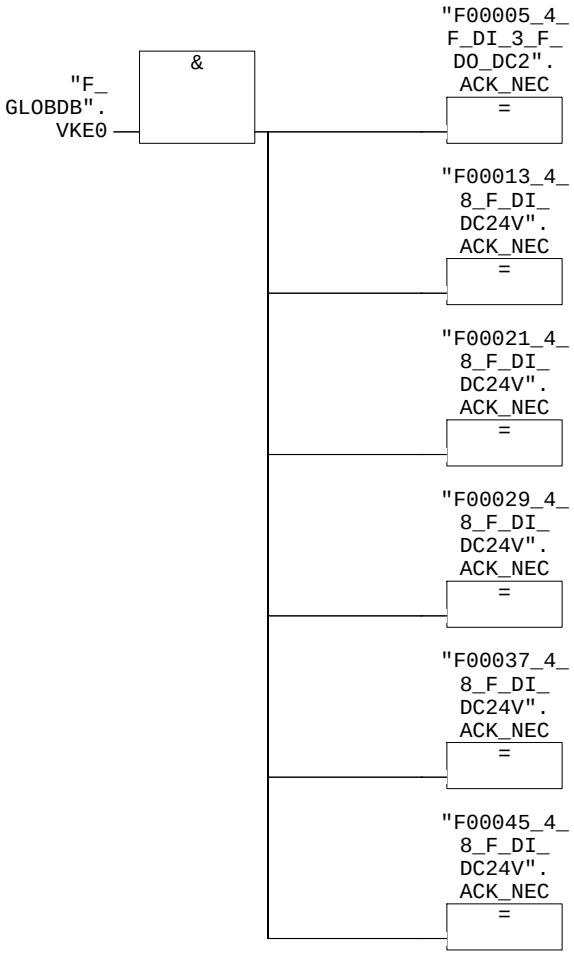


Network: 11 Enable Laser



Network: 12 Reintegration

Reintegration of safety modules



FB3 - <offline>

"F_IL_MANAGEMENT" Safety_Interlock_Management
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/10/2008 07:50:28 PM
Interface: 04/10/2008 06:51:31 PM
Lengths (block/logic/data): 00310 00162 00008

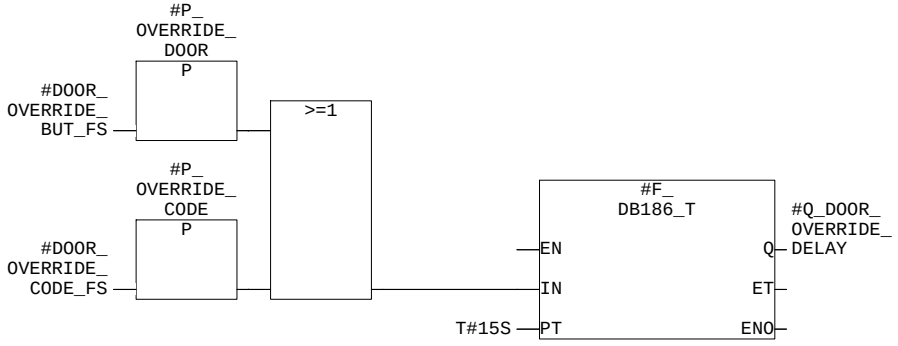
Name	Data Type	Address	Initial Value	Comment
IN		0.0		
DOOR_IL_FS	Bool	0.0	FALSE	
DOOR_OVERRIDE_CODE_FS	Bool	0.1	FALSE	
DOOR_OVERRIDE_BUT_FS	Bool	0.2	FALSE	
IL_BUTTON_ROOM_FS	Bool	0.3	FALSE	
IL_BUTTON_AZIMUTH	Bool	0.4	FALSE	
ACKN_LOCAL	Bool	0.5	FALSE	
OUT		0.0		
LASER_ENABLE_OK	Bool	2.0	FALSE	
Q_DOOR_OVERRIDE_DELAY	Bool	2.1	FALSE	
Q_ACKN_LOCAL	Bool	2.2	FALSE	
IN_OUT		0.0		
STAT		0.0		
P_OVERRIDE_DOOR	Bool	4.0	FALSE	
P_OVERRIDE_CODE	Bool	4.1	FALSE	
P_ACK_REQ_LASER_ENABLE	Bool	4.2	FALSE	
F_DB186_T	F_TOF	6.0		
LASER_ENABLE_FLAG	Bool	30.0	FALSE	
FFF_LOCAL_ACKN	Bool	30.1	FALSE	
TEMP		0.0		

Block: FB3 Safety FB to realise door overide funktion

Triggers door override for x seconds -> Override disables the door IL function
for x seconds

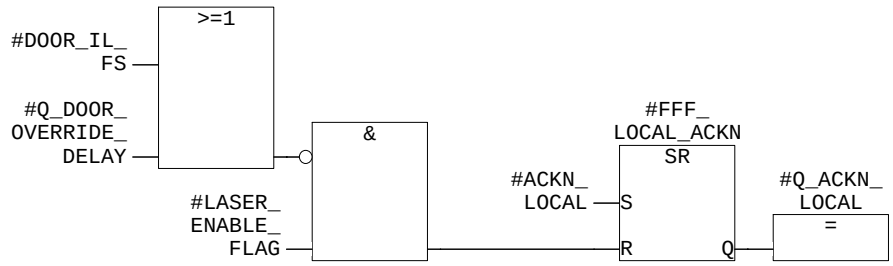
Network: 1 Disable IL system for particular door for x seconds

Trigger Safety Door override delay if DOOR_OVERRIDE_CODE is ok or
DOOR_OVERRIDE_BUTTON is triggered.



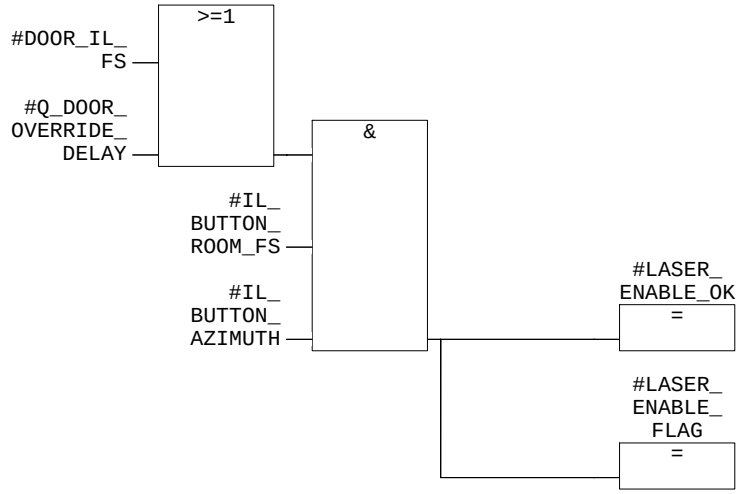
Network: 2 Local Interlock Acknowledge

Local Acknowledge is required if a local door interlock is triggered.
It is realised with a prefered set FF. If the "ACKN_LOCAL is set permanently 1
no acknowledge is required even if an interlock is triggered.



Network: 3 Check IL and enable Laser

Override DOOR_IL with Q_DOOR_OVERRIDE_DELAY. If none of the ILs are triggered /
Enable Laser



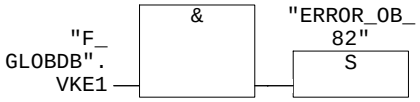
OB82 - <offline>

"I/O_FLT1" I/O Point Fault 1
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/10/2008 12:14:29 PM
Interface: 02/15/1996 04:51:13 PM
Lengths (block/logic/data): 00170 00012 00020

Name	Data Type	Address	Comment
TEMP		0.0	
OB82_EV_CLASS	Byte	0.0	16#39, Event class 3, Entering event state, Internal fault event
OB82_FLT_ID	Byte	1.0	16#XX, Fault identifcation code
OB82_PRIORITY	Byte	2.0	Priority of OB Execution
OB82_OB_NUMBR	Byte	3.0	82 (Organization block 82, OB82)
OB82_RESERVED_1	Byte	4.0	Reserved for system
OB82_IO_FLAG	Byte	5.0	Input (01010100), Output (01010101)
OB82_MDL_ADDR	Word	6.0	Base address of module with fault
OB82_MDL_DEFECT	Bool	8.0	Module defective
OB82_INT_FAULT	Bool	8.1	Internal fault
OB82_EXT_FAULT	Bool	8.2	External fault
OB82_PNT_INFO	Bool	8.3	Point information
OB82_EXT_VOLTAGE	Bool	8.4	External voltage low
OB82_FLD_CONNCTR	Bool	8.5	Field wiring connector missing
OB82_NO_CONFIG	Bool	8.6	Module has no configuration data
OB82_CONFIG_ERR	Bool	8.7	Module has configuration error
OB82_MDL_TYPE	Byte	9.0	Type of module
OB82_SUB_MDL_ERR	Bool	10.0	Sub-Module is missing or has error
OB82_COMM_FAULT	Bool	10.1	Communication fault
OB82_MDL_STOP	Bool	10.2	Module is stopped
OB82_WTCH_DOG_FLT	Bool	10.3	Watch dog timer stopped module
OB82_INT_PS_FLT	Bool	10.4	Internal power supply fault
OB82_PRIM_BATT_FLT	Bool	10.5	Primary battery is in fault
OB82_BCKUP_BATT_FLT	Bool	10.6	Backup battery is in fault
OB82_RESERVED_2	Bool	10.7	Reserved for system
OB82_RACK_FLT	Bool	11.0	Rack fault, only for bus interface module
OB82_PROC_FLT	Bool	11.1	Processor fault
OB82_EPROM_FLT	Bool	11.2	EPROM fault
OB82_RAM_FLT	Bool	11.3	RAM fault
OB82_ADU_FLT	Bool	11.4	ADU fault
OB82_FUSE_FLT	Bool	11.5	Fuse fault
OB82_HW_INTR_FLT	Bool	11.6	Hardware interupt input in fault
OB82_RESERVED_3	Bool	11.7	Reserved for system
OB82_DATE_TIME	Date_And_Time	12.0	Date and time OB82 started

Block: OB82 "I/O Point Fault"

Network: 1



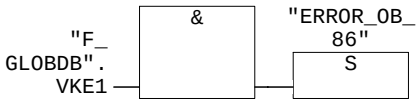
OB86 - <offline>

"RACK_FLT" Loss of Rack Fault
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/10/2008 12:14:42 PM
Interface: 02/15/1996 04:51:04 PM
Lengths (block/logic/data): 00128 00012 00020

Name	Data Type	Address	Comment
TEMP		0.0	
OB86_EV_CLASS	Byte	0.0	16#38/39 Event class 3
OB86_FLT_ID	Byte	1.0	16#C1/C4/C5, Fault identifcation code
OB86_PRIORITY	Byte	2.0	Priority of OB Execution
OB86_OB_NUMBR	Byte	3.0	86 (Organization block 86, OB86)
OB86_RESERVED_1	Byte	4.0	Reserved for system
OB86_RESERVED_2	Byte	5.0	Reserved for system
OB86_MDL_ADDR	Word	6.0	Base address of IM module in rack with fault
OB86_RACKS_FLTD	Array [0..31] Of Bool	8.0	
OB86_DATE_TIME	Date_And_Time	12.0	Date and time OB86 started

Block: OB86 "Loss Of Rack Fault"

Network: 1



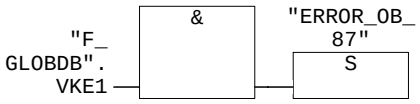
OB87 - <offline>

"COMM_FLT" Communication Fault
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/10/2008 12:14:55 PM
Interface: 02/15/1996 04:51:13 PM
Lengths (block/logic/data): 00122 00012 00020

Name	Data Type	Address	Comment
TEMP		0.0	
OB87_EV_CLASS	Byte	0.0	16#39 Event class 3
OB87_FLT_ID	Byte	1.0	16#XX, Fault identifcation code
OB87_PRIORITY	Byte	2.0	Priority of OB Execution
OB87_OB_NUMBR	Byte	3.0	87 (Organization block 87, OB87)
OB87_RESERVED_1	Byte	4.0	Reserved for system
OB87_RESERVED_2	Byte	5.0	Reserved for system
OB87_RESERVED_3	Word	6.0	Reserved for system
OB87_RESERVED_4	DWord	8.0	Reserved for system
OB87_DATE_TIME	Date_And_Time	12.0	Date and time OB87 started

Block: OB87 "Communication Fault"

Network: 1



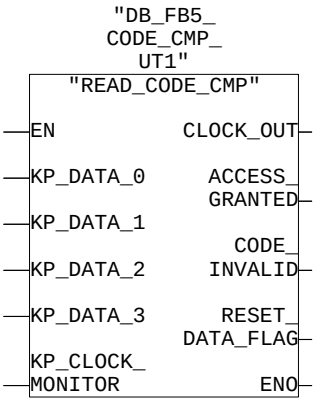
OB100 - <offline>

"COMPLETE RESTART" Complete Restart
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/07/2008 03:26:57 PM
Interface: 02/15/1996 04:51:10 PM
Lengths (block/logic/data): 00146 00036 00026

Name	Data Type	Address	Comment
TEMP		0.0	
OB100_EV_CLASS	Byte	0.0	16#13, Event class 1, Entering event state, Event logged in diagnostic buffer
OB100_STRTUP	Byte	1.0	16#81/82/83/84 Method of startup
OB100_PRIORITY	Byte	2.0	Priority of OB Execution
OB100_OB_NUMBR	Byte	3.0	100 (Organization block 100, OB100)
OB100_RESERVED_1	Byte	4.0	Reserved for system
OB100_RESERVED_2	Byte	5.0	Reserved for system
OB100_STOP	Word	6.0	Event that caused CPU to stop (16#4xxx)
OB100_STRT_INFO	DWord	8.0	Information on how system started
OB100_DATE_TIME	Date_And_Time	12.0	Date and time OB100 started

Block: OB100 "Complete Restart"

Network: 1 Initialise FB5



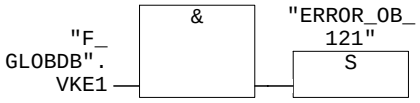
OB121 - <offline>

"Error_FB"
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/10/2008 02:19:00 PM
Interface: 02/15/1996 04:51:14 PM
Lengths (block/logic/data): 00124 00012 00020

Name	Data Type	Address	Comment
TEMP		0.0	
OB121_EV_CLASS	Byte	0.0	16#25, Event class 2, Entering event state, Internal fault event
OB121_SW_FLT	Byte	1.0	16#XX Software programming fault
OB121_PRIORITY	Byte	2.0	Priority of OB Execution
OB121_OB_NUMBR	Byte	3.0	121 (Organization block 121, OB121)
OB121_BLK_TYPE	Byte	4.0	16#88/8A/8B/8C/8E Type of block fault occured in
OB121_RESERVED_1	Byte	5.0	Reserved for system
OB121_FLT_REG	Word	6.0	16#XX Specific register that caused fault
OB121_BLK_NUM	Word	8.0	Number of block that programming fault occured in
OB121_PRG_ADDR	Word	10.0	Address in block where programming fault occured
OB121_DATE_TIME	Date_And_Time	12.0	Date and time OB121 started

Block: OB121 "Programming Error"

Network: 1



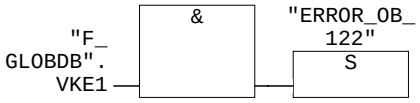
OB122 - <offline>

"MOD_ERR" Module Access Error
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/10/2008 12:15:25 PM
Interface: 02/15/1996 04:51:10 PM
Lengths (block/logic/data): 00124 00012 00020

Name	Data Type	Address	Comment
TEMP		0.0	
OB122_EV_CLASS	Byte	0.0	16#29, Event class 2, Entering event state, Internal fault event
OB122_SW_FLT	Byte	1.0	16#XX Software error code
OB122_PRIORITY	Byte	2.0	Priority of OB Execution
OB122_OB_NUMBR	Byte	3.0	122 (Organization block 122, OB122)
OB122_BLK_TYPE	Byte	4.0	16#88/8C/8E Type of block fault occured in
OB122_MEM_AREA	Byte	5.0	Memory area where access error occured
OB122_MEM_ADDR	Word	6.0	Memory address where access error occured
OB122_BLK_NUM	Word	8.0	Block number in which error occured
OB122_PRG_ADDR	Word	10.0	Program address where error occured
OB122_DATE_TIME	Date_And_Time	12.0	Date and time OB1 started

Block: OB122 "Module Access Error"

Network: 1



DB1 - <offline> - Declaration view

"CODE_ACCESS_FLAGS" CONTAINS CODE ACCESS FLAGS to manage access
Global data block DB 1
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 04/08/2008 05:59:36 PM
Interface: 04/08/2008 05:59:08 PM
Lengths (block/logic/data): 00102 00002 00000

Block: DB1

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	INVALID_CODE_STO_R	BOOL	FALSE	Temporary placeholder variable
+0.1	INVALID_CODE_ANTE_CH	BOOL	FALSE	
+0.2	INVALID_CODE_UT1	BOOL	FALSE	
+0.3	INVALID_CODE_UT2	BOOL	FALSE	
+0.4	INVALID_CODE_UT3	BOOL	FALSE	
+0.5	INVALID_CODE_UT4	BOOL	FALSE	
=2.0		END_STRUCT		