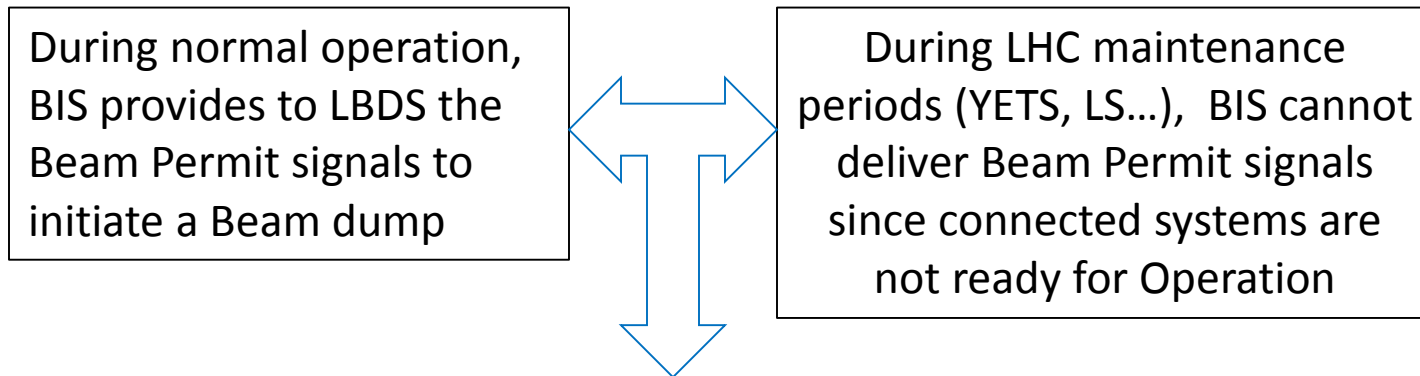


- Why do we need “Local BIS Loops” ?
- local BIS loops proposal
- local BIS loops layout
- Machine protection aspect
- Conclusion

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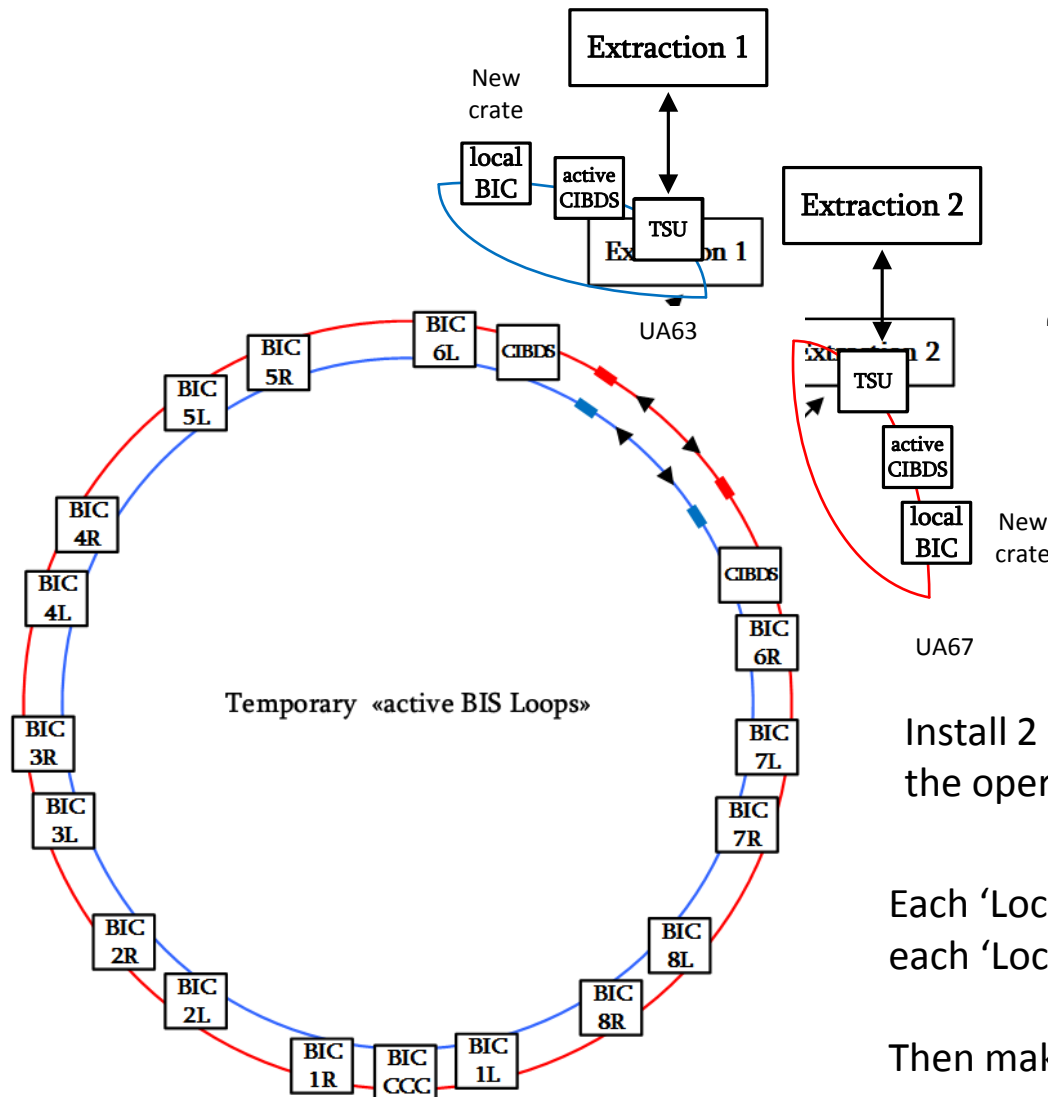
To circumvent this issue,
the installation of two “Local BIS Loops” in point 6 is proposed
in order to provide
a copy of (or simulated) Beam Permit signals to LBDS

These local loops will be also useful in the following cases:

- Test an upgraded version of the CIBDS board (like for EYETS 2016-2017 with a new version of the CIBDS)
- Test an upgraded version of the TSU board (a new version is expected during LS2)
- Test any other element of the LBDS triggering chain after one shut down

- Why do we need “Local BIS Loops” ?
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At the level of “active” BICs, the connection with the TSU must be “bypassed “ in order to close the optical loops. They are then called temporary “active BIS loops”



“local BIS loops”

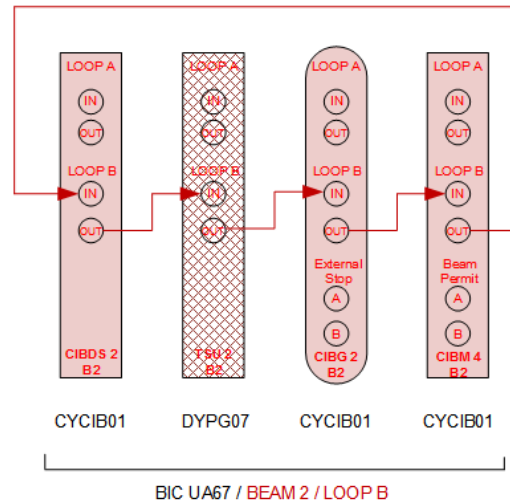
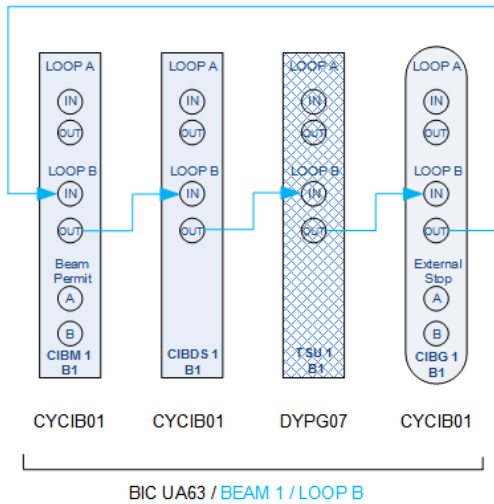
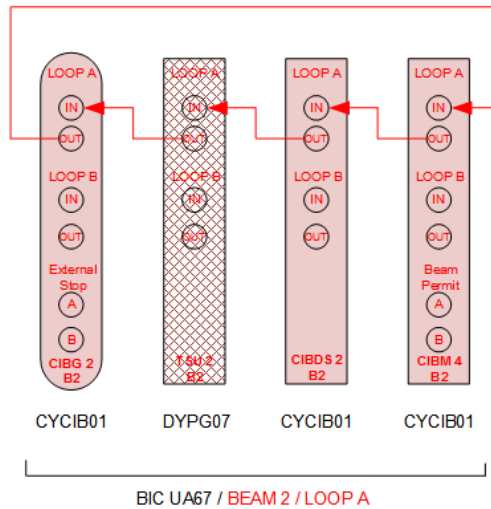
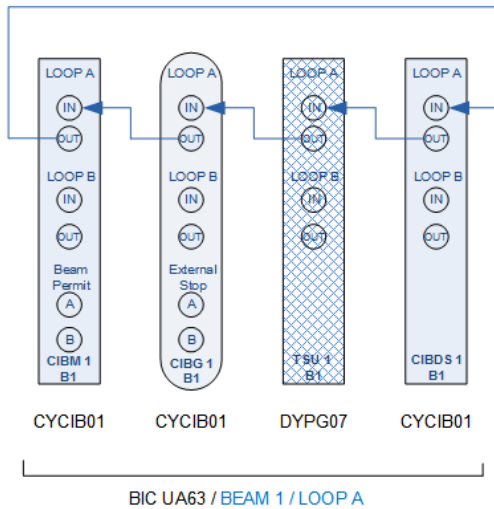
Install 2 new BICs in UA63 and in UA67 (in each of the operational BIS rack)

Each ‘Local BIC’ includes one CIBG and one CIBM, and each ‘Local BIC’ hosts one CIBDS

Then make redundant optical loops in including the TSU

- Why do we need “Local BIS Loops” ?
- local BIS loops proposal
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local BIS Loops optical parts



— Beam1 Frequency A anticlockwise
 — Beam1 Frequency B clockwise

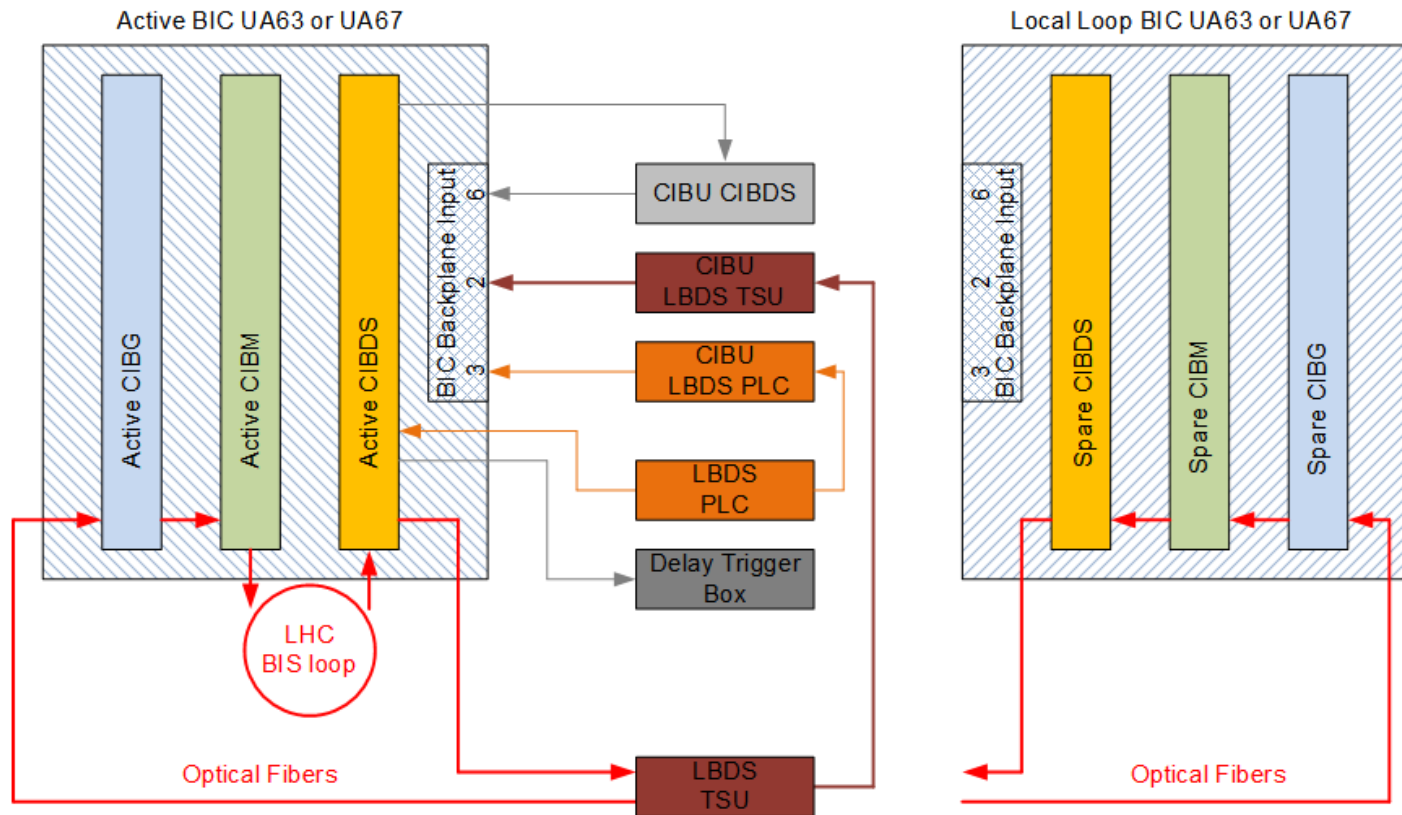
— Beam2 Frequency A anticlockwise
 — Beam2 Frequency B clockwise

- The optical path is reduced to a minimum between the BIS rack (CYCIB01) and the TSU rack (DYPG07)

- One CIBDS board is included in each Local BIS Loops

Note: in order to reduce the complexity there is no link between Beam 1 loops and Beam 2 loops

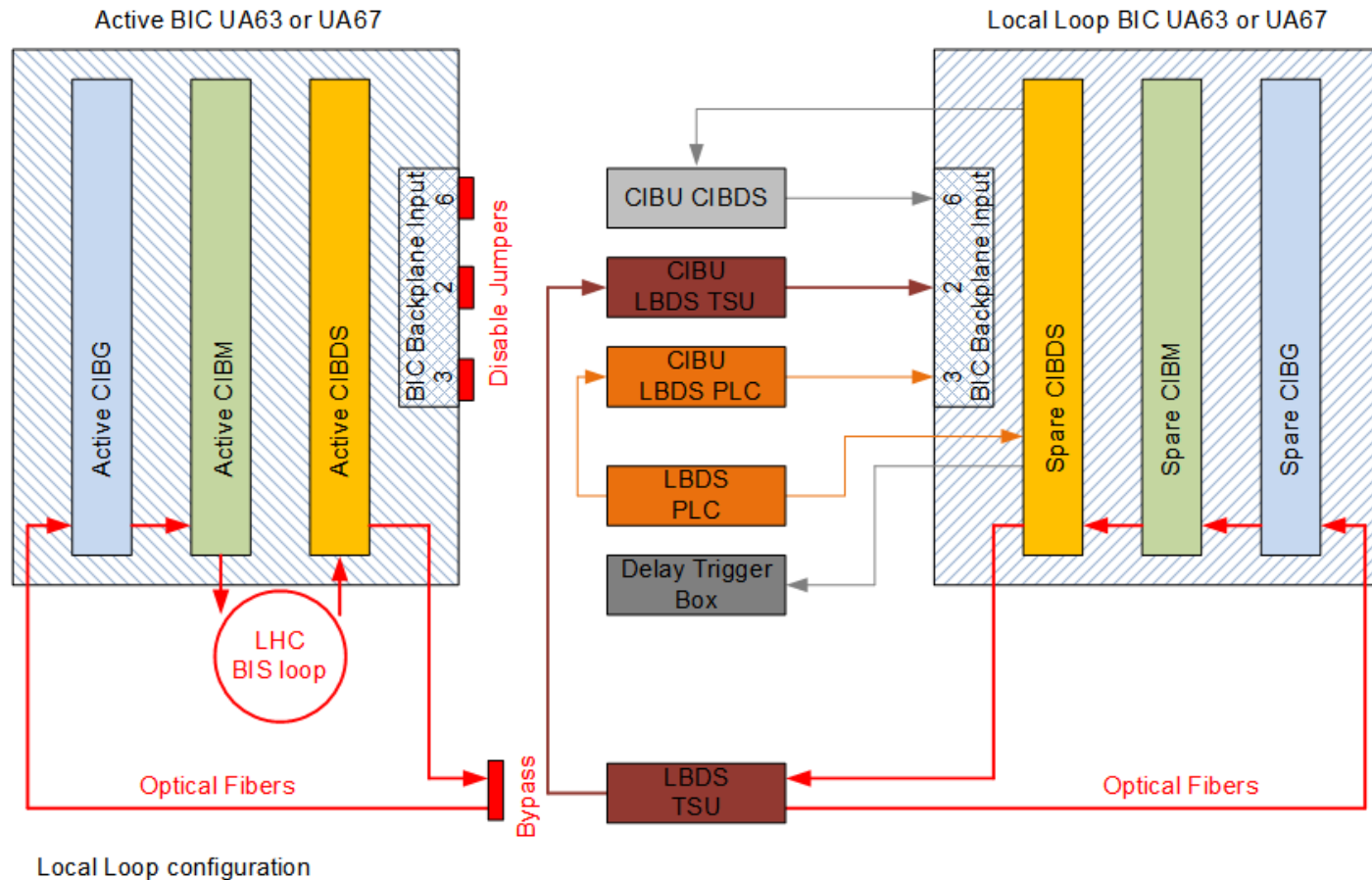
Connected items for normal operation



Normal configuration

During normal operation, the “Local BIS Loops” (together with the related HW) stay in place in UA63 and in UA 67 . The related fiber optics links are not connected.

Active BIS once the local BIS loops were established



In order to close the temporary “active BIS loops” :

- Input #2, #3, #6 must be “disabled” at the level of “active” CIBM
- The connection with the TSU must be “bypassed”

- Why do we need “Local BIS Loops” ?
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One key point for the Local BIS Loops deployment feasibility is to minimise the risks in terms of safety once the operational loops are re-established.

The steps to roll back in operation after the “Local Loops” establishment are detailed in chapter 3.4 of the following document:

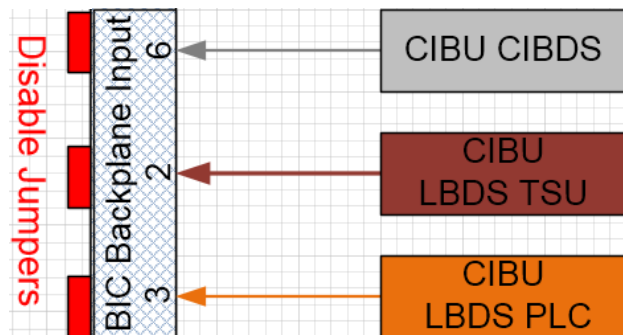
<https://edms.cern.ch/document/1739915/1>

For each action to perform a risk assessment was made and is describes in the next pages.

CIBUs reconnection to the active BIC

Action to be performed	Possible error	Protection	Dependencies	Consequence in case of error
Connect the CIBD, TSU and PLC CIBU on the BIS active BIS backplane	The CIBU is (are) not reconnected	The pre-op check verify the CIBU presence	Database	the LHC SIS will be set to False
	Some CIBU are swapped	The pre-op check verify the expected CIBU ID	Database	the LHC SIS will be set to False

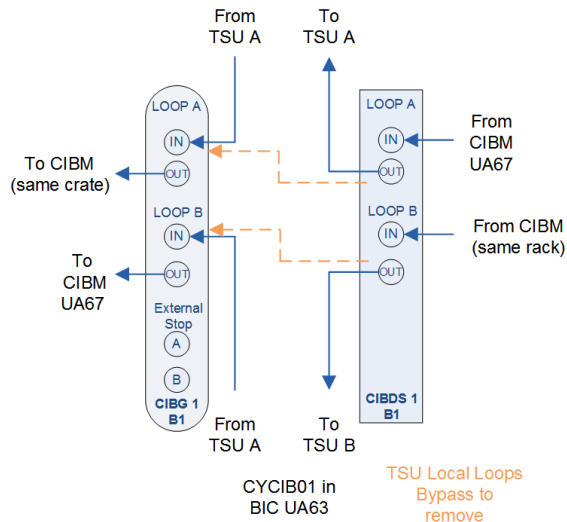
Action to be performed	Possible error	Protection	Dependencies	Consequence in case of error
Remove the 'Disable' jumpers on the active CIBM	The jumper (s) stay in place	The pre-op check verifies all enabled inputs match the BIS Configuration DB	Database	the LHC SIS will be set to False
	The wrong jumper (s) is (are) removed			



Fibres reconnection to close the active loops

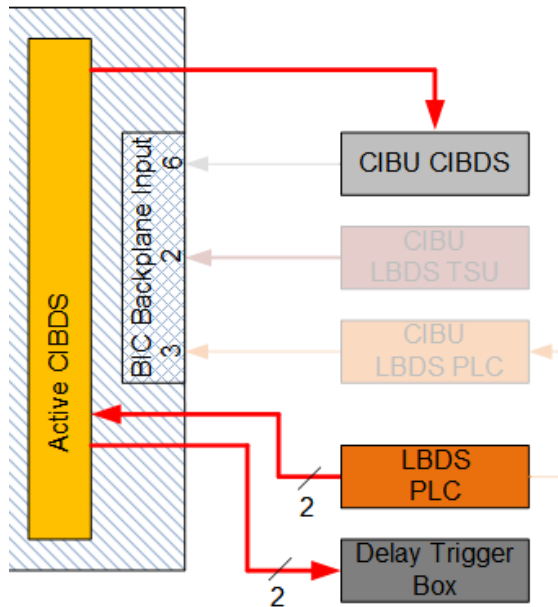
Action to performed	Possible error	Protection	Dependencies	Consequence in case of error
Remove the two optical patch cord between the CIBDS and the CIBG (TSU bypass)	The patch cord are not removed	The active fibres can't be put in place on the CIBDS; see next point	NA	NA

Action to performed	Possible error	Protection	Dependencies	Consequence in case of error
Connect the 4 active fibers on the active CIBDS and CIBG	1) In/Out inverted at the CIBO level 2) Loop A and Loop B inverted	CIBDS	VHDL & sequencer	No frequency or wrong frequency on the CIBDS; The CIBDS will give a User Permit to false to its connected CIBU; the loop can't be armed (local permit false)
		TSU	VHDL & sequencer	Wrong frequency or no frequency on the TSU; The TSU will give a User Permit to false to its connected CIBU; the loop can't be armed (local permit to false)
		CIBG	VHDL (latch mode)	The CIBG don't receive or receive a wrong return frequency; the output frequency is removed 400 Us after receiving the start command (the Beam Permit is set to false)



Reconnect the cables to the CIBDS

Action to performed	Possible error	Protection	Dependencies	Consequence in case of error
Connect the Lemo 8 pin cable "CIBU LBDS" on the active CIBDS	The cable is not connected	CIBU	VHDL (fail safe)	The CIBU will provide a User Permit to false; the loop can't be armed (local permit false)
Connect the 2 Lemo 2 pin cables "Pulse to delay box" on the active CIBDS	The cable(s) is (are) not connected	Delay trigger box	fail safe (pull down)	LBDS PLC CIBU User Permit to false; the loop can't be armed (local permit false)
	The cables are swapped	none	none	Functionality ensure; discrepancies in monitoring
Connect the 2 Lemo 4 pin cables "LBDS local mode" on the active CIBDS	The cable(s) is (are) not connected	CIBDS	CIBDS hardware	In normal mode the dump can't be inhibited (fail safe)
		LBDS PLC	Code	LBDS PLC read back error; system cannot be armed
	The cables are swapped each over	none	none	Functionality ensure; discrepancies in monitoring



After re-establishing the normal BIS configuration the following tests need to be made without beam in the presence of a BIS expert:

- Run the BIS pre-operational check and verify that all tests are passed successfully

Unlink the BIS loops of beam 1 and beam 2

- Arm the BIS of beam 1, open the B1 loops via the Operator switch, verify history buffers (BIS, TSU, MKD)
- Repeat above checks for beam 2

Link the BIS loops of beam 1 and beam 2

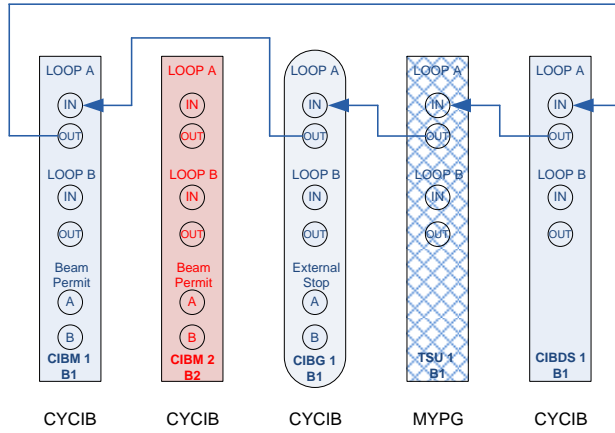
- Link the BIS loops of beam 1 and beam 2 and repeat all above checks

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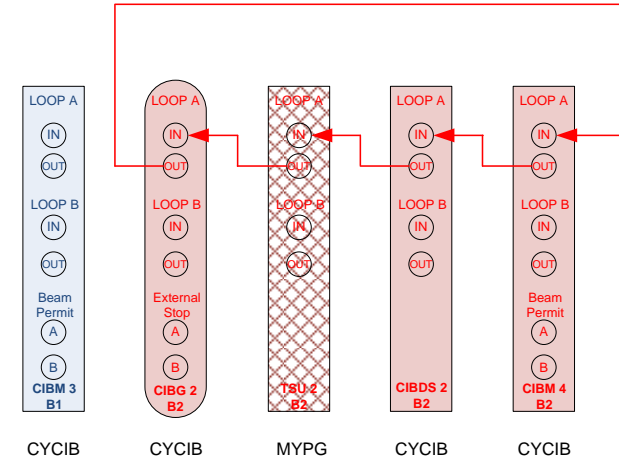
- ❑ Only few manipulations are required on the “active BIS loops” to setting-up the “local BIS loops”
- ❑ The “local BIS Loops” can be deployed in approximately 1 hour
- ❑ These “local BIS Loops” will be useful to validate the elements included in the critical dumping system chain (new CIBDS, new TSU ...)
- ❑ When the “local BIS Loops” are established, the “active BIS loops” can be closed
- ❑ Currently no machine protection risks are identified when the “active BIS loops” are re-established

Spare slides

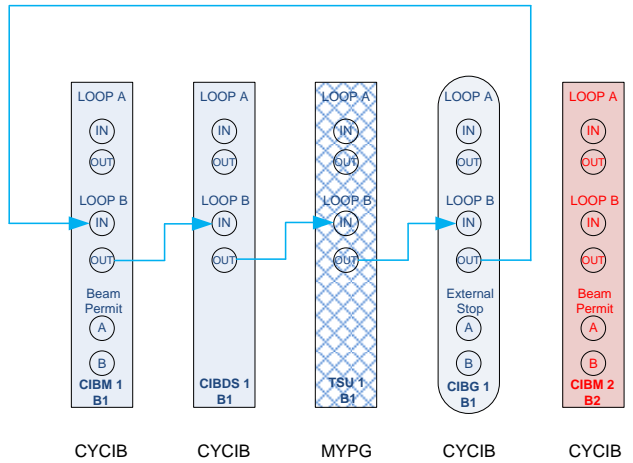
BIS local Loop layout without B1 & B2 link



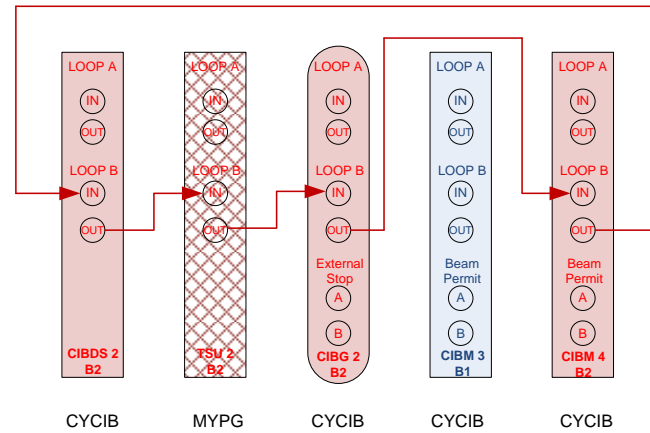
BIC UA63 / BEAM 1 / LOOP A



BIC UA67 / BEAM 2 / LOOP A



BIC UA63 / BEAM 1 / LOOP B



BIC UA67 / BEAM 2 / LOOP B

Optical fiber

- Beam1 Frequency A anticlockwise
- Beam1 Frequency B clockwise

Optical fiber

- Beam2 Frequency A anticlockwise
- Beam2 Frequency B clockwise