Phase 2 tests @BCI

- CLBs configured with NG- alpha6 f/w

Check on CLB-9:

Power-up CLB-9 → it gets stuck in Golden image → one must command “mboot 1” and it loads the runtime image but it does not synchronize. Pinging ok, but error when trying to make it into run state (Error INV_STATE (4): invalid state”

1. Tried to connect it to a different WWRS port but situation does not change

Voltage check:
Power at connector: 11.4 V

→ increase voltage

CLB-9 Voltage = 11.92 V *when all other CLBs are powered*

CLB-9 Voltage = 12.28 V *when all other CLBs are NOT powered*

→ ~0.02 V drop every CLB powered on

Planned tests:

1. Configure switches so that all ports are active at start (standard configuration), all CLBs’ fibres are connected, and try to power-up the CLBs one at a time
2. Configure switches so that all ports are down at start, all CLBs are powered-up together, and try to activate ports, enabling connections, one by one.

Note: before any attempt, a complete power-cycle has been done (CLBs + WWRS)

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1 - POWER UP ONE CLB AT A TIME WITH PORTS ALL ACTIVE

Power up one CLB at a time, starting with CLB 9

1° attempt

1) CLB-9 receives 12.28 V and it automatically boots the runtime image, synchronizes and goes into run state

   update: it doesn’t boot automatically anymore, need to boot manually

2) After powering up 2 other CLBs the CLB-9 goes back into Golden image and de-synchronizes. Tried to power down again the 2 other CLBs and reset the CLB-9 but still it got stuck in Golden image and after manually booting it did not synchronize...

update: complete power cycle (shut down also WWRS) → power up CLB-9, had to manually boot this time → CLB-9 synchronizes → as soon as CLB-8 is powered on, CLB-9 gets back to Golden image (reset) mmm … maybe electric contact for CLB-8 , check cable!

update: problem solved (Luigi), it was a cable issue for CLB-8

2° attempt

Turn on CLB-9 and then others one by one. This time CLB-9 synchronized. CLB-3 did not synchronize.

As soon as CLB-14 is turned on, also CLB-8 de-synchronizes! And now CLB-14 does not boot automatically the runtime image and does not synchronize….

3° attempt

Change order of powering-up: CLB-9,14,3 did not synchronize.

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2- BRING UP PORTS ONE BY ONE, ALL CLBs POWERED-ON

Test: change enabling_switch.sh file in WWRS-A & B in order to turn down all ports at start. Then restart switches and power on CLBs. Bring up ports one at a time and run the corresponding CLB. *Refer to the following scheme for association port-CLB:*

	WWRS Port	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A	type	DWRS B	*IL WWRS-B*	1*	2	3	4	5*	6	7	8	9*	*11*	*12*	*13*	*15*	*16*	*17*	base
B	type	DWRS B	*IL WWRS-A*	10*	11	12	13	14*	15	16	17	18*	*2*	*3*	*4*	*6*	*7*	*8*	base

1° attempt

Start with port 11A (CLB 9*) → Boot automatically but NO SYNC

then:

11B (CLB 18*) → OK

3A (CLB 1*)→ OK

3B (CLB 10*)→ OK

4A (CLB 2)→ OK

4B (CLB 11)→ Ok

5A (CLB 3)→ NO SYNC

5B (CLB 12)→ OK

6A (CLB 4)→ DEAD, no led, checked with power meter → no signal coming out from that port

6B (CLB 13)→ OK

7A (CLB 5*)→ OK

7B (CLB 14*)→ OK

8A (CLB 6)→ OK

8B (CLB 15)→ OK (but no running: ERROR 9 - device error)

9A (CLB 7)→ NO SYNC + LED OFF

9B (CLB 16)→ OK

10A (CLB 8)→ NO SYNC

10B (CLB 17)→ OK

18A (BASE) → OK

Turned on the redundancy of CLB-4 (i.e. bring up port 14-B) and suddenly also port 6-A turns on! Is port 6-A really active now? Bring down again port 14-B, but CLB-4 does not synchronize via its port 6-A. → hence bring down 6-A again and activate redundancy on 14-B → CLB-4 runs correctly at this point. (*see later* ***(*)***)

CLBs 8 and 5 are not synchronized → try to activate redundancies and bring down ports on WRS-A → reset those CLBs → they automatically boot but they are still de-synchronized and leds on redundancies ports on WRS-B are orange.

2° attempt

Power cycle again and bring up ports one at a time.

This time:

-3A (CLB 1*) → No Sync

-8B (CLB 15) → Led Off Despite port brought up

-5A (CLB 3) → No Sync

-11A (CLB 9*) → No Sync

-9A (CLB 7) → No Sync

Tried with redundancies, but result doesn't change

3° attempt

Power cycle again and bring up ports one at a time, but without running them. Running done only at the end of the process.

CLBs 1,2,3,7,8,9 No Sync (orange port's led)

Activate redundancies: after a while CLB 2 synchronizes. De-activate redundancy and open its port on WR-A → it synchronizes → CLB 2 "recovered"

All other redundancies don't work instead, as usual.

- CLB 10 sometimes disconnects (led off, stops pinging)... its port is still up (checked with multimeter), and leds on CLB blink… clean fibre and reset → now it seems it doesn't disconnect anymore.
- Switch CLB-7 port with another one "working" (move CLB-7 to port 5) but it doesn't change, led still orange → seems like it is a CLB problem (?), not a port one.
- **(*)** Led of port 6A has turned on → the port is down (checked also with power meter), moreover I disconnect the fibre from the port but the led keeps being on! Probably it is just a led error.
- Clean all problematic CLBs' fibers, and checked with power meter that from CLBs' signals come out, so it is not a problem of fibers.

When turning on the switches, sometimes 1 or 2 leds of some casual ports are on, even if CLBs are still turned off. But this doesn't seem to affect situation, probably it is just a led error.

4° attempt

Same test again, running only at the end. First ports brought up are the ones of CLB-1,3,7,8,9.

This time CLB-1 is OK, while still CLBs-3,7,8,9 No Sync.

5° attempt

Same test again but bring up ports *rapidly*, without waiting for synchronizations: total mess, CLB 1,3,5,7,8,9 but also 12, 17 doesn't synchronize. Some of them (5,17) do not ping neither.

6° attempt

Power cycle again. First bring up **redundant** port of CLBs 3,7,8,9 → No Sync

Then try to connect CLB-1 with fiber of BASE CLB (i.e. with port of BASE CLB) → No Sync

Reconnect the BASE fiber to BASE CLB (i.e. to its own port) → BASE Synchronizes, OK

→ Definitely exclude a port/switch issue??

- At this point we have focused attention to “misbehaving” CLBs: 1,3,7,8,9

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3- DIRECT CONNECTION CLB-1,3,7,8,9 with WRS-B

Try to make a direct connection of CLBs 1,3,7,8,9 with port 10B.

Connect CLB-1 → synchronizes + run OK

Shut off. Connect CLB3. Turn on → no sync

Shut off. Connect CLB7. Turn on → Sync + run OK

Shut off. Connect CLB8. Turn on → no sync

Shut off. Connect CLB9. Turn on → Sync + run OK

Shut off. Connect CLB-1 → Sync + run OK. Connect directly also one other CLB from the selected ones (without power-cycling) with the remaining direct fibre on WRS-B (the one of CLB-18) → None of them sync.

Seems like CLB-1,7,9 synchronize only if connected at shut on...

Actually managed to synchronize CLB-9 at shut on and then connect CLB-1 with direct fiber of CLB-18 and this also synchronizes. But if I change CLB-1 with 3,7,8 they won’t. Put back to CLB-1 and it synchronzes.

4- DIRECT CONNECTION CLB-1,3,7,8,9 bypassing splitter

- Make direct connection with LC-LC junctions of CLB-3,7,8 to WRS-B redundant ports → same situation as before: 1,9 Sync + 3,7,9 No Sync.
- Make direct connection of CLB-1 and 9 to their own ports in WRS-A with backup fibres and direct connections w. LC-LC junc. of 3,7,8 to WRS-A → CLB-1 sync, 3,7,8,9 No Sync.
- Implement all direct connections with backup fibres to ports 3B,4B,5B,6B…

  → CLB-1 and 9 sync, 3,7,8 No Sync

  But when I put back CLB-9 on its original port 4A: No Sync, no automatic booting

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5- CONNECTION CLB-1,3,7,8,9 with DRY SWITCH

To exclude involvement of the WRSS, we tried to connect those CLBs to the Dry Switch.

Powering-up the CLBs one after the other:

1,7,9 → Sync

3,8 → No Sync

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6- AFTER SCB SWITCH

To investigate whether problems could be due to an SCB issue, we switched the SCBs of the WWRS-A and B.

Then we activated all ports at start (std switch configuration), and redundancies are removed by disconnecting redundant fibres from the splitter. All the CLBs powere-up together.

1° attempt

CLB 5,9,14,18 stuck in Golden → mboot 1

8,9: No Sync

All others: Sync

CLB 13 port on B no signal, check with power meter → no signal from the port. Connect redundancy on A → CLB 13 sync!

2° attempt

5,9,14,18 stuck in Golden

13 port on B no signal

3,7,8,9: No Sync

All others: Sync

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7- POWER UP ONE AFTER THE OTHER

In the last test all ports are active at start. Redundancies are removed from the splitter. CLBs are powered one after the other. In this configuration **ALL THE CLBS ARE CORRECTLY SYNCHRONIZED AND GO INTO RUNNING STATE!**

Shut off and turned everything on at once → 1,3,7,8,9 No Sync.

→ measure Voltage on Sync and No Sync CLBs → no differences found

Shut off and turned on one by one (order: 4-3-1-7-8-9) : 1,7 Sync. 3,8,9 No Sync.

Shut off and turn on one by one (same order as for the first time: B-1-2-3-4-..-18):

When I power up CLB 1 and 2, immediately BASE CLB turns down and up again… this was seen also the first time.

This time only CLB3 does not synchronize, but the led is off in the port… mabye error of the switch. Open redundant link, still does not synchronize, even after power-cycling it.

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8- POWER UP ONE INDIVIDUALLY

- **8.1**

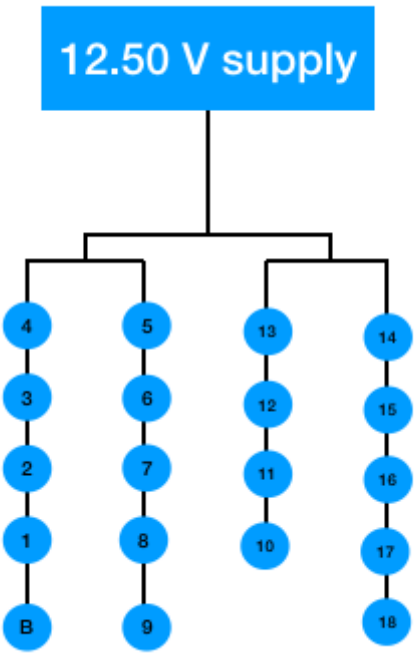
Power-up individually CLBs, make them into running state and measure voltage.

CLB	STATUS	RUN	VOLTAGE (V)
4	TRACK_PHASE	✔	12.48
3	TRACK_PHASE	✔	12.48
2	TRACK_PHASE	✔	12.48
1	TRACK_PHASE	✔	12.48
BASE	TRACK_PHASE	/	12.59
5	TRACK_PHASE	✔	12.49
6	TRACK_PHASE	✔	12.48
7	TRACK_PHASE	✔	12.48
8	TRACK_PHASE	✔	12.48
9	TRACK_PHASE	✔	12.46
13	TRACK_PHASE	✔	12.50

12	TRACK_PHASE	✔️	12.50
11	TRACK_PHASE	✔️	12.50
10	TRACK_PHASE	✔️	12.49
14	TRACK_PHASE	✔️	12.50
15	TRACK_PHASE	❌	12.50
16	TRACK_PHASE	✔️	12.49
17	TRACK_PHASE	✔️	12.50
18	TRACK_PHASE	✔️	12.49

- **8.2**

Now try to power them up sequentially following the branches of the power supply:



so 4,3,2,1,B,5,6,7,8,913,12,11,10,14,15,16,17,18

CLB	STATUS	RUN	Final voltage when all are ON (V)

4	TRACK_PHASE	✔️	12.14
3	TRACK_PHASE	✔️	12.12
2	TRACK_PHASE	✔️	12.11
1	TRACK_PHASE	✔️	12.10
BASE	TRACK_PHASE	/	12.10
5	TRACK_PHASE	✔️	12.14
6	TRACK_PHASE	✔️	12.12
7	TRACK_PHASE	✔️	12.11
8	TRACK_PHASE	✔️	12.09
9	TRACK_PHASE	✔️	12.09
13	TRACK_PHASE	✔️	12.26
12	TRACK_PHASE	✔️	12.24
11	TRACK_PHASE	✔️	12.23
10	TRACK_PHASE	✔️	12.23
14	TRACK_PHASE	✔️	12.25
15	TRACK_PHASE	❌	12.23
16	TRACK_PHASE	✔️	12.22
17	TRACK_PHASE	✔️	12.21
18	TRACK_PHASE	✔️	12.21

*For CLB 5,9,18 had to “mboot 1” manually

Coming soon: measure of transients during booting of CLBs.

- **8.3**

2° attempt

Change order of sequence: start with CLB1: power up CLB3, as soon as the cable is plugged, CLB1 shuts off and on again. After this reboot however CLB-1 is *no more synchronized, nor is the CLB-3*. **(*)**

Continue to power on CLB-2, 9, 8, 7 → 2,7 Sync. 8,9 No Sync. ***This happened also in this case for CLB-9 and 8 (see later also).**

- OK, let's shut everything off and make also a WWRS power cycle. Now what happens if I power on ONLY CLB-1?

First of all I had manually boot it. But then it did NOT synchronized, not even in **standalone** configuration. Turn OFF / On again x4 times → **never synchronizes.**

3° attempt

Shut everything off. Try again sequential powering, starting from CLB-3.

CLB-3 Sync, then CLB-4 on → as soon as cable plugged in, CLB-3 reboots → both 3,4 No Sync now! ...

- Let's check that: apparently if you turn on a CLB in the 4,3,2,1,B power branch and then you plug an adjacent one, especially (but not always, it was seen also for CLB-1 → Base) if the adjacent one comes before in the chain of powering, the first CLB reboots and then sometimes loses its synchronization. This has happened also for CLB-9 and 8 in the other power branch.

There is definitely something wrong with the way we provide current to the CLBs. It could be the reason why apparently only specific sequences gave the desired outcome, whereas other did not.

However**,** this may not be the only source of error. As a matter of fact, **when I tried to shut off everything and power up individually CLBs 3 and 8, both of them now did not synchronize,** while I would expect them to do so if they are the only CLB powered on and any kind of disturbance with other CLBs is present at the moment of booting…

- **8.4**

Finally, let's try to reproduce the situation in 8.2

Apply the same sequence of powering → all CLBs Sync and RUN ✔️

Measure voltages in CLBs' rails (following Diego's scheme) and check whether they are different from nominal values and/or whether there are differences between sync. and non-sync. CLBs:

CLB	Nominal 3.3V (Volts)	Nominal 2.5V (Volts)	Nominal 1.0V (Volts)	Nominal 5.0V (Volts)	Nominal 3.3V (Volts)	Nominal 1.8V (Volts)
4 SYNC	3.310	2.520	1.003	4.966	3.281	1.770

3 NO SY.	2.313	2.506	1.005	4.946	3.299	1.779
2 SYNC	3.309	2.543	1.004	4.966	3.278	1.773
10 SYNC	3.303	2.512	1.003	4.969	3.276	1.797