Document Approval:

Originator: Courtney Curtis, Profile Monitor Controls Engineer	*Courtney Curtis* Courtney Curtis (Jun 15, 2021 11:50 PDT)
Approver: Jeremy Mock, Profile Monitor Controls Lead	*Jeremy Mock* Jeremy Mock (Jun 15, 2021 13:38 PDT)
Approver: Debbie Rogind, Controls Software Head	*Debbie Rogind* Debbie Rogind (Jun 15, 2021 11:47 PDT)

Revision History

Revision	Date Released	Description of Change
R0	6/15/2021	Original Release.

Table of Contents

1. Purpose

This is a checkout plan for the profile monitor system equipment within a rack. This procedure shall be performed after a given rack has been energized but before any long-haul cables leaving the racks have been connected to ensure the system controls are properly installed and configured.

The equipment in a rack that composed the profile monitor system is described in LCLS-II Profile monitor Engineering Specifications, LCLSII-2.7-ES-0625-R0, and consists of an Industrial PC attached to a SLAC-designed chassis. The chassis can connect to and provide controls for up to 4 profile monitors or profile monitor-like devices, such as tune up dumps, on the beam line. The chassis connects to the SLAC EPICS control system through an IOC hosted on the Industrial PC. The communication between the host Industrial PC and the chassis is handled by an EtherCAT coupler whereby the EtherCAT master is hosted on the Industrial PC and the coupler in the chassis acts as a slave. The physical connection is with a single Ethernet cable linking the devices together from J6 on the chassis to Ethernet port 1 on the IPC. The chassis also sends limit switch in and out positions directly to MPS without relying on the control system from a DB-37 connector J5 to the MPS link node. The chassis receives EVR timing via an EVR timing fiber connected to SFP on frame grabber in PCIe slot on IPC. The connection to the camera is made through QSFP+ on the frame grabber connecting to a FODU in the same rack. This provides the termination point for the fiberoptic trunk that goes into the tunnel to another FODU to connect to the cameras via a RCX C-link module.

2. References

Associated Document(s) Reference Number	Document Title
LCLSII-2.4-PR-0169-R0	Injector/Linac Profile Monitor System Requirements
LCLSII-2.7-PP-0948-R0	Profile Monitor Acceptance Test Procedure
LCLSII-2.7-FR-0677-R2	LCLS-II Profile Monitor Controls Functional Requirements Specification
LCLSII-2.7-ES-0625-R0	LCLS-II Profile monitor Engineering Specifications
LCLSII-2.7-IC-0266-R1	Electron Beam Controls to Accelerator Systems, Cryogenic Systems, Photon Systems, and Infrastructure Systems

3. Roles and Responsibilities

Only the personnel listed in the table below are authorized to perform the work in this procedure.

Jeremy Mock	AD EED Profile Monitor Controls Lead
Courtney Curtis	AD EED Profile Monitor Controls Engineer

4. Safety Guidelines

All SLAC safety requirements shall be followed. The proper rack power on procedure shall be followed prior to execution of this procedure. No long-haul cables leaving the rack connecting to equipment on the beamline shall be connected during this procedure. Tester shall stop work if any conditions arise that lead to unsafe working conditions.

5.   Preparation / Prerequisite Actions

5.1   Office Preparation / Prerequisite Actions

1.   Ensure configuration of IPC with nodename listed above following steps outlined here: https://confluence.slac.stanford.edu/display/LCLSControls/LinuxRT+Boot+-+Quick+Start-up

2.   Create ipxe file for IPC at /usr/local/common/tftpboot/linuxRT/boot/ipxe/<nodename>.ipxe This file should contain the commands:

3.   set vers buildroot-2016.11.1-x86_64

4.   set extra-args brd.rd_size=524288 pcie_aspm.policy=performance pci=noaer

5.   Add IPC to screeniocs file located at /usr/local/lcls/epics/iocCommon/All/Prod/screeniocs

6.   Add IPC to IOCManager EPICS application, AlarmConfigs-ntwk, and appropriate control screens

5.2   Field Preparation / Prerequisite Actions

1.   IPC disconnected from rack AC power

2.   Chassis disconnected from rack AC power

3.   Cables connecting to J1, J2, J3, J4, J5, and J6 on chassis disconnected

4.   Ethernet connection between IPC and EPICS control system on port "CA"

5.   Ethernet connection between IPC and management network on port "MGT"

6.   Ethernet connection through adapter dongle made between terminal server and "console" port on IPC

7.   EVR timing is available

8.   EVR timing fiber connected to SFP on frame grabber in PCIe slot on IPC

9.   Camera connection between QSFP+ on frame grabber and FODU in same rack established.

10. Ethernet connection between port "1" on IPC and J6 on chassis

6.   Check Out Procedure

1.   Connect the chassis power cord to the rack power strip and turn on the chassis power. Wait 60 seconds while the EtherCAT coupler boots up.

2.   Connect to IPC terminal screen with iocConsole

   a.   iocConsole <nodename>

3.   Plug in both IPC power plugs to the rack power strip. The IPC should start its boot up process

4.   Watch the boot up process in the console. Verify it reaches the end without errors

5.   Detach from the console. Ping the IPC

   a.   ping <nodename>

6.   Connect to the IPC in a terminal as the laci user

a. ssh laci@<nodename>

7. Type "ifconfig –a" and look for the eth0 connection. It should have IP address 192.168.1.1 and have status UP

8. Type "ethercat slave" and verify the output is the same as that shown in Appendix A below.

9. Type "lspci | grep –i slac" and look for the following line:

a. 04:00.0 Signal processing controller: SLAC National Accelerator Lab PPA-REG Device 2020

7. Profile Monitor Device Checkout Checklist

7.1 Device Information

MAD Name	Control System Name (Device Prefix)	Testers	Date

Hardware Information: Optionally enter hardware information to aid in checklist.

Host IOC	IPC Host node name	Control chassis location	Camera Z-Location(ft)	Camera Channel	Chassis Channel

7.2 Office Preparations / Prerequisite Actions:

IPC configured with nodename	
ipxe file created for IPC	
IPC added to screeniocs	
IPC added to IOCManager EPICS application, AlarmConfigs-ntwk, and appropriate control screens	

7.3 Field Preparations / Prerequisite Actions:

All long-haul cables terminated and disconnected	
Ethernet connected properly	
EVR timing connected & available	
Frame grabber & FODU camera connection established	

7.4 Rack Startup Procedure:

Connect chassis power and start up	
Connect to IPC with iocConsole	
Plug in IPC plugs and watch bootup process	
Connect to IPC as laci	

Confirm eth0, ethercat slave, and signal processing controller	

8. Sign Off

If the above conditions are met, the control system is ready to connect profile monitor devices to.

I, _____, attest that the above steps were completed.

_____   _____

      (signature)   (date)

9. Comments:

10. Appendix A

This is what the output of the ethercat slave command should show:

[Development laci@cpu-b34-pm01]$ ethercat slave

0 0:0 OP + EK1101 EtherCAT-Koppler (2A E-Bus, ID-Switch)

1 0:1 OP + EL4002 2K. Ana. Ausgang 0-10V, 12bit

2 0:2 OP + EL2872 16K. Dig. Ausgang 24V, 0.5A

3 0:3 OP + EL2872 16K. Dig. Ausgang 24V, 0.5A

4 0:4 OP + EL2872 16K. Dig. Ausgang 24V, 0.5A

5 0:5 OP + EL1872 16K. Dig. Eingang 24V, 10µs

6 0:6 OP + EL1872 16K. Dig. Eingang 24V, 10µs

7 0:7 OP + EL1872 16K. Dig. Eingang 24V, 10µs

8 0:8 OP + EL1872 16K. Dig. Eingang 24V, 10µs