

Product Assembly Document

Antenna Processing Subrack Clock and Translator (APSCT)

PCB nr.: 03116

	Organisatie / Organization	Datum / Date
Auteur(s) / Author(s): Gijs Schoonderbeek Sieds Damstra	ASTRON	11-03-2022
Controle / Checked: M. Gerbers	ASTRON	09-02-2022
Goedkeuring / Approval: N. Ebbendorf	ASTRON	
Autorisatie / Authorisation: W. van Cappellen Handtekening / Signature	ASTRON	

© ASTRON

All rights are reserved. Reproduction in whole or in part is prohibited without written consent of the copyright owner.



This publication is part of the project DUPLO with project number 175.2017.012 of the research program "Investerings NWO-groot" which is (partly) financed by the Dutch Research Council (NWO).

Doc.nr.: PAD00054
Rev: 1.0
Date: 11-03-2022
Class.:

Distribution list:

Group:	Others:
S. Damstra G.W. Schoonderbeek N. Ebbendorf	A. v. Duin

Document history:

Revision	Date	Chapter / Page	Modification / Change
0.1	05-01-2022	-	Creation
0.2	31-01-2022	-	Review
0.3	09-03-2022		Review Marchel Gerbers
0.4	10-03-2022		Process review
1.0	11-03-2022		Final

Table of contents:

1	Introduction.....	4
1.1	Document Scope	4
1.2	List of Terms and acronyms	4
1.3	Applicable documents (AD)	4
1.4	Reference documents (RD)	4
1.5	Label information	4
2	IPC Quality standards	5
2.1	Design.....	5
2.2	Assembly	5
3	Description	5
4	Items to assemble	5
4.1	PCB Manufacturer and EMS serial / lot number	6
4.2	SMD Assembly	6
4.3	Press-fit.....	6
4.4	Light-pipes	7
4.5	Mounting of front panel.....	7
4.6	Mounting of Raspberry Pi CM4 module	7
4.7	Set switches and place jumpers	8
4.8	Serial number placement.....	8
5	Precautions	9
6	Delivery and logistics.....	9
7	Annexes	10
7.1	Assembly drawing	10

1 Introduction

1.1 Document Scope

This document is intended for PCB assembly manufacturers and test facilities. It describes the assembly of a LOFAR2.0 APSCT. More information about the production of the CCD can be found in [AD-1]. In section 2 an overview of the most important applicable standards are given and special requirements/treatments if needed. Section 4 describes the assembly steps to complete the PCB / module.

1.2 List of Terms and acronyms

APSCT	Antenna Processing Subrack Clock and Translator
BOM	Bill Of Material
IPC	Association Connecting Electronics Industries
PCB	Printed Circuit Board
PCBA	Printed Circuit Board Assembly
EMS	Electronics Manufacturing Services, Assembly company

1.3 Applicable documents (AD)

Ref.nr.	Doc. number	Title	Author
AD-1	PMS00044	APSCT Product Manufacturing Specifications	Gijs Schoonderbeek

1.4 Reference documents (RD)

Ref.nr.	Doc. number	Title	Author
RD-1	TPR00019	APSCT Test plan	Gijs Schoonderbeek
RD-2	014974-01	Mechanical drawing APSCT module	Jeroen Herrewijnen

1.5 Label information

A small readable label has to be placed onto the designated area of the assembled board and a label on the front panel, see section 4.8. The labels shall be equal and must contain the items:

Product name → APSCT (5-digits)
 Batch number → YY (last 2 digits year) WW (week nr.) D (day)
 Serial number → 5-digits, starting with 00000

Basic; APSCT -YYWWD-YYYYY
 Example: APSCT-22091-00100

The information has to be printed in readable text at least 5mm high together with a QR-code pointing to the ASTRON database.

Example:



APSCT -YYWWD-YYYYY



This publication is part of the project DUPLO with project number 175.2017.012 of the research program "Investeren NWO-groot" which is (partly) financed by the Dutch Research Council (NWO).

Doc.nr.: PAD00054
 Rev: 1.0
 Date: 11-03-2022
 Class.:

2 IPC Quality standards

2.1 Design

IPC requirement	Comment
IPC 2221B	Class 2 Dedicated Service Electronic Products
IPC 2222B	Type 3, Multilayer Printed Board without blind and buried via's

2.2 Assembly

IPC requirement	Comment
IPC-A-610	Class 2 Dedicated Service Electronic Products

Production tests are described in RD-1

3 Description

A functional description for the LOFAR2.0 APSCT can be found in the "Product Manufacturing Specification" document [AD-1].

4 Items to assemble

Item nr.	Amount	Description	Remarks
#1	1	APSCT board assembly	SMD components
#2	~25	Non SMD components (connectors)	
#3	10	Press fit	See section 4.3
#4	9	Light-pipes	See section 4.4
#5	1	Front panel	See section 4.5
#6	1	Mount Raspberry Pi CM4 module	See section 4.6
#7	2	Place ASTRON serial number (QR-code)	See section 4.8

The following instructions are required for the APSCT assembly. The assembly order may be changed for efficiency and/or quality reason for the working flow. Any change in the assembly order must be discussed and agreed with the design engineer.

Assembly order:

1. Place Manufacturer Serial Number, see section 4.1
2. SMD component reflow assembly, see section 4.2
3. Verify assembly (AOI, AXI), See [RD-1] for more details.
4. Press fit connectors correct press-in force, see section 4.3
5. Solder Through hole components (jumpers, connectors)
6. Place Light pipes (see section 4.4)
7. Mount front panel (see section 4.5)
8. Mount Raspberry Pi CM4 module (see section 4.6)
9. Set dip-switches and place jumpers (see section 4.7)
10. Place QR label on PCB and front panel (see section 4.8)
11. Functional testing see [RD-1]

A 3D drawing of the assembled board is shown in Figure 1. The assembly drawing are shown in Section 7.1. On request a STEP-model of the assembly can be supplied by ASTRON.

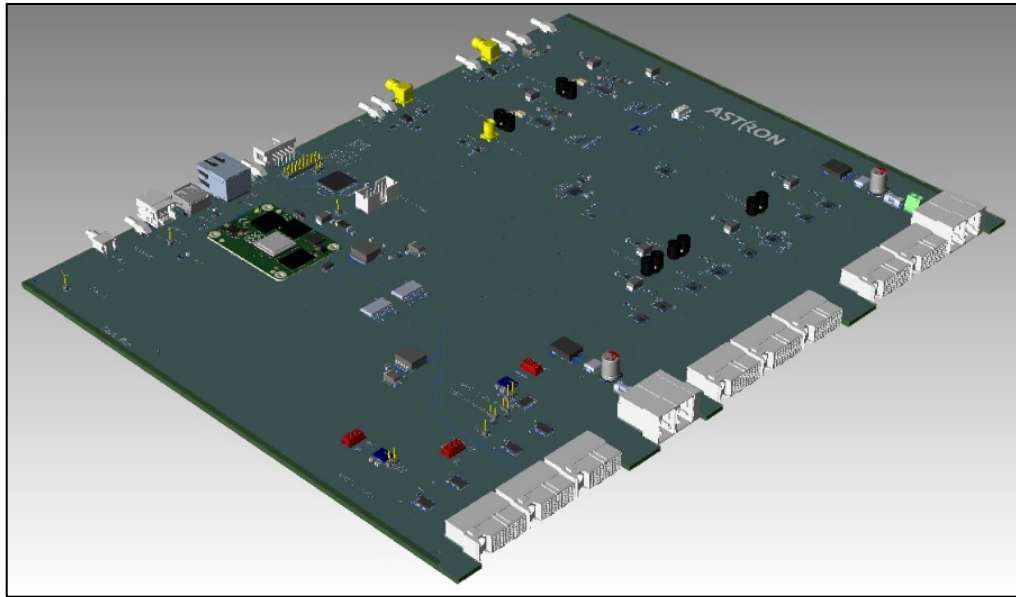


Figure 1 3D-drawing of APSCT PCBA

4.1 PCB Manufacturer and EMS serial / lot number

Both the PCB manufacturer and the EMS have to place a serial and or lot number on the PCB in order to track issues during the guarantee period of the PCBA. In the ODB++ and in the PSF of the APSCT the locations are shown, see Figure 2.

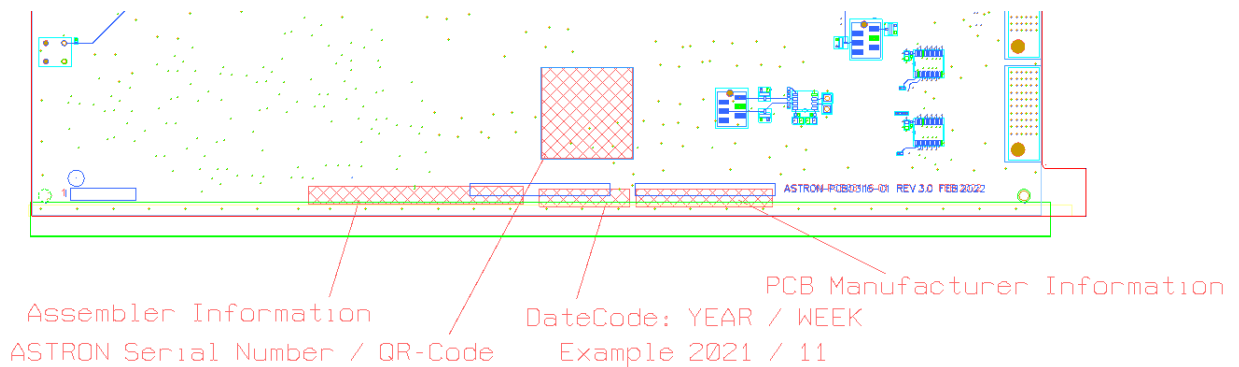


Figure 2 Location for PCB manufacturer and EMS serial or lot numbers.

4.2 SMD Assembly

A component placement file and polarity drawing can be found in section 7.1. All assembly verification steps, like SPI and AOI are described in APSCT Test plan [RD-1].

4.3 Press-fit

The press-fit components on APSCT are shown in Table 1.

Table 1 Press-fit connectors on APSCT.

Type	ASTRON	Refdes	Force
MOLEX 764603020	AST02151	P10, P11, P12, P13, P17, P29, P30, P32	1.8kgf per pin (108 kgf per connector)
MOLEX 783472044	AST02162	P16, P31	6 kgf per pin (48 kgf per connector)

Remarks:

- Information about the press-fit tools can be found here:
https://www.molex.com/pdm_docs/ats/TM-622018799-001.pdf
- Use a support pallet to support the PCBA during press-fit.
- Use press-in tools suitable for each independent corrector.
- The screws have to be tighten with an ESD safe screwdriver with a torque of 0.3 Nm (30.0 Ncm).

4.4 Light-pipes

The light-pipes are press-fit stile light pipes which have to be pressed in the holes from the top side of the PCBA, see Figure 3. Make sure that the bottom of the PCB is supported while pressing the light-pipe into the PCB.

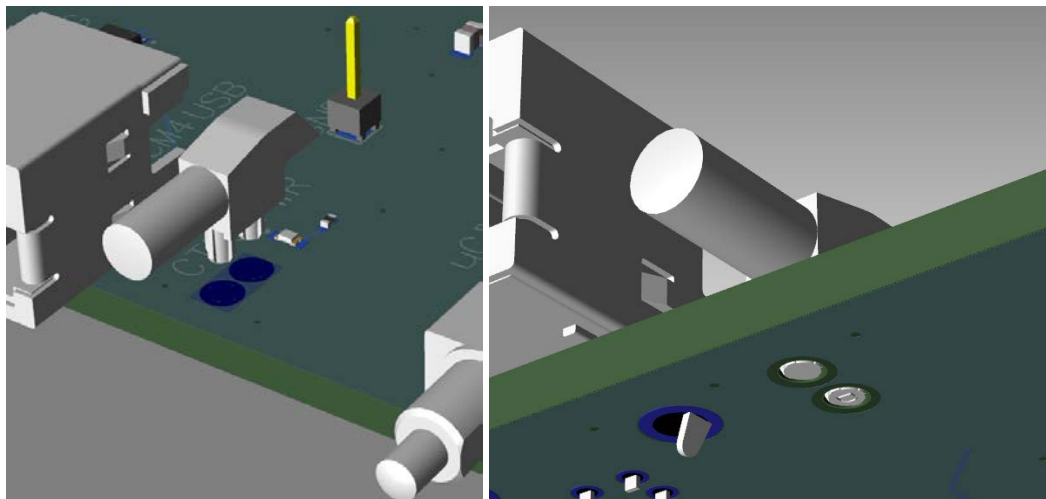


Figure 3 Mounting instruction for light-pipes.

4.5 Mounting of front panel

Before the front panel can be mounted, the PCB metal Brackets (Schroff 60807181) has to be mounted on the PCB. See mechanical drawing in [RD-2] for more details. EMC-gaskets and ejectors will be mounted by the front panel supplier.

All screws have to be tighten, with an ESD safe screwdriver with a torque as indicated on the mechanical drawing.

4.6 Mounting of Raspberry Pi CM4 module

The orientation of the pre-configured Raspberry Pi CM4 module is shown in Figure 4. The CM4 should be plugged in the connector. Screws are not needed to secure the CM4 to APSCT. The configuration of the Raspberry Pi CM4 module is described in the APSCT Production Test Procedure [RD-1].

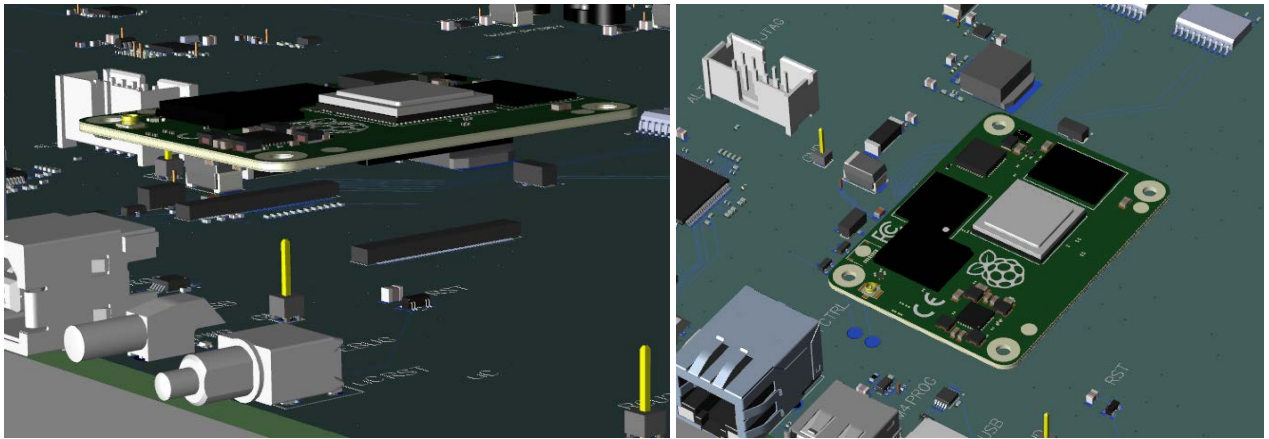


Figure 4 Mounting instruction for the Raspberry Pi CM4

4.7 Set switches and place jumpers

The two switches SW7 and SW8 have to be set according the red arrows shown in Figure 5.

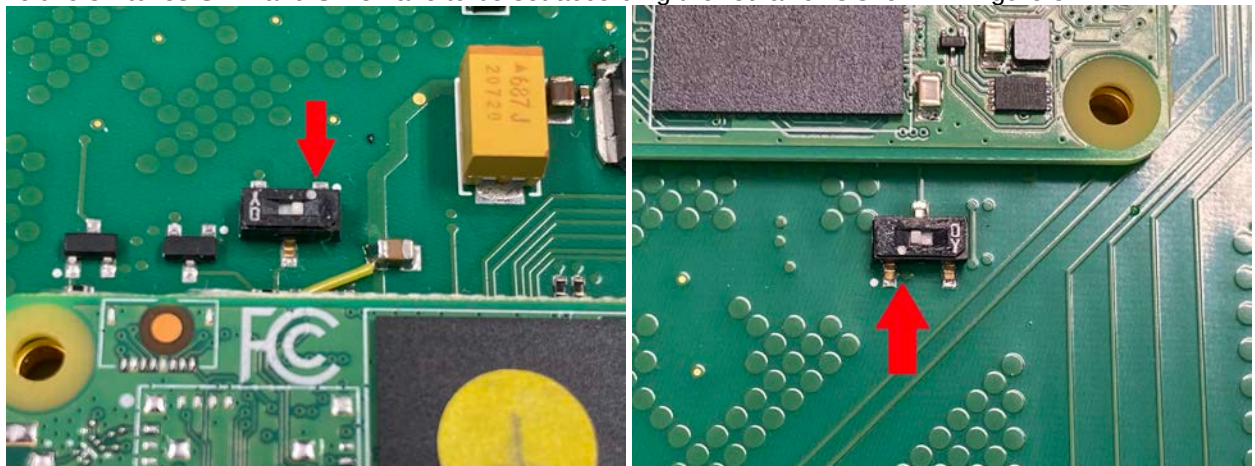


Figure 5 DIP-Switch setting on APSC7

On APSC7 no jumpers have to be placed.

4.8 Serial number placement

Two equal serial numbers stickers, including QR-codes, have to be placed on the assembly. One serial number has to be placed on the top side of the PCB as indicated in silkscreen on the PCB by "QR-CODE", see Figure 6.

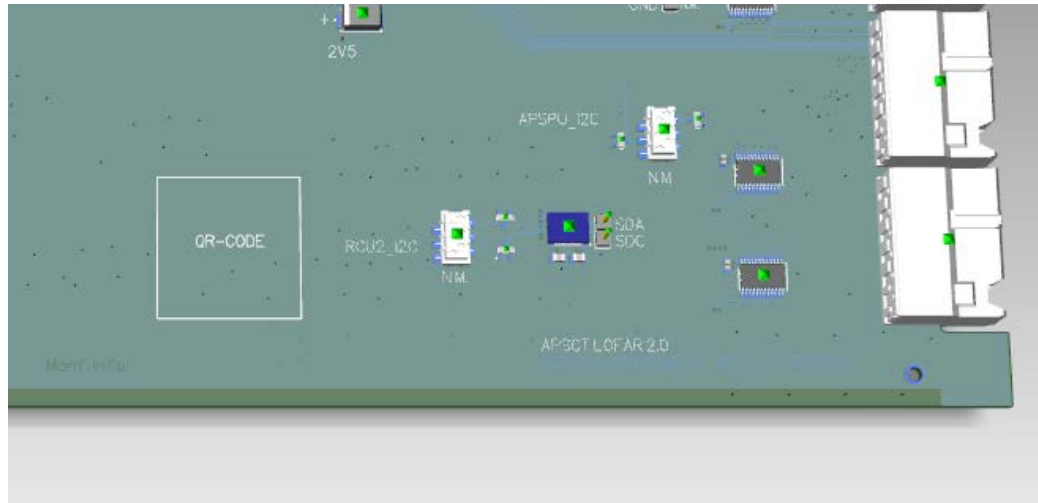


Figure 6 Location of the Serial Number on the PCB.

The second serial number sticker has to be placed on the front panel as shown in Figure 7.

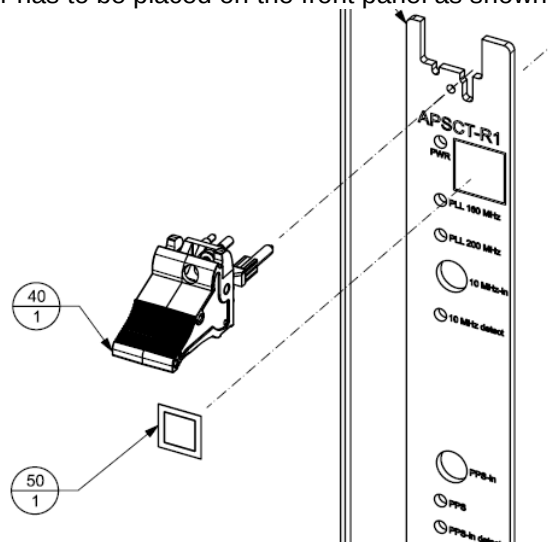


Figure 7 Location of the serial number on the front panel, indicated by #50.

5 Precautions

A list of precautions are given, which are important during production.

1. The PCBA is ESD sensitive. ESD precautions must be taken at any time during the assembly and handling of the PCBA or individual components (use a wrist strap connected to a ground terminal).

6 Delivery and logistics

Delivery and logistic information is provided in the procurement documentation.

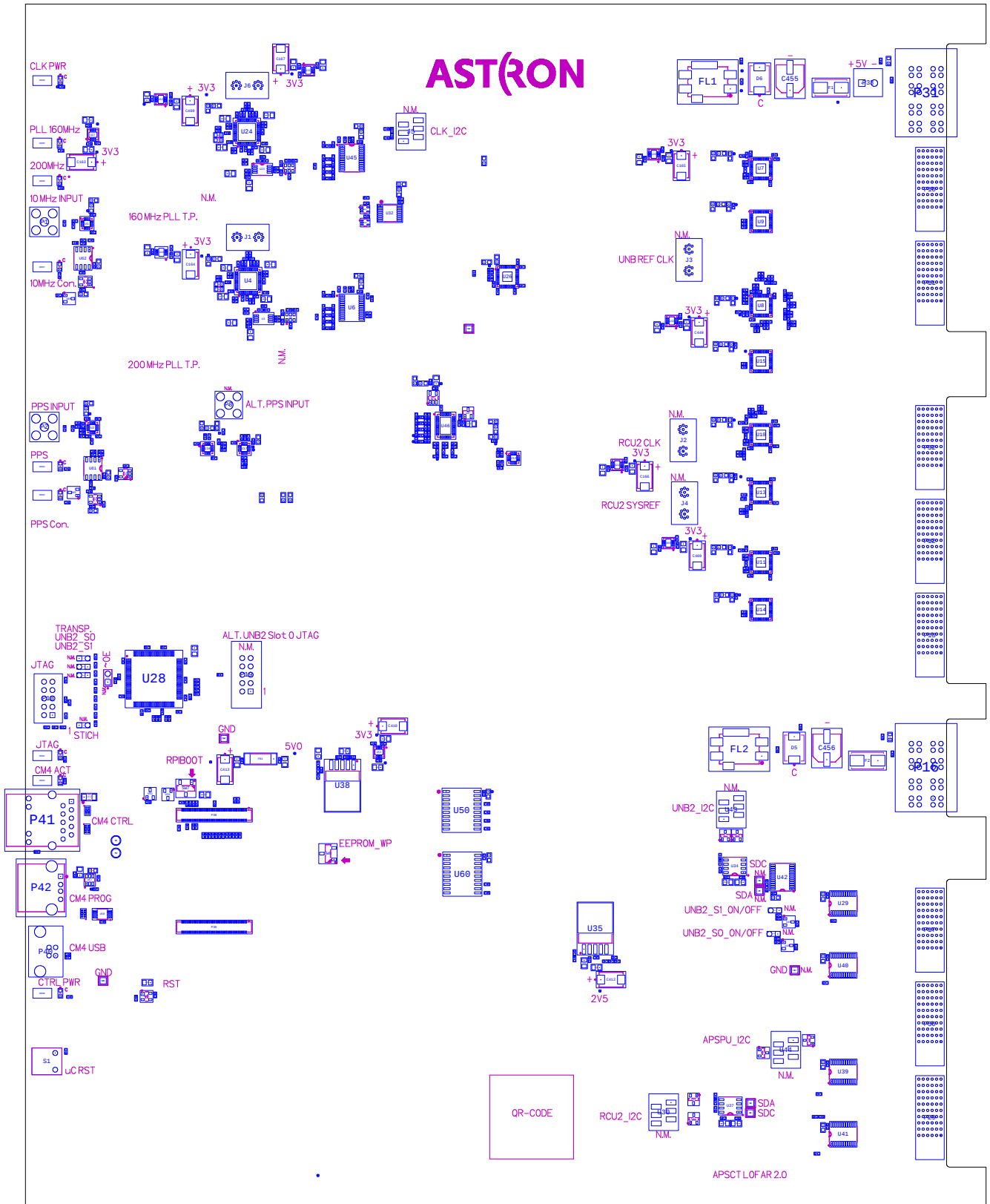
7 Annexes

7.1 Assembly drawing

An assembly drawing of the top and bottom will be added to the next pages.



Top Components, sst



Bottom Components

