

Product Manufacturing Specification

Cabinet Clock Distribution (CCD)

PCB nr.: 03124

	Organisatie / Organization	Datum / Date
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1 Introduction

1.1 Document Scope

This document is the Product Manufacturing Specification (PMS) and intended for PCB assembly manufacturers and test facilities. It describes the manufacturing specification for a complete PCB assembly, production and handling quality and if applicable a final functional test. A functional description of the assembly is presented in section 2. Specific information and specification for this assembly can be found in the underlying documents shown in section 1.2. In section 3 the quality requirements and specifications are mentioned. References to general documents related to this module can be found in section 1.3. These documents are available upon request from the manufacturer.

1.2 Applicable documents (AD)

Ref.nr.	Document number	Rev.	Title	File name
AD-1	012032		Verzoek tot Offerte LOFAR2.0 Modules	
AD-2	012033		Annex-A Pakket van Eisen LOFAR2.0 Modules	

1.3 Reference documents (RD)

Ref.nr.	Document number	Rev.	Title	File name
RD-1	EDW00069	2.0	Schematic CCD, CABINET CLOCK DISTRIBUTION BOARD FOR LOFAR 2.0 PCB-03124	EDW00069.pdf
RD-2	PPL00056	2.02	PPL CCD, CABINET CLOCK DISTRIBUTION BOARD FOR LOFAR 2.0 PCB-03124	PPL00056_CCD_20220630.xlsx
RD-3	PSF00173	2.3	PSF CCD, CABINET CLOCK DISTRIBUTION BOARD FOR LOFAR 2.0 PCB-03124	PSF00173_CCD_LOFAR_2_0_PCB3124.pdf
RD-4	PPD00072	2.1	PPD PSF CCD, CABINET CLOCK DISTRIBUTION BOARD FOR LOFAR 2.0 PCB-03124	ccd_30062022.tgz
RD-5	PAD00051	1.1	PAD CCD, CABINET CLOCK DISTRIBUTION BOARD FOR LOFAR 2.0 PCB-03124	PAD00051_CCD.pdf
RD-6	TPR00022	1.0	TPR CCD, CABINET CLOCK DISTRIBUTION BOARD FOR LOFAR 2.0 PCB-03124	TPR00022_CCD.pdf
RD-7	T.B.D.		Mechanical drawing	T.B.D.
RD-8	ASM00004	0.1	BOM CCD IN 19" BOX	M-BOM_CCD_20220630.xlsx

1.4 List of Terms and acronyms

ANSI	American National Standards Institute
AOI	Automated Optical Inspection
APS	Antenna Processing Subrack
APSCT	Antenna Processing Subrack Clock and Translator
BOM	Bill Of Material
CCD	Cabinet Clock Distribution
ESD	Electro Static Discharge
IPC	Association Connecting Electronics Industries
LOFAR	Low Frequency Array
PO	Purchase Order
PCB	Printed Circuit Board
PMS	Product Manufacturing Specification
RoHS	Restriction of Hazardous Substances
SMD	Service Mount Devices
SPI	Solder Paste Inspection
VtO	Verzoek tot Offerte (request for quotation)

2 Functional description

The **Cabinet Clock Distribution board (CCD)** is a central board in a LOFAR2.0 Station. On the CCD module, two timing reference signals, (a 10 MHz clock signal and a 1 pulse per second signal), are cleaned and distributed to 12 outputs. These outputs will be connected to the inputs on the Antenna Processing Subracks (APS). A Raspberry Pi computer module is added to translate low-level I2C communication to an OPC-UA communication interface. The I2C communication is used to communicate with the hardware monitor and control points on CCD and the OPC-UA communication interface is used by the software layers in station control. A schematic of the CCD is provided in Schematic diagram CCD [RD-1]. In Figure 1 a 3D drawing of the CCD is shown.

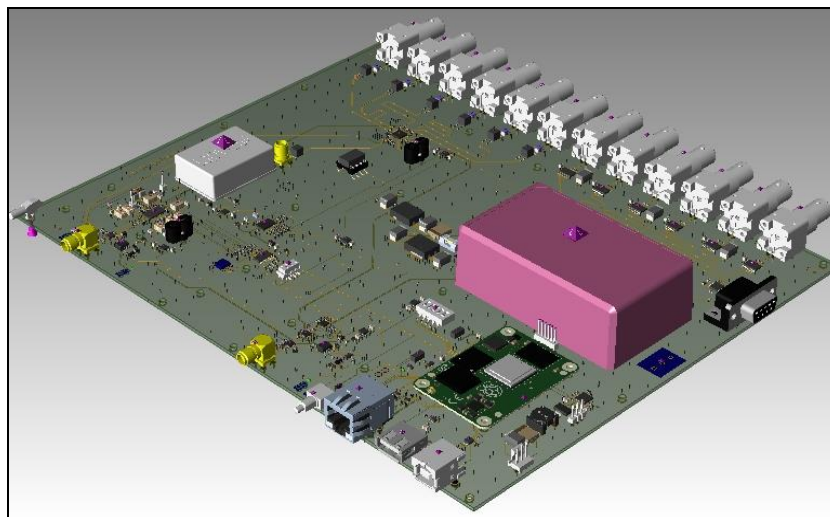


Figure 1 3D drawing of the CCD board.

The CCD has to be mounted in a 19" housing, an example is shown in Figure 2.

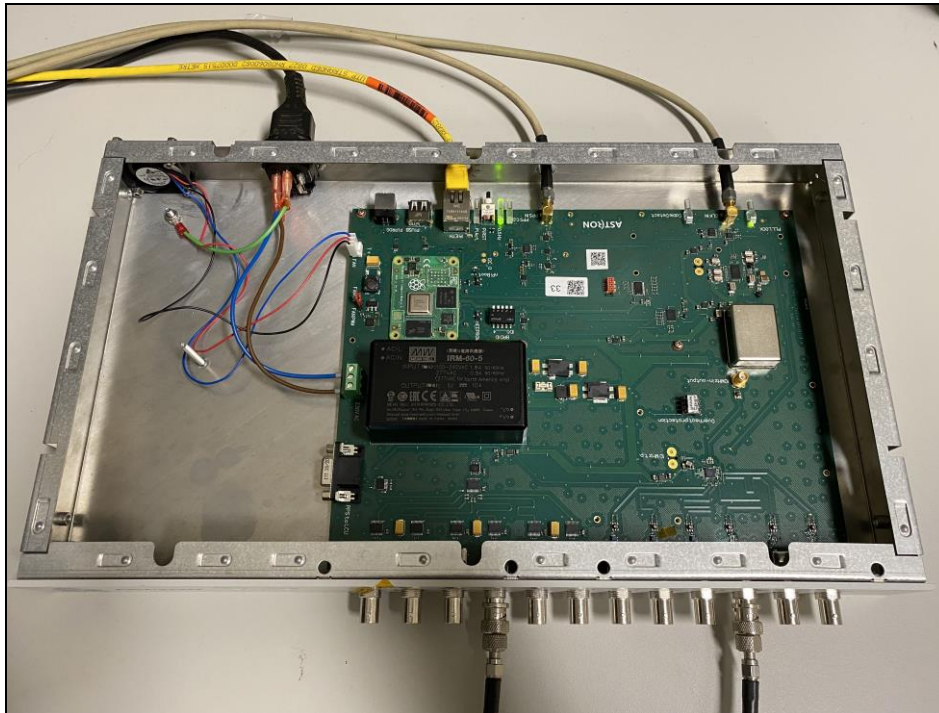


Figure 2 CCD inside 19" housing

3 General technical assembly requirements and specifications

Unless otherwise specified in the VtO [AD-1], the assembly will be complete and carried out according to good workmanship and quality. The work will involve but not limited to the following responsibilities:

- Inspection of incoming design files for manufacturing.
- Component purchase according to the BOM provided in [RD-2] (both electrical and mechanical parts).
- Proposing alternative components in case of obsolescence, long lead time and/or economical reason. Since not all parts can be replaced by alternatives, like components in a sensitive analogue filter, ASTRON engineers keep final control as to whether an alternative component may be used.
- Purchase of PCB according to the provided design files [RD-4] and PCB specification form [RD-3] (a preferred supplier maybe demanded).
- Component assembly including in-line quality tests.
- Module assembly.
- Functional test according to provided test specifications.

The following standards are applicable for the PCB production and the assembly process including purchase and handling:

- ISO 9001
- For the PCB design the following IPC standards have been used:
 - o IPC-2221B, Class 2 Dedicated Service Electronic Products Level B, Moderate Design Producibility-Standard
 - o IPC-2222B, Type 4, Multilayer Printed Board with blind and buried vias
 - o IPC-7351, Level B Moderate Design Producibility-Standard

3.1 PCB quality requirements and standards

The CCD is a double sided multilayer rigid organic printed circuit board without blind and buried vias. The design includes via in pad technology and press-fit connectors. More information about the PCB is provided

in the CCD PCB specification form. [AD-3]

The following standards are applicable for the PCB production process including purchase and handling:

- IPC-A-600, Class 2
- IPC-6011
- IPC-6012
- IPC-SM-840
- IPC-SM-4100

The bare PCB board has to pass PCB electrical test (isolation, shorts and conductance) as provided in the CCD Production Test Procedure [RD-6].

3.2 CCD assembly quality requirements and standards

The main assembly of the CCD require SMD assembly technology. Further mechanical assembly is required for the screw type mechanical parts, see bill of material [RD-8], such mounting the board in the 19" housing. More information about the mechanical parts is provided in the mechanical drawing of the CCD [RD-7]. Assembly details are provided in the CCD Product Assembly Document [RD-5].

The following standards are applicable for the PCB production process including purchase and handling:

- IPC-A-610, Class 2
- RoHS directives, 2011/65/EU
- ANSI/ESD-S-20.20 (ESD prevention)
- ANSI/EIA-471 (ESD symbol and labels)
- JESDD625-A (ESD handling devices)
- Other applicable IPC norms specifically related to the product

All components must be RoHS compliant unless specifically stated otherwise in the product BOM. In case RoHS components are not available an alternative option must be discussed with the project manager (see section 4).

The during the assembly process inspections like SPI, AOI, AXI are advised or have to be performed. More details on the inspections and test are provided in in CCD Production Test Procedure [RD-6].

3.3 Functional test

A functional test of the CCD assembly is required. ASTRON will provide the requirements and specification for the test and the test setup. These requirements are detailed in the board test documentation, [RD-6]. The manufacturer must specify the test- and test facility options to carry out such a functional test. ASTRON designers will assist where special test equipment or test jigs are not available at the manufacturer. Such a request for support must be clearly stated in the manufacturer quotation.

3.4 Acceptance

ASTRON will only accept PCB assemblies as specified in the Annex-A of the VtO [AD-2] and underlying documents. Incomplete or non-functional items will be subject for negotiation.

4 Information and Communication

Detailed information is provided in the VtO [AD-1].



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