

Test Report

Verified code:591544

Report No.: E20211115129001-2

Customer: Comba Telecom Network Systems Limited

Address: Flat/Rm 10, 3/F, Bio-Informatics Ctr, 2 Science Park West Avenue, HK Science Park,
Pak Shek Kok, N.T. Hong Kong

Sample Name: Public Safety UHF DAS Master Unit

Sample Model: RX45V2F-A-48/ RX45V2F-A-AC

Receive Sample Date: 2021-11-22

Test Date: 2021-11-22 ~ 2021-12-15

Reference Document: FCC PART 90 §90.223-RF exposure

Test Result: Pass

FCC ID: PX8RX45V2F-A

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GUANGZHOU GRG METROLOGY & TEST CO., LTD

Issued Date: 2022-01-20

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----- The following blanks -----

1 Applicant information

1.1 Client information

Name: Comba Telecom Network Systems Limited
Address: Flat/Rm 10, 3/F, Bio-Informatics Ctr, 2 Science Park West Avenue, HK Science Park, Pak ShekKok, N.T. Hong Kong

1.2 Manufacturer and Factory

Name: Comba Network Systems Company Limited
Address: No.10 Shenzhou Road, Guangzhou Science City, Guangzhou 510663, Guangdong, P.R. China
Factory: Comba Telecom Technology (Guangzhou) Ltd.
Address: No.6 Jinbi Road, Economics and Technology Development District, Guangzhou Guangdong China

2 General description of EUT

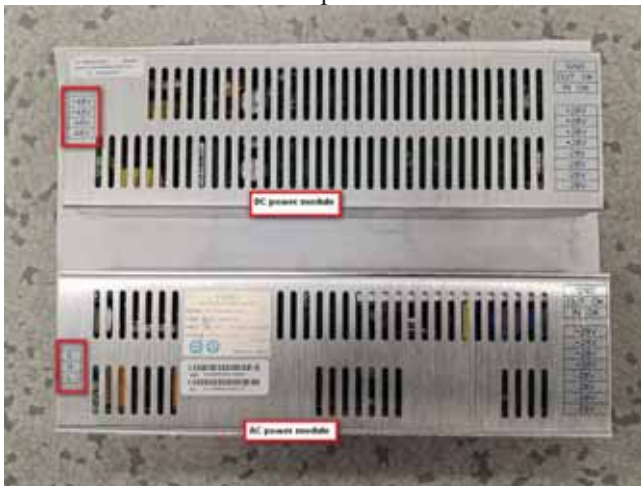
2.1 Basic description of EUT

Product Name: Public Safety UHF DAS Master Unit
Product Model: RX45V2F-A-48
Adding Model: RX45V2F-A-AC
Trade Name: Comba
Power Supply: Typical DC input power: DC -48V and Typical output power: DC -28V
Or
Typical AC input power: AC 110V, 50/60Hz and Typical output power: DC -28V
Power cord: AC power cord (4m)
Frequency Band: Downlink: 450MHz ~ 512MHz, Uplink: 450MHz ~ 512MHz
Nominal Output Power: Master Unit and System:
Downlink: 36dBm; Uplink: 30dBm
Nominal Gain: Master Unit:
Downlink: 102dB, Uplink: 102dB
System Gain:
Downlink: 105dB, Uplink: 102dB
EUT Operating Temperature: -33°C to +55°C
Operating Humidity: 5% to 95%
Antenna Type: N/A

NOTE 1: The device is a Narrowband device, which belongs to Class A signal booster.

NOTE 2: The device provides two PSU power supply modes by manufacturer's statement, one Typical is DC-48V input, the other Typical is AC 110V, 50Hz / 60Hz input. Except for the different PSU power supply mode input and arrester, the power supply output to the device is the same, all other electrical parameters have the same circuit schematic, components, critical components and also the same construction. please see the following the differences below:

PSU power



Arrester



NOTE 3: The device is an outdoor device, the device does not provide antenna by Manufacturer's statement, but it is required that the Antenna gain shall not exceed 0 dBi for Downlink and Uplink when the project is used by Manufacturer's statement.

NOTE 4: According to the device signal flow, the device supports independent uplink and downlink input/output, and system uplink output. Therefore, this report provides single device uplink and downlink test and system uplink test.

3 Assessment result summary

Item	Assessment Requirement	Assessment Method
RF exposure	FCC PART 90§90.223	FCC PART 1.1307(b) FCC PART 2.1091 FCC PART 2.1093

4 Radio frequency radiation exposure

4.1 Applicable Standard

According to the requirements of FCC PART 90§90.223, the test method of RF exposure is based on FCC PART 1.1307(b), FCC PART 2.1091 and FCC PART 2.1093, so RF exposure is calculated.

4.2 Limits for Maximum Permissible Exposure (MPE)

The limits are shown in Table 4-1.

Table 4-1 Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m²)	Averaging Time E ², H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ₂)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

Note: f=frequency in MHz; *=Plane-wave equivalent power density

Prediction of MPE limit at given distance, equations from OET Bulletin 65, Edition 97-01:

$$S = (P * G) / (4 * \pi * R^2) \text{ (where } PG = \text{EIRP) Where:}$$

S = power density

P= power input to antenna

G= numeric gain of the antenna

R= distance to the center of radiation of the antenna

4.3 Test results

Devices that operate under CFR47 Part 90 are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if they operate at frequencies of 1.5 GHz or below and limit for power density for general population/uncontrolled exposure is $f/1500 \text{ W/m}^2$. The nominal output power for middle frequency by manufacturer statement is $36\text{dBm} \pm 1\text{dB}$ for Downlink and $30\text{dBm} \pm 1\text{dB}$ for Uplink, the sum of antenna gain and cable loss is 0dBi for Downlink and uplink, Therefore, in this report, according to "the output power capability of a signal booster must be designed for deployments providing a radial power not exceeding 5 watts ERP for each transmitted channel" in FCC part 90.219 (E) (1) requirement, MPE is evaluated with a maximum output power of 5W, that is, the maximum output power of downlink is 37dBm , and the maximum output power of uplink is 31dBm , so it has the following assessment:

NOTE: The total power output from MU will not exceed 30dBm for RU uplink input and MU uplink input signals, because they share a power amplifier.

4.3.1 Downlink

Prediction frequency (MHz):	450
Maximum peak output power at antenna input terminal (dBm):	37.0
Maximum peak output power at antenna input terminal (W):	5
Maximum antenna gain (dBi):	0
Maximum RF output power (W):	5.0
MPE limit for uncontrolled exposure at predication frequency (W/ m²):	0.3
$S = f/1500 = 450/1500$	

$$R_1 = \sqrt{\frac{PG}{4\pi S}} = \sqrt{\frac{5}{0.3 * 4 * 3.14}} \approx 1.151\text{m}$$

$$\text{Conversely, when } R > 1.151\text{m, and } S < \frac{PG}{4\pi R^2} = \frac{5}{4 * 3.14 * 1.151^2} \approx 0.3(\text{W/m}^2)$$

4.3.2 Uplink

Prediction frequency (MHz):	455
Maximum peak output power at antenna input terminal (dBm):	31
Maximum peak output power at antenna input terminal (W):	1.259
Maximum antenna gain (dBi):	0
Maximum RF output power (W):	1.259
MPE limit for uncontrolled exposure at predication frequency (W/ m²):	0.303
$S = f/1500 = 799/1500$	

$$R_1 = \sqrt{\frac{PG}{4\pi S}} = \sqrt{\frac{1.259}{0.303 * 4 * 3.14}} \approx 0.575\text{m}$$

$$\text{Conversely, when } R > 0.575\text{m, and } S < \frac{PG}{4\pi R^2} = \frac{1.259}{4 * 3.14 * 0.575^2} \approx 0.303(\text{W/m}^2)$$

4.4 Conclusion

The above all, when the sum of antenna gain and cable loss is 0dBi for downlink and the shortest distance from the human specific is 1.151m, the device is compliant with the requirement MPE limit for uncontrolled exposure.

5 APPENDIX A. PHOTOGRAPHS OF EUT

5.1 Master Unit (MU)

5.1.1 External photos



Top surface



Front surface-1



Front surface-2



Side surface-1



Side surface-2



Behind surface



Bottom surface

5.1.2 Internal photos



MU Inside

5.1.2.1 PA-3035AG00





5.1.2.2 PA-3645AG00

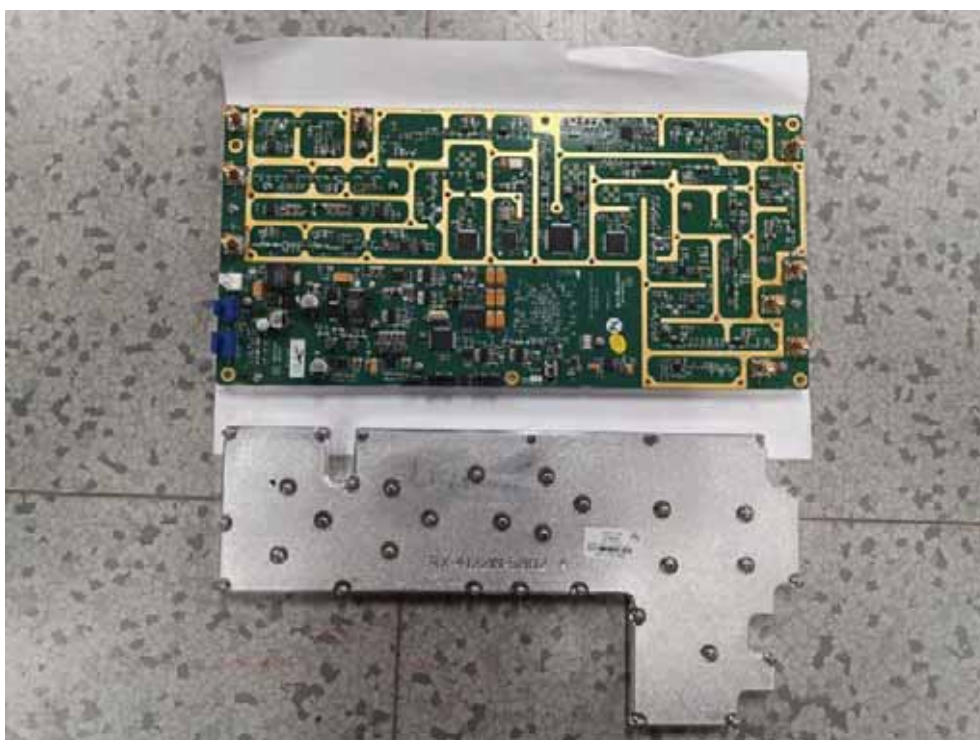








5.1.2.3 RX-4122IN02





5.1.2.4 RX-4122JK-3002

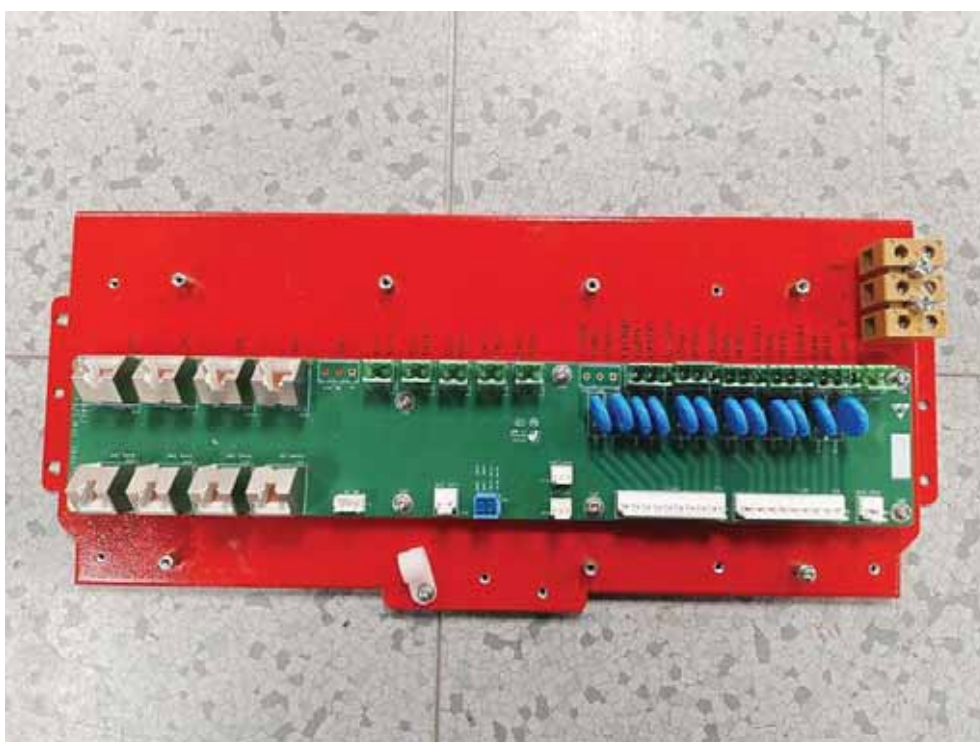


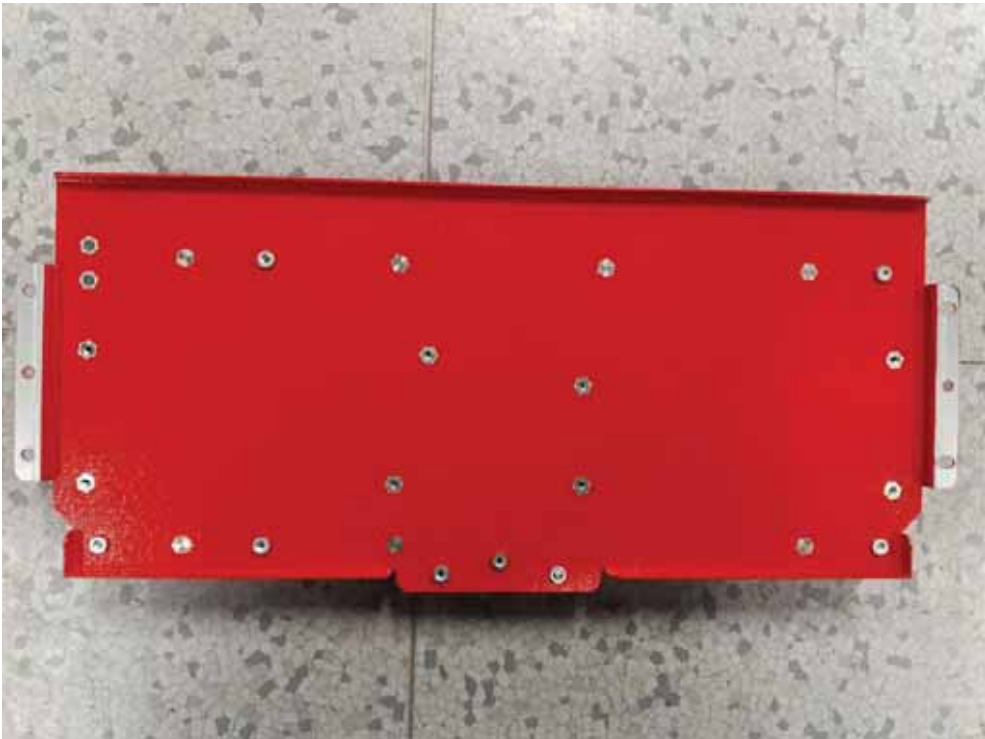






5.1.2.5 RX-4122JK01-3001







5.1.2.6 PS-2H10

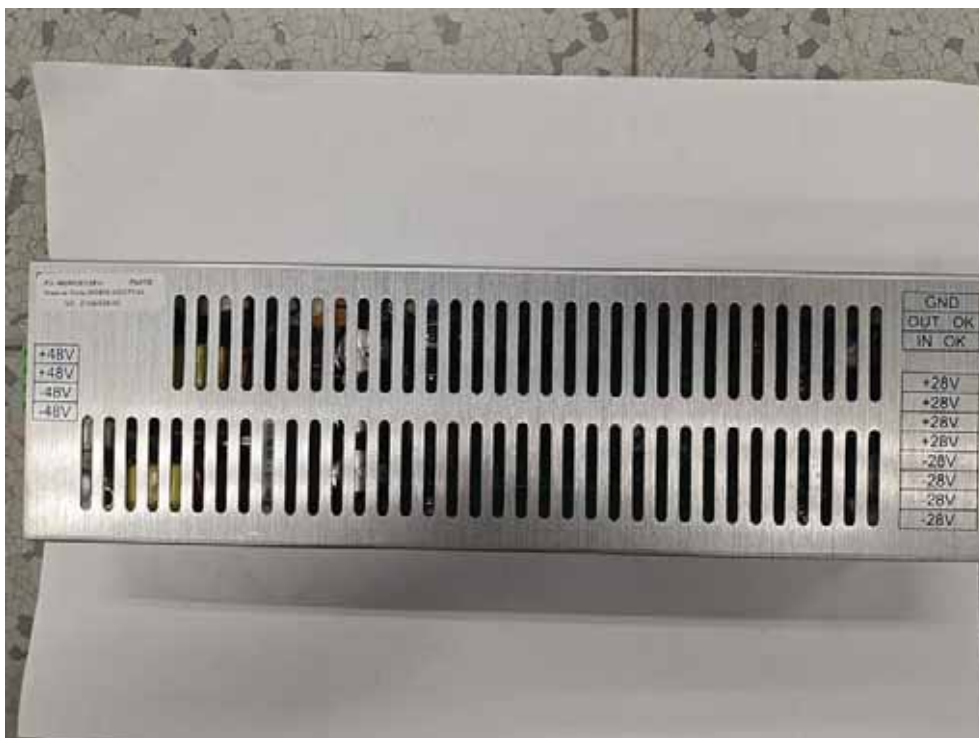






5.1.2.7 Power module

5.1.2.7.1 PD-482450E0(28V)







5.1.2.7.2 PC-922430E0(28V)







5.1.2.8 Arrester

5.1.2.8.1 PA20-48V-JX03A







5.1.2.8.2 PA20-220V-JX04A





5.2 Remote Unit (MU)

5.2.1 External photos



Top surface



Front surface-1



Front surface-2



Side surface-1



Side surface-2



Behind surface



Bottom surface

5.2.2 Internal photos

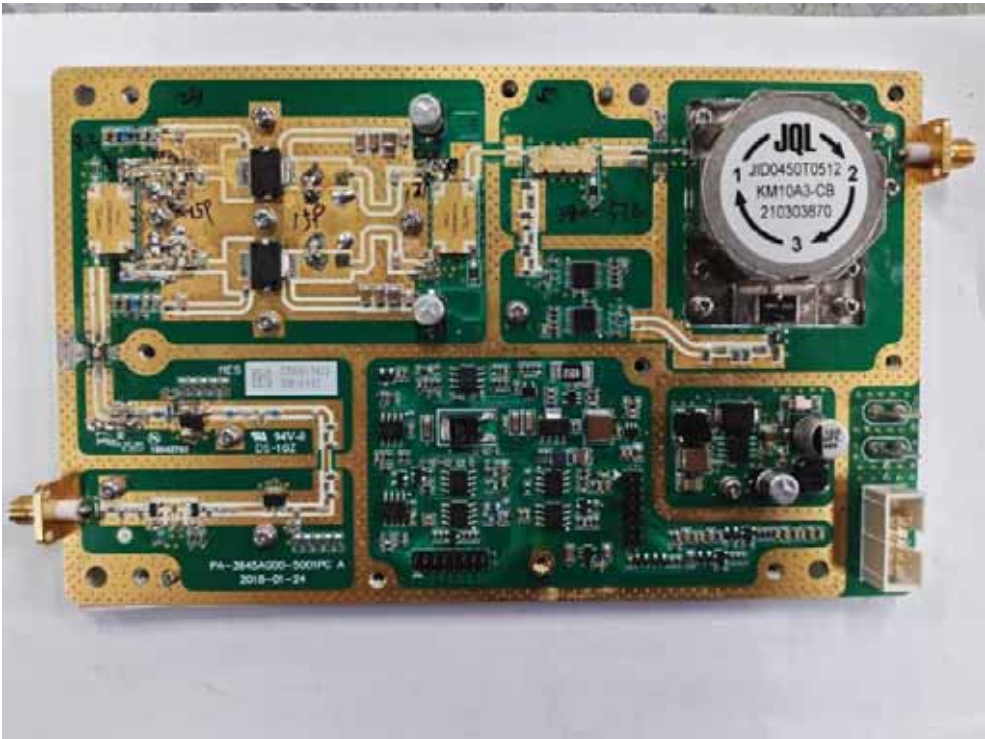


RU Inside

5.2.2.1 PA-3645AG00



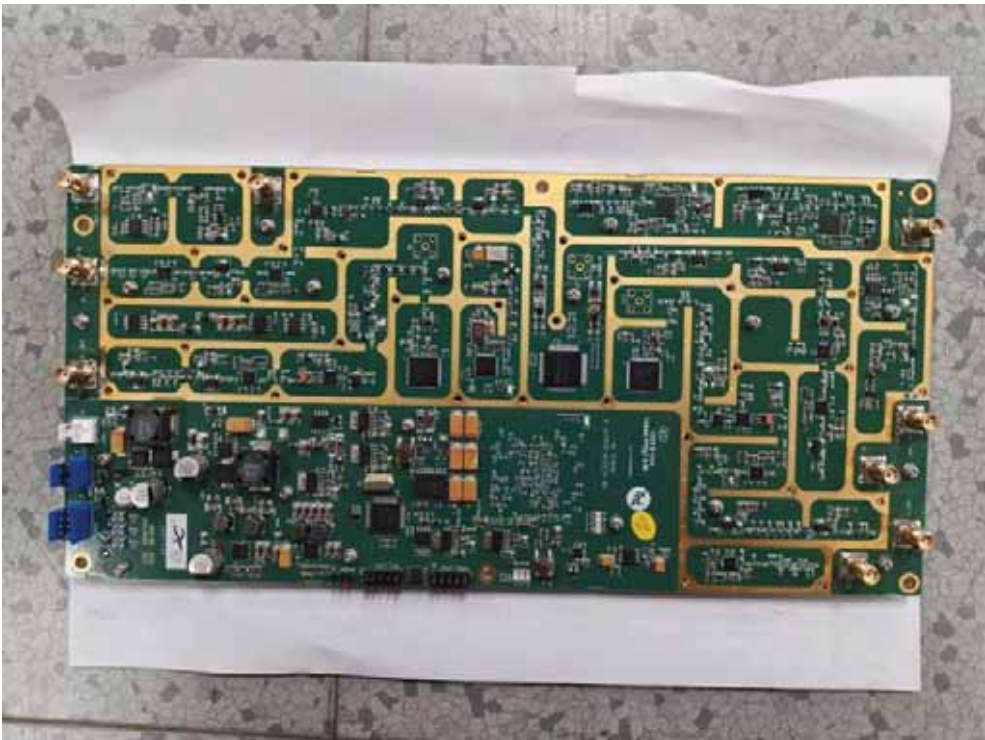
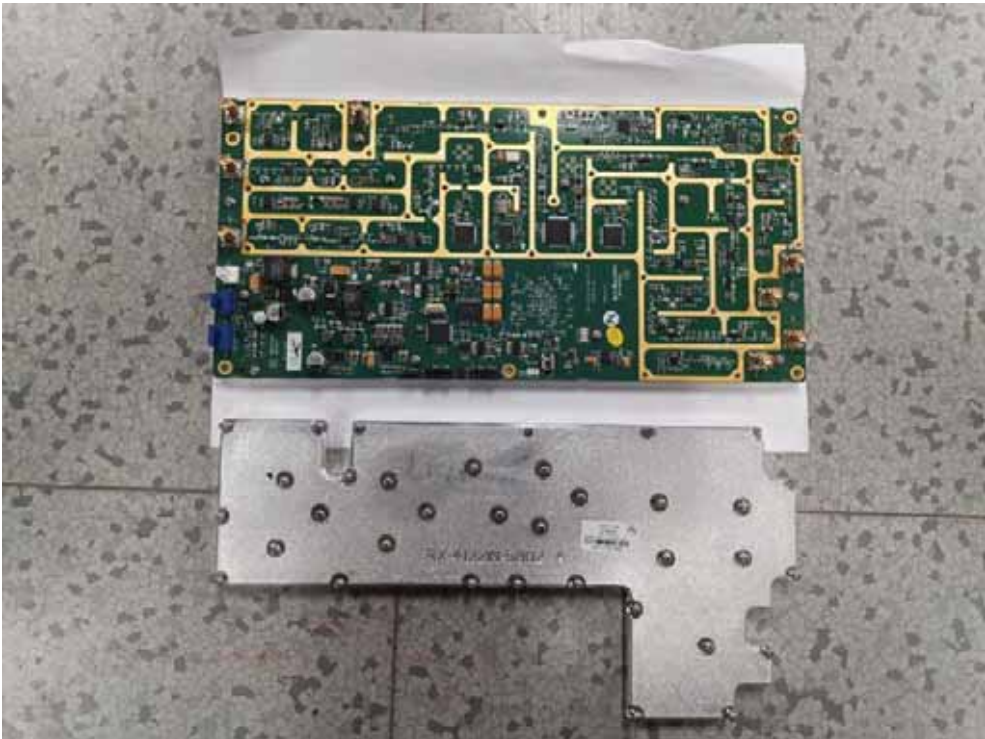






5.2.2.2 RX-4122IN02





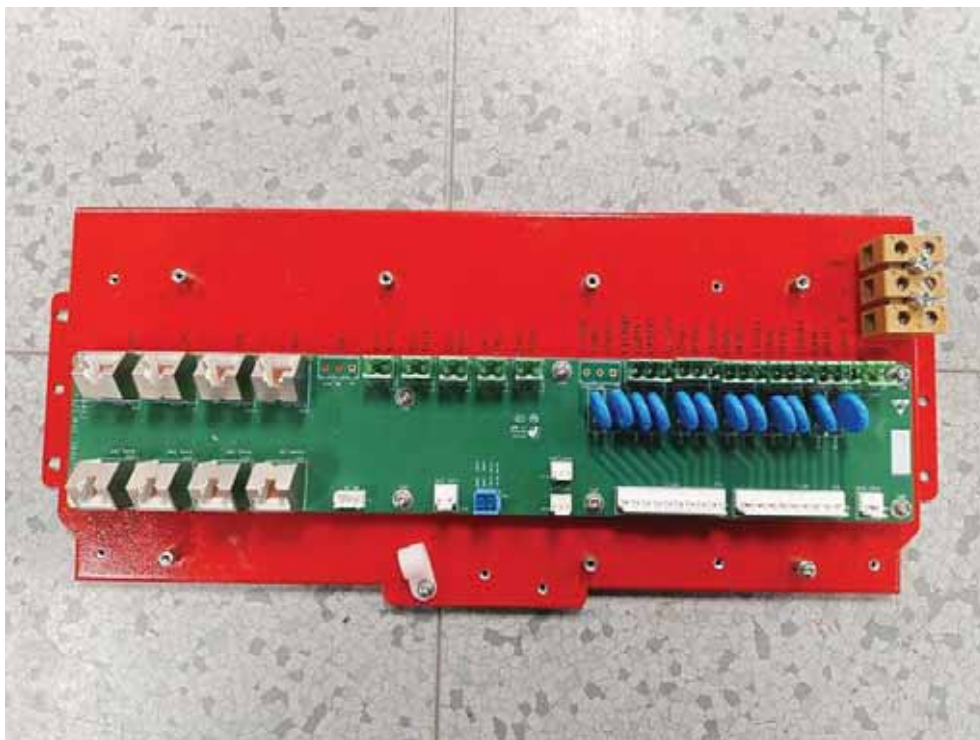
5.2.2.3 RX-4122JK-3002







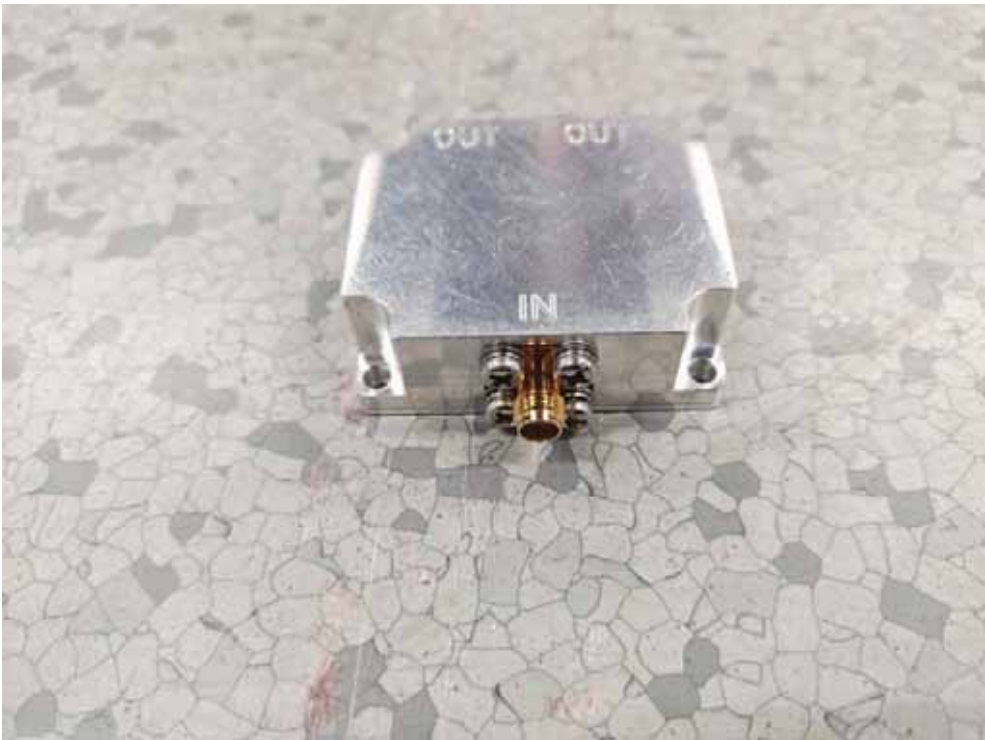
5.2.2.4 RX-4122JK01-3001





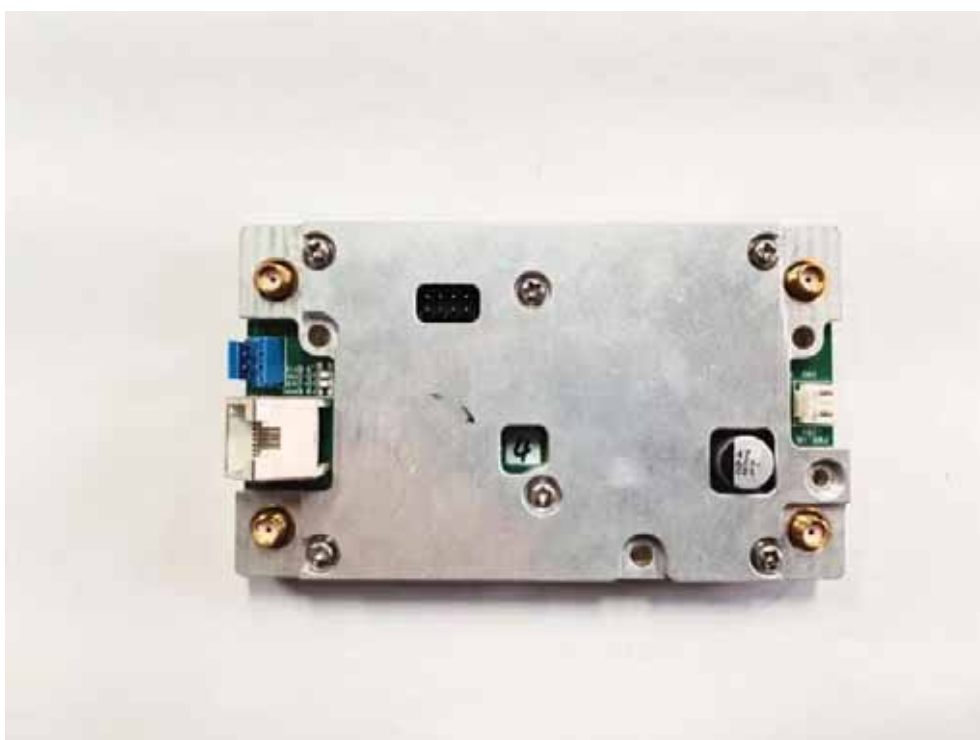
5.2.2.5 PS-2110



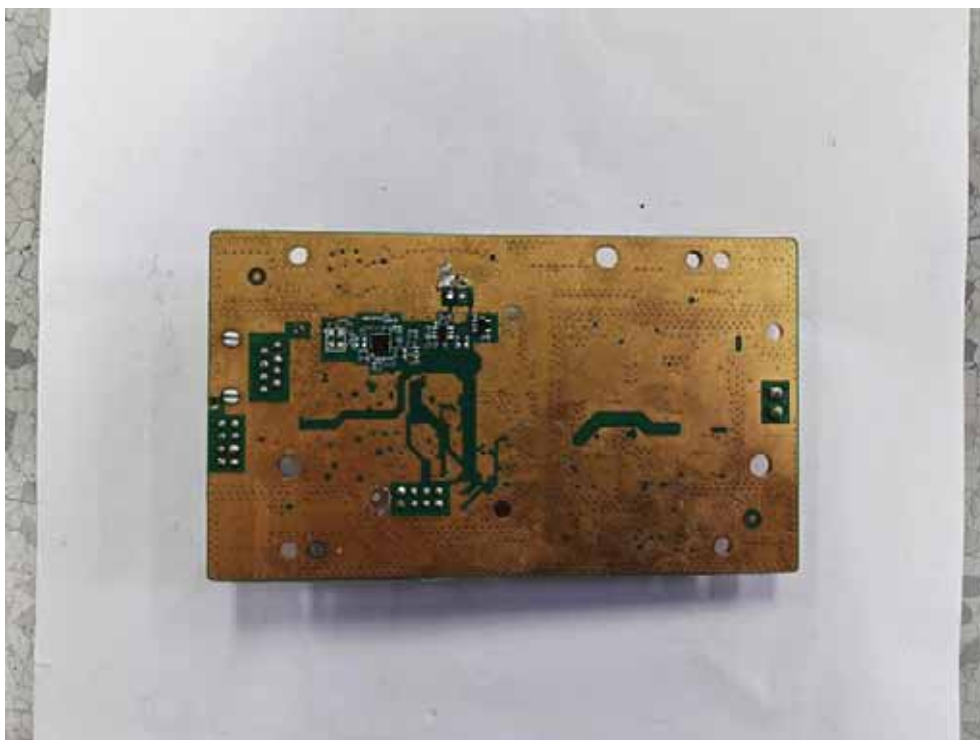




5.2.2.6 ROU-3X11WA01

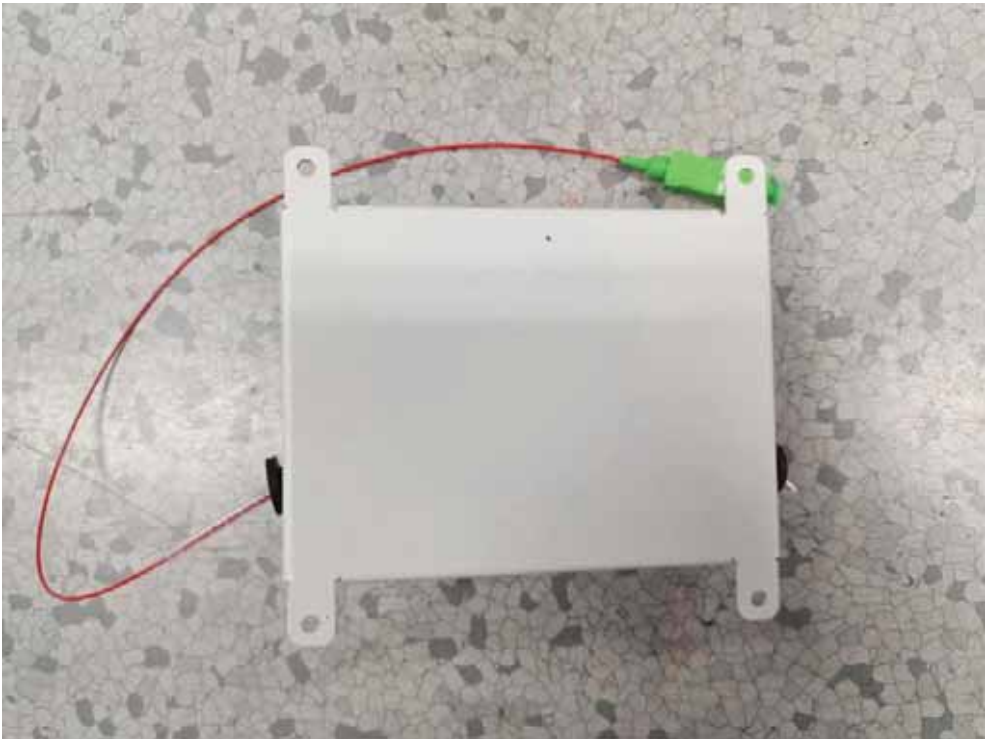


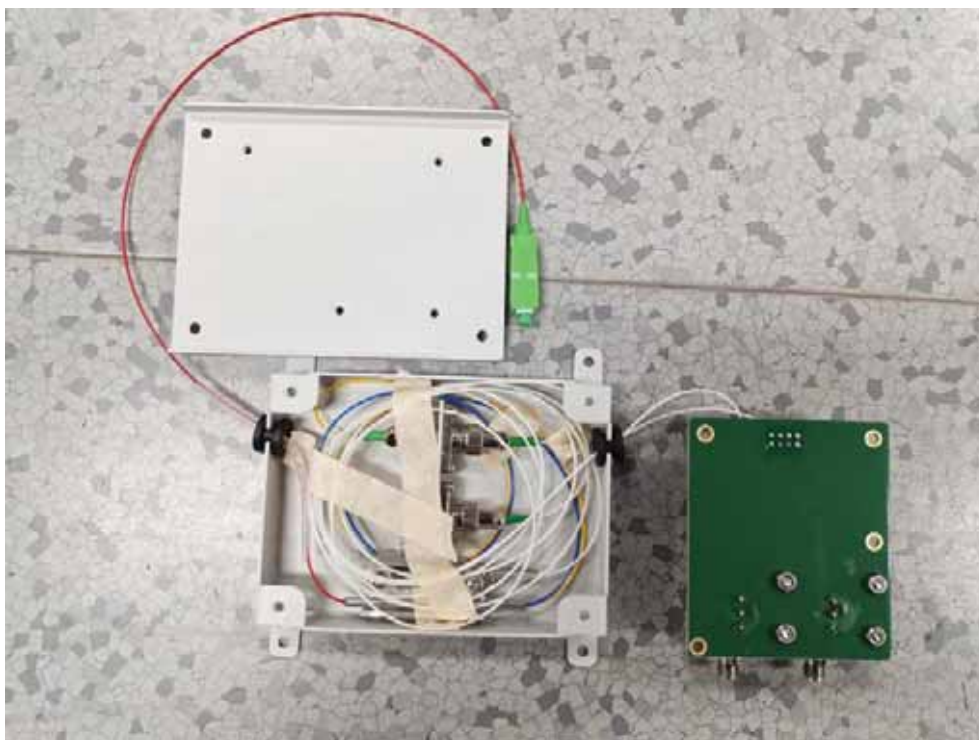




5.2.2.7 ROU-3X11WA02

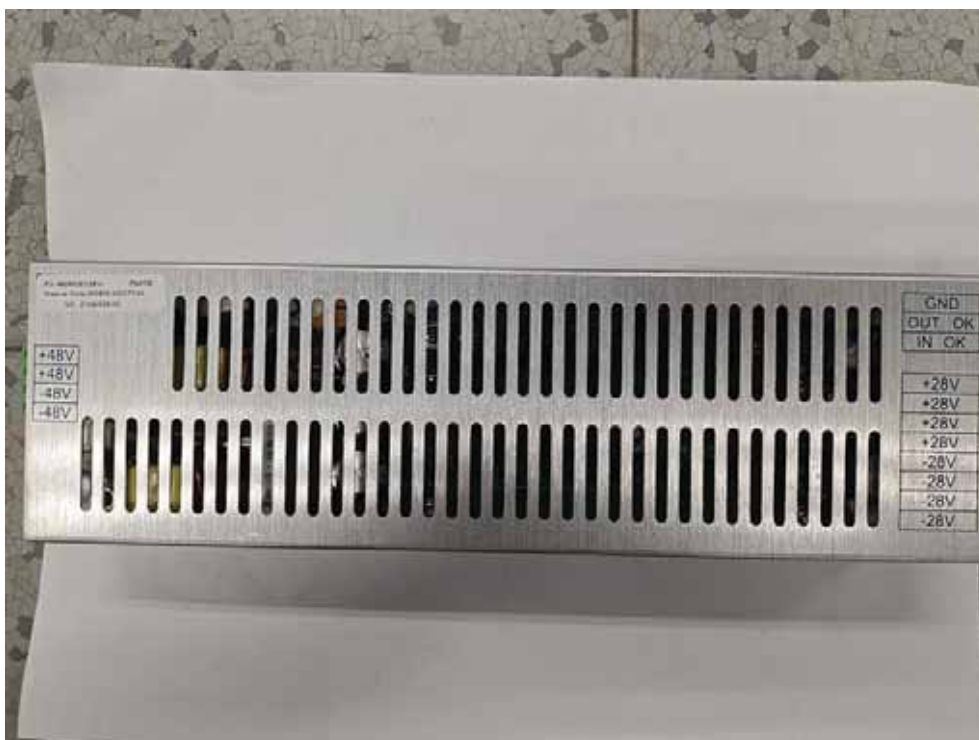






5.2.2.8 Power module

5.2.2.8.1 PD-482450E0(28V)









1.1.1.1.1 PC-922430E0(28V)



5.2.2.8.2







5.2.2.9 Arrester

5.2.2.9.1 PA20-48V-JX03A



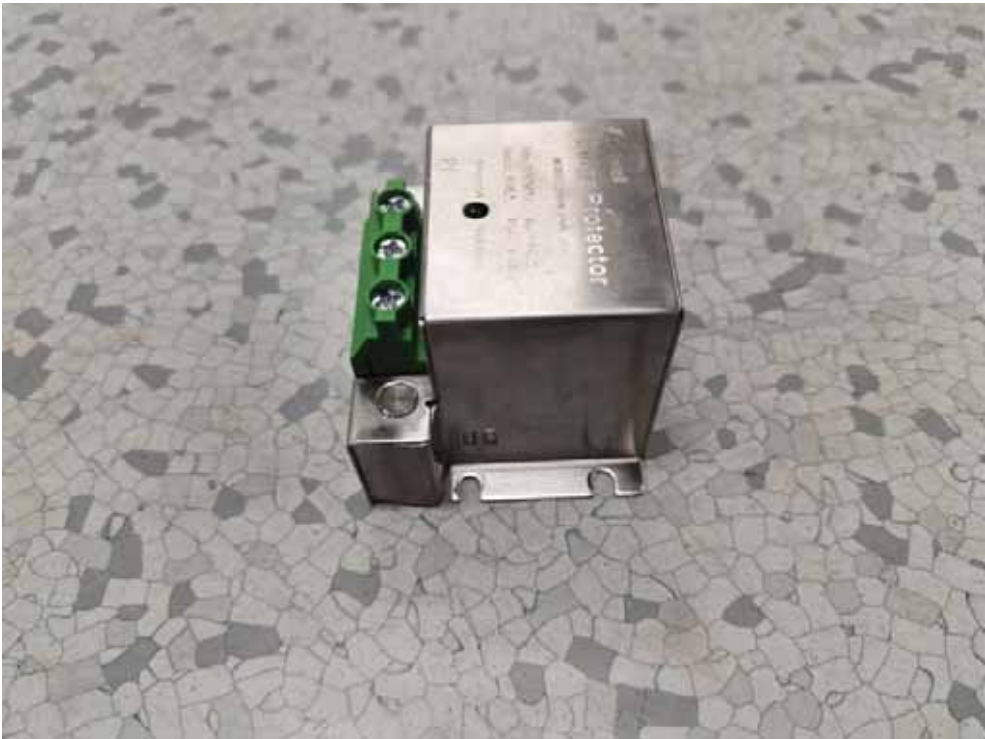




5.2.2.9.2 PA20-220V-JX04A

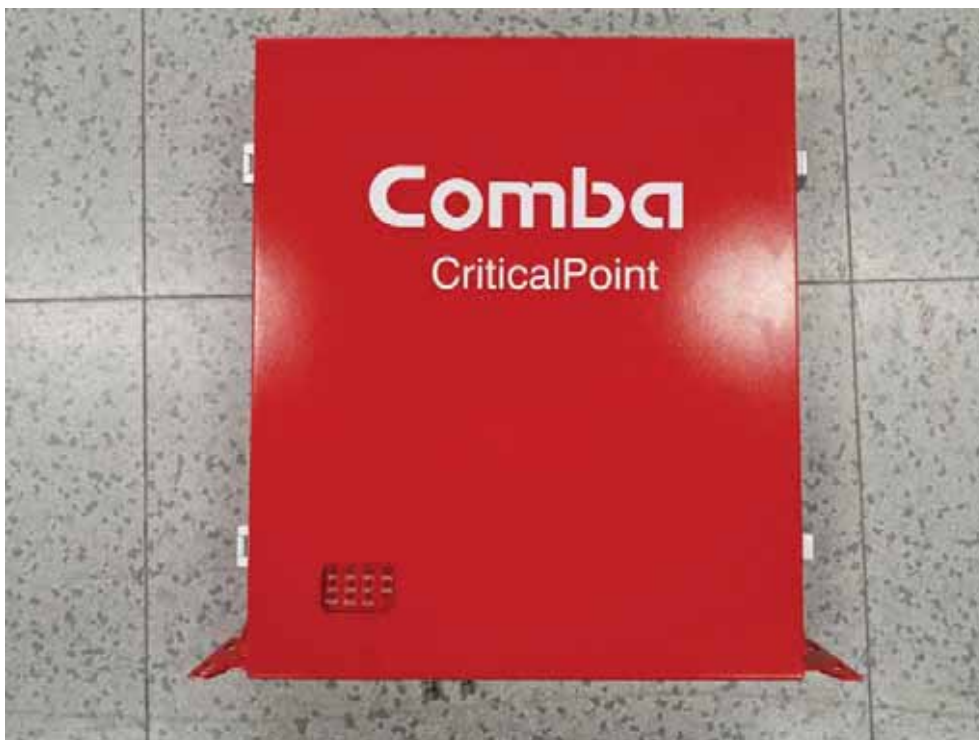






5.3 Optical Expansion Unit (FOU)

5.3.1 External photos



Top surface



Front surface-1



Front surface-2



Side surface-1



Side surface-2



Behind surface



Bottom surface

5.3.2 Internal photos

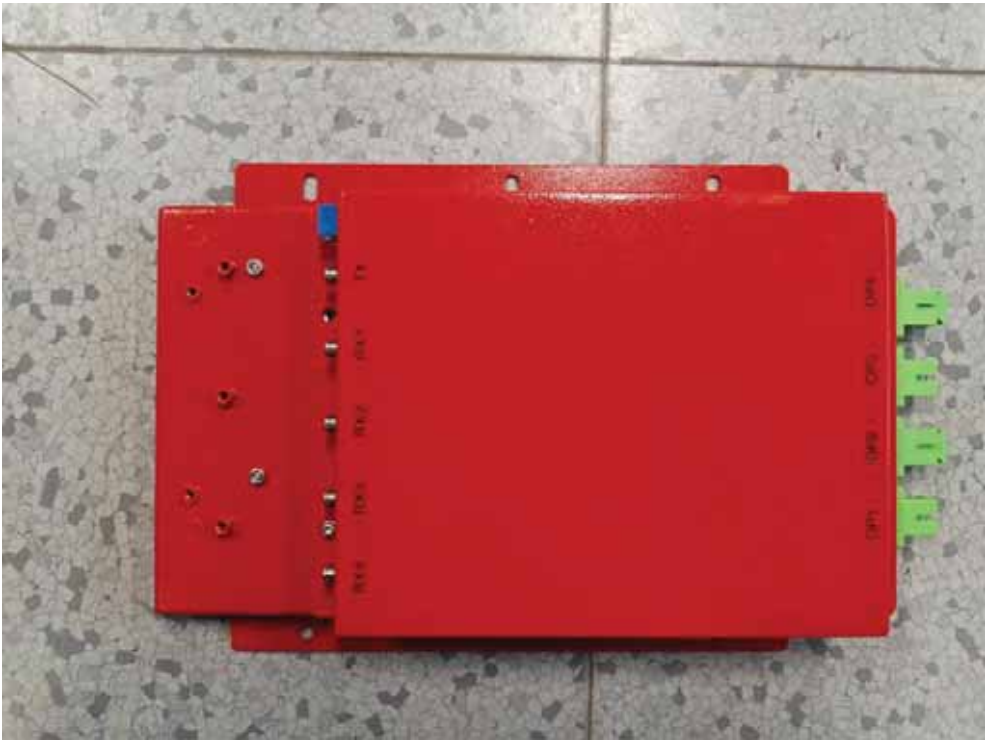


FOU Inside-1

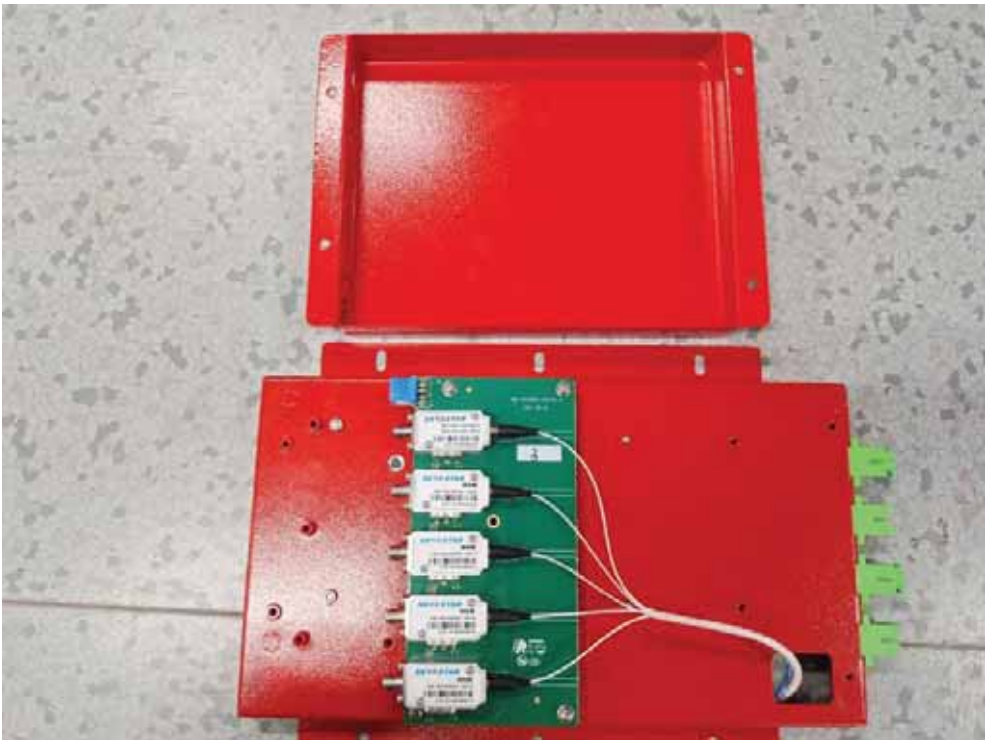


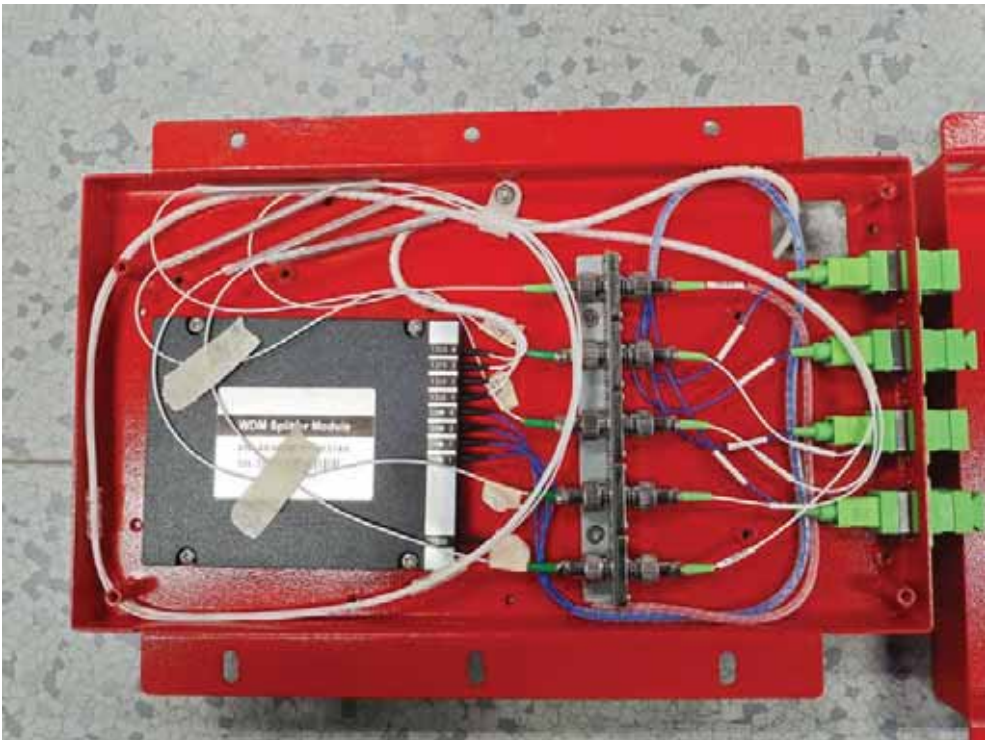
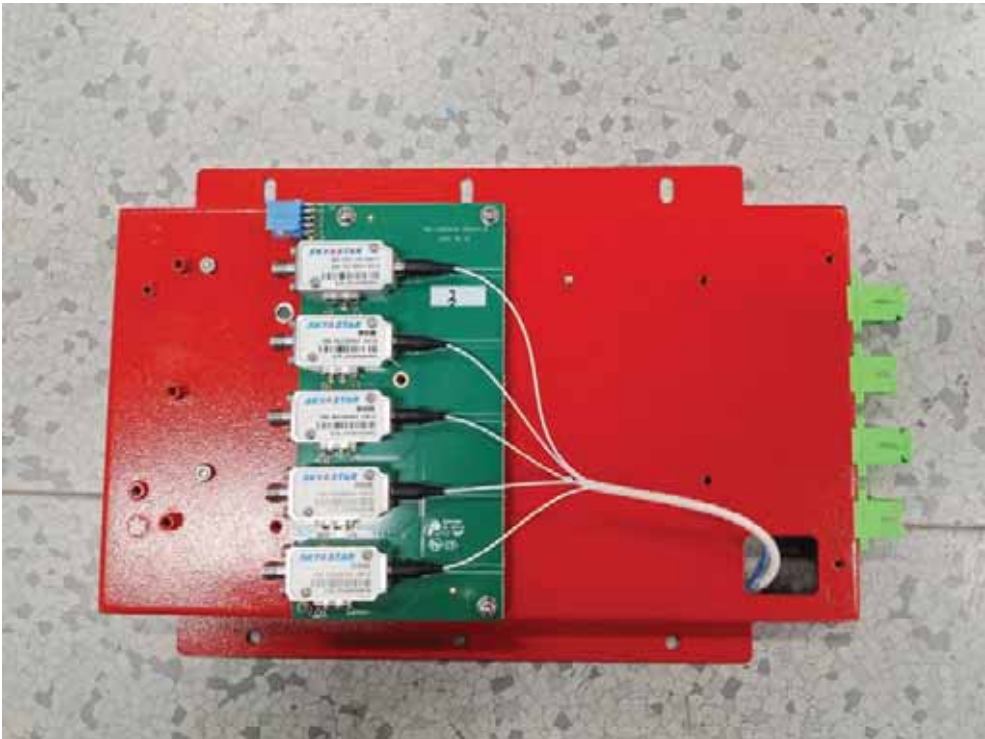
FOU Inside-2

5.3.2.1 MOU-5X44WA01



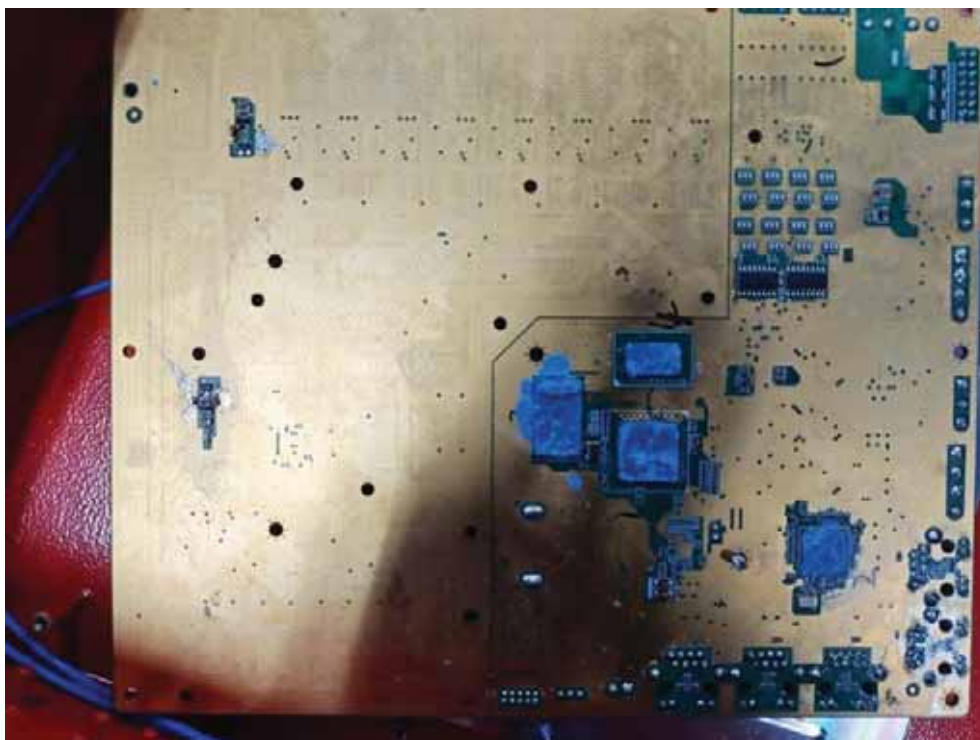






5.3.2.2 MOU-5X88WA01



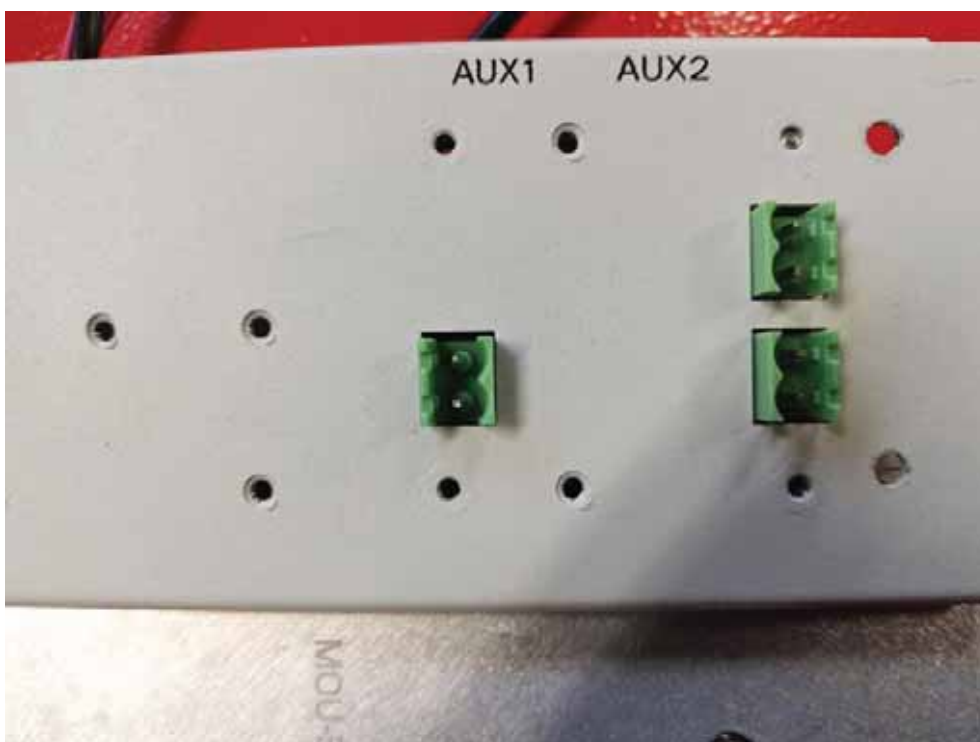


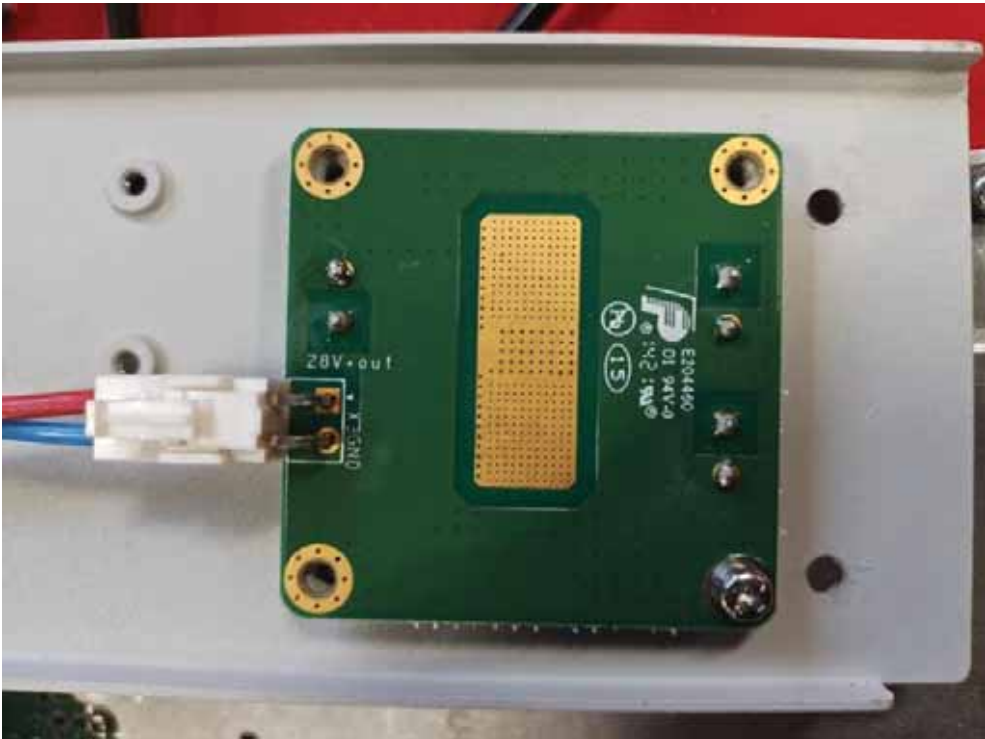
5.3.2.3 PD-481205A0



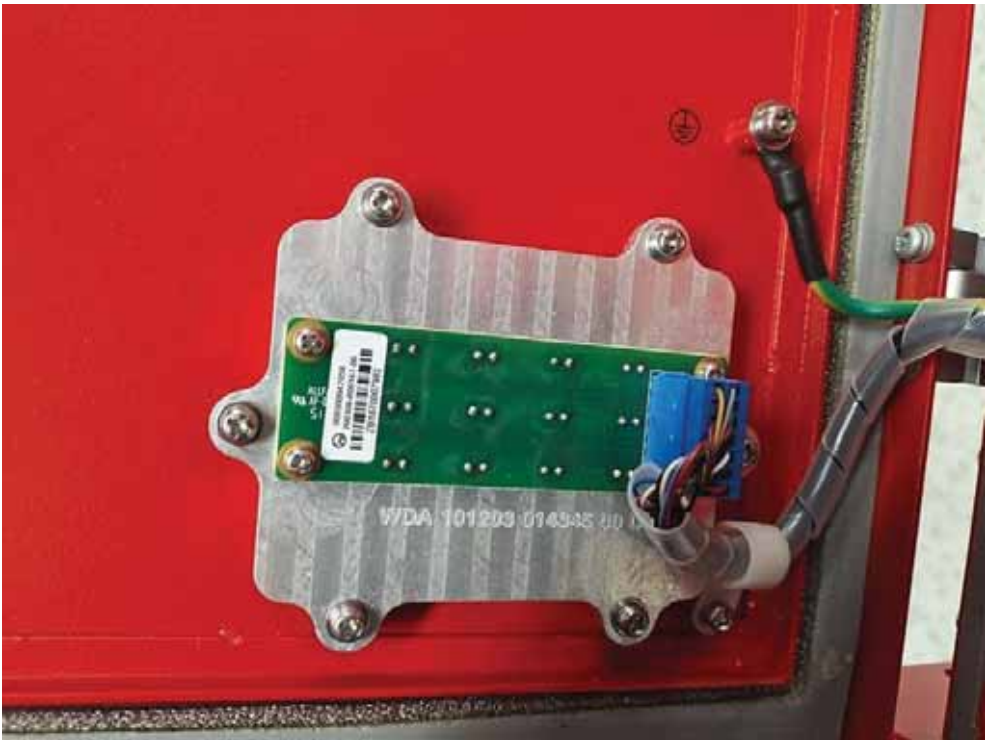


5.3.2.4 PNDAS-00EPW-3001





5.3.2.5 RH-7W22JK-3002





----- End of Report -----