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USER OPERATION AND MAINTENANCE MANUAL

RADIOMETER 320 GHz
Part No. RDM-320/4



**1st Edition
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1. INTRODUCTION.

This instruction manual contains information on installation and operation of the 320GHz fixed radiometer.

1.1 General Description.

320 GHz fixed radiometer is intended for measuring the brightness temperature in 320+/-2GHz frequency range.

Base principle of operation is a collection of radiation of from atmosphere or any objects.

The Radiometer is a super heterodyne receiver with direct power detection in IF channel. The Radiometer picks up RF signal and produces 0...+5V analogue output signal proportional to the brightness temperature of objects.

2. SPECIFICATIONS.

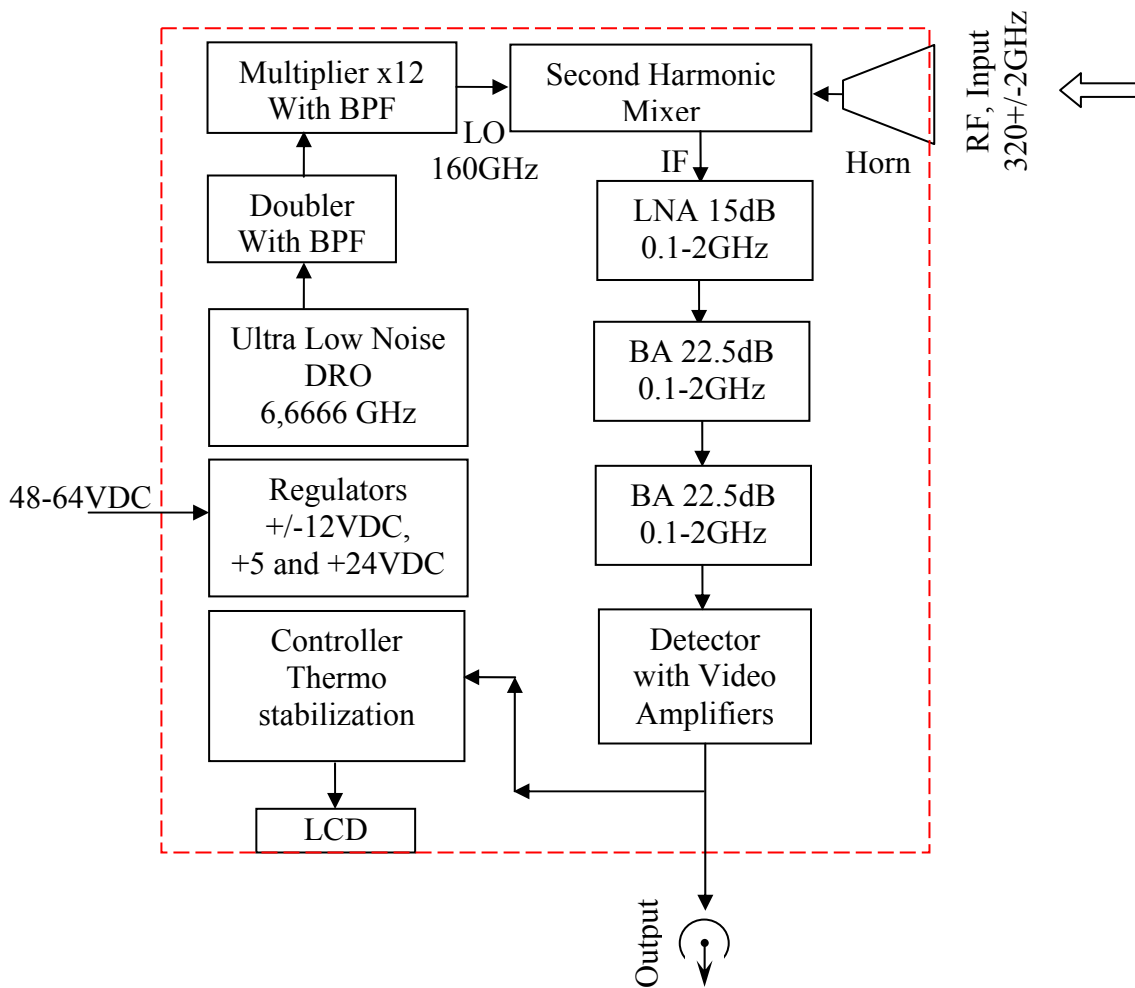
2.1 Electrical Specifications.

1. Radiometer type:	Direct power
2. Operating Center Frequency:	320.0 GHz
3. RF Bandwidth GHz	4.0 GHz
4. LO Source Frequency	160.0 GHz
5. Pre-Detection Bandwidth	2.0 GHz
6. Centre frequency Accuracy	10 MHz (-20 ...+ 50C)
7. Radiometric Dynamic Range	0 - 400 K
8. Radiometric Sensitivity	1.5 K
9. Temperature Sensitivity	0.27 K
10. Integration Time	1s
11. System Noise Figure (DSB)	14 dB
12. Conical Antenna beam wide	$\theta=0.94^\circ$
13. Conical antenna gain	45 dB
14. Voltage Output	0 - +5 V
15. Detector Type	Linearized, square law
16. Conical Antenna Flange	UG-387/U-M / WR-03
17. Waveguide flange	UG-387/U-M / WR-03
18. Video Output Connector	BNC
19. Internal temperature stabilization	Yes
20. External nitrogen cooled load	Yes
21. Power Requirements	48-64DCV, Power supply 220ACV is included.

2.2 Mechanical Specifications.

22. Size	370x250x110 mm;
23. Weight	3 kg.

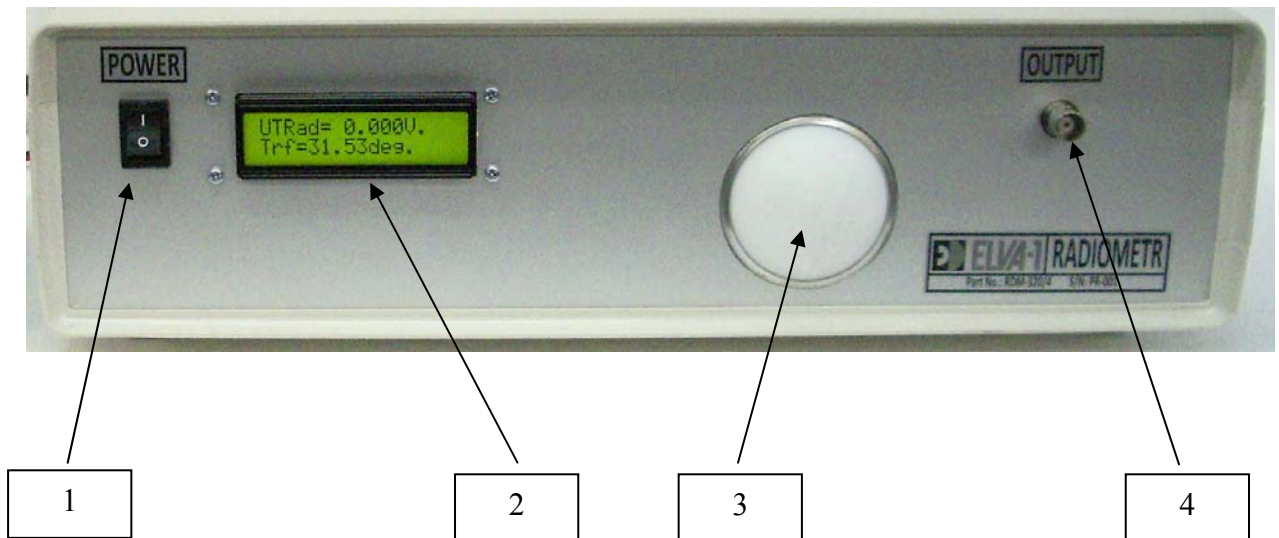
2.3 Block-diagram of the Radiometer.



Picture No1. Block-Diagram of the Radiometer.

2. 4 Front panel.

Disposition of the plugs and knobs on the front panel of the Radiometer are the following:

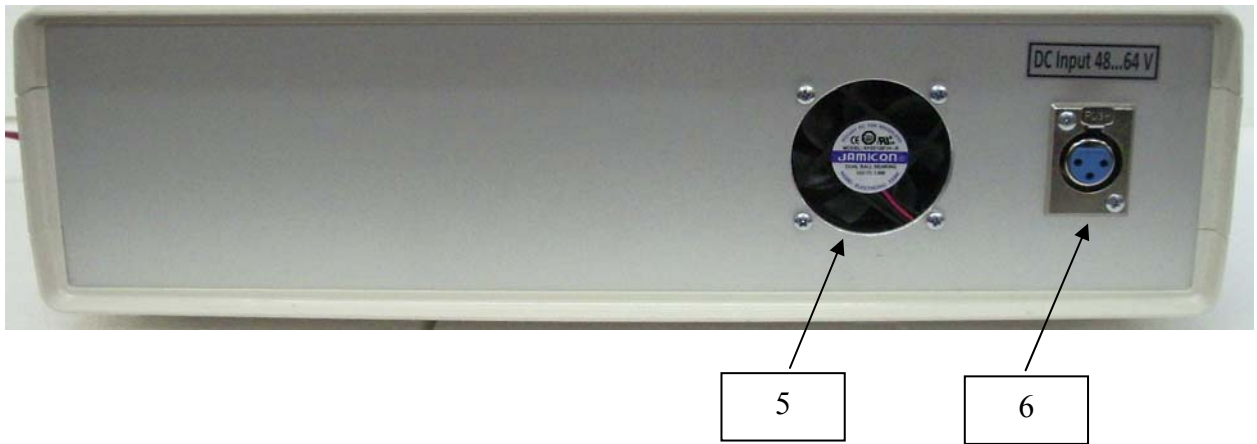


Picture No2. Front panel of the Radiometer.

1. Power switch;
2. LCD;
3. Input horn;
4. Output (BNC);

2. 5 Rear panel.

Disposition of the plugs on the rear panel of the Radiometer are the following:

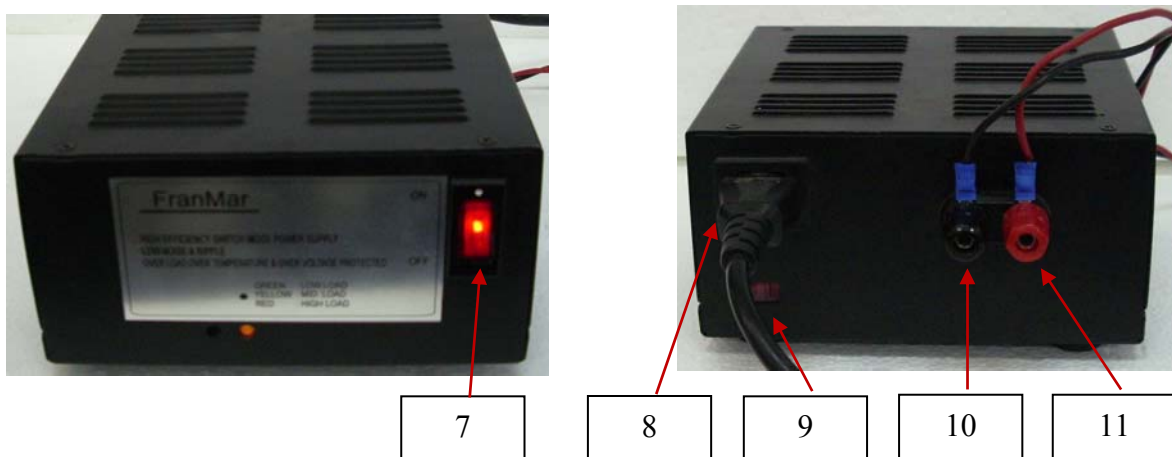


Picture No3. Rear panel of the Radiometer.

- 5. Fan;
- 6. Power plug 48-64V DC.

2. 6 Power supply 220/56.

Disposition of the plugs of the power supply 220VAC to 56VDC are the following:



- 7. Power switch with indicator
- 8. Plug 220V AC
- 9. Switch 110/220V AC
- 10. '-56V connector
- 11. '+56V connector

3. INSTALLATION.

3.1 Assembly procedure.

The Radiometer is fully completed device and don't require any special components.

3.2 Put into operation.

- Connect power supply 220/56 with the Radiometer by applied cable, as it is shown below. Red wire is '+56V line, black wire is '-56V line



- Switch ON power supply and the Radiometer by power switches No7 and 1.



- Wait about 20 min for warm up procedure and internal thermo stabilization. Status of the Radiometer is shown on LCD



- After warm up period the Radiometer is ready for measurement. The following information can be read from LCD:

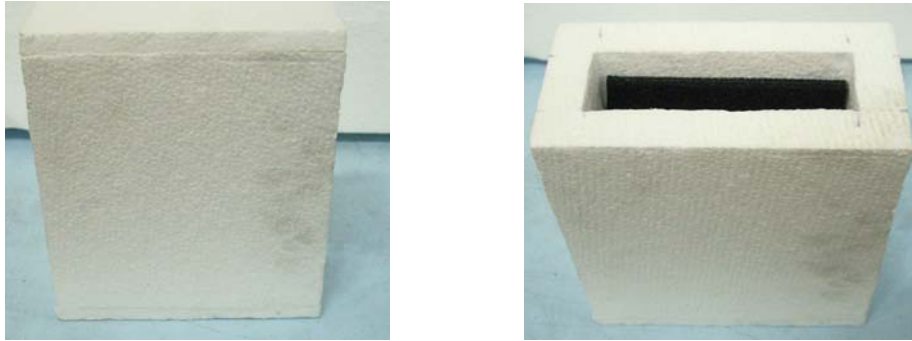


- First Line, 'UTRad=': online actual measured output voltage;
- Second Line, service information:
 - 'Trf' – actual temperature of LO module, stabilization temperature 37C;
 - 'Tif' – actual temperature of IF module, stabilization temperature 35.5C;
 - 'U1' – actual voltage of +12VDC regulator;
 - 'U2' – actual voltage of -12VDC regulator;
 - 'U3' – actual voltage of +24VDC regulator;

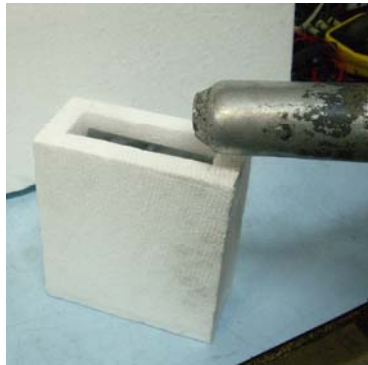
4. CALIBRATION PROCEDURE.

4.1 External Liquid Nitrogen Cooled Calibration load.

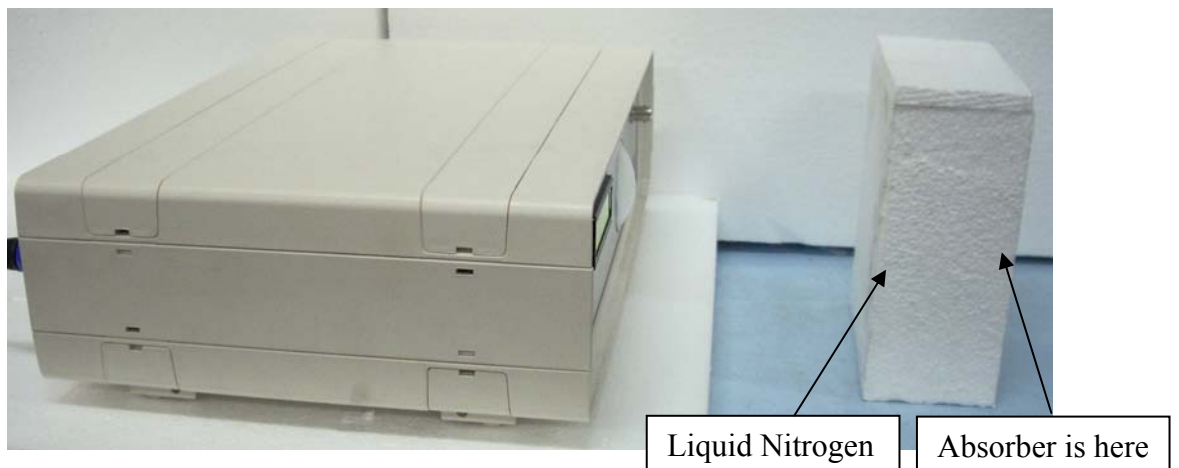
Applied with radiometer cavity with special absorber can be used for absolute calibration of the Radiometer.



To fill cavity with liquid Nitrogen and close it by cover and wait about 1 min while the load comes to stable temperature.



Lift the Radiometer at 5-7cm and install load at 15-20cm in front of the Radiometer input horn. After output data stabilization the result can be stored. It corresponds to 77.25K



4.2 External Hot Calibration load.

For absolute calibration, the second temperature point should be fixed. The some cavity with absorber can be used as hot load 'Dry' absorber corresponds to room temperature and filled by water – water temperature.

4.3 Measured data.

Below it is presented data for liquid Nitrogen and heated water at 355K loads.

U1 (cool load) = 0.765V

U2 (hot load) = 3.595V

Sensitivity = 0.0102 V/deg

Measured temperature= $77+(U_{out}-0.765)/0.0102$

