

Interface Thermal Mathematical Model

1. ELECTRONIC BOX (C/C UNIT)

1.1. Geometrical Model

The CONSERT electric box geometrical model is a simple parallelipedic volume. The dimensions are 300 x 160 X 40 mm.

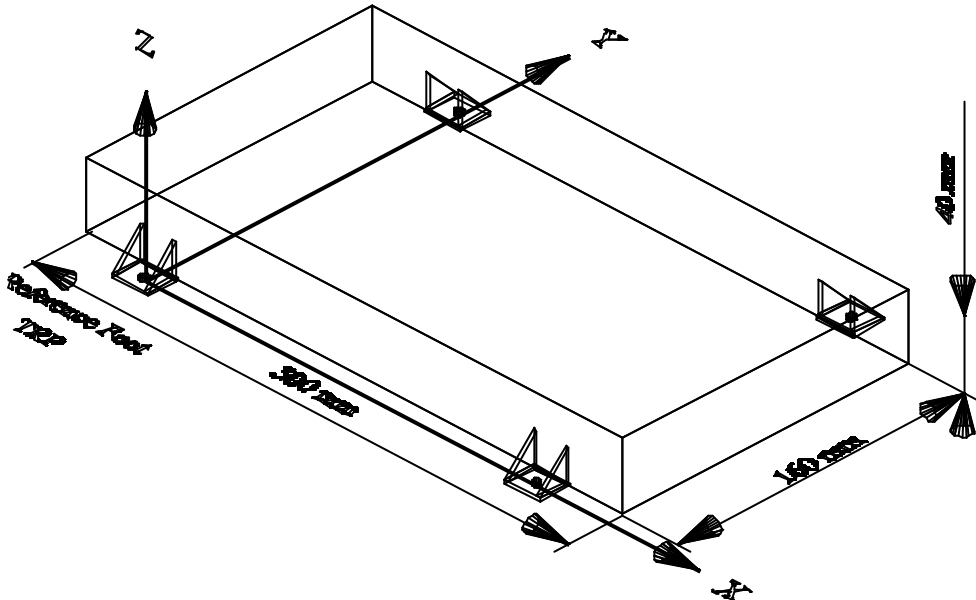


Figure 1.1 : Electronic box Lay-out & dimensions

1.2. Tables

Node	Name	Material	Thermal Finish	a_s	r_s^d	r_s^s	e_h	r_h^d	r_h^s
50060	Electronic	AL alloy 2618A	ban	-	-	-	0.88	0.12	-

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Table 1.1 : BOL/EOL Surface Properties

Node	Name	Material	A (m ²)	mCp (J/K)	Non-Op. Heater	TRP location
50060	Electronic	AL alloy 2618A	0.133	1200.	HT	TH

Table 1.2 : Nodes properties

Node	Op. (°C)	Non-Op. (°C)	Op. Stab. (°C/h)
50060	-20 / +50	-30 / +60	± 20.

Table 1.3 : TRP Design Temperature Ranges

		BOL / EOL	
Mode	Node	Op. QI (W)	Non-Op QR (W)
min/max	50060	1.56 / 2.94	S/C

Table 1.4 : Power Dissipations

Type	Number	Ac (cm ²)	Node	Conductive I/F Node
4 feet - 4*M4	4	4 * 3.4	50060	60060

Table 1.7 : Interface Conductances

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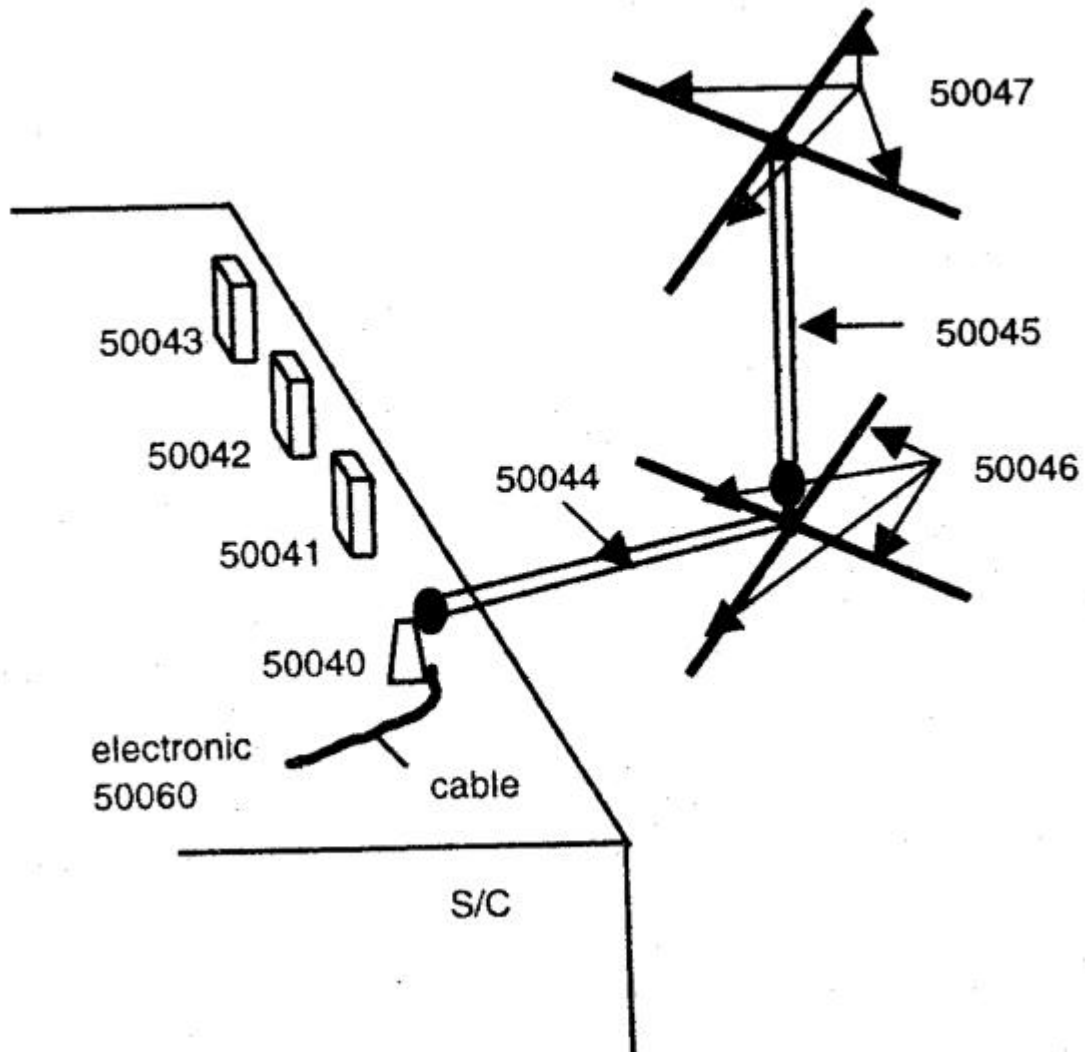
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2. ANTENNA

2.1. Geometrical Model

The CONSERT antenna nodal breakdown and 3D view is shown on the following figures :



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Figure 2.1 : Antenna Nodal Breakdown

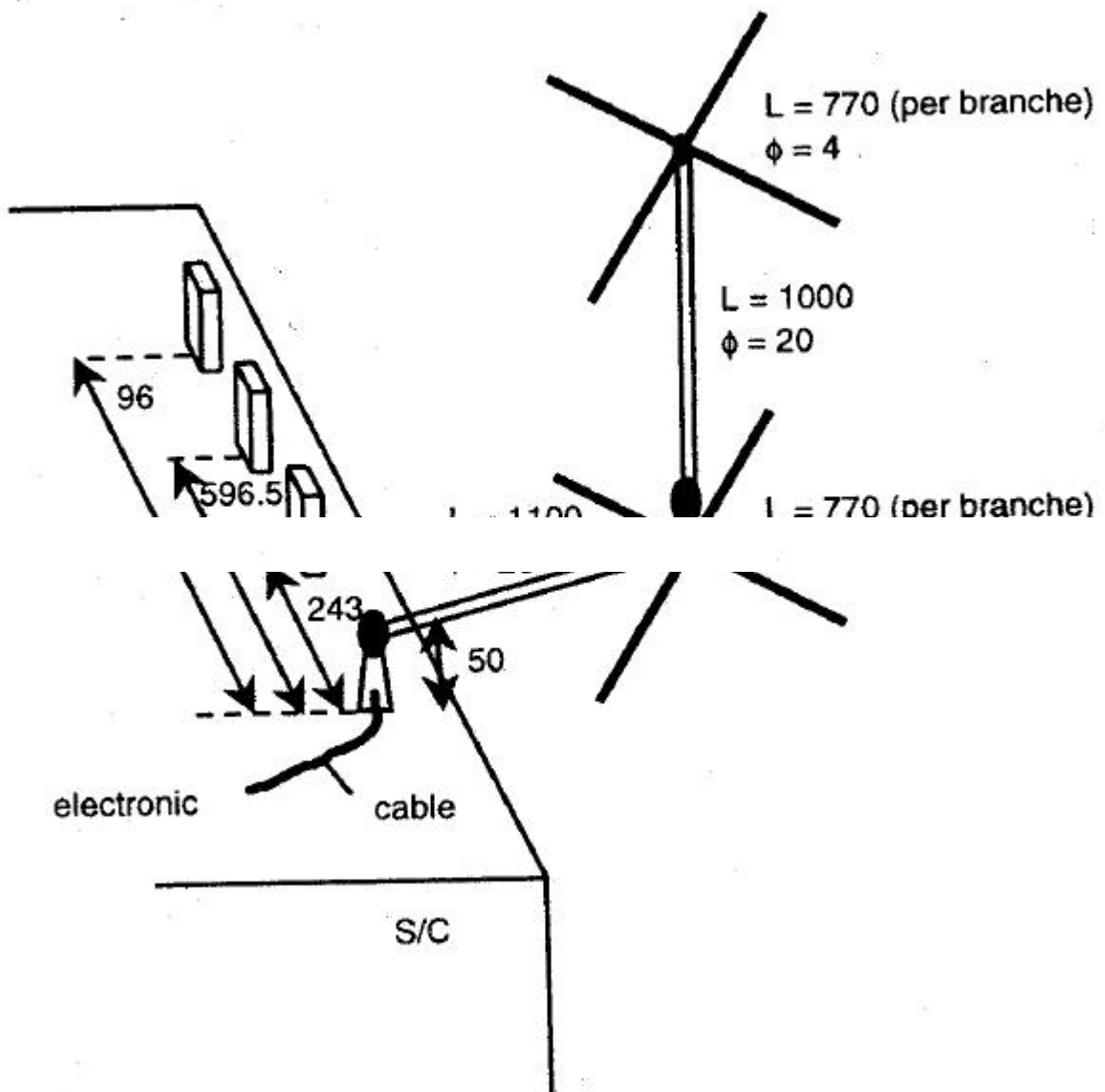
Area between nodes and Spacecraft:

50040 25.0 cm²

50041 16.5 cm²

50042 33.0 cm²

50043 16.5 cm²



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Figure 2.2 : Antenna 3D view

Distance between reference Point on node 50040 and center of nodes

50041 243 mm

50042 598 mm

50043 918 mm

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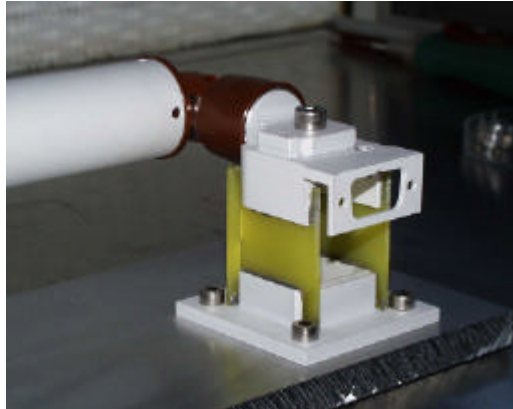


Figure 2.3 : Detail of Support 1

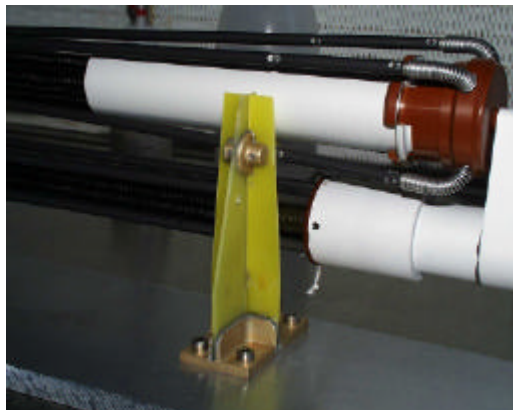


Figure 2.4 : Detail of Support 2 (Support 4 is identical)

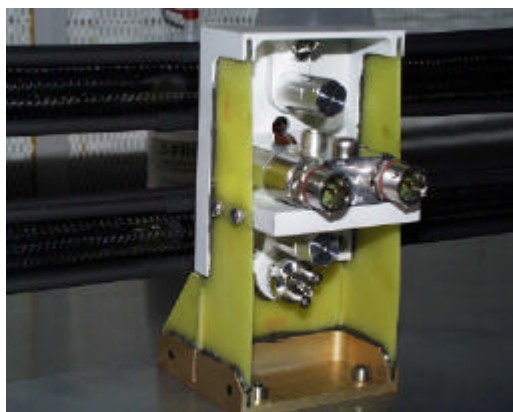


Figure 2.3 : Detail of Support 1

Note : All Parts are Black painted

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2.2. Tables

Node	Name	Material	Thermal Finish	a_s	r_s^d	r_s^s	e_h	r_h^d	r_h^s
50040	support-1	GFK (1)	Black paint	0.95	0.05	0.	0.85	0.15	0.
50041	support-2	GFK (1)	Black paint	0.95	0.05	0.	0.85	0.15	0.
50042	support-3	GFK (1)	Black paint	0.95	0.05	0.	0.85	0.15	0.
50043	support-4	GFK (1)	Black paint	0.95	0.05	0.	0.85	0.15	0.
50044	Mast-1	C-Fiber (2)	WP (4)	0.34	0.66	0.	0.76	0.24	0.
50045	Mast-2	C-Fiber (2)	WP (4)	0.34	0.66	0.	0.76	0.24	0.
50046	Reflectors	Al (3)	BP (5)	0.91	0.09	0.	0.77	0.23	0.
50047	Dipoles	Al (3)	BP (5)	0.91	0.09	0.	0.77	0.23	0.

- (1) GlassFiber reinforced Epoxy
- (2) CFK Tube (Carbon fiber tube from Schütze)
- (3) Aluminium Alloy, WK3.4365 AA 7075
- (4) White Plasmocer
- (5) Black Plasmocer

Table 2.1 : BOL/EOL Surface Properties

Node	Name	Material	A (m ²)	mCp (J/K)	Non-Op. Heater	TRP location	At av. (%) trim.
50040	support-1	GFK	0.020	40.	-	-	-
50041	support-2	GFK	0.020	30.	-	-	-
50042	support-3	GFK	0.030	100.	-	Pyro	-
50043	support-4	GFK	0.020	30.	-	-	-
50044	Mast-1	C-Fiber	0.069	21.	-	-	-
50045	Mast-2	C-Fiber	0.063	19.	-	-	-
50046	Reflectors	Al	0.039	81.	-	-	-
50047	Dipoles	Al	0.039	81.	-	-	-

Effective heat conductivity of :

Each support (top to bottom) : $0.60 \cdot 10^{-3}$ W/K

Each Mast (end to end) : $1.62 \cdot 10^{-3}$ W/K

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Table 2.2 : Nodes properties

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Node	Op. (°C)	Non-Op. (°C)	Op. Stab. (°C/h)
50042 (pyro)*	-80 / +100	-	-

* at deployment

Table 2.3 : TRP Design Temperature Range

Mode	Node	BOL / EOL	
		Op. QI (W)	Non-Op QR (W)
no power	50042	0. / 0.	no heater

Table 2.4 : Power Dissipations

Status (-)	Node i (-)	Node j (-)	GL (W/K)
Deployed	50040	50044	1.2
	50044	50045	1.2
	50044	50046	8.0
	50045	50047	8.0
Stowed	50040	50044	0.003175
	50044	50045	0.003175
	50044	50041	8.0
	50044	50042	8.0
	50044	50043	8.0
	50045	50041	8.0
	50045	50042	8.0
	50045	50043	8.0

Tables 2.5 : Internal Conductive Couplings

Type	Number	Ac (cm ²)	C (W/K)	Node	Conductive I/F Node
support-1	1	1.5	0.0012 (*)	50040	60040

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support-2	1	1.5	0.0012 (*)	50041	60041
support-3	1	1.5	0.0012 (*)	50042	60042
support-4	1	1.5	0.0012 (*)	50043	60043
cable	1	0.0033	0.0013	50040	50060 (electronic)

(*) Estimated from half height to bottom (= 50 mm)

Table 2.7 : Interface Conductances