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AUTOMATISMES & TELECOMMUNICATIONS

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ARTEMA 900 MHZ FHSS RADIO

REF. P4432-150 (BASE UNIT)
P4432-050 & -052 (HAND HELD UNIT)

DESCRIPTION OF TRANSMISSION

Distribution :	**CONFIDENTIAL**

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Revisions

Indice	Date	Objet
1.0	25/04/00	Création du document
1.2	25/07/01	Answers to FCC questions
1.2	04/09/01	Answers to additional FCC questions

DESCRIPTION OF TRANSMISSION

The radio module RFM 900 FHSS is a 900MHz FCC 15.247 frequency hopping transceiver.

At baseband end, the interface of the radio module is a serial link.

At the antenna interface the radio is working between 903.8 and 911.15 MHz using frequency hopping.

The frequency hopping :

There are 50 frequencies numbered from 0 to 49

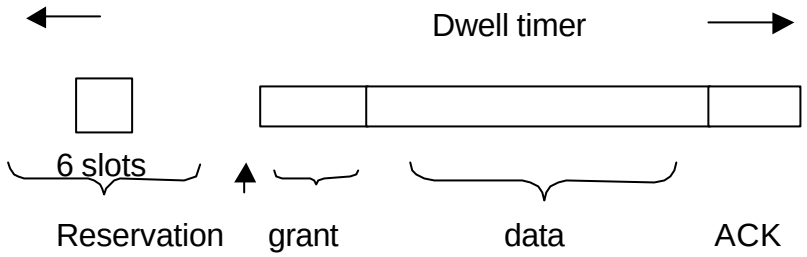
spaced by 150 kHz, that is to say :

903.8	CH. 0	center frequency
903.95	CH 1	"
907.4	CH 24	"
911.15	CH 49	"

These frequencies are arranged randomly in up to 3 different tables which are stocked in the software.

Each dwell timer the transmission occurs on a different channel, following the order defined by the table at both ends synchronously

The dwell timer



The dwell timer is divided in several parts :

- Reservation

in which up to 6 mobiles may send a reservation burst in order to get a grant from the base station.

The base station may however keep the current dwell timer for itself, not granting to any mobile.

- Depending of the decision of the base, based on a priority scheme, the mobile (or base) that was designated by the grant is allowed to transmit a data packet during the current dwell timer. Data is protected by a CRC.

- The data is transmitted during the data phase of the dwell timer using FSK modulation. Two bits are associated to code a baseband – tone frequency among four tones (18/22/28/40 kHz). Each tone, during the dual bit duration modulates the frequency of the transmit oscillator.

- The last phase of the dwell timer is the ACK which is sent if the receive side has a correct CRC checksum.

dwell time :	92 ms			
reservation slot :	4 ms / 6ms			
reservation:	36 ms			
grant :	7 ms			data+ carrier =
data :	64	char.	max +10	19+ 5 ms =24ms
ACK :	7ms			

Prioritization scheme

The priority algorithm attempts to share the frequency equally between the links.

More specifically at each grant the base gives the link to

- the various mobile in ascending order
- itself if it has not just transmitted and needs to do it.

Examples :

1. – B M1 B M2 B M3 B M4 B M5 B M6 B….

only if the base has something to transmit at that time.
(the base has many things to transmit)

2 - B M1 M2 M3 M4 M5 M6 B

(the base has few things to transmit)

3 - M1 M4 M5 M1 M4 M5

(only M1 M4 and M5 have something to transmit)

4 - M1 M1 M1 M1

(only M1 has something to transmit)

Synchronization

On two frequencies (selected by software for one network), the base transmits a synchronization burst on which each mobile may synchronize to the frequency table.

At the beginning, the mobile settles on a synchronization frequency alternatively and looks for the synchronization burst.

When found, the mobile follows the frequency table in synchronization with the base.

The channel access is done by transmitting a reservation slot in the reservation phase.

Radiated Power density

$$Ô = \frac{Pe\ Ge}{4Ï\ d^2}$$

d min = 5 mm between antenna wire and outside of the base or hand held unit

P max = 10.67 dBm = 11.7mw (Hand-Held Unit, P4432-050 & -052)

G 0 dBi

$$Ô \quad \frac{11.7\ mw}{4\ x Ï\ (0.5)^2} = 3.72 mw/cm^2$$

P max = 12.33 dBm = 17.1mw (Base Unit, P4432-150)

G 0 dBi

$$Ô \quad \frac{17.1\ mw}{4 x Ï\ (0.5)^2} = 5.44 mw/cm^2$$

Radio block diagram

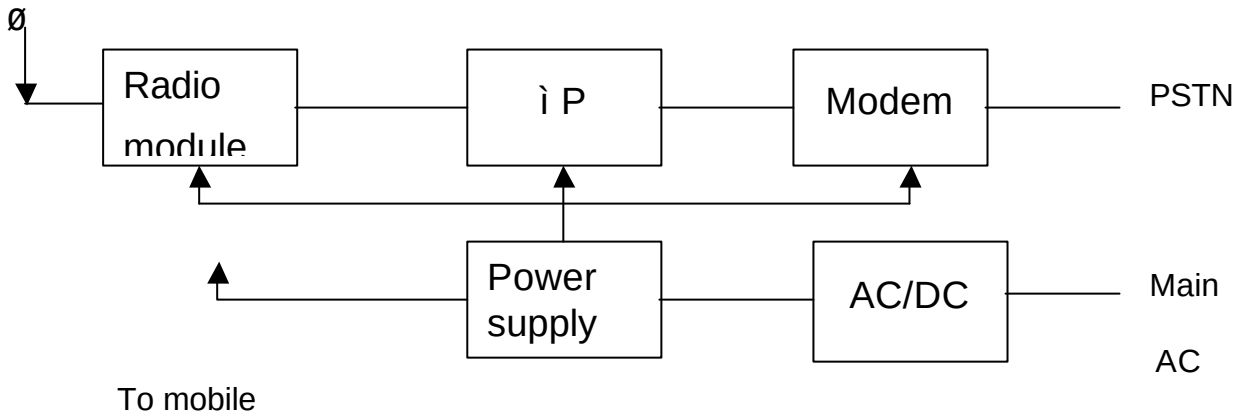
See block diagram in attachments

Output power : 10.67dBm (Hand-Held Unit), 12.33dBm (Base Unit)

Sensitivity Rx : - 85 dBm @ 10^{-3} BER

Antenna gain ~ 0 dBi

Overall block diagram



Channels

N.B. : table 0 is not used currently (except for tests) and is always on the same channel given by register S202

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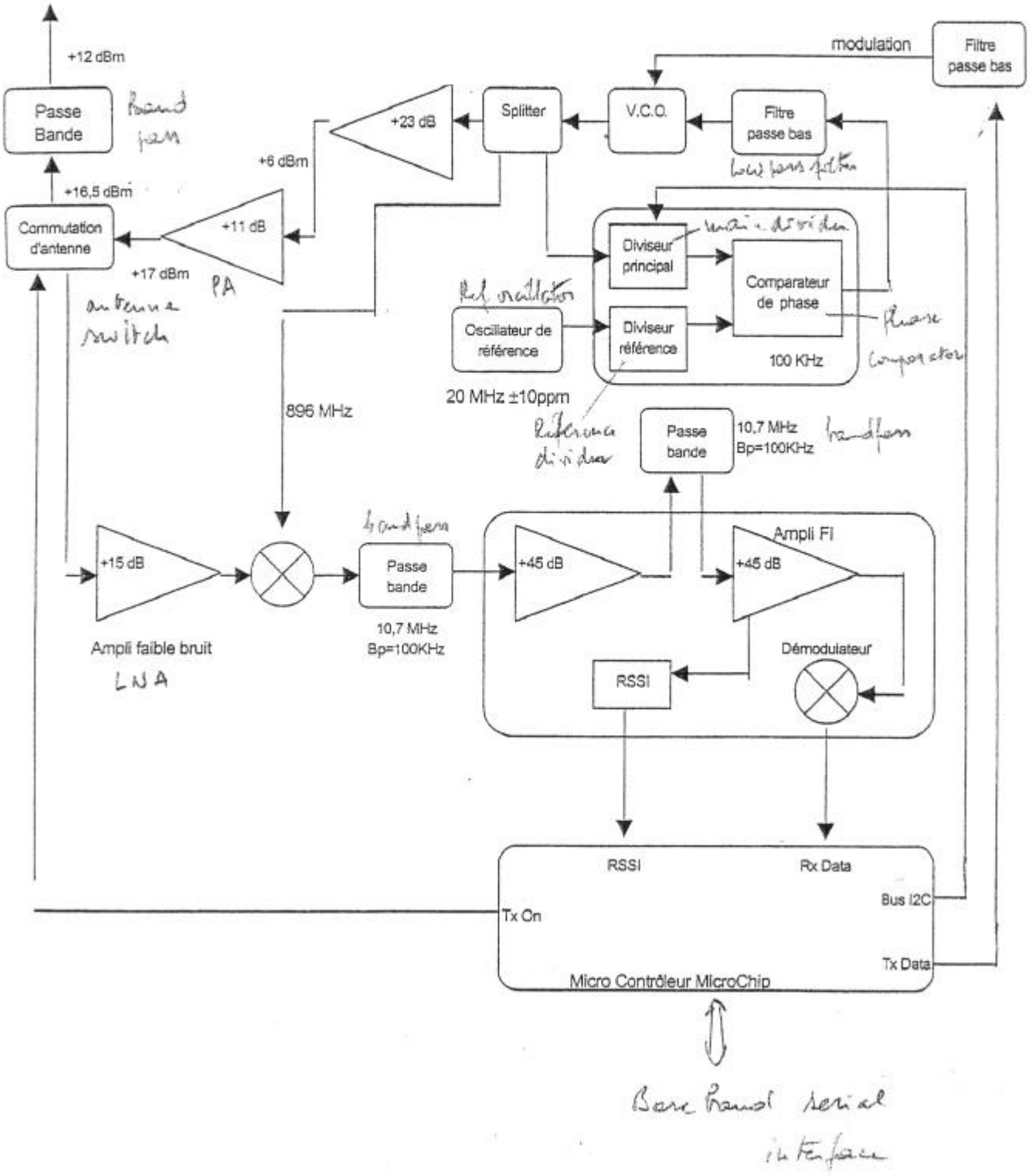
Tables des Canaux B900SS-20

Table 1	Table 2	Table 3	Table 4	Table 5	Table 6	Table 7	Table 8
16	31	14	2	47	39	42	44
23	48	27	18	24	31	9	8
30	32	40	34	48	49	41	11
37	1	39	39	18	10	5	36
44	2	26	23	35	2	38	17
0	4	13	7	25	40	47	7
49	8	3	3	30	11	3	49
42	16	16	19	32	26	24	1
35	33	29	35	46	47	7	47
28	3	42	40	20	16	16	14
21	6	38	47	34	14	32	43
14	12	25	22	19	17	8	18
7	24	12	20	16	9	27	10
5	49	0	36	10	43	34	5
12	34	11	28	44	3	25	20
19	5	24	44	23	45	46	2
26	10	37	38	42	41	19	29
33	20	49	30	0	12	26	0
40	41	36	13	41	30	49	30
47	19	23	8	31	37	22	46
45	39	10	6	8	44	36	21
38	15	4	4	14	6	10	3
31	30	17	9	28	23	13	22
24	40	30	25	27	24	17	28
3	17	43	41	15	8	14	37
17	35	48	5	12	25	43	19
10	7	35	21	21	20	1	39
1	14	22	37	36	46	2	27
8	28	9	24	22	29	35	4
15	0	2	10	1	42	48	40
22	36	15	26	43	15	20	16
29	9	28	45	13	35	28	45
36	18	41	42	6	22	15	34
43	37	47	33	45	48	45	15
48	11	34	15	39	34	30	35
41	22	21	0	17	13	11	12
34	45	8	11	37	21	23	31
27	27	1	27	38	32	37	23
20	46	5	43	9	18	29	41
13	29	18	29	3	36	18	6
6	44	31	12	33	19	39	38
4	25	44	1	11	5	0	26
11	38	46	14	26	27	40	33
18	13	33	46	7	4	6	25
25	26	20	31	49	1	21	42
32	42	7	16	4	28	33	32
39	21	6	32	29	38	4	9
46	43	19	48	2	7	12	24
2	23	32	17	5	33	31	13
9	47	45	49	40	0	44	48

V. Spécifications partie Radio

1) Synoptique



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