11 HOP SELECTION

In total, 10 types of hopping sequences are defined – five for the 79-hop and five for the 23-hop system, respectively. Using the notation of parentheses () for figures related to the 23-hop system, these sequences are:

- A **page hopping sequence** with 32 (16) unique wake-up frequencies distributed equally over the 79 (23) MHz, with a period length of 32 (16);

- A **page response sequence** covering 32 (16) unique response frequencies that all are in an one-to-one correspondence to the current page hopping sequence. The master and slave use different rules to obtain the same sequence;

- An **inquiry sequence** with 32 (16) unique wake-up frequencies distributed equally over the 79 (23) MHz, with a period length of 32 (16);

- A **inquiry response sequence** covering 32 (16) unique response frequencies that all are in an one-to-one correspondence to the current inquiry hopping sequence.

- A **channel hopping sequence** which has a very long period length, which does not show repetitive patterns over a short time interval, but which distributes the hop frequencies equally over the 79 (23) MHz during a short time interval;

For the page hopping sequence, it is important that we can easily shift the phase forward or backward, so we need a 1-1 mapping from a counter to the hop frequencies. For each case, both a hop sequence from master to slave and from slave to master are required.

The inquiry and inquiry response sequences always utilizes the GIAC LAP as lower address part and the DCI (Section 5.4 on page 72) as upper address part in deriving the hopping sequence, even if it concerns a DIAC inquiry.

11.1 GENERAL SELECTION SCHEME

The selection scheme consists of two parts:
- selecting a sequence;
- mapping this sequence on the hop frequencies;

The general block diagram of the hop selection scheme is shown in Figure 11.1 on page 127. The mapping from the input to a particular hop frequency is performed in the selection box. Basically, the input is the native clock and the current address. In **CONNECTION** state, the native clock (CLKN) is modified by an offset to equal the master clock (CLK). Only the 27 MSBs of the clock are used. In the **page** and **inquiry** substates, all 28 bits of the clock are used. However, in **page** substate the native clock will be modified to the master's estimate of the paged unit.

The address input consists of 28 bits, i.e., the entire LAP and the 4 LSBs of the UAP. In **CONNECTION** state, the address of the master is used. In **page** sub-state the address of the paged unit is used. When in **inquiry** substate, the UAP/LAP corresponding to the GIAC is used. The output constitutes a pseudo-random sequence, either covering 79 hop or 23 hops, depending on the state.
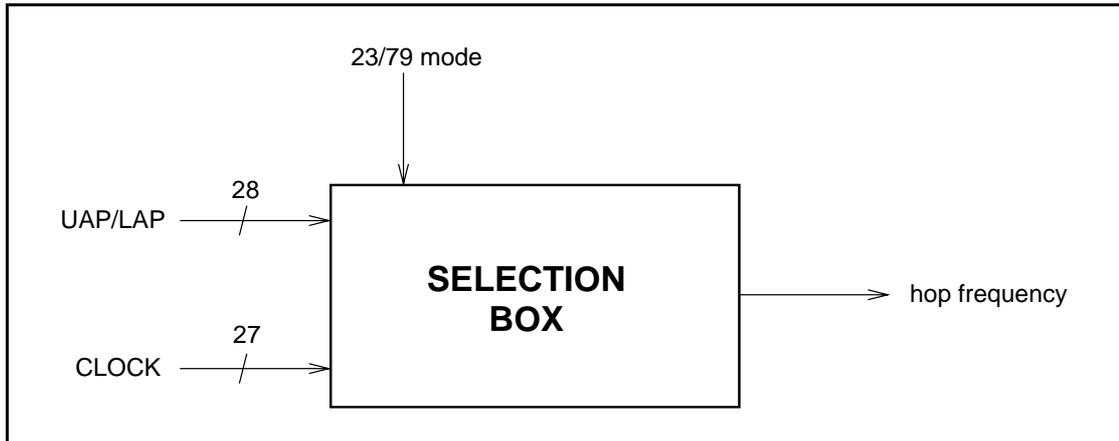

Figure 11.1: General block diagram of hop selection scheme.

For the 79-hop system, the selection scheme chooses a segment of 32 hop frequencies spanning about 64 MHz and visits these hops once in a random order. Next, a different 32-hop segment is chosen, etc. In case of the **page, page scan,** or **page response** substates, the same 32-hop segment is used all the time (the segment is selected by the address; different units will have different paging segments). In connection state, the output constitutes a pseudo-random sequence that slides through the 79 hops or 23 hops, depending on the selected hop system. For the 23-hop systems, the segment size is 16. The principle is depicted in Figure 11.2
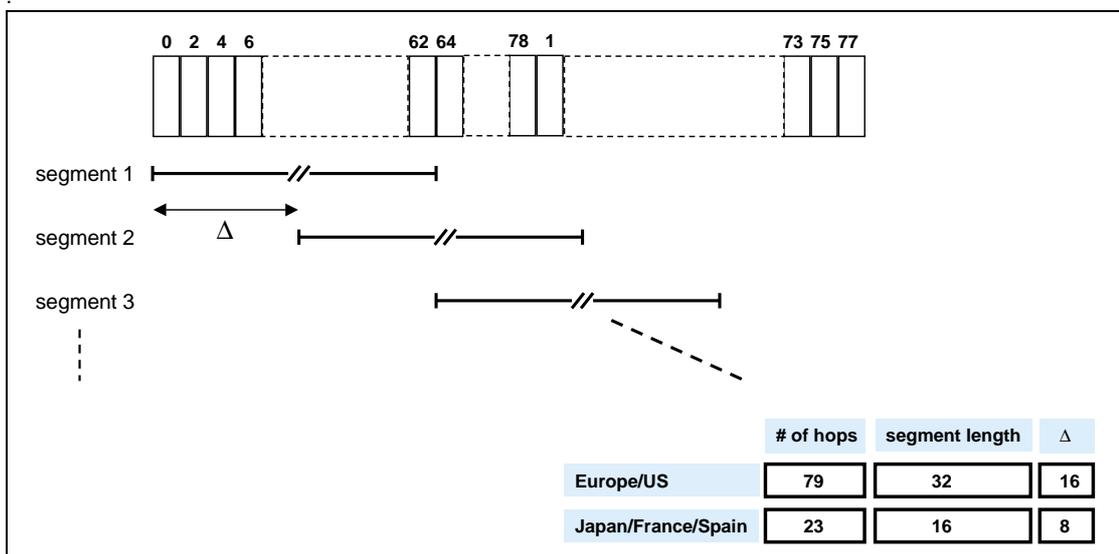

	# of hops	segment length	Δ
Europe/US	79	32	16
Japan/France/Spain	23	16	8

Figure 11.2: Hop selection scheme in CONNECTION state.

11.2 SELECTION KERNEL

The hop selection kernels for the 79 hop system and the 23 hop system are shown in Figure 11.3 on page 128 and Figure 11.4 on page 128, respectively. The X input determines the phase in the 32-hop segment, whereas Y1 and Y2 selects between master-to-slave and slave-to-master transmission. The inputs A to D determine the ordering within the segment, the inputs E and F determine the mapping onto the hop frequencies. The kernel addresses a register containing the hop frequencies. This list should be created such that first all even hop frequencies are listed and then all odd hop frequencies. In this way, a 32-hop segment spans about 64 MHz, whereas a 16-hop segment spans the entire 23-MHz.
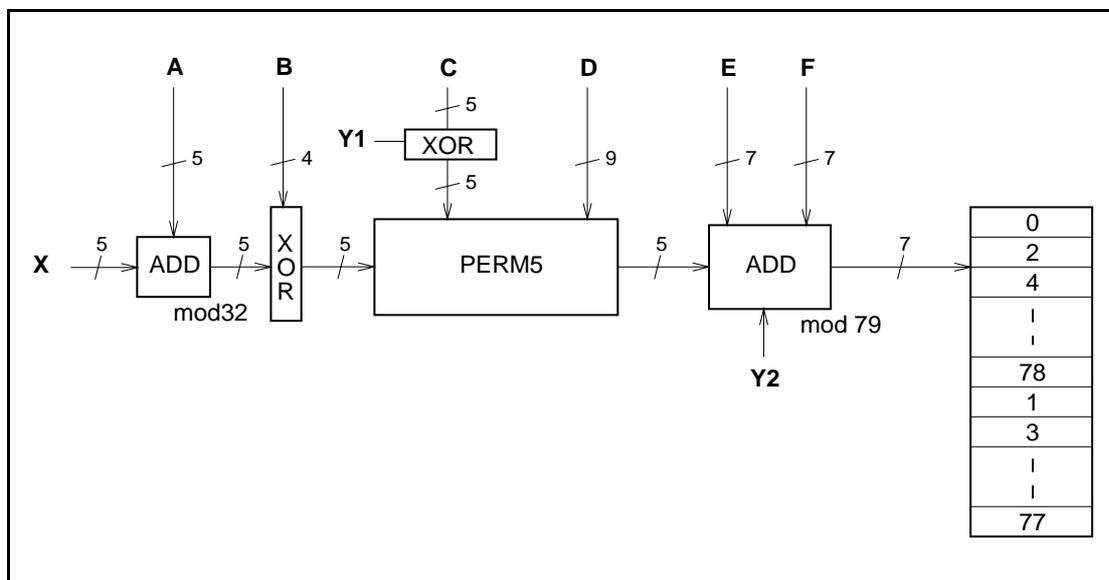

Figure 11.3: Block diagram of hop selection kernel for the 79-hop system.
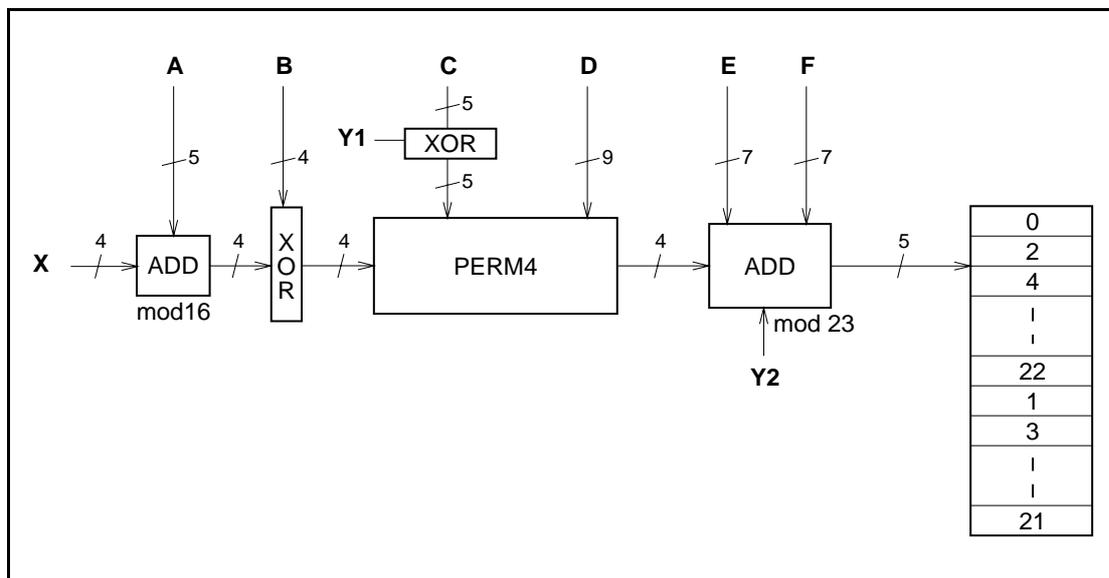

Figure 11.4: Block diagram of hop selection kernel for the 23-hop system.