Block contains all the effect definitions stored in the DSE file. The Effect Set Name Block, which is optional, contains the name of the effect set.

FIG. **5** is a block diagram of the Effect Storage Block, in accordance with one embodiment, which has two sub-blocks: an Effect Storage Offset Sub-Block and an Effect Storage Data Sub-Block.

The Effect Storage Offset Sub-Block is an array of offsets, one offset for each effect. Each offset occupies two bytes with the least-significant byte at the lower memory address. The number of effects is stored in the DSE file header. The offset, in bytes, specifies where in the Effect Storage Data Sub-Block the effect's definition begins relative to the start of the Effect Storage Data Sub-Block. The size of the Effect Storage Offset Sub-Block is 2*EFFECTCOUNT. The EFFECTCOUNT comes from the DSE file header. The Effect Storage Data Sub-Block stores the effect definitions.

In one embodiment, the DSE contains magnitude control information over time. An idealized voltage, from −127 to 127, is modulated over time to drive a vibration actuator. For AC control (e.g., LRAs), other parts of the system (driver software, electronics) are responsible for synthesizing the AC signal, and the DSE represents the maximum value attained, per cycle, by the AC control signal.

FIG. **6** illustrates a typical short control signal or stored haptic effect where the critical data to be encoded is clearly identified in accordance with one embodiment. Unlike known systems that generate haptic effects in real-time by generating haptic effects from a plurality of high level parameters, the haptic effect in FIG. **6** is predefined with the low level haptic parameters such as voltage levels and time duration.

Point **1** is the start of the haptic effect, which is always assumed to start at time t=0 ms. Assume that idealized voltage level is 127. The time between point **1** and point **2** is the kickstart pulse. Point **2**, occurring at, for example, time=20 ms, identifies the start of the sustain period, with voltage level 80 applied. This level is applied until point **3** at time=100 ms, for example, where a braking pulse starts, with voltage at −127. At point **4**, time t=120 ms, voltage drops to 0. An additional zero point, point **5**, is placed at t=150 ms to encode a certain amount of silence—useful when the effect is designed to be repeated (the same effect can be obtained by specifying a gap value in a DAI/API call). Table 1 below is an example of how the critical points and timings are encoded in one embodiment.

TABLE 1

Byte #	Data	Meaning
0	127	Apply voltage level 127 . . .
1	20	For 20 ms.
2	80	Apply voltage level 80 . . .
3	80	For 80 ms.
4	−127	Apply voltage level −127 . . .
5	20	For 20 ms.
6	0	Apply voltage level 0 . . .
7	30	For 30 ms.
8	0	Apply voltage level 0 . . .
9	0	For 0 ms - this means, "end of digitized streamed effect definition".

In one embodiment a slightly more complex encoding that incorporates a slope encoding is shown in Tables 2 and 3 below. Regarding table 2, the following applies:

1. Data is organized in voltage/time pairs.
2. Time is relative, not absolute. "Apply X voltage for the next Y milliseconds", and not "Apply voltage X starting at time=Y".

TABLE 2

Generalized Voltage/Time Pair Encoding, "Set & Hold" Pair:

Byte #	Bits	Data	Meaning
0	7	Ramp/nHold	0 => Hold this voltage level constant for this duration
0	6 . . . 0	Voltage/2	Voltage level to be applied, divided by 2. Use a single left shift command and cast to a signed 8-bit integer to obtain the desired voltage level between −127 and 127. The driver should always add 1/−1 to the result unless the value is 0.
1	7 . . . 0	Time, ms/5	Time, in 5 ms increments. For best results, the driver code should run the control loop at 200 Hz. Maximum time that can be encoded = 255 × 5 ms = 1.275 sec. For longer durations, create a sequence of voltage/time pairs.

TABLE 3

Generalized Voltage/Time Pair Encoding, "Set & Ramp" Pair:

Byte #	Bits	Data	Meaning
0	7	Ramp/nHold	1 => Start at the voltage level and ramp according to the enclosed parameters for the specified duration
0	6 . . . 0	Voltage/2	Voltage level to be applied at time 0, divided by 2. Use a single left shift command and cast to a signed 8-bit integer to obtain the desired voltage level between −127 and 127. The driver should always add 1/−1 to the result unless the value is 0.