SREC (file format)

The **Motorola S-record** format is an ASCII hexadecimal ("hex") text encoding for binary data. It is also known as the **SREC**[1] or **S19**[2] format. Each record contains a checksum to detect data that has been corrupted during transmission. The first record (S0) may include arbitrary comments such as a program name or version number. The last (termination) record (S7, S8, or S9) may include a starting address.

The S-record format was created in the 1970s for the Motorola 6800 processor. Software development tools for that and other embedded processors would make executable code and data in the S-record format. PROM programmers would then read the S-record format and "burn" the data into the PROMs or EPROMs used in the embedded system.

There are other ASCII encoding with a similar purpose. BPNF, BHLF, and B10F were early binary formats, but they are neither compact nor flexible. Hexadecimal formats are more compact because they represent 4 bits rather than 1 bit per character. Many, such as S-record, are more flexible because they include address information so they can specify just a portion of a PROM. Intel HEX format was often used with Intel processors. Tek Hex is another hex format that can include a symbol table for debugging.

Format

An SREC format file consists of a series of ASCII records. All hexadecimal (hex) numbers are Big Endian. The records have the following structure:

1. **Start code**, one character, an *S*.
2. **Record type**, one digit, *0* to *9*, defining the type of the data field.
3. **Byte count**, two hex digits, indicating the number of bytes (hex digit pairs) that follow in the rest of the record (in the address, data and checksum fields).
4. **Address**, four, six, or eight hex digits as determined by the record type for the memory location of the first data byte. The address bytes are arranged in big endian format.
5. **Data**, a sequence of 2*n* hex digits, for *n* bytes of the data.
6. **Checksum**, two hex digits - the least significant byte of ones' complement of the sum of the values represented by the two hex digit pairs for the byte count, address and data fields. For example:

S1137AF0 0A0A0D000000000000000000000000000061

13+7A+F0 +0A+0A+0D+00+00+00+00+00+00+00+00+00+00+00+00+00 = 19E, then take the least significant byte and then take the ones' complement of that byte (9E) which equals 0x61

There are eight record types, listed below:

Record	Description	Address Bytes	Data Sequence
S0	Block header	2	Yes
S1	Data sequence	2	Yes
S2	Data sequence	3	Yes
S3	Data sequence	4	Yes
S5	Record count	2	No
S7	End of block	4	No
S8	End of block	3	No
S9	End of block	2	No

S0

The **S0** record data sequence contains vendor specific data rather than program data. String with file name and possibly version info.

S1, S2, S3

Data sequence, depending on size of address needed. A 16-bit/64K system uses **S1**, 24-bit address uses **S2** and full 32-bit uses **S3**.

S5

Count of S1, S2 and S3 records previously appearing in the file or transmission. The record count is stored in the 2-byte address field. There is no data associated with this record type.

S7, S8, S9

The address field of the **S7**, **S8**, or **S9** records may contain a starting address for the program.

Example

```
S00F000068656C6C6F202020202000003C
S11F00007C0802A6900100049421FFF07C6C1B787C8C23783C6000003863000026
S11F001C4BFFFFE5398000007D83637880010014382100107C0803A64E800020E9
S111003848656C6C6F20776F726C642E0A0042
S5030003F9
S9030000FC
```

Start code

Record type

Byte count

Address

Data

Checksum

References

[1]   SREC is an abbreviation of S-RECord

[2]   S19 comes from the initial characters of each record: S1, S2, S3, ... S9. That gives S1-S9 which is shortened to just S19.

• Motorola (1992), *MC68000 Family Programmer's Reference Manual* (http://www.freescale.com/files/ archives/doc/ref_manual/M68000PRM.pdf)

External links

• SRecord (http://srecord.sourceforge.net/) is a collection of tools for manipulating SREC format files.

Article Sources and Contributors

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