position of the target within the constructed set. For example, if a target of 7 is chosen, then the set of odd values is constructed including the following values: 1, 3, 5, 7, ... The target is the 4th value in the series. Therefore, the target may be represented as "1" because it is odd and "4" because it is the fourth ordinal value in the series. In this example, the data representation is not compact. In fact, the exact same number of bits is used to represent the target in binary as in the encoded representation. It may be desirable to decrease the number of bits used to represent the ordinal position of the target within the constructed series. Various data representation techniques further refining relational differentiation encoding are described below.

Referring to FIG. 2, a relational differentiation encoding module performs a data encoding process that generates a compact representation of input data. This process is typically performed either by a programmed digital computer, dedicated circuitry, or a combination of the two. Relational differentiation encoding begins by receiving an input (step 202). This input, T, is the target designating the number to be encoded and then later recovered. The target T is encoded so that a reduced number of bits are needed for transmission and storage. The target number can be reconstituted from the bits transmitted or stored.

After the target T is received, the system computes one or more characteristics of the target to create an ordinal series. For example, the system may compute the senior most bit (SMB) and the so many on bits (SMOB) for the target (step 204) to create a combinatorial ordinal series of values. The SMB is the position of the senior most on bit of the bit string to be encoded. For example, an 8-bit binary bit string having a 1 in the high-order position would have an SMB equal to 8. An 1000-bit binary number having a one in the senior most (high-order) position would have an SMB equal to 1000. In the descriptions that follow, SMB is sometimes abbreviated with the capital letter N.

The SMOB is the number of on or 1 bits in a binary stream having a given SMB. Thus, an 8-bit number having an SMB of 8 and four on bits has an SMOB of 4. Similarly, a 1000-bit binary number having an SMB of 1000 and 365 on bits has an SMOB of 365. In the description that follows, SMOB is sometimes abbreviated with