[0069] External computer **44** has loaded in its RAM an operating system such as UNIX®, WINDOWS® 98, WINDOWS® ME, or the like. External computer **48** may have an architecture and hardware components like that shown in **FIG. 3** for data processor **26**, albeit with a larger memory component suitable for storage of a list of uncompressed ID character strings. Programming **54** is loaded in the memory of the external computer **44** that is capable of calculating CRC values for a plurality of ID strings, sorting the CRC values, and storing a list of the CRC values. The sorted, stored CRC values are then transferred or downloaded to data processor **26** via interface **46** and stored in memory **34** for authorization of users of data processor **26**.

[0070] When an entered or input ID character string from keypad **10** must be compared against the list of stored CRC values for authorized strings, the user-inputted ID string is compressed by calculating a CRC value therefor by programming loaded in memory **34**, and a binary search is carried out for that calculated CRC value in the stored list of authorized CRC values. If the CRC value of the input ID string is found in the list of authorized CRC values in memory **34**, the input ID string is validated. If the CRC value of the input ID string is not found in the list, the input ID string is unauthorized.

[0071] Different sizes of CRC values can be utilized to provide different degrees of confidence in authorization. For example, the use of 32-bit CRC values would result in only a one in 4,294,967,296 chance that an invalid input string would be validated or authorized. Use of a 16-bit CRC value provide a one in 65,536 chance or incorrect validation of an input string, and 8-bit CRC values would result in a one in 256 chance of validation of an invalid string. The size of the CRC values used may vary according to the level of security required.

[0072] The use of CRC values of character strings for validation of input string CRC values provides some important advantages over the use of full character strings for validation. The amount of space in memory **34** required for storage of a list or table of authorized strings is thus substantially reduced. For example, the storage of 4000 authorized ID strings each having up to 18 characters requires about 72,000 bytes of RAM space for uncompressed strings, which is beyond the memory capability for typical hand held data processors. Compression of the 4000 ID strings to 32-bit CRC values in accordance with the invention, however, requires memory space of 16,000 bytes for storage of the entire list. The confidence level for these stored, compressed ID strings is quite high, as noted above, with only a one in 4,294,967,296 chance of incorrect validation.

[0073] Compression of authorized ID strings into CRC values also decreases the amount of time needed to transfer a list of authorized strings from one computer to another. In the case of hand held data processors, lists of authorized ID strings are often downloaded from another machine to the hand held data processor. At a data transfer rate of 9600 baud via conventional RS-232 link, for example, approximately 72 seconds are required to transfer a list of 4000 18-byte ID strings between computers. When the 4000 ID strings are compressed to 4000 32-bit CRC values, data transfer requires only about 16 seconds at 9600 baud rate.

[0074] The use of compressed ID strings in the form of CRC values will be more fully understood by reference to **FIG. 6**A and **FIG. 6**B, as well as **FIG. 3**. **FIG. 6A** illustrates the creation of a stored list of compressed ID strings in an external computer **44** in accordance with the invention. That is, the events of **FIG. 6A** are carried out in association with programming **54** residing on a separate, external computer **44** having a memory sufficient to store a substantial list of uncompressed user ID character strings. The events of **FIG. 6B** show the use of the compressed ID string list in the data processor **26** for authentication of a user-inputted ID string. The use of compressed data strings for authentication or validation purposes is also described in U.S. patent application Ser. No. _____ to inventors David Hohl et al., Attorney Docket No. LIFE 060, filed concurrently herewith, the disclosure of which is incorporated herein by reference.

[0075] At event **300** in **FIG. 6**A, programming **54** in the external computer **44** is initiated or started to create a list of compressed, authorized identification or ID strings. This programming carries out operations associated with acquiring authorized ID strings, compressing the ID strings by calculating CRC values therefor, and sorting and storing of a list of compressed ID strings.

[0076] At event **310**, the first ID string is obtained from the memory of the external computer **44**, and in event **320**, the ID string is compressed by calculating a CRC value for the string. This compression event may be carried out by conventional software techniques, as the external computer **44** will typically have sufficient memory and processing power for an all-software compression operation. Alternatively, the compression may be carried out with a CRC circuit together with a software loop for carrying out the division algorithm. It is also contemplated that the external computer **44** may be configured in the manner of data processor **26**, with data associated with each string transferred directly from memory to a CRC circuit via a DMA circuit in the manner shown in **FIG. 4** and described above, with minimal software aspects involved in the compression. The compressed CRC value obtained in event **320** is stored in a list of compressed strings in the memory of the external computer.

[0077] At event **330**, a query is made by programming in the external computer as to whether the last string to be compressed has been retrieved from the memory of the external computer. If the last string to be compressed has not yet been received and compressed, event **340** is carried out. If the last string has been received from memory and compressed, event **350** is carried out.

[0078] Event **340** provides for retrieving the next uncompressed ID character string from memory, after which event **320** is repeated to compress the string by calculating a CRC value therefor. Following compression of the last ID string, at event **350**, the list of compressed ID strings, which is now in the form of a list of corresponding CRC values, is sorted. In event **360**, the sorted list is stored in the memory of the external computer used for the compression process of **FIG. 6A**.

[0079] At event **370**, the stored list of CRC values is downloaded or transferred to the hand held data processor **26** for use in user authorization as shown in **FIG. 6B**. Transfer of the stored list of compressed ID strings may be carried out by data transfer via GPIB, RS-232, PCI, USB, SCSI, ETHERNET®, FIREWIRE®/IEEE 1394, or other type of communication interface from the external computer