

devices. The apparatus of the invention comprise, in general terms, a keypad including a plurality of first, fixed, keys and plurality of second, soft keys, with one or more of the first keys having at least one primary alphanumeric symbol associated therewith, and with one or more of the first keys having at least one secondary alphanumeric symbol associated therewith and being operable to selectively display the secondary alphanumeric symbols in association with the secondary keys. The apparatus may further comprise a display operable to display selected primary and secondary alphanumeric symbols according to actuation of the first and second keys.

[0011] The apparatus may further comprise a direct memory access controller and a cyclic redundancy check circuit operatively coupled to each other, with the direct memory access controller configured to transfer data to the cyclic redundancy check circuit for check calculations. The apparatus may still further comprise a display controller operatively coupled to the direct memory access controller, with the direct memory access controller configured to transfer display data to the display controller. The apparatus may additionally comprise a stored list of authorized character string check values usable to compare to calculated check values for identification character strings entered by a user.

[0012] The methods of the invention comprise providing a keypad including a plurality of first, fixed, keys and plurality of second, soft keys, with one or more of the first keys having at least one primary alphanumeric symbol associated therewith, and with one or more of the first keys having at least one secondary alphanumeric symbol associated therewith, actuating one of the first keys having an associated secondary alphanumeric symbol, and displaying the secondary alphanumeric symbol in association with the second keys. The methods may further comprise selecting the primary alphanumeric symbol associated with the actuated first key, and/or selecting a secondary alphanumeric symbols by actuating one of the second keys. The methods may additionally comprise displaying the selected alphanumeric symbols.

[0013] The methods may further comprise actuating an additional first key to display additional secondary alphanumeric symbols in association with the second keys, and selecting the primary alphanumeric symbol on the additional first key, or actuating one of the second keys to select one of the secondary alphanumeric symbols thereon, and displaying the selected alphanumeric symbol. The methods may still further comprise actuating an nth first key to display an nth set of secondary alphanumeric symbols on the second keys, selecting one of the nth primary or secondary alphanumeric symbols, and displaying the selected alphanumeric symbol.

[0014] In certain embodiments, the subject methods may comprise providing a data processor in association with the keypad, transferring data, by a direct memory access controller to a cyclic redundancy check element, and calculating check values for the transferred data by the cyclic redundancy check element. The data may be associated with the alphanumeric characters selected on the keypad. The methods may additionally comprise transferring display data from the memory to a display controller using a direct memory access controller, and displaying the display data.

The methods may still further comprise comparing a calculated check value for an identification string entered by a user to a list of stored, authorized check values, and determining validity or authorization of the calculated check value for the entered identification string. The methods may further comprise creating and storing the list of authorized check values.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The invention will be more fully understood by reference to the following drawings, which are for illustrative purposes only.

[0016] FIG. 1 is a schematic illustration of a keypad in accordance with the invention.

[0017] FIG. 2A through FIG. 2H illustrate the entry of an alphanumeric character string on the keypad of FIG. 1

[0018] FIG. 3 is a functional block diagram of a data processing device in accordance with the invention.

[0019] FIG. 4 is a flow chart illustrating the transfer of data from a direct memory access controller to a CRC circuit in accordance with the invention.

[0020] FIG. 5 is a flow chart illustrating the transfer of data from a direct memory access controller to a display controller in accordance with the invention.

[0021] FIG. 6A is a flow chart illustrating the creation of a list of authorized check words for alphanumeric character strings.

[0022] FIG. 6B is a flow chart illustrating the comparison of a alphanumeric character string to the list of authorized check words.

#### DETAILED DESCRIPTION OF THE INVENTION

[0023] Before the subject invention is described further, it should be understood that the invention is not limited to the particular embodiments of the invention described below, as variations of the particular embodiments may be made and still fall within the scope of the appended claims. It is also to be understood that the terminology employed is for the purpose of describing particular embodiments, and is not intended to be limiting. Instead, the scope of the present invention will be established by the appended claims.

[0024] Any definitions herein are provided for reason of clarity, and should not be considered as limiting. The technical and scientific terms used herein are intended to have the same meaning as commonly understood by one of ordinary skill in the art to which the invention pertains.

[0025] The terms "alphanumeric character" and "alphanumeric symbol" and grammatical equivalents thereof as used herein means any numeral, alphabetic letter, monosyllabic symbol, polysyllabic symbol, text symbol, math symbol or any other symbol which may be used in the entry of data from a keyboard or keypad by a user. Exemplary "alphanumeric characters" include, by way of example, roman alphabet letters, Arabic numerals, and punctuation symbols such as "periods", "commas", "hyphens" and the like.

[0026] The invention provides devices and methods for fast, easy and efficient use of hand held data processing