

METHOD AND APPARATUS FOR DISPLAYING INFORMATION ON A HUMAN MACHINE INTERFACE

5 FIELD OF INVENTION

This invention relates to a display on a Human Machine Interface (HMI) or Graphical User Interface (GUI) control, particularly to facilitate the view of the status of devices being monitored, on a display.

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BACKGROUND OF THE INVENTION

Human Machine Interface (HMI) displays are useful for displaying the status of devices that are being monitored by any known device management system of the art. The HMI displays receive messages from the device by means of a network connection through the device management system, and each HMI display can display the messages of multiple category of the device. These messages are indicative of the status of each device, i.e. error, warning or normal, and are sent to the device management system either periodically or whenever a status is changed, depending on the algorithm of the device management system. Hence, users and/or maintenance personnel do not need to check the physical device for any error or warning messages. This allows for a centralised and remote monitoring of the device.

25 In the prior art as seen in Figure 1, the error messages are structured and displayed in the form of a hierarchical tree for each device monitored. The root of the tree is the name of the device 402. Each of the received messages are categorised and these categories form the 'Categories' or branches of the tree. The individual error or warning messages of each category form the leaves of their respective category branch. As seen in Figure 1, there are 3 categories, Category A 403, Category B 405 and Category C 407. Due to the size limitation of the HMI display frame 200, a vertical scroll bar 409 is provided. Therefore, in cases where the size of the hierarchical tree exceeds the HMI display frame 200, the user can use the scroll bar 409 to view all the messages listed of the device.

However, this method of viewing messages from devices is tedious, as the user needs to review all the messages and attend to error and/or warning messages. Precious time and manpower is wasted on accessing the levels of each branch within the hierarchical tree so as to review all the messages to determine the criticality level of each message.

Further, there is no additional information provided for each message. The users or maintenance personnel will need to rely on their experience in handling the alarm or warning messages to understand and remember the root cause and counter measures for the messages of error or warning types indicated.

It is an object of the invention to ameliorate one or all of the above problems.

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SUMMARY OF THE INVENTION

According to an embodiment of the invention, there is provided a method for displaying information of a monitored device on a Human Machine Interface (HMI) including the steps of defining a device area to represent the monitored device, defining a device area property, said property having a variation, allowing a message of a message type from the monitored device to be received, defining a category for each message, defining a category area for each category, displaying the received message in the category, defining and allowing a message area for each message, identifying the type of received message, whereby the message type of a pre-determined highest property from the monitored device is known from the device area property variation.

Preferably, the method further includes the steps of identifying the device area property representing the type of received message, and displaying or updating the device area property variation of the device area according to the type and priority of the message received.

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Preferably, the method further includes the step of allowing a collapsed or expanded view of the plurality of categories.

Still preferably, the method further includes the step of allowing a collapsed or
5 expanded view of the plurality of messages received.

In a preferred variation, the device area property is a colour whereby a variation of colours represents different types of messages.

10 In a second variation, the device area property includes flashing the device area property for a predefined type of message.

In a third variation, the device area property includes a pattern on the device area.

15 In a fourth variation, the device area property includes an icon on the device area. Preferably, the icon has a property according to an area property according to any one of variations of a colour, flashing, pattern.

According to a second embodiment of the invention, there is provided a method for
20 displaying information of a monitored device on a Human Machine Interface (HMI) including the steps of defining a device area to represent the monitored device, defining a device area property, said property having a variation, allowing a message of a message type from the monitored device to be received, defining a category for each message, defining a category area for each category, displaying the received
25 message in the category, defining and allowing a message area for each message, identifying the type of received message, whereby the message type of a pre-determined highest property from the monitored device is known from the device area property variation, the steps further including defining a category area property; identifying the category of the received message, identifying the category area
30 property variation representing the type of received message, establishing the priority rating of the received message, displaying or updating the category area property variation of the device according to the message received having the highest priority rating, whereby the message type of the highest priority rating from the monitored device received is known from the category area property.

According to a third embodiment of the invention, there is provided a method for displaying information of a monitored device on a Human Machine Interface (HMI) including the steps of defining a device area to represent the monitored device, defining a device area property, said property having a variation, allowing a message of a message type from the monitored device to be received, defining a category for each message, defining a category area for each category, displaying the received message in the category, defining and allowing a message area for each message, identifying the type of received message, whereby the message type of a predetermined highest property from the monitored device is known from the device area property variation, defining a category area property, identifying the category of the received message, identifying the category area property variation representing the type of received message, establishing the priority rating of the received message, displaying or updating the category area property variation of the device according to the message received having the highest priority rating, whereby the message type of the highest priority rating from the monitored device received is known from the category area property, said method further including the steps of defining a message area property and displaying or updating a variation of the message area property according to the message type received from the monitored device.

In a variation, the area property is a colour whereby a variation of colours represents different message types.

In a second variation, the area property further includes flashing the area for a predefined message type.

In yet another variation, the area property is a pattern on the area.

In a fourth variation, the area property is an icon on the area.

Preferably, the icon has a property according to an area property according to any one of variations of a colour, flashing, pattern.

According to a fourth embodiment of the invention, there is provided a method as claimed in any of the preceding claims further including the steps of selecting a message and having a message window wherein information of the selected message is displayed.

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Preferably, the information includes error codes, cause of error and counter measures of the selected message.

Still preferably, the method further includes having a cursor on the HMI to select an error message.

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Preferably, the method further includes providing a window device error message window wherein the error message information of the monitored device is displayed.

15 Preferably, the error message information is error codes.

According to another aspect of the invention, there is provided an apparatus for displaying information of a monitored device on a Human Machine Interface (HMI) comprises a device area to represent the monitored device, a device area property, a plurality of categories for each message, a category area for each category, a plurality of messages, a message area for each message and a message received from the monitored device whereby the type of received message, and the device area property representing the type of received message is identified and the device area property of the device area is displayed or updated.

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Preferably, the apparatus further includes the feature of including a collapsed or expanded view of the plurality of categories.

Still preferably, the apparatus further includes the feature of including a collapsed or expanded view of the plurality of error messages.

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In a variation, the device area property is colour whereby different colours represent different types of messages.

In a second variation, the device area property is flashed for a predefined type of message.

In a third variation, the device area property is a pattern on the area.

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In a fourth variation, the device area property is an icon on the area.

Preferably, the icon has a property according to an area property according to any one of variations of a colour, flashing, pattern.

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Preferably, the apparatus further comprises category area property whereby the category of the received message, and the category area property representing the type of received message is identified and the category area property of the device is updated.

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In a variation, the category area property is colour whereby different colours represent different types of messages.

In a second variation, the category area property is flashed for a predefined type of message.

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In a third variation, the category area property is a pattern on the area.

In a fourth variation, the category area property is an icon on the area.

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Preferably, the icon has a property according to an area property according to any one of variations of a colour, flashing, pattern.

Preferably, the apparatus further comprises a message window wherein information of a selected message is displayed.

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Still preferably, the information includes error codes, cause of error or warning, and counter measures of the selected error or warning message.

Still preferably, the apparatus further comprises a cursor on the HMI to select the error message.

Still preferably, the apparatus further comprises a device message window wherein
5 the predefined information of the monitored device is displayed.

Preferably, the predefined information is error codes.

10 **BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 illustrates the Human Machine Interface (HMI) display of the prior art;

Figure 2A shows a first embodiment of the method for displaying information on a
15 HMI display panel;

Figure 2B shows a display on the HMI for error display according to a preferred embodiment of the current invention;

20 Figure 2C shows a second embodiment of the method for displaying information on a HMI display panel;

Figure 3 shows a display view representation of the HMI of the display when the device is in a normal state;

25 Figure 4 shows a display view representation of the HMI display when the device is in a warning state;

Figures 5A and 5B shows a display view representation of the HMI of the display
30 according to a fourth embodiment of the invention when the device is in both error and warning state;

Figure 6A shows a flowchart to display the error message window relative to the movement of the cursor; and

Figure 6B shows a flowchart to display the error message predefined information relative to the movement of the cursor.

- 5 The figures are not necessarily drawn to scale.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

- 10 The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings wherein the reference numbers represent the parts of the invention.
- 15 The invention is a method for displaying information or specifically, messages from a monitored device as shown in Figure 2A. The information is displayed on a Human Machine Interface (HMI) 401 as shown in Figure 2B. The method comprises the steps of defining a device area 402 to represent the monitored device, defining a device area property, the device area property having at least one property variation,
- 20 allowing a message from the monitored device to be received, each message pre-classified into a category and having a pre-defined message type attributed to a property variation, and each message type having a priority rating, defining at least one category for the received message, allowing a collapsed or expanded view of the at least one category, defining at least one category area shown as category areas
- 25 403, 405, 407 in Figure 2B for each respective message category, displaying the at least one message, allowing a collapsed or expanded view of the at least one message defining at least a message area shown in Figure 2A as 404, 406, 408 for each message, receiving a message from the monitored device, identifying the message type of the received message, identifying the device area property variation
- 30 representing the type of received message and displaying/updating the device area property variation of the device area according to the type of received message having the highest priority rating. According to this method, the message type received from the monitored device is known from the device area property variation. The message types of the monitored device include error, warning or normal

message types. Preferably, the priority rating is error, warning and normal in terms of decreasing priority rating.

In a first preferred variation of the device area property, the variation is a colour.
 5 Different message types are represented by the device property variation in the form of different colours. Preferably, the device property variation is a conventionally understood variation. For example, if the message type is normal, i.e. none of the messages are error or warning types, the device area will be a green. If the received message is a warning message, the device area is yellow. If the received message is
 10 an error message, the device area is red. The user will be able to visually identify the criticality of the status of the device being monitored and choose to attend to a device, which is more critical. Where more than one message is received, the device property variation that is reflected is the variation depicting the highest priority of the messages received.

15 Preferably, the device area property further includes flashing the device area property when a predefined type of message such as a warning or error is received. Therefore, in this variation, the device area property is a colour and is flashing. In this embodiment, if the received message is a warning message, the device area colour
 20 turns yellow and will flash. Advantageously, this will capture the attention of the user.

In another variation, the device area property is a pattern on the device area. For example, the pattern on the device area is changed to a different pattern when the highest priority of the messages received from the device management system
 25 changes, for example, from a hatched device area (when a warning message is received) to a cross-hatched device area (when an error message is received). However, the device area property of flashing and colour is preferred for attracting the attention of the user.

30 In a fourth variation, the device area property is includes having a graphical icon within the device area to depict the status of the messages received, i.e. forming functionally as a status icon of the messages received.

The icon may depict the status of the messages received in the form of colours, and/or flashing of the icon, to attract the attention of the user. The frequency of the flashing may also be indicative of the priority rating of the received messages. For example, a higher frequency of flashing will indicate a message of a higher priority rating.

In a second embodiment as seen in Figure 2C, the method further includes defining a category area property, identifying the category of the received message, identifying the category area property variation representing the type of received message, establishing the priority rating of the received message, and displaying or updating the category area property of the device according to the category of the received message of the highest priority. Hence, the message type of the highest priority from the monitored device is known from the category area property.

In the preferred variation, the category area property is a colour. The different message types (normal, error or warning) are represented by different colours. Preferably, the colour representation is the same as for the device area to avoid confusion. Preferably, the category area property further includes flashing the category area similar to the device area property, similar to the variations of the first embodiment.

In a third embodiment, the method further includes defining a message area property, and displaying or updating a variation of the message area property according to the message type received from the monitored device.

The type of message area property defined may be any of the area property variations as previously discussed. As previously explained, the preferred variation is a variation of colour.

Figure 3 shows a display view representation of the HMI display frame of the third embodiment when the device is in a normal state. In the normal state, the received messages for all message categories of the device are not of error or warning type, hence the category areas A, B, C, 403, 405, 407 are in green, and therefore, the device area 402 is also in green.

Figure 4 shows a display view representation of the HMI when the device is in a warning state. In this example, one of the messages in Category C 407 is a warning type and none of the error messages in Category A 403 or B 405 are either error or warning type. Hence, both the device area 402 and the Category C area 407 are in yellow colour and the colours are flashing to advantageously attract the attention of the user.

Figure 5A shows a display view representation of the HMI of a fourth embodiment of the invention when the device is in an error state. In this example, one of the messages in Category B 405 is an error type and none of the messages in Category A 403 or C 407 are an error or warning type. Hence, both the device area 402 and the Category B area 405 are in red and the colours are flashing to attract the attention of the user. Therefore, the category area property continually establishes the highest priority rating of the messages received to display the relevant area property variation.

Figure 5B shows a display view representation of the HMI of the fourth embodiment, when the device is in both an error and warning state. In this example, one of the messages in Category B 405 is an error type, and one of the messages in Category C 407 is a warning type, and none of the messages in Category A 403 are either error or warning type. Hence, both the device area 402 and the Category B area 405 are in red and are flashing, since error messages have a higher priority rating over warning messages. The Category A area 603 is green and Category C area 407 is in yellow, reflecting the highest priority message type within the category.

The fourth embodiment of the invention as seen in Figures 5A and 5B includes having a tool to allow a user to select a message of interest and having a message window 410 to display predefined information of the user selected message. A preferred tool for selecting a message is a cursor or pointer. The predefined information displayed in the message window 410 preferably includes error codes, cause of error or warning and counter measures for the selected message. The information will be useful as the user need not spend time going through the

respective device manuals to understand the cause of the error or warning and finding the counter measures for the error or warning when it is encountered.

5 In this fourth embodiment, the method further includes the steps of displaying a message window within the HMI display frame as shown in Figure 6A and displaying the predefined information of a selected message as shown in Figure 6B. The method includes the steps of determining the position of the message window 410 relative to the cursor. If the cursor position is within the area of a message, for example Error X1, the message window 410 updates the predefined information of the message, Error X1. If the cursor position is moved out of the message, Error X1, and is not within the area of any other message, the message window 410 will not appear and the information of Error X1 is removed.

15 In a preferred embodiment, the method further comprises having a device error message window 410 to display the error message information of the monitored device. The location of this window is fixed on the HMI display frame for ease of quick reference to the error codes, cause of the error or warning and/ or counter measures for the error or warning of the selected message.

20 The method further comprises providing a scrollbar to allow the user to scroll up and down the screen if the expanded view of the categories and/ or error messages requires a larger area than the display frame of the HMI.

25 Therefore, with the method of the present invention, a user need not fully expand the hierarchical tree structure to see the present status of the device, as this will cause the user to have to scroll the screen to see the entire tree structure. A user may collapse the individual alarms, and or categories, so that the structure may be viewed within the HMI display frame. The status of the device may be visually perceived by merely looking at the device area, thus saving time. When the device area shows a warning or error message (yellow or red, and flashing), only then will a user expand the root to see which category of alarms is experiencing a warning or error. Only the particular category which indicates a yellow or red need to be further expanded to see the exact warning or error message of the device.

According to another aspect of the invention, there is provided an apparatus for displaying information of a monitored device on a Human Machine Interface (HMI). The apparatus comprises a device area to represent the monitored device, a device area property, a receiving means to receive a plurality of messages received from the monitored device, a plurality of categories for messages received from the monitored device, a means to collapse and expand the plurality of categories, a category area for each category of message of the device, a means to collapse or expand the plurality of the messages, a message area for each message. The type of received message and the device area property representing the type of received message is identified and the priority rating of the received messages is compared. After the identification and comparison, the device area property of the device area is displayed/updated accordingly.

Preferably, the device area property is a colour. Different colours represent different types of messages. For example, if the received message is a normal message, the device area colour is green. If the received message is a warning message, the device area colour is yellow. If the received message is an error message, the device area colour is red.

In the preferred embodiment, the device area property flashes according to the type of message. For example, if the received message is either a warning or an error type, the device area colour will flash. This serves to highlight the message to the user.

The apparatus further includes a category area property for each category area. When a received message is identified as belonging to a category, for example Category A 603, the area property of Category A will be displayed or updated according to the type of message, whether it is a normal, a warning, or an error status.

For ease of understanding, it is preferred to select the same property as for the device area, in this case the area property is a colour. Different colours will represent different types of message status. In another embodiment, the apparatus can be

configured to select another property for the category area to reflect the type of messages. An example is the pattern of the category area.

Further, the category area property, which, in the preferred embodiment, is colour, is
5 flashed for predefined types of messages such as a warning or an error. For
example, if the received message is a warning or an error message, the device area
colour will flash. This will capture the attention of the user. In another embodiment,
another type of device area property can be changed. For example, the pattern of the
device area is changed to a different type, for example, from hatched to
10 crosshatched. However, flashing the colour of the device area property, colour or
pattern, is effective in attracting the attention of the user.

Therefore, in use, the category branch may be collapsed to maximise the display of
the device and categories on the HMI display screen. A user need only expand a
15 category which is of interest, for example, when the category area is in yellow or red,
to see the detailed error message.

In a further embodiment, the apparatus further includes a message area property for
each received message. The area property for the message will reflect the type of
20 message received in the variations as previously discussed.

Preferably, the apparatus further includes a tool to navigate on the HMI display frame
to select messages and an error message window to display predefined information
on the selected message. The tool used can be a pointing device, for example, a
25 mouse, scroll mouse, joystick, glide point touch sensitive pads on the screen or any
other controls linked to the HMI for example keys on a keyboard which is connected
to the HMI. The predefined information displayed in the error message window
preferably includes error codes, cause of error or warning and counter measures of
the selected message. The information will be useful as the user need not spend
30 time going through the respective device manuals to understand the cause of the
error or warning and finding the counter measures for the error or warning.

The apparatus further includes a device window to display predefined information of the monitored device. The predefined information serves to provide brief information of the monitored device such as error codes.

CLAIMS

What is claimed is:

- 5 1. A method for displaying information of a monitored device on a Human Machine Interface (HMI) including the steps of
 - a. defining a device area to represent the monitored device;
 - b. defining a device area property, said property having a variation;
 - c. allowing a message of a message type from the monitored device to
 - 10 be received;
 - d. defining a category for each message;
 - e. defining a category area for each category;
 - f. displaying the received message in the category;
 - g. defining and allowing a message area for each message;
 - 15 h. identifying the type of received message;

whereby the message type of a pre-determined highest property from the monitored device is known from the device area property variation.
- 20 2. A method as claimed in claim 1, including the steps of identifying the device area property representing the type of received message;, and displaying or updating the device area property variation of the device area according to the type and priority of the message received.
- 25 3. A method as claimed in claim 1 further including the step of allowing a collapsed or expanded view of the plurality of categories.
4. A method as claimed in claim 1, 2 or 3 further including the step of allowing a collapsed or expanded view of the plurality of messages received.
- 30 5. A method as claimed in any of the preceding claims wherein the device area property is a colour whereby a variation of colours represent different types of messages.

6. A method as claimed in any of the preceding claims further includes flashing the device area property for a predefined type of message.

7. A method as claimed in any one of claims 1 to 5, wherein the device area
5 property includes a pattern on the device area.

8. A method as claimed in any one of claims 1 to 5, wherein the device area property includes an icon on the device area.

9. A method as claimed in claim 8, wherein the icon has a property according to an area property according to any one of variations of a colour, flashing, pattern.

10. A method as claimed in any of the preceding claims further including the steps of
a. defining a category area property;
15 b. identifying the category of the received message;
c. identifying the category area property variation representing the type of received message;
d. establishing the priority rating of the received message; and
e. displaying or updating the category area property variation of the
20 device according to the message received having the highest priority rating

whereby the message type of the highest priority rating from the monitored device received is known from the category area property.

11. A method as claimed in any of the preceding claims further including the steps of
a. defining a message area property; and
b. displaying or updating a variation of the message area property
according to the message type received from the monitored device.

12. A method as claimed in any of the preceding claims wherein the area property is a colour whereby a variation of colours represent different message types.

13. A method as claimed in claim 12 wherein the area property further includes flashing the area for a predefined message type.

14. A method as claimed in any of claims 1 to 11 wherein the area property is a pattern on the area.

5 15. A method as claimed in any of claims 1 to 11 wherein the area property is an icon on the area.

16. A method as claimed in claim 15, wherein the icon has a property according to an area property according to any one of claims 12, 13 or 14.

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17. A method as claimed in any of the preceding claims further including the steps of

- a. selecting a message; and
- b. having a message window wherein information of the selected message is displayed

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18. A method as claimed in claim 17, wherein the information includes error codes, cause of error or warning and counter measures for the errors or warning of the selected message.

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19. A method as claimed in any of the preceding claims further comprises having a cursor on the HMI to select an error message.

20. A method as claimed in any of the preceding claims further comprises having a window device error message window wherein the error message information of the monitored device is displayed.

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21. A method as claimed in claim 20 wherein the error message information is error codes.

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22. An apparatus for displaying information of a monitored device on a Human Machine Interface (HMI) comprises

- a. a device area to represent the monitored device;
- b. a device area property;

- c. a plurality of categories for each message;
- d. a category area for each category;
- e. a plurality of messages;
- f. a message area for each message; and
- 5 g. a message received from the monitored device;

whereby

the type of received message, and

the device area property representing the type of received message is identified; and

10 the device area property of the device area is displayed or updated.

23. An apparatus as claimed in claim 22 further including a collapsed or expanded view of the plurality of categories.

15 24. An apparatus as claimed in claims 22 or 23 further including a collapsed or expanded view of the plurality of error messages.

25. An apparatus as claimed in any of the claims 22 to 24 wherein the device area property is colour whereby different colours represent different types of
20 messages.

26. An apparatus as claimed in any of the claims 22 to 25 wherein the device area property is flashed for a predefined type of message.

25 27. An apparatus as claimed in any of claims 22 to 24 wherein the area property is a pattern on the area.

28. An apparatus as claimed in any of claims 22 to 24 wherein the area property is an icon on the area.

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29. An apparatus as claimed in claim 28, wherein the icon has a property according to an area property according to any one of claims 25, 26 or 27.

30. An apparatus as claimed in any of the preceding claims 22 to 29 further comprises category area property whereby
the category of the received message, and
the category area property representing the type of received message is
5 identified; and
the category area property of the device is displayed or updated.
31. An apparatus as claimed in claim 30 wherein the category area property is colour whereby a variation of colours represents different types of messages.
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32. An apparatus as claimed in claims 30 or 31 wherein the category area property is flashed for a predefined type of message.
33. An apparatus as claimed in any of the preceding claims 22 to 32 further
15 comprising a message window wherein information of a selected message is displayed.
34. An apparatus as claimed in claim 33 wherein the information includes error codes, cause of error or warning, and counter measures of the selected error or
20 warning message.
35. An apparatus as claimed in any of the preceding claims 22 to 34 further comprising a cursor on the HMI to select the error message.
- 25 36. An apparatus as claimed in any of the preceding claims 22 to 35 further comprising a device message window wherein the predefined information of the monitored device is displayed.
- 30 37. An apparatus as claimed in claim 36 wherein the predefined information is error codes.