

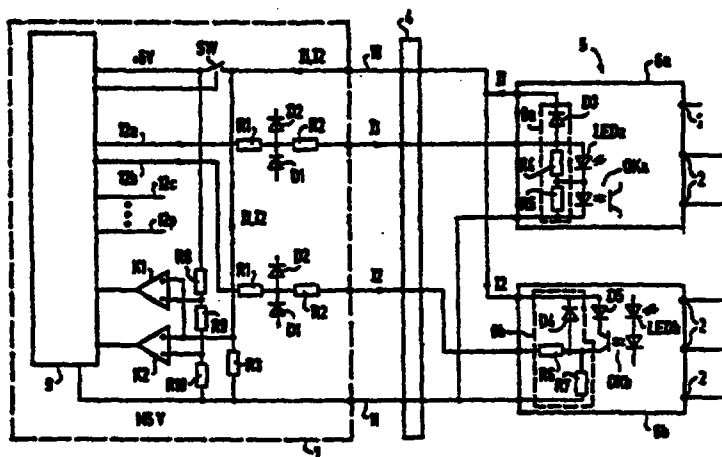
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As printed

(54) Title: ARRANGEMENT WITH A SIGNAL PROCESSING CONNECTION AND A FUNCTIONAL UNIT

(54) Bezeichnung: ANORDNUNG MIT EINER SIGNALVERARBEITUNGSANSCHALTUNG UND EINER FUNKTIONSEINHEIT



(57) Abstract

An arrangement allows peripherals of a decentralised peripheral system connected to automation systems to be identified. For that purpose, the peripherals of the decentralised peripheral system are provided with a device that in an identification mode in which the supply voltage is cut off converts a received polling signal into an identification signal. The invention has applications in decentralised peripheral systems of stored program controls.

Description

Arrangement with a signal processing interface connection and a functional unit

5 The invention relates to an arrangement in accordance with the preamble of claim 1.

10 In modular automation systems, it is desired with regard to the use of the actuators and sensors to match the input and output components of a system to the conditions occurring in a technical process. For this purpose, it is necessary for the CPU of the system to determine the type of configuration, in order to determine the consistency between a projected configuration, presupposed in the user program, and an actual configuration, e.g. for diagnostic purposes. The international
15 patent application WO 94/15299 describes an arrangement with a CPU, which detects whether the mounting locations of the arrangement are fitted with functional units. For this purpose, the pluggable units have level changeover means which, for the case in which the units receive a
20 mounting location identification signal of the CPU during a read access, switch over the level of the address line assigned to it.

Decentral peripheral systems, for example in the form of so-called "active terminals", are used in order to reduce
25 the number of the input and output components fitted in the automation unit in automation systems, despite a high degree of extension. A housing with I/O modules is relocated to the actuators and sensors of the process, and there is a need in the automation unit only for an interface module which is connected to the decentral
30 peripheral system via a cable. The arrangement proposed in the international application WO 94/15299 can certainly detect whether the interface connection is plugged in a mounting location of the automation unit, but it
35 cannot detect

whether the I/O modules are present in the decentral peripheral system.

It is the object of the present invention to provide an arrangement of the type mentioned at the beginning in which it is possible to identify a functional unit which has been plugged or mounted. Moreover, the aim is to specify an identifiable functional unit which can be identified even if it is set up spatially independently of its signal processing interface connection.

This object is achieved by means of an arrangement having the measures specified in claim 1. A functional unit in accordance with the measures specified in claim 3 can also be identified even if it is set up spatially independently of its signal processing interface connection. It is not necessary for the signal processing interface connection and the functional unit to be arranged, for example, together in an automation unit provided with a backplane bus.

Further refinements of the invention follow from the subclaims.

The setup of the functional unit can be designed actively or passively. An active setup has means for generating an identification signal from a voltage generated in the setup itself; a passive setup, by contrast, converts a voltage fed from the signal processing interface connection into an identification voltage. The voltage of the interface connection and the identification voltage are preferably transmitted via the existing signal line.

The invention and refinements and advantages are explained below in more detail with the aid of the drawings, in which an exemplary embodiment of the invention is represented.

In the drawings:

Figure 1 shows a decentral peripheral system, and
Figure 2 shows a block diagram of a signal processing
interface connection of an automation unit with
connected digital input/output units.

Represented in Figure 1 is a housing 1 of a decentral peripheral system, which housing is provided with three rows of openings 2. These openings 2 have unscrewed spring terminals for the connection of external lines, which can be disconnected via operating openings 3. Mounted in housing 1 are digital input and output modules 5 whose inputs are connected to the cable terminal 4 and whose outputs are connected to the openings 2 by means of a printed circuit board (not represented here) in housing 1. Provided at the left-hand end of the row of openings 2 are openings, denoted by L- and L+, for potential lines, which serve to feed the potential lines onto a fuse module having a fuse which can be replaced from the front. It is possible to connect to the cable terminal 4 a ribbon cable which connects the decentral peripheral system 1 to a signal processing interface connection 7 (Figure 2) of an automation unit. Each digital input and output module is assigned three openings 2 to which actuators or sensors can be connected by means of a three-bar connection. In this arrangement, a supply voltage for the sensors/actuators is respectively applied to two of these three openings 2; one opening is provided for the connection to a signal line. In the present example, sixteen digital input and output modules can be plugged into the decentral peripheral system, as a result of which the ribbon cable to be connected to the cable terminal 4 must have a total of eighteen lines, of which sixteen lines are provided for signal transmission between the interface connection and the at most sixteen modules which can be mounted or plugged, and two lines are provided for a voltage supply of +5 V, M5 V. The modules 5 use the voltage supply +5 V, M5 V to form suitable supply voltages at two of the three openings 2 of the

connected sensors/actuators. Arranged above the spring terminals is a labeling field on which designations 1 ... 16 (1 ... 6 covered in Figure 1) of the individual connections are carried.

5 In order to illustrate the way in which the signal processing interface connection 7 of the automation unit functions and works with regard to identifying the digital input and output modules 5 mounted in the decentral peripheral system, reference is made to Figure 2, in
10 which a block diagram of this signal processing interface connection 7 is represented with two connected digital input and output modules 5. The identical parts occurring in Figures 1 and 2 are provided with identical reference symbols. One of the modules 5 is designed as a digital
15 output module 6a, the other as a digital input module 6b, the output module 6a comprising a device 8a formed from resistors R4, R5 and diode D3, an optocoupler OKa and a light-emitting diode LEDa for displaying the signal state, while the input module 6b comprises an optocoupler
20 OKb, a light-emitting diode LEDb and a device 8b formed from resistors R6, R7 and diode D4.

In so-called normal operation, a supply and identification device 9 of the interface connection 7 supplies the modules 6a, 6b with the supply voltage +5 V and M5 V
25 via the lines 10, 11 of the ribbon cable and via the cable terminal 4. For this purpose, the controllable switch SW is closed, and in this operating mode signals in the form of 0- levels or 1- levels are applied to the respective signal lines 12a, 12p. For the case in which
30 the module 5 is a digital output module (module 6a in the example), the supply and identification device 9 supplies this output module via the corresponding line 12a with a 0- level or 1- level in accordance with the stipulations of a control program, while in the case of a digital
35 input module (module 6b in the example) this module supplies the device 9 via the line 12b with a 0- level or 1- level, which corresponds to a measured value at the measured-value inputs (openings 2) of the module. Each of the sixteen signal lines 12a ... 12p has an input circuit

of resistors R1, R2 and decoupling diodes D1, D2, the way in which the diodes D1, D2 function and work being of no significance for the invention, and therefore not being explained in more detail.

- 5 In a so-called identification operating mode, which the interface connection 7 introduces cyclically or after prescribable times, the supply and identification device 9 opens the switch SW, as a result of which the supply of the modules 5 with the voltage +5 V, M5 V is interrupted.
- 10 Instead of this, the supply and identification device 9 applies a test voltage of normally 5 V to the modules 5 sequentially via the signal lines 12a ... 12p. The components of the device 8a, 8b of the digital input and output modules are dimensioned such that in the case of
- 15 this test voltage the outputs 2 of the digital output module 6a do not switch through, and any possibly driven inputs 2 of the digital input module 6b do not influence the interface connection 7 with regard to identifying this module. It is assumed that the device 9 first
- 20 applies a test voltage of 5 V to the digital output module 6a via the signal line 12a. As a result, a current I1, flows via the resistors R1, R2, the diode D3 and an input resistor R3 of comparators K1, K2. An identification voltage diminished by the voltage drop across the
- 25 resistors R1, R2 and the diode D3 is produced at this input resistor R3. The input circuit of the comparators K1, K2 comprises further resistors R8, R9, R10, the latter and the resistor R3 being dimensioned in such a way that a 1-level is present both at the output of the
- 30 comparator K1 and at the output of the comparator K2. The resistors R4 and R5 are designed with a high resistance by comparison with the resistor R3 so that the current I1 flows as far as possible via the supply line 10 to the resistor R3. The voltage occurring across the resistors
- 35 R4 and R5 is so low that the optocoupler OKa and the light-emitting diode LEDa are not flooded. Because of a handling instruction stored in the supply and identification device 9, the device 9 detects that the module 6a is a digital output module

from the bit combination 1,1 of the output signal levels of the comparators K1, K2. After this identification, the device 9 applies the test voltage +5 V to the module 6b via the line 12b, as a result of which a current I2 flows via the resistors R1, R2, a resistor R6, a diode D4 and the resistor R3. The resistor R6 of the device 8b is dimensioned such that a voltage drop across the resistor R3 causes an output level 0 at the comparator K1 and an output level 1 at the comparator K2. The resistor R7 is likewise of high resistance by comparison with the resistor R3, and a diode D5 prevents the interface connection 7 from being subjected to an interfering influence with regard to identification of the module 6b in the case of a driven input 2. In accordance with the handling instruction, the device 9 of the interface connection 7 detects a digital input module from the bit combination 0, 1 of the output signal levels of the comparators K1, K2. For the case in which the comparators K1, K2 each have a 0- output level (bit combination 0, 0), the device 9 detects that no module is arranged in the corresponding mounting location in the decentral peripheral system. This is the case, for example, whenever the device 9 applies the test voltage 5 V to the line 12 C. An identification voltage of 0 V is present across the resistor R3, and this indicates that no module is connected to this signal line 12c.

Patent Claims

1. An arrangement with at least one functional unit (5; 6a, 6b), which is provided with first connections (10, 11) for supply lines and a signal line (12a, ...) which can be connected to a signal processing interface connection (7), and with two connections (2) for connecting a sensor/actuator, it being the case that in a normal operating mode the unit (5; 6a, 6b) receives a supply voltage (+5 V, M5 V) from the interface connection (7) and connects a signal to the sensor/actuator or receives a signal therefrom, characterized in that the functional unit (5; 6a, 6b) is provided with a device (8a, 8b) which, while an identification operating mode in which the interface connection (7) does not feed a supply voltage to the unit (5; 6a, 6b), feeds to the interface connection (7) via a line of the first connection an identification signal which the interface connection (7) evaluates in accordance with a handling instruction and determines the type of unit (5; 6a, 6b).
2. The arrangement as claimed in claim 1, characterized in that in the identification operating mode the interface connection (7) feeds the device (8a, 8b) via the signal line (12a ... 12p) a voltage which the device (8a, 8b) converts into an identification voltage and feeds back to the interface connection (7) via the supply line.
3. A functional unit (5; 6a, 6b) with first connections (10, 11) for supply lines and a signal line (12a, ...), which can be connected to a signal processing interface connection (7) of a basic unit, and with second connections (2) for connecting a sensor/actuator, the functional unit (5; 6a, 6b) receiving a supply voltage (+5 V, M5 V) in a normal operating mode, characterized in that the functional unit (5; 6a, 6b) is provided with a device (8a, 8b) which produces an identification



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signal during an identification operating mode in which the supply voltage is switched off.

4. The functional unit as claimed in claim 3, characterized in that the device (8a, 8b) converts into an identification signal an interrogation signal which has been fed from the interface connection (7) via a line of the first connection.

5. The functional unit as claimed in claim 4, characterized in that in the identification operating mode the device (8a, 8b) converts a voltage fed from the interface connection (7) via the signal line (12a ... 12p) into an identification voltage and feeds it back to the interface connection (7) via the supply line.



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Abstract

Arrangement with a signal processing interface connection and a functional unit

5 An arrangement is proposed in which I/O modules
of a decentral peripheral system connected to an auto-
10 mation unit can be identified. For this purpose, the I/O
modules of the decentral peripheral system are provided
with a device which, during an identification operating
mode in which the supply voltage is switched off, con-
verts an interrogation signal fed to it into an ident-
ification signal.

The invention is applied in decentral peripheral
systems of programmable controllers.

FIG 2

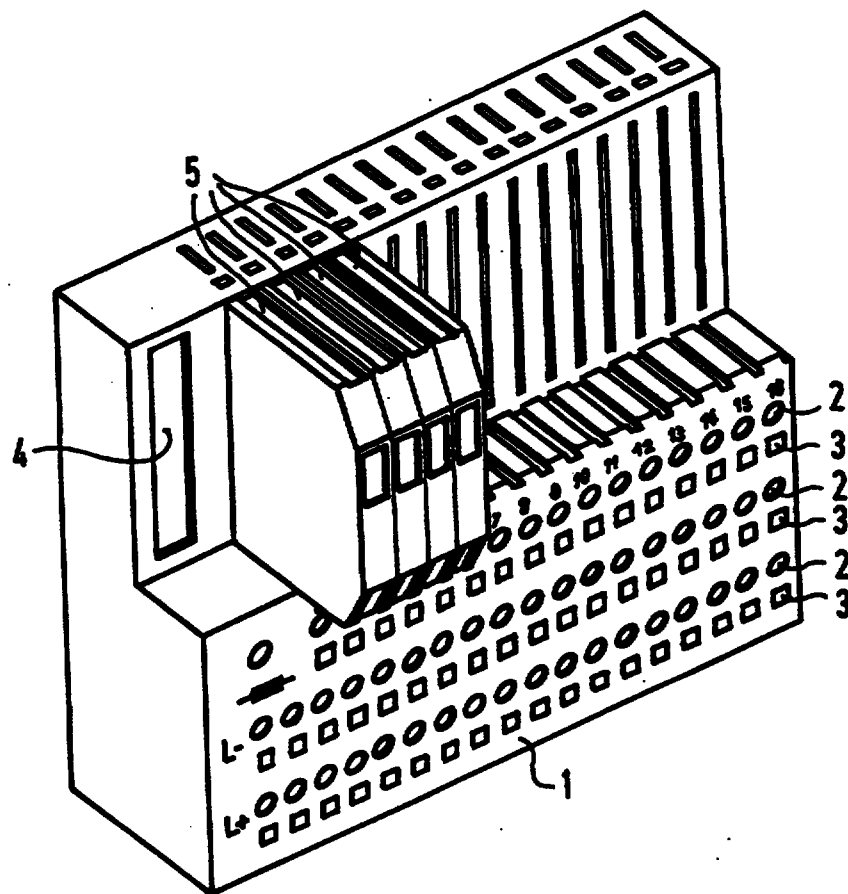


FIG 1



FIG 2

Patent Claims

1. A functional unit (5; 6a, 6b) which can be connected to a signal processing interface connection (7) via a supply line (10) and via a signal line (12a, 12b, ...), it being the case that in a normal operating mode the signal processing interface connection (7) feeds a supply voltage to the functional unit (5; 6a, 6b), characterized in that during an identification operating mode in which the signal processing interface connection (7) does not feed a supply voltage to the functional unit (5; 6a, 6b), it is possible to feed to a device (8a, 8b) of the functional unit (5; 6a, 6b) via the signal line (12a, 12b) an interrogation signal of the signal processing interface connection (7) on the basis of which the device (8a, 8b) generates an identification signal which indicates to the signal processing interface connection (7) the type of the functional unit (5; 6a, 6b) and which the device (8a, 8b) feeds back to the signal processing interface connection (7) via the supply line (10).
2. The functional unit (5; 6a, 6b) as claimed in claim 1, characterized in that the device (8a, 8b) generates the identification signal by converting the interrogation signal.
3. An arrangement with a functional unit as claimed in claim 1 or 2, characterized
- in that further functional units (5; 6a, 6b) provided with a device (8a, 8b) in each case can be connected to the signal processing interface connection (7) via the supply line (10) and, in each case, via a signal line (12a, 12b) assigned to each functional unit (5; 6a, 6b),
 - in that during the identification operating mode the signal processing interface connection (7) in each case feeds the units (5; 6a, 6b) an interrogation signal on the basis of which each of the devices (8a, 8b) generates an identification signal



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- which indicates to the signal processing interface connection (7) the type of the respective functional unit (5; 6a, 6b) and which each of the devices (8a, 8b) feeds back to the signal processing interface connection (7) via the supply line (10) and
- 5 - in that the signal processing interface connection (7) is provided with means (K1, K2, R3, R8, R9, R10) for evaluating the identification signals.
4. The arrangement as claimed in claim 3, characterized in that the signal processing interface connection
- 10 (7) introduces the identification operating mode cyclically or after prescribable times.
5. A peripheral system with a plurality of functional units (5; 6a, 6b) as claimed in claim 1 or 2, it
- 15 being the case that the functional units are digital output (6a) and digital input modules (6b), and that the digital output modules (6a) generate a first identification signal from an interrogation signal, and the digital input modules (6b) generate a second identification
- 20 signal.

