Description

Programmable logic controller

The present invention relates to a programmable logic controller, comprising assemblies which communicate with one another via a backplane bus, it being possible to arrange the programmable logic controller on a mounting rail.

A programmable logic controller of this type is disclosed, for example, in DE 36 03 750 A1. In this document, individual bus modules are arranged on a supporting rail and the assemblies of the programmable logic controller are pivoted onto the bus modules.

The object of the present invention consists in specifying a structure for a programmable logic controller by means of which the assemblies of the programmable logic controller can communicate with one another in a manner as immune from interference as possible.

The object is achieved by virtue of the fact

- that the backplane bus is mounted in an essentially C-shaped, electrically conductive mounting rail, with the result that the backplane bus is enclosed by the mounting rail on three sides,
- that the assemblies are placed onto the mounting rail, with the result that the assemblies are mechanically retained on the mounting rail and are electrically connected to the backplane bus,
- that the assemblies have a direct earth connection to the mounting rail.

On account of the fact that the backplane bus is mounted in the mounting rail, the backplane bus is already electrically screened on three sides. The emplacement of the assemblies then produces screening from the fourth side. The screening is particularly effective since the assemblies can be connected to earth via just a single

contact resistance, namely that with respect to the mounting rail.

If the backplane bus comprises individual bus modules which adjoin one another at boundary surfaces and are connected to one another, the length of the backplane bus can be optimally matched to the relevant requirements. The backplane bus does not therefore project at the sides of the structure. For this reason, the risk of interference being coupled in is reduced even further.

If the bus modules are mounted such that they can move in the mounting rail, the bus modules can compensate for tolerances on account of their mobility.

If the bus modules have latching hooks and latching recesses on their boundary surfaces, and if the latching hooks and the latching recesses of neighbouring bus modules interact, the bus modules can be connected to one another simply yet reliably.

If, when the bus modules are mounted in the mounting rail, the latching hooks are accessible from the side on which the bus modules is [sic] not enclosed by the mounting rail, with the result that they can be pressed out of the latching recesses, the bus modules can be detached from one another in a particularly simple manner.

Further advantages and details emerge from the following description of an exemplary embodiment. In the figures:

FIG. 1 shows a side view of the mounting rail, bus module and assembly,

FIG. 2 shows a perspective view of FIG. 1 from the left underneath,

FIG. 3 shows the same structure from the front underneath,

FIG. 4 shows the structure from the right underneath,

FIG. 5 shows an exploded illustration of the structure and

FIG. 6 perspectively shows a bus module from below.

Modular programmable logic controllers comprise, as is generally known, a power supply assembly, a central processing unit and peripheral units. The individual assemblies of the programmable logic controller communicate with one another via a backplane bus.

In the case of the present invention, the backplane bus 1 is mounted in an essentially C-shaped mounting rail 2. The mounting rail 2 is composed, in the present case, of aluminium or steel. It could, if appropriate, be provided with a plastic coating. As an alternative, the mounting rail 2 could also be composed of a plastic which is provided with a metallic coating. The mounting of the backplane bus 1 in the mounting rail 2 means that from the outset the backplane bus 1 is enclosed on three sides by the mounting rail 2, with the result that the backplane bus 1 is screened against electrical irradiation from three sides.

The assemblies 3 are connected to the backplane bus 1 and the mounting rail 2 in that they are first inserted into a projection 5 by means of a pivot groove 4 and are then pivoted onto the mounting rail 2 and the backplane bus 1. After being pivoted on, they are definitively secured by a screw 6, which is screwed into the grooved slot 7 of the mounting rail 2. As a result, the assemblies 3 are therefore mechanically retained on the mounting rail 2. Furthermore, when the assemblies 3 are pivoted on, the assemblies 3 make contact with the contact sets 8 of the backplane bus 1, with the result that the assemblies 3 are also electrically connected to the backplane bus 1.

As is particularly evident from FIG. 3, the assemblies 3 have a printed circuit board 9 on which an electrical/electronic circuit is arranged. The printed circuit board 9

can - see FIG. 5 in particular - be plugged by its contact points 9' into one of the contact sets 8. The printed circuit board has screening plates 10 for screening this circuit. As is likewise evident from FIG. 3, the screening plates 10 are connected to one another by a transverse plate 11. The screening plates 10 and the transverse plate 11 are preferably designed as an integral unit, for example in the form of a stamped and bent part.

As is evident from FIGS. 2 and 3, the screw 6 passes through the transverse plate 11. As a result, the screw 6 bears on the transverse plate 11 in the screwed-tight state, and the thread of the screw 6 makes contact with the grooved slot 7. The assemblies consequently have a direct earth connection to the mounting rail 2. The backplane bus is therefore screened on its fourth side as well.

As an alternative or in addition, the transverse plate 11 could also be routed outwards on the rear side of the assembly 3, thereby producing a direct contact of the transverse plate 11 with the mounting rail 2.

As is evident from FIGS. 2 to 5, the backplane bus 1 comprises individual bus modules 12, which can be electrically connected to one another via mutually corresponding connectors 13, 14, with the result that the bus modules 12 adjoin one another with their boundary surfaces 15, 16 when the connectors 13, 14 have been plugged one into the other.

For the purpose of improved mechanical stability of the connection, the bus modules 12 have, on their boundary surfaces 15, latching hooks 17 which interact with corresponding latching recesses 18 on the boundary surfaces 16 of neighbouring bus modules 12.

When the bus modules 12 are joined together, the latching hooks 17 automatically latch in the latching recesses 18 of the respectively neighbouring bus module 12. The bus modules 12 can therefore no longer be separated from one another without a tool. In order to be able to separate the bus modules 12

from one another again, the bus modules 12 have a recess 19 on their front side facing the assemblies 3. The corresponding latching hook 17 is accessible through this recess 19 by means of a screwdriver or a similar tool. As a result, the latching hooks 17 can be pressed out of the latching recesses 18 again. The recess 19 is particularly evident in FIG. 5.

According to the exemplary embodiment, in order to mount a bus module 12 in the mounting rail 2, the webs 20 of the bus module 12 are first of all inserted into the groove 21 of the mounting rail 2. The bus module 12 is then pivoted into the mounting rail 2 in the direction of the arrow B until the abutments 22 of the bus module 12 are placed on the web 23 of the mounting rail 2. Shortly before this, the latching hook 24 engages behind the web 23 (See FIG. 6 in particular), with the result that the bus module 12 is mechanically retained in the mounting rail 2. The latching hook 24 can be pressed out by application of a screwdriver through the recess 25, with the result that the bus module 12 can then be detached again from the mounting rail 2.

As an alternative, the bus modules 12 can also just be laid into the mounting rail 2. In every case, however, the bus modules 12 are mounted such that they can move in the mounting rail 2 in the direction of the double arrow A (see FIG. 5). This has the advantage that the bus modules 12 can compensate for tolerances of the assemblies 3 which would otherwise lead to impermissible mechanical stresses.

The FIG. illustrates just one bus module 12, which is equipped with just one assembly 3. However, it goes without saying that a plurality of bus modules 12 may be present and that each bus module 12 is equipped with more than one assembly 3.

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Patent Claims

1. Programmable logic controller, comprising assemblies (3) which communicate with one another via a backplane bus (1),

- the backplane bus (1) being mounted in an essentially C-shaped, electrically conductive mounting rail (2), with the result that the backplane bus (1) is enclosed by the mounting rail (2) on three sides,
- the assemblies (3) being placed onto the mounting rail (2), with the result that the assemblies (3) are mechanically retained on the mounting rail (2) and are electrically connected to the backplane bus (1),
- the assemblies (3) having a direct earth connection to the mounting rail (2).

2. Programmable logic controller according to Claim 1, characterized in that the backplane bus (1) comprises individual bus modules (12) which adjoin one another at boundary surfaces (15, 16) and are connected to one another.

3. Programmable logic controller according to Claim 2, characterized in that the bus modules (12) are mounted such that they can move in the mounting rail (2).

4. Programmable logic controller according to Claim 2 or 3, characterized in that the bus modules (12) are latched in the mounting rail (2).

5. Programmable logic controller according to Claim 2, 3 or 4, characterized in that the bus modules (12) have latching hooks (17) and latching recesses (18) on their boundary surfaces (15, 16), and in that the latching hooks (17) and the latching recesses (18) of neighbouring bus modules (12) interact.

6. Programmable logic controller according to Claim 5, characterized in that, when the bus modules (12) are mounted in the mounting rail (2), the latching hooks (17) are accessible from the side on which the bus modules (12) is [sic] not enclosed by the mounting rail (2), with the result that they can be pressed out of the latching recesses (18).