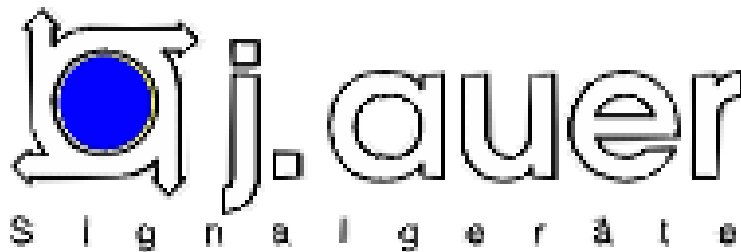


P-NET enabled Auer-Signal devices

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Abstract

Auer Signal is a company producing signalisation components for industrial installations. The palette of devices offered is designed to offer the greatest modularity and flexibility in installation and commissioning. It is the aim of the company to offer flexible interfaces that allow to adapt to existing and future installations in the easiest way for the customer. Fieldbus technology is one of the most important developments for the future.

The P-Net interface has been chosen as the first fieldbus interface to be developed because of its ease of implementation and relative low requirements in computing power. This paper describes the implementation of the interface of the modules that have been developed to work with P-Net networks.

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Outline

1. Company description
2. Implementation of the P-Net interface
3. P-Net controlled automated module testing
4. Conclusion

1. Company description

Auer Signalgeräte GesmbH is a company producing signalisation components for industrial installations. The palette of devices offered is designed to offer the greatest modularity and flexibility in installation and commissioning.

Safety is our concern. As a company of long tradition in signal equipment, precise manufacturing and reliable quality have always been the foundation of our competence. Innovative thinking, fast acting and flexibility, allows us to manufacture most advanced products and hence satisfy the market. The variety of our product range, as well as the quantity of our products, both guarantee to meet all requirements of our customers. The product range consists of many different components to enhance safety in industrial installations:

- warning beacons
- flashing beacons
- signal horns
- Buzzers
- electronic sound generators
- ex- and waterproof telephone sets
- ex-proof signal horns and bells
- tower lights

It is the aim of the company to offer flexible interfaces that allow to adapt to existing and future installations in the easiest way for the customer. We are interested in offering as many standardized interfaces as possible for our customers. Current components offer a wide range of connection possibilities as 12 V, 24 V, 110 V and 220 V among others.

Fieldbus technology is one of the most important developments for the future. We are currently working on different implementations for our product palette.

As the demand for our components has dramatically increased in the past and to warranty constant high quality, the production and quality management processes are being completely automated. The second part of this paper describes the first automatic test unit also built using the P-Net protocol. In the future, the complete production process including storage and logistics will be automated in a computer integrated manufacturing environment.

2. Implementation of the P-Net Interface

The P-Net interface has been chosen as the first fieldbus interface to be developed because of its ease of implementation and flexibility. The main reasons for this choice are, that the protocol has become a European standard together with two other Fieldbus interfaces. The hardware requirements are relatively low and the slave implementation suits the actual resources in the devices. In this way, the redesign of the devices is minimal.

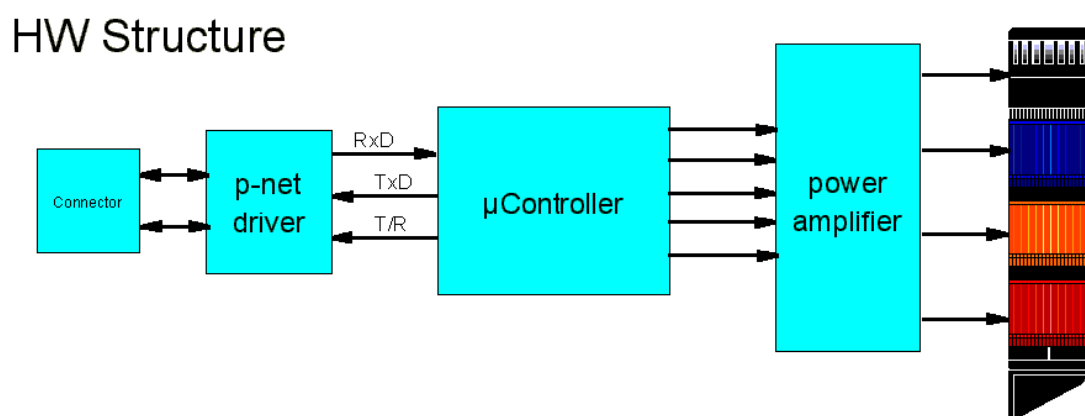


Figure 1

The original circuit was designed around a Phillips derivate of an Intel 80C52 that controlled the light tower, power electronics and connectors for the modules. This circuit could easily be enhanced by the P-Net interface without changing the already existing components. The size of the original print did not have to be changed, making a redesign of the plastic parts unnecessary. The computing power of the microcontroller was also enough to cope with the protocol. All these reasons where very important for the decision to take P-Net as the most interesting approach to fielddbus technology.

The tower lights consist of a socket base module that can control up to five different signal modules (light and sound). This base module can configure the other ones via an intrnal bus implemented over the internal power lines. The internal 4-bit protocol is an internal development that allows to set brightness, intensity, speed and other parameters of each signal module.

Softwire List

Reg No.	Service channel	Moduls 1-5
0	numSW	Power
1	DeviceType	LEDMask
2		RunMode
3	Reset	On_Time
4	SerialNr	Off_Time
5		
6	Time	
7	FrTimer	
8	WDTimer	
9	ModulConf	
A	WD	
B		
C		
D	WriteE	
E		
F	CommonE	Module

Figure 2

Fig 1 shows the blocks of the enhanced module, the only change made to the original design was, as mentioned, the additional P-Net driver to connect the device to

the P-Net bus. The communication between the protocol and the existing software was implemented by mapping the software list into memory to allow sharing of variables.

The functions implemented to be accessed over the P-Net fieldbus are mainly operation and configuration. The different modules can be switched on and off and their properties can be configured over the bus. These configuration variables include the description of the module, and the operation mode, as e.g. rotating, turning, flashing lights and timing information. Error detection is also a possibility offered by the interface. The main structure of the software list is shown in fig. 2.

The interface has been tested with a 3920 P-Net card to communicate over the P-Net bus and has been proved to operate appropriately with other P-Net devices. Official certification is planned in the next future.

3. P-Net controlled automated module testing

The P-Net fieldbus is also used internally in the company to automate production and testing. The testing facility has been already developed and was designed as the first step into an integrated production system including assembly, testing and data gathering.

Automated Modul Testing - p-net communication

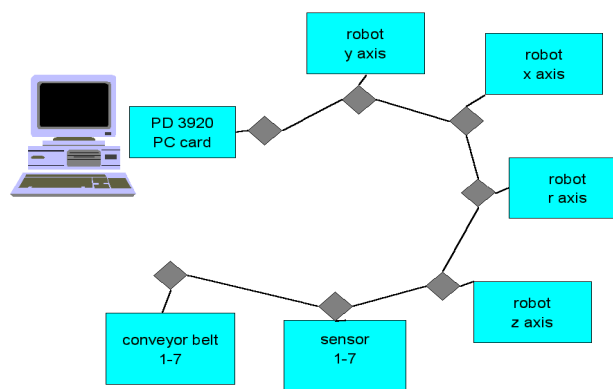


Figure 3

The structure of this production step is shown in fig 3. This facility allows to guaranty a higher quality of the shipped devices as the functionality of every device can be tested before delivery to the customer. The automatic report generation can be also used to fulfill the requirements for ISO 9000.

P-Net modules are used to control the movement of the conveyor belts ,and the different movements of the positioning robots and to obtain data from different sensors.

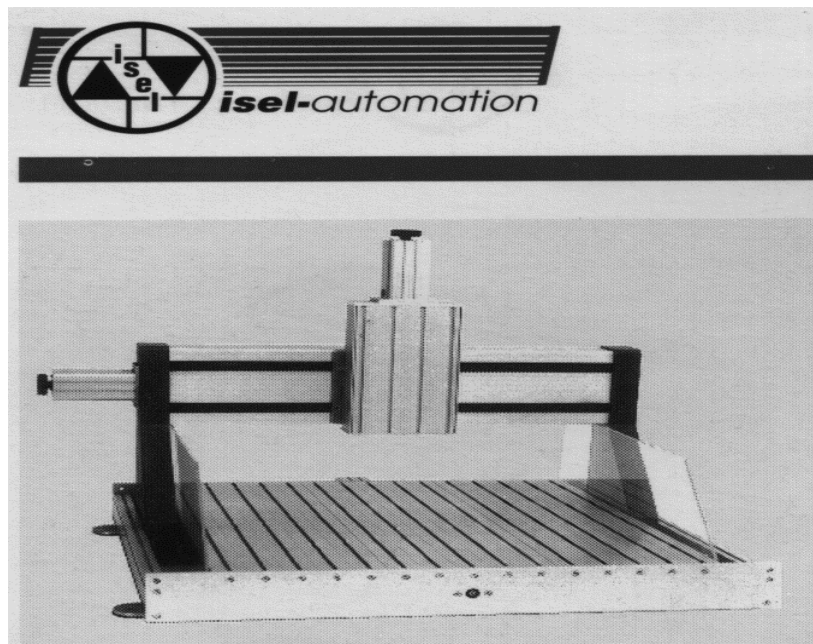


Figure 4

The modules are transported by a robot (fig. 4) to a recognition system and rotated to fit into the test bed. After detecting the type of the module, different test are applied to assure a correct functionality. Depending on the result of these tests, the modules are sorted and prepared for shipping.

Fig. 5 shows the P-Net controlled hardware used to implement this system.

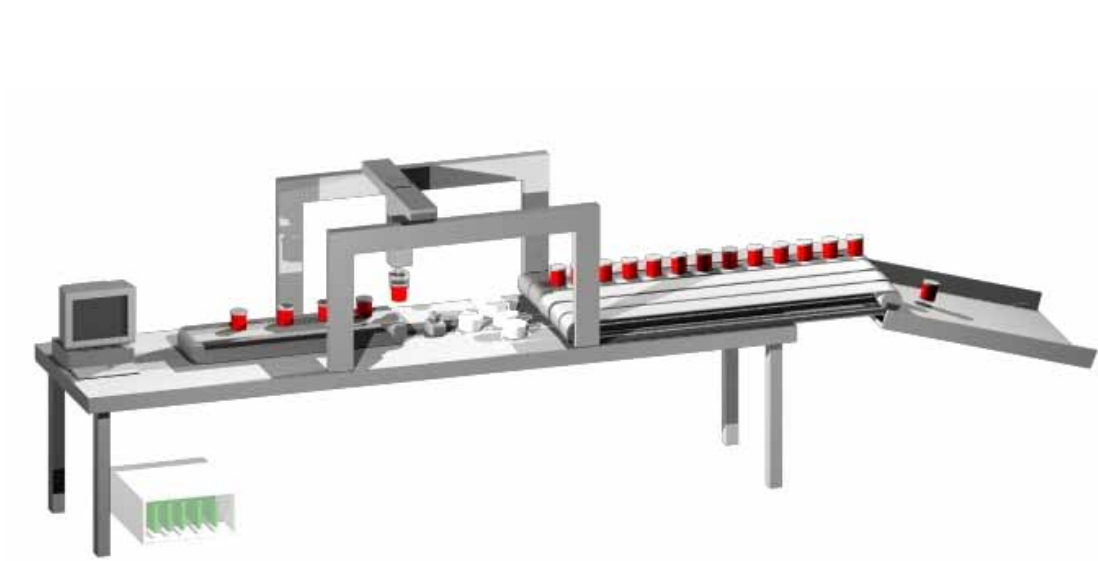


Figure 5

4. Conclusion

P-Net has proved to be a flexible enhancement for our company and for our products. As mentioned above, we find this fieldbus to fit extremely well into our products. We believe it will be an interesting extension for our customers and enhance the value of our products.

P-Net is also finding an interesting place inside the company, making the automation processes easier to implement and to manage. We are going to collect first experiences with the first testing unit and believe, that due to the flexibility and expandability of the system, in future most of our production will be automated with this fieldbus.