PROFIBUS infrastructure components

What is a repeater and what is it used for?

A repeater is an electronic component that receives incoming signals and forwards – repeats – them refreshed (see fig. 19). Because this process uses optocouplers in the repeater, two galvanically separate segments are created.

Repeaters are used to ensure trouble-free operation of a PROFIBUS network and fulfil the relevant standards. Per seg-ment, a maximum of 32 devices can be used (including the repeater). The maximum line length is always considered per segment.

For creating a network with 32 devices or a very large net-works, then the use of repeaters is necessary. They are also suitable for isolating anomalous devices or devices that are susceptible to faults.

RECOMMENDATION – Cable length

In PROFIBUS networks, the maximum transmission distance for the transmission speed has to be observed.

Transmission speed in kbps	Transmission distance in m
9,6	1200
19,2	1200
45,45	1200
93,75	1200
187,5	1000
500	400
1500	200
3000	100
6000	100
12000	100
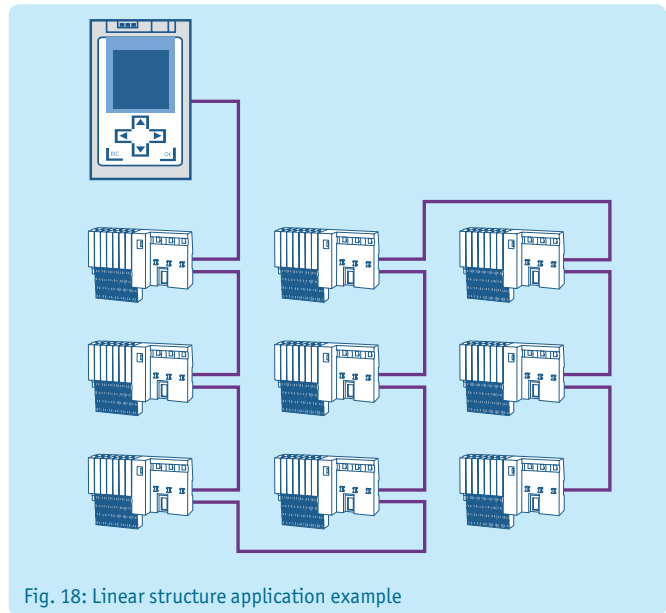
Fig. 18: Linear structure application example

incoming bad signal

outgoing refreshed signal

outgoing refreshed signal

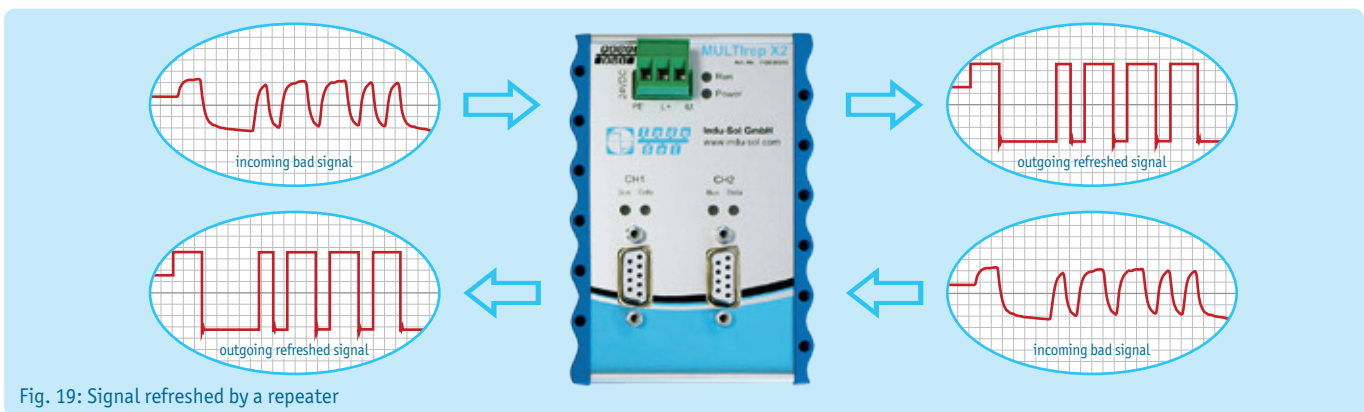incoming bad signal

Fig. 19: Signal refreshed by a repeater

RECOMMENDATION – star-shaped structure

The use of repeaters (**INBLOX**® or **MULTIrep**) enables the implementation of a key benefit of Ethernet-based networks into PROFIBUS: The star-shaped structure (see fig. 20). Every thread going out from a repeater is a galvanically independent segment with a refreshed signal. This permits the formation of groups by location, function or techno-logy – the linear structure (see fig. 18) is dissolved. Small segments make the network structure easy to understand and simplify diagnostics.

Repeater product range MULTIrep (X2, X5, X7)

## Star networks and telegram traffic

With the **MULTIrep** range of repeaters, the PROFIBUS network can be subdivided into two, five or seven galvanically independent segments. The star structure with multiple small segments and refreshed signals has many benefits in regard to stable operation and troubleshooting.

Bus:		Bus health by channel
🟢	**Green:**	Okay
🔴	**Red:**	Error telegram, repetition, diagnostic messages, device failures
Data: 🟢	**Green:**	Bus activity on the channel
🔴	**Red:**	Configuration problem on the PB
⚪	**Off:**	No bus activity present

The **MULTIrep** repeater continuously monitors the PROFIBUS telegram traffic and signals any detected logical or physical anomalies. The bus LED signals error telegrams and repetitions. The data LED shows whether a slave is communicating on the channel and whether it is configured without errors.

📦 Highlights

- Enables stubs in PROFIBUS
- Isolates sensitive or problematic areas
- Expansions or shutdowns possible during running operation
- Errors affect only small parts of the network

Fig. 20: Star network application example
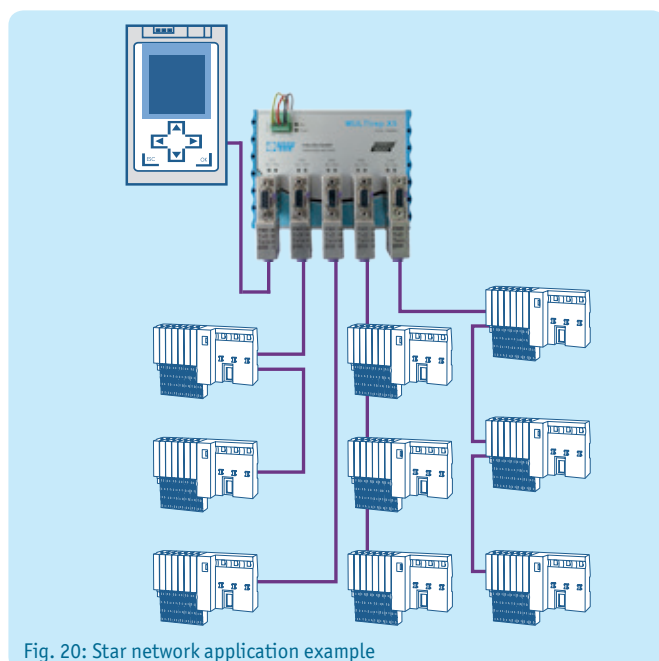
MULTIrep X2

The use of repeaters enables the expansion of a PROFIBUS network to include a maximum of 126 devices, as well as longer cables for the same transmission speed. Per segment, a maximum of 32 devices are permitted. The **MULTIrep X2** repeater regenerates the voltage signal in both directions and amplifies it to the standard PROFIBUS level. The content of the signal remains unchanged. From a physical point of view, the use of this repeaters creates two galvanically separated segments.

MULTIrep X2 – 105 mm

72 mm

MULTIrep X5 und X7

With the multiple repeaters **X5** and **X7**, the **MULTIrep** range is the ideal basis for a robust PROFIBUS star network. The **MULTIrep** stands out by its simplicity and reduction to the essentials. The PROFIBUS wiring is implemented with proven, reliable SUB-D connectors. There are no error-prone DIP switches or terminal points on the device. The integrated diagnostic function is a highlight of the **MULTIrep** series. The telegram traffic is continuously monitored, and the health of each segment is indicated with LEDs.

MULTIrep X5 – 105 mm

142 mm

MULTIrep X7 – 105 mm

212 mm