Application

The module is used to transmit and receive the PROCONTROL telegrams via optical waveguides (OWGs). The module also contains a noise transmitter for generating the noise signal for event and acknowledgement annunciations.

Features

The module can be plugged into every multi-purpose processing station of the PROCONTROL bus system. Two such modules are required per multi-purpose processing station in the case of redundant remote bus structure.

It serves to implement pure point-to-point circuits between a multi-purpose processing station (88 FT03) and the master station (88 FV03).

Disturbances of the module are signalled on the front side of the module with a red light-emitting diode.

The signals of the remote bus, received via the optical waveguide, are converted by the module to electrical signals (TTL level). The electrical signals of the multi-purpose processing station (TTL level) are converted to optical signals for connection to the optical waveguide.

A graded-index fiber 50/125 μm is used as the optical waveguide (OWG).

Description

BASIC DESIGN

The module essentially consists of the following components:

- Fiber-optic transmitter (data)
- Fiber-optic receiver (data)
- Fiber-optic transmitter (noise channel)

FIBER-OPTIC TRANSMITTER (DATA)

The coded transmit signal at input 1A is stored by the clock signal STA and is then issued to the fiber-optic transmitter via a flip-flop. The flip-flop is reset via input SA. The transmitter is enabled by a 0 signal at input SA.

The supply voltage of the fiber-optic transmitter can be switched off via input SE. The transmitter is activated when input SE is connected to the reference conductor Z. Transmitter monitoring signals when a transmit command is pending. When a transmit command is pending, a zero signal is issued at output SF by the transmitter monitoring circuit.

FIBER-OPTIC RECEIVER (DATA)

The optical waveguide for receive data is connected to the module via input DE on the front side of the module.

The converted electrical signal is available at output IE.
FIBER-OPTIC TRANSMITTER (NOISE CHANNEL)

The optical waveguide for the noise signal is connected to the module at output RS on the front side of the module.

The noise signal is activated via input RE.

The fiber-optic transmitter is activated by a 0 signal at RE, providing the supply voltage UD+ is applied.

When a noise level is applied, the transmitter monitoring circuit issues a 0 signal at output RF, and the green light-emitting diode QES on the front side of the module is switched on.

System design

When using modules 88 FT03, 88 FV03 on a remote bus line, only point-to-point circuits are possible between the master station and a multi-purpose processing station.

Three optical waveguides, used for the following tasks, are required per remote bus:
- Transfer of the transmit data DS
- Transfer of the receive data DE
- Transfer of the noise signal RE
Module settings

If using modules 88 FT03 and 88 FV03, settings appropriate to the relevant remote bus line must be carried out.

The settings are carried out on the coupling module for master station 88 VK01. They relate to evaluation of the noise channel.

Modules 88 FT03 and 88 FV03 have no setting facilities.

The table below specifies the settings of the 5 dual-in-line switches of the coupling module for master station 88 VK01 for defined lengths of the optical cable (cf. 88 VK01, Time setting)

<table>
<thead>
<tr>
<th>Switch designation</th>
<th>Switch function</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1: 1 ... 8</td>
<td>Waiting time event annunciation, transmission</td>
</tr>
<tr>
<td>S2: 1 ... 8</td>
<td>Waiting time event annunciation, reception</td>
</tr>
<tr>
<td>S3: 1 ... 8</td>
<td>Waiting time acknowledgement annunciation, transmission</td>
</tr>
<tr>
<td>S4: 1 ... 8</td>
<td>Waiting time acknowledgement annunciation, reception</td>
</tr>
<tr>
<td>S5: 1 ... 8</td>
<td>Waiting time event localization</td>
</tr>
</tbody>
</table>
If the distances of the multi-purpose processing station from the master station are other than those specified in the table, the time setting on the noise channel can be determined by calculating as follows.

The following boundary conditions must be observed:

- The calculated setting in µs must be rounded to an integral decimal value.
- In the case of the binary values to be set on the relevant switch (contacts 1...8), "1" means contact open (contact setting OFF) and "0" means contact closed (contact setting ON).
- Differences in cable length less than ± 20 m do not influence the relevant switch setting.

Basic formulae:

\[ t(K) = \frac{4.833 \, \text{µs/km}}{50/125 \, \text{µm graded-index fiber}} \]

Telegram delay \( t(\text{VTLG}) = \text{cable delay} \times \text{cable length} \)

\[ t(\text{VTLG}) = 4.833 \, \text{µs/km} \times \text{length} \]

Formulae for switches S1 ... S5:

Switch S1: Waiting time event announcement, transmission

\[ t(\text{AES}) = 2 \times t(\text{VTLG}) + 40 \, \text{µs}, \]

setting S1 = \( \frac{t(\text{AES})}{0.4 \, \text{µs}} \)

Switch S2: Waiting time event announcement, reception

\[ t(\text{AEA}) = \text{fixed value} \, 56 \, \text{µs}, \]

setting S2 = 140 (see table)

Switch S3: Waiting time acknowledgement announcement, transmission

\[ t(\text{AQS}) = 2 \times t(\text{VTLG}) + 24 \, \text{µs}, \]

setting S3 = \( \frac{t(\text{AQS})}{0.4 \, \text{µs}} \)

Switch S4: Waiting time acknowledgement announcement, reception

\[ t(\text{AQC}) = \text{fixed value} \, 24 \, \text{µs}, \]

setting S4 = 60 (see table)

Switch S5: Waiting time event localization

\[ t(\text{AEA}) = 2 \times t(\text{VTLG}) + 35 \, \text{µs}, \]

setting S5 = \( \frac{t(\text{AEA})}{0.4 \, \text{µs}} \)

Example:

Setting switch S1 for 2 km optical cable

Setting determined: 148.33
Setting after rounding: 148

Significance (binary):
128 64 32 16 8 4 2 1
Binary notation
148 : 1 0 0 1 0 1 0 0

Switch setting S1 : 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8

ON 0 0 0 0 0 0 0

ANNUNCATIONS ON THE MODULE

The following are indicated with light-emitting diodes on the front side of the module:

- ST module disturbance
- TS transmit telegram
- QES transmit acknowledgement event

Annunciation ST is formed in module 88 FN01 or 88 FN02 and is preset via input SSE.

- The red disturbance light-emitting diode ST responds when the checkback signal of the transmit signal SP or the checkback signal of the noise signal RP does not correspond to activation of the transmitter.

Annunciation TS is formed in module 88 FN01 or 88 FN02 and preset via input SA.

- The annunciation lamp TS responds when input SA has a "0" signal.

Annunciation QES responds when the noise transmitter is in operation.
Connection diagram

88 FT03

88 FN01-E or 88 FN02-E

Local bus in the multi-purpose processing station, to 88 TK02

e.g. multi-purpose processing station X
Mechanical design

Board size: 6 units, 1 division, 160 mm deep

Connector: in accordance with DIN 41 612
1 x 48-pole,
edge-connector, Type F

Optical wave-
guide connection: miniature BNC fiber optic
CAM-125 S/L, 3 x for RS, DS, DE

Weight: approx. 0.3 kg

Note:
During storage or if the optical cables are disconnected, the OWG connections which are highly sensitive to soiling must be protected with rubber protective caps.

Three parking positions are provided for accommodating the rubber protective caps during operation.
Technical data

In addition to the system data, the following values apply:

POWER SUPPLY

Operating voltages
UD+ = + 5 V
UB+ = + 24 V

Current consumption
ID+ = ≤ 500 mA

Power dissipation
P_max. = 2.5 W

ZD reference conductors for
UD+ and UB+

INPUT/OUTPUT VALUES

Signal exchange between the module and modules 88 FNO1 or 88 FNO2 is carried out with TTL signal level, with the exception of signal SE

INPUT SIGNALS

IA - transmit data
STA - transfer clock
SA - command Data transmitter OFF
RE - command Noise transmitter OFF
SE - voltage supply transmitter ON
SEE - activation fault annunciation lamp

OUTPUT SIGNALS

SP - annunciation Data transmitter OFF
RP - annunciation Noise transmitter OFF
IE - receive data

OPTICAL WAVEGUIDE

Graded-index fiber 50/125 μm

ORDERING DATA

Type designation: 88 FT03/R0100

Order number: GJR2372400R0100

Technical data are subject to change without notice!