

Coupling for PROCONTROL Bus Systems

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87TS01 – E/R1233/R1234

Application, Features

The coupling serves is used for serial process data transfer from one PROCONTROL station bus to another. It may therefore also be used for serial process data transfer between two PROCONTROL systems (see Fig. 2).

The following pair of modules is required for this coupling:

87TS01 – E/R1233 Master–function coupling module

87TS01 – E/R1234 Slave–function coupling module

The modules may be plugged into any station of the PROCONTROL bus system with redundant 24 V module supply (from 89MS01/R0200 or 89MS02/R0100). They are provided with a standard interface for the PROCONTROL station bus.

Module version R1233 (Master function) is used in that PROCONTROL system to which the data are to be transferred.

Module version R1234 (Slave function) is used in that PROCONTROL system from which the data are to be transferred (see Fig. 2).

If data transfer in the opposite direction is required another pair of modules is needed (see Fig. 3).

For the coupling function the modules are equipped with serial interfaces type RS 232c in connectors X1 or X2 on the front of the module.

Up to 192 telegrams may be transferred, i.e. the Slave module includes 192 receive registers for the reception of send–location addressed telegrams, and the Master module includes 192 send registers. With each telegram 1 analog value or, depending on the allocation, up to 16 binary values may be transferred.

Process data are transferred both in cyclic and in event-related mode. The data contents of the telegrams are transferred without any change from one station to another, and/or from one PROCONTROL system to another.

If more than 192 telegrams are needed for the data exchange further pairs of modules may be used.

Monitoring of the interface protocol incl. receive monitoring is effected in the same way as for all other PROCONTROL modules. The errors are signalled in the diagnosis register.

The transfer speed amounts to 9600 baud. In the case of an allocation for 192 telegrams, the typical transfer performance depicted in Fig. 1 can thus be achieved.

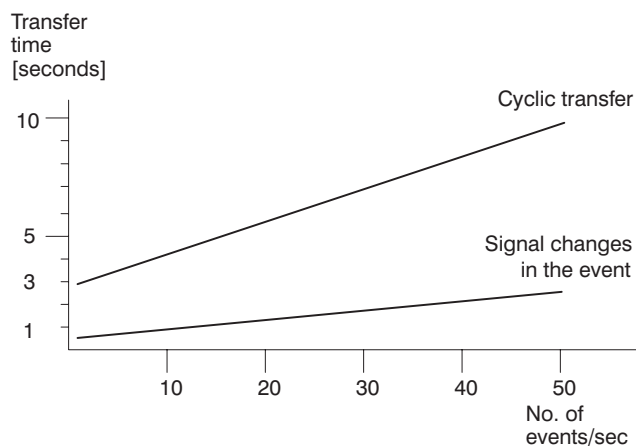


Fig.1: Transfer time at the interface depending on the number of events per second.

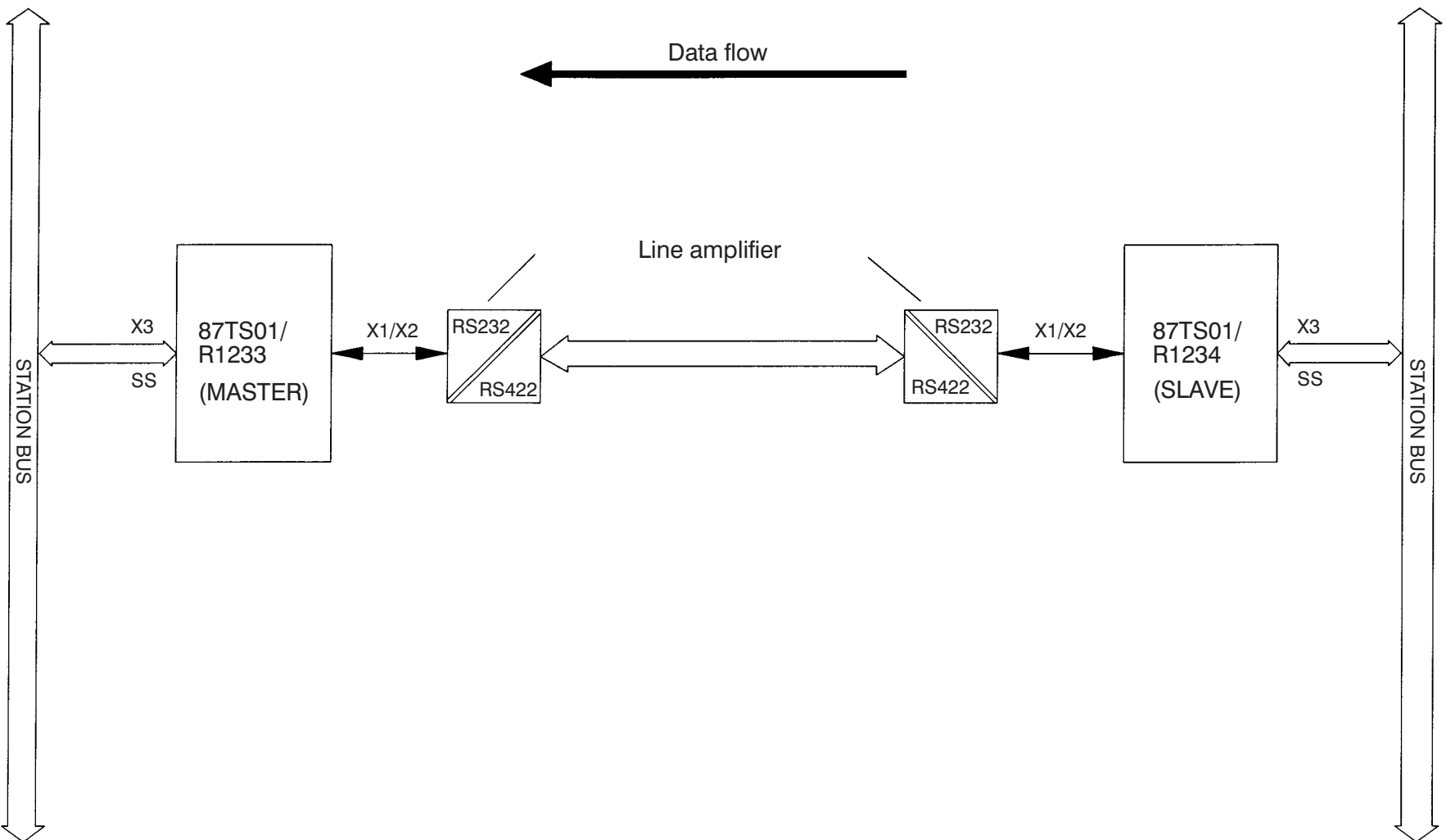


Fig. 2: Coupling for PROCONTROL bus systems in one direction

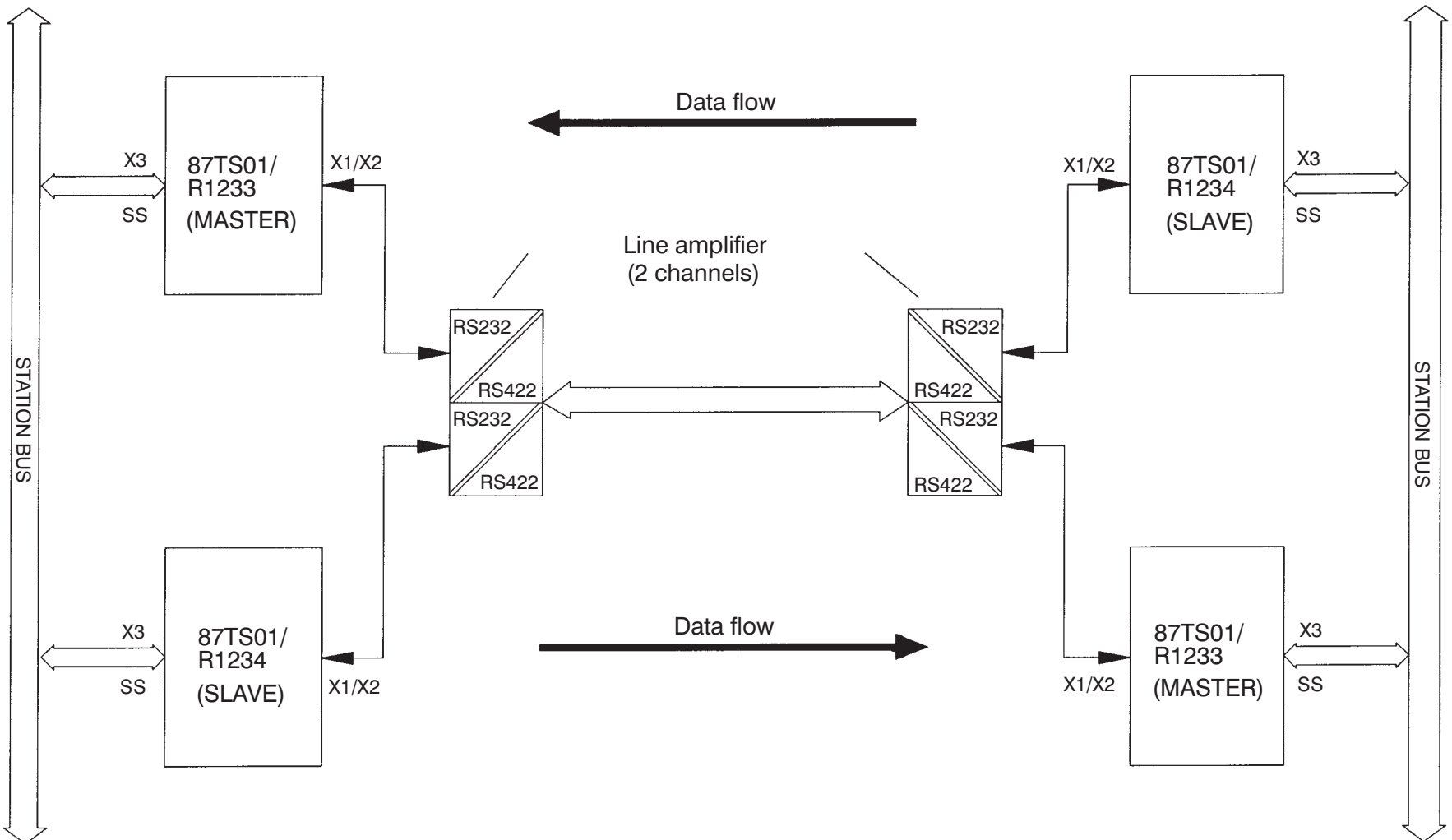


Fig. 3: Coupling for PROCONTROL bus systems in two directions

Connection

The connection is made as shown in Figs. 2 and 3.

For a transfer in both directions both stations must be equipped with a R1233 and a R1234 module. The modules are to be accommodated in the same subrack and in adjacent slots.

Line amplifiers with potential isolation shall be used for the connection.

The maximum allowable distance is 500 m.

Transfer

Data communication between Master and Slave module is based on transfer protocols according to the call/response principle as laid down in DIN 19244.

The Master function is always assigned to the receiving system, the Slave function to the transmitting system.

For definition purposes the different data formats used for the transfer of process data in the PROCONTROL system and at the serial interfaces acc. to DIN 19244 have been given different designations. The data format in the PROCONTROL system is called a "telegram". The term "data record" is used for the data format at the serial interface.

After connection to the power supply, as well as after disturbances in the module or errors during data transfer the initialization phase is passed through. During this phase all internal memory areas are cleared and the module parameters are set anew. Then the connection via the serial interface is established. Initialization is complete after all data records have been transferred completely and free from errors, and after the transfer release to the PROCONTROL system has been given.

No processing of events takes place while the connection is being built up.

Depending on the amount of data, the initialization phase lasts for 10 to 20 seconds. During this time, the red disturbance lamp "ST" is on.

With the completion of the initialization phase, the module goes into the operating phase. If events are present, an event transfer may now be requested by the Master.

To increase the data transfer rate, both the cyclic data and the event data will from this moment onward be transferred as "packed data records".

A packed data record transferred in cyclic mode includes 4 PROCONTROL telegrams. A packed data record in event transfer mode includes 1 up to 16 PROCONTROL telegrams.

After each data record transferred in cyclic mode an event data record may be transferred upon request.

Event Recognition

Event recognition by the Slave module is effected through evaluation of the event bit in the telegram.

After recognition the transfer of every event takes place according to the protocol via the interface to the Master module. This module on its part transmits the telegram as an event to its PROCONTROL system.

A maximum of 50 different registers per second can be transferred as events from one system to the other system at a rate of 9600 baud via the serial interface. If the PROCONTROL system receives more events than can be transferred via the serial interface, the respective registers are overwritten. This arrangement ensures that in all cases the latest valid process parameter is transmitted.

Monitoring

The monitoring of the serial interface is structured in the same way for both module versions.

Data reception is checked for the following points:

- parity error of each bit (parity even)
- character length
(1 start bit, 8 data bits, 1 parity bit, 1 stop bit)
- data record error
(start character, length, checksum, stop character)
- time monitoring for the reception of a following character after the valid start character of a data record
- time monitoring for the reception of the next valid data record.

Data records in which a parity error, a data record error or a time monitoring error for the reception of a following character have been recognized are discarded. By means of suitable protocol steps disturbed data records may be repeated.

After a disturbance has occurred three times, the error is signalled to the diagnosis register.

The loss of entire data records and a response of the time monitoring system generate a diagnosis report and lead to the re-initialization of the serial interface.

Data Transfer

For the data transfer via the serial interface the data record formats set forth in DIN 19244 are used.

Data records for calls and acknowledgements which serve for transfer control at the serial interface are not generated by PROCONTROL telegrams. They are permanently specified by the protocol.

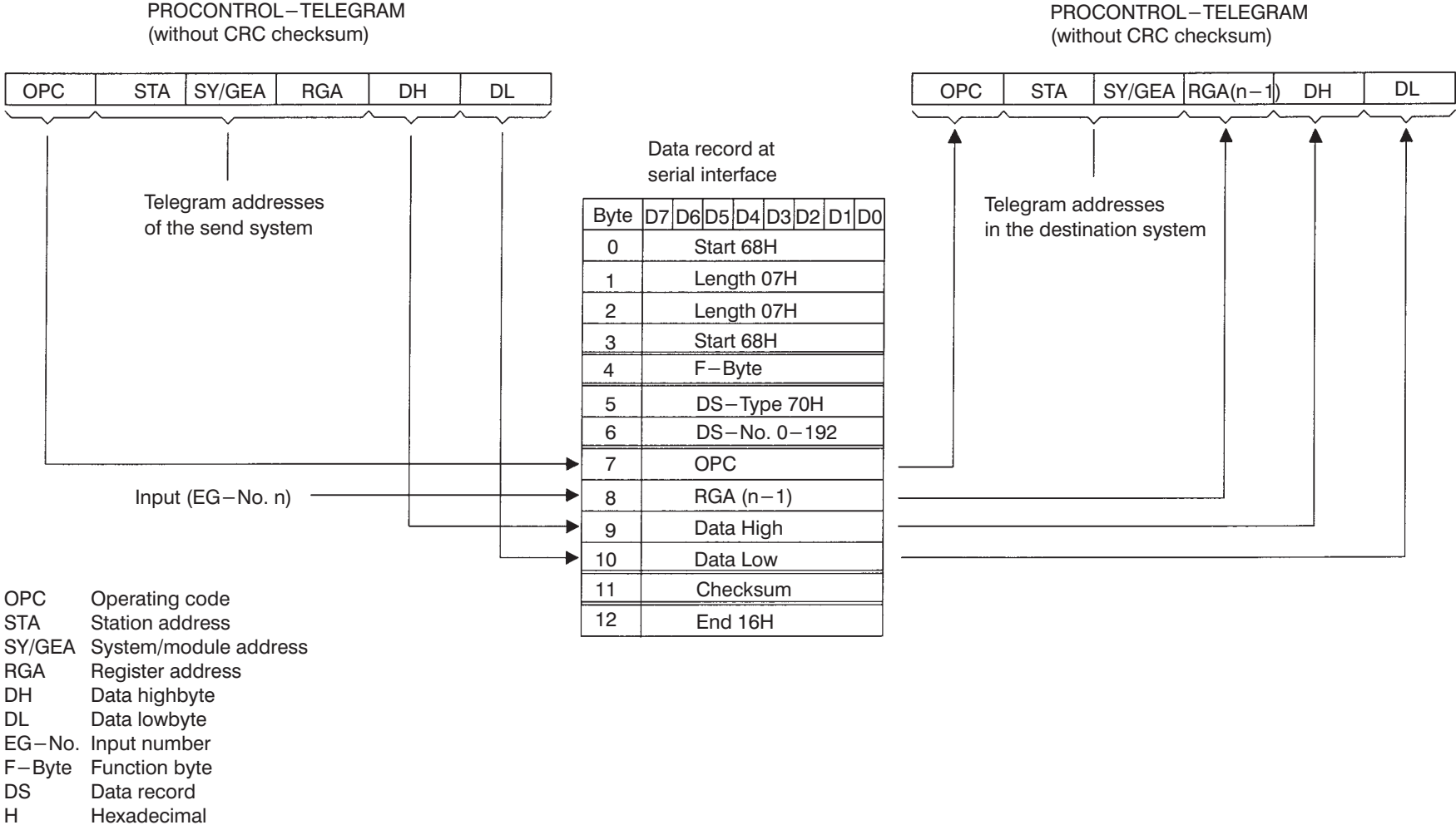
These data records also have no influence upon the transfer run in the PROCONTROL system.

There exists a fixed allocation between the PROCONTROL telegram to be received in the Slave module via a receive register, the register address transferred in the process data record, and the send register address in the Master module.

The telegram programmed in the Slave module under input EG1 is entered in the receive shared memory under register address 0 and transferred at the interface with the data record number 1 and the register address 0.

The send-location telegram derived from this data record is also assigned register address 0 in the Master module (cf. Fig. 4).

Fig. 4: Allocation of PROCONTROL telegram and data record at the serial interface



Address PROM

The address PROM in the Slave module defines which PROCONTROL telegrams are to be received by the bus and to be transferred at the interface.

The preparation program PEB is used for the preparation of the address PROM.

Receive Monitoring

All telegrams received from the PROCONTROL bus in cyclic mode are subject to receive time monitoring. The response of the receive time monitoring, upon a failure of the telegrams, is signalled in the diagnosis register of the module.

When the receive monitoring responds, the respective telegram is marked by the Slave module.

For data records with a tag "receive time monitoring responded" which are transferred at the serial interface, the transfer to the PROCONTROL bus by the Master module is blocked.

Transfer Parameters

The parameters are required for the transfer run and the protocol monitoring at the interface. They are filed in the address PROM.

The stated values are entered by the PEB program as standard values. They are adjusted to the transfer run of the interface protocol.

Diagnosis and Disturbance Signals

Faults at the module and at the serial interface are detected by the diagnosis function of the module and signalled (see also Module Description 87TS01/R1xxx).

Signals appearing on the module

Two red and two green LED's are arranged at the front of the module. Correlations are shown in Fig. 5.

- LED ST
The red LED ST emits a steady light when a disturbance has been detected in the area of the station bus interface or when the receive time monitoring has responded.
- LED STV
The red LED STV emits a steady light when a disturbance has been detected in the area of the processing section. The processing section is not operational.

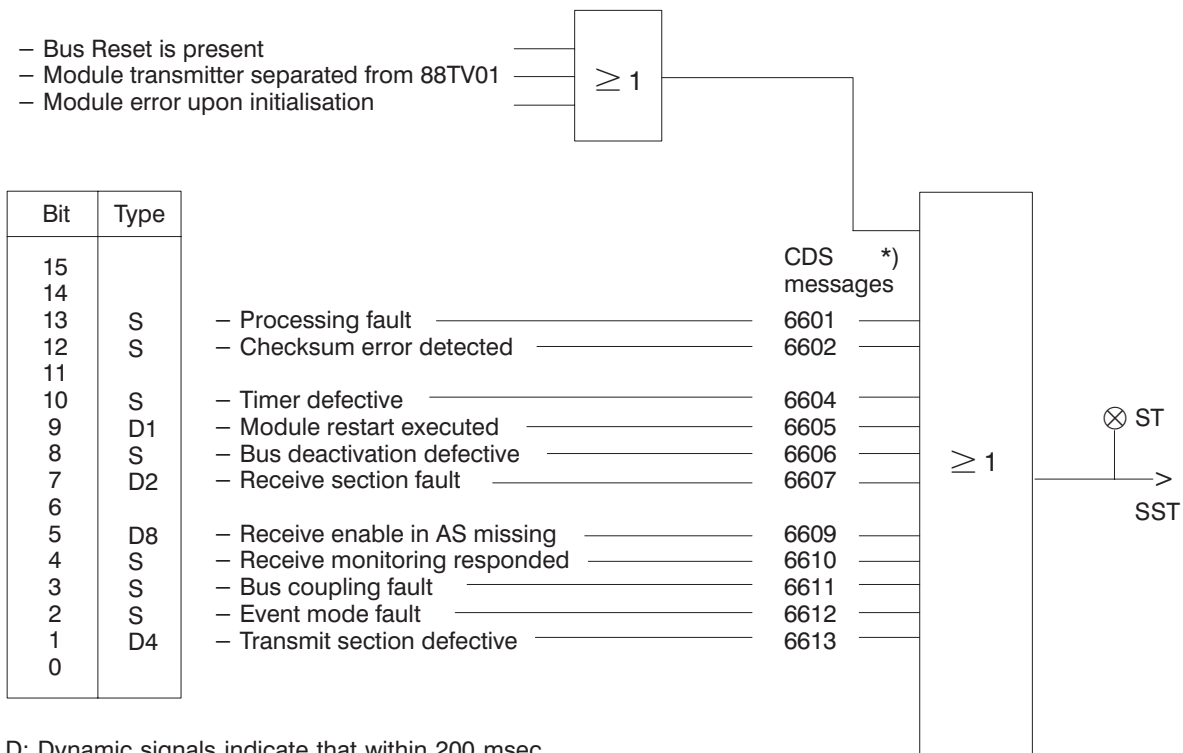
By means of the green LEDs M1 and M2 the operating modes of the processing section are indicated:

- LED M1
The green LED M1 lights up when data transfer with the external system across the interface takes place.
- LED M2
The green LED M2 lights up when processing takes place in the processing section of the module.

The monitoring of the processing section ensures that a re-initialization of the serial interface is effected when disturbances in the processing program occur. Transfer via the serial interface is secured by means of a checksum; when transfer errors occur the affected data record is repeated.

Signalling via the diagnosis register

All important module functions are checked by means of the diagnosis routines which are run in the bus program and the processing program. The results are filed in diagnosis register 246. Fig. 5 shows the correlations of signals and indications on the module.



D: Dynamic signals indicate that within 200 msec the error has occurred more often than the threshold value (stated number). These signals are erased by reading of the diagnosis register.

S: Static signals indicate the actual status with a resolution of 200 msec. The signals disappear automatically when no longer activated.

LED	Meaning
M1 ○	No data transfer at the serial interface
M1 ●	Data transfer at the serial interface
M2 ○	Program run disturbed
M2 ◐	Program run o.k. (approx. 1 Hz)
M2 ●	Program run disturbed

Processing not operational	STV
Data transfer at the interface	M1
Processing	M2

- LED off
● LED on
◐ LED flashing

Fig. 5: Signals and disturbance alarms

*) The control diagnosis system (CDS) provides a description for every message number. This description provides, among other data:

- Information on cause and effect of the disturbance
- Recommendations for its elimination.

This makes for fast elimination of disturbances.

Technical Data

The equipment data of module 87TS01–E/R12.. are applicable (see Module Description), with the following additions:

Standard setting for RS232

UART character format:

Start bit:	1
Data bit:	8
Parity:	Even
Stop bit:	1
Baud rate:	9600

Max. length of line:

RS232 to the line amplifier:	20 m
RS422 between line amplifiers:	500 m

Maximum transfer characteristics:

Slave coupling module
Inputs (EG): 192
Receive registers: 192

Master coupling module
Outputs (AG): 192
Send registers: 192

Transfer performance at 9600 baud and 192 programmed telegrams. Typical values:

Transfer of all 192 telegrams, without event telegrams

– cyclic mode: approx. 3.0 secs

Transfer of all 192 telegrams plus 50 event telegrams per second

– cyclic mode: approx. 10.0 secs
– signal changes in the event: max. 2.5 secs.

Ordering Data

Order number for complete module

Module with bus interface firmware and
Master function software:

Type: 87TS01–E/R1233 Order no.: GJR2368900R1233

Module with bus interface firmware and
Slave function software:

Type: 87TS01–E/R1234 Order no.: GJR2368900R1234

Order numbers of pluggable memory modules

Memory module	Item	Order number
Bus interf. section	A401	programmed PROM: GKWE856438Pxxxx
Proc. sect. Master	A106	GKWE856434Pxxxx
Proc. sect. Master	A108	GKWE856435Pxxxx
Proc. sect. Slave	A106	GKWE856436Pxxxx
Proc. sect. Slave	A108	GKWE856437Pxxxx
Address PROM	A104	empty PROM: HETN400829P0001 * (27C256) HETN400339P0004 (27C512) (Basic equipment)

* Observe jumper setting, see module description.

Pxxxx = Item no. according to the applicable program version.

Signal cables

Cable assignments depending on the line amplifiers used.

Technical data are subject to change without notice!



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