Module and Application Description

PROCONTROL P

Transfer

Station Bus Coupling Module

coupling the PROCONTROL
station to the remote bus
in redundant applications

88TK05 – E/R1220

Application

This module is used for redundant applications in stations of the PROCONTROL system.

Used in conjunction with remote bus coupling module 88FT05, this module couples the PROCONTROL station to the remote bus.

Moreover, the module controls all operations which are required for data exchange inside the PROCONTROL station in redundant applications.

Features

The module is equipped with

– one standard interface (SS) with the station bus

– one RS485 interface with the remote bus coupling module 88FT05

– one module data interface with the remote bus coupling module 88FT05

– one isolated monitoring interface

– one input to operate the transmitter high–level stages in the remote bus coupling module 88FT05.

The module is always used in the single–channel mode and occupies the module addresses 60 and 62 (see chapter "Setting the station, system and module addresses").

The module can be plugged into any slot of the PROCON-TROL cabinet. In the standard cabinets, however, slots are reserved for the module.

Design of the module

The module comprises the following functions:

– remote bus coupling

– control of the station protocol

– setting the module, station and system addresses

– RS485 interface

– module data interface

– monitoring interface

– diagnosis and annunciation functions

Remote bus coupling

Transmitting data from the station

Two main operating modes are available for transmittal data communication which are controlled by the master station:

– cyclic mode

– event mode.

In cyclic mode, the master station (MS) polls the stations one by one. 88TK05 evaluates this call to transmit data telegrams and forwards it to the station.

In event mode, the 88TK05 signals the presence of events in the station by activating the noise channel. Then the MS identifies the requesting station and generates an event call which is evaluated by 88TK05 and forwarded to the station.

88TK05 transmits the cyclic or event telegrams, provided by the station modules after polling, via the 88FT05 module to the remote bus.

All telegrams are checked for formal correctness and correct contents. If an error is detected, the telegram will be retained and 88TK05 will transmit a diagnosis telegram instead.

In case the master station does not receive a telegram which has been transmitted or receives it incorrectly, the 88TK05 will buffer each block of telegrams transmitted by the station until the next call so that it can be repeated if required.

ABB

Transmitting data to the station

The module receives all telegrams which are transmitted to the PROCONTROL remote bus and checks them for formal correctness and correct contents.

Send−location−addressed and destination−addressed telegrams are distinguished. Send−location−addressed telegrams are checked for formal correctness and if they are valid they will be transmitted to the station.

Destination−addressed telegrams are checked for formal correctness and correct contents and will be transmitted to the station only if the system and station addresses match.

Formal correctness is checked by means of test marks with which the contents of the telegram (operation code, addresses, data) is protected (hamming distance: 6).

Special destination−oriented telegrams can be transmitted via the PROCONTROL bus system which are destined exclusively for the station bus coupling module. These are mainly telegrams to control the remote bus coupling module 88FT05. These telegrams are identified by comparing the addresses (station, system, module), but are not forwarded to the station bus.

If an error is detected in those telegrams destined for the station, the module will not input these telegrams into the station. Instead the module outputs a signal via the noise channel to make the master station retransmit the incorrect telegrams.

Control of the station protocol

Station bus communication

Data communication with the station follows a defined protocol, which is controlled by 88TK05.

All PROCONTROL station modules follow this protocol, i.e. no module of the station may participate actively in data communication without permission by the protocol.

Protocol control comprises the following functions:

− Identifying those modules requesting the permit to transmit data telegrams to the station bus,

− Granting one module of the station at a time the permit to transmit data telegrams to the station bus,

− Enabling or inhibiting a transmitted or received data telegrams on checking its contents and formal validity,

− Controlling cyclic operation in the station:

  In the cyclic mode all the modules of a station are permitted to transmit their cyclic data one by one starting with the highest module address. The permit remains valid until all data have been transmitted.

− Controlling the event mode in the station:

  In the event mode each module of the station which has output an event signal is permitted to transmit a data telegram. Transmission begins with the highest module address.

  Then, in descending order, all other modules with events are permitted to transmit a data telegram. This process is repeated until all event messages have been transmitted (rotating priority).

− Controlling the list mode in a station:

  List transmission is used to transmit big volumes of data. Depending on the type of list transmission (writing/reading) either the list master or the list slave is granted the permit to transmit a telegram block of list data. List transmission is performed in the cyclic mode.

− Event mode:

  When the station is receiving a data telegram from the remote bus, both the cyclic and the event modes are interrupted in the station and the station bus coupling module is granted access to the bus to transmit a receive telegram.

− Autonomous mode:

  The autonomous mode will be selected automatically if the station is not connected to the remote bus or no telegram has been received over the remote bus for more than 100 ms. The autonomous mode is terminated by the first telegram received from the remote bus.

  In the autonomous mode the station bus coupling module generates all calls required thereby taking over the control function of the master station within the station.

− Telegram monitoring:

  Each telegram contains a number of test marks (hamming distance= 6) by means of which the contents of the telegram (operation code, addresses, data) are protected. The station bus coupling module listens in on all telegrams transmitted over the station bus and checks the telegrams for errors by means of these test marks. In case of error the telegram will be inhibited. If no error is detected, the module outputs an enable signal. A telegram may be transmitted from the station to the PROCONTROL bus system or the output and processing modules of the station may resume processing of this telegram only if the enable signal is available.

These processes ensure that only one module at a time outputs data to the serial station bus and that data exchange within the station and to the remote bus is undisturbed.

Redundancy capabilities

As a station bus coupling module for redundant stations, the 88TK05−E/R1220 has the following capabilities:

− The module forms and transmits the station address in relation to the status of the SRA line after power−on, plugging in of the module, and during operation (see chapter "Address transmission").

− When the status of the SRA line changes as a result of a redundancy switchover, the current telegram protocol is terminated. After a waiting period of 8 ms, during which no telegrams are received or transmitted, the station is again ready to receive and send under its new address (ACTIVE/ PASSIVE).

− The module detects changes in the module arrangement whenever modules in the station are removed or installed and generates an appropriate diagnosis message (see chapter "Diagnostic and annunciation functions").

Address transmission

The system and station addresses of a PROCONTROL station are set on the 88TK05 module.

88TK05−E/R1220 detects the current status of the station (ACTIVE or PASSIVE) from the status of the SRA line.

If the status is active, the address set on the station address switch is used as the station address.

If the status is passive, an offset of 128 is added to the address set.

The 88TK05 transmits this address information in a special telegram to the station bus whenever the station is initialized and once per system cycle. This ensures that all modules of a PROCONTROL station are assigned the same station and system addresses.

Setting the station, system and module addresses and the operating mode

The station and system addresses as well as the module address 60 are set on the 88TK05−E/R1220 module with two switches (S1 and S2). Module address 62 is set automatically.

The station address must be within the range from 1 to 121.

Switch S1 sets the station address (STA).

Switch S1:

Assignment S1	STA							
Contacts S1	1	2	3	4	5	6	7	8
Significance	1	2	4	8	16	32	64	128

Example	ON		●	●	●	●	●		●
STA 65			●						●	

The contact S1/8 must be set to ON.

Switch S2 sets the module addresses (GA) 60 of the module, and the system addresses (SYS) 0, 1, 2, or 3.

Switch S2:

Assignment S2	GA	not assigned					SYS	
Contacts S2	1	2	3	4	5	6	7	8
Significance							1	2

Example	ON	●							●
SYS01				●	●	●	●	●	●	

The contact for setting the module address shall be set to 'ON' (GA 60). The contacts which are not assigned shall be set to 'NOT ON'.

Incorrect setting of the switches S1 or S2 results in the failure of the module functions.

RS485 interface

In this interface the signals to be transmitted to the remote bus coupling module 88FT05 are conditioned and adapted.

All signals of this interface are transmitted with their true and inverted values.

This RS485 interface handles the following signals:

SE1+, SE1−	controlling the telegram transmitter and transmitter monitoring remote bus channel A ON
SE2+, SE2−	controlling the telegram transmitter and transmitter monitoring remote bus channel B ON
RE+, RE−	noise transmitter ON
DA+, DA−	telegram data
RA+, RA−	telegram frame
TA+, TA−	telegram clock pulse
SP+, SP−	checkback signal of the transmission level of the active remote bus channel
RP+, RP−	checkback signal of the noise level of the active remote bus channel
FS+, FS−	annunciation remote bus coupling disturbed as general disturbance annunciation of 88FT05 to the RS485 interface
ESP+, ESP−	disconnect signals for the 24 V supply of the high−level stages of the telegram and noise transmitters
ANB+, ANB−	annunciation active remote bus channel (channel A = 1, channel B = 0)
SGD, SGD	reference conductor interface RS485
US, US	+24 V for 88FT05
Z, Z	reference conductor for +24 V

Module data interface

The data identifying the module is transmitted to the remote bus coupling module 88FT05 via this interface.

Monitoring interface

The module is equipped with three isolated signal inputs G12, G22 and G32 to which external disturbance annunciation signals can be connected. The monitoring module 89NU01 can be connected to the binary signal output MST.

Input G12 uses the closed−circuit principle to monitor the cabinet supply. Thereby it is possible to detect whether the power supply of the modules has failed in the station. If 88TK05 is used without 89NU01 the input shall be connected externally. This requires the contacts b08/d08 and d06/z06 of connector X21 to be connected (assignment see function diagram).

Input G22 uses the open−circuit principle and is intended to monitor the temperature in the cabinet.

Input G32 uses the open−circuit principle. This input may be used to monitor the door if one is mounted.

These three signals are provided by the monitoring module 89NU01 (see Fig. 1).

If these disturbance annunciations are present this fact will be input in the diagnosis register. If provided, a cabinet disturbance lamp can be activated via output MST and module 89NU01.

Diagnostic and annunciation functions

Disturbance annunciation signals to the annunciation system

The annunciation system and/or the control diagnosis system (CDS) receives the disturbance annunciation signals of the module via the PROCONTROL bus.

They also include all disturbances which are detected by the transmission monitor on the remote bus coupling module 88FT05 and the "general disturbance annunciation - station detected" generated from the signals of the modules.

The 88TK05 transmits its disturbance annunciations and diagnosis results to 2 diagnosis registers using register address 246.

Six additional background diagnosis registers with register addresses 225, 227, 228, 230, 232 and 237 are used for error localization. They are only transmitted on request under module address 60.

The contents of either diagnosis register with register address 246 is transmitted to the remote bus at the beginning of each cyclic call of the processing station.

Sequence:
− Diagnosis register for module address 60
− Diagnosis register for module address 62

In the event mode, each time the station is called the first time, merely the diagnosis register for module address 60 is the first data telegram to be transmitted to the remote bus.

The following types of disturbance are recorded:

1. Internal disturbances of the module
2. Disturbance in data communication on the station and the remote bus
3. Disturbance annunciations of other modules of the station (as "general disturbance annunciation - station detected")
4. Disturbance annunciations from the remote bus coupling module 88FT05
5. Disturbance annunciations from the monitoring interface

All types of disturbance (1 ... 5) lead to the activation of the binary signal output MST.

The types of disturbances (1 ... 4) are indicated on the front panel of the module (see chapter "Disturbance annunciations on the module").

As an option, disturbance type 5 is indicated by means of 89NU01 by activation of the cabinet disturbance lamp.

The contents of the diagnosis registers, the annunciations of the general disturbance line, the annunciations on the CDS and the indications ST and SG are shown in the Figs. 1 ... 5.

Disturbance annunciations on the module

The following disturbances are indicated on the front panel of the module by red LEDs:

Designation of the LED

– Disturbance general   ST
types of disturbance 1 ... 4

– Disturbance module 88TK05   SG
type of disturbance 1

– Disturbance transmission path 88TK05/88FT05   SG1
type of disturbance 4

– Acknowledgement error   QF
type of disturbance 2 (remote bus only)

The LED ST indicates all the disturbances of the module and of the data communication with the module. When three cycles of the master station have been performed without disturbance, the red LED ST is switched off. Moreover, ST is activated for about 3 s when the module is being initialized or when 88TK05 has disconnected a disturbed module from the station bus.

The LED SG indicates module disturbances only. Moreover SG is activated for about 3 s when the module is being initialized.

The LED SG1 indicates disturbances of the transmission path on the data channel and the noise channel.

The LED QF indicates telegrams received incorrectly from the remote bus. For this purpose, the error pulse is prolonged to approx. 100 ms.

Status signals on the module

The following operating states are indicated by green LEDs on the front panel:

Designation of the LED

– Telegram transmit to remote bus   FS
– Telegram receive from remote bus   FE
– Station bus communication   SV
– Station bus modules with events   ER

The LED FS will be activated if telegrams of 88TK05 or telegrams from the station bus are transmitted to the remote bus.

The LED FE will be activated if telegrams are transmitted from the remote bus to the station bus.

The LED SV will be activated if telegrams are transmitted from the station bus to the remote bus.

The LED ER is switched on from the moment when events are detected until the event telegrams are transmitted.

Reception monitoring on 88TK05 and 88FT05

Reception monitoring on 88FT05 monitors the received telegrams for character distortion.

If the reception monitor responds the transmission of frames, data and the clock pulse (RA, DA, TA) from 88FT05 to 88TK05 via the RS485 interface will be interrupted until the next, valid SYN character is received.

As a result, the abortion detector of the reception monitor of 88TK05 responds. 88TK05 signals the disturbance by means of the input "remote bus acknowledgement error" (bit 8) in its diagnosis register (GA60) and the LED QF on the front panel of the module is activated.

Transmitter monitoring on 88TK05 and 88FT05

The station bus coupling module 88TK05 which controls the telegram and noise transmitters of 88FT05 monitors the telegram transmitters on the active remote bus channel for the absence of the transmission level and excessive transmission telegrams i.e. the telegram frame is longer than 63 μs, and also monitors the noise transmitters on the active remote bus channel for the absence of the noise level.

Transmitter monitoring on 88FT05 monitors the telegram transmitter of the active remote bus channel for an excessive telegram "transmit", i.e. transmission of more than 64 telegrams without interruption by the reception of a complete telegram, and the noise transmitter of the active remote bus channel for an excessive noise signal, i.e. the noise transmitters are switched on for more than 10 ms incessantly.

In case of excessive transmission telegrams, an excessive telegram"transmit" or and excessive noise signal, the drivers of the disturbed telegram transmitter on 88FT05 are switched off by the signals SE1 or SE2 until the end of the cycle.

The drivers will be switched on again by 88TK05 with the signals SE1 or SE2 when the telegram "start cycle VS" has been received.

If transmission monitoring of the telegram transmitters responds, three times in succession, the drivers of the disturbed telegram transmitter remain switched off.

Each of the above−mentioned disturbances is signalled by the entry "transmission path fault" (bit 9) in the diagnosis register (GA60) of 88TK05.

Monitoring of module arrangement in the PROCONTROL station

In order to ensure fast detection of changes in the station's module arrangement due to the removal or insertion of modules, the 88TK05 polls the modules at time intervals < 3 ms over the station's internal parallel bus. The current arrangement determined in this way is compared to the previous arrangement. If the same changes are consistently detected in three polling cycles, the diagnosis message "Module arrangement changed" is generated in the diagnosis register of module address 62 (see Fig. 2). This message is transferred to the PROCONTROL system and is cancelled again > 1 s after the disturbance has occurred.

88TK05–E/R1220

Transmit monitoring

Excessively long send telegram

Transmission level missing

Noise level missing

Receive monitoring

Telegram abortion

Telegram invalid

Abortion detector

CDS messages 1)

Diagnosis register 246 using module address 60

Bit	Type	
15	0	Module restart executed
14	0	Noise channel test, event
13	0	Group malfunction station detected
12	D	Transmit path fault
11	0	Remote bus acknowledgement error
10	S	Transmit allocation in AS missing
9	S	Checksum error detected
8	0	
7	S	Cabinet door open
6	S	Power supply fault
5	0	Temperature monitoring responded
4	S	Substitute telegram transmitted
3	S	AS restart executed
2	S	
1	D	
0	D	

4404
4405
3401
4406
4407
4401
4402
4403
4409
4410

SST
SSG
ST
SG
SG1
QF

≥1

Bus coupling module not accessible from bus

Restart by resetting
Watchdog responded
Power ON
Voltage monitoring responded

Bus coupling module not operating

Incorrect firmware PROM
Hardware defect

88FT05

≥1

Transmit monitoring

Excessively long telegram

Excessively long noise signal

Voltage monitoring

Reception monitoring

Character distortion cancels reception of telegrams

Frame

Data

Clock pulse

FS

RA
DA
TA

MST

G32
G12
G22

Optional

89NU01

MST
MTK
MSP
MTE

MST = Disturb. signal from station
MTK = Door open
MSP = Power supply fault
MTE = Temperature inside the cabinet too high

S = Static annunciations disappear automatically upon deactivation

D = Dynamic annunciations are cancelled after the contents of the diagnosis register has been transmitted

0 = not used

1) The control diagnosis system provides a description for every message number.
This description includes:
– Information about cause and effect of the disturbance
– Recommendations for elimination

Thus, fast elimination of the disturbance is ensured.

Fig. 1: 88TK05 diagnosis messages with module address 60

Module operating

Diagnosis register 246
using module address 62

CDS messages

Bit	Type	
15	S	Module address code (A = 0 = 60)
14	S	Signal simulated — 4430
13	D	Protocol error AS detected ① — 4412
12	0	
11	0	
10	0	
9	D	Module restart executed — 4415
8	S	Module from AS bus disconnected ① — 4416
7	S	Operating mode setting wrong ② — 4423
6	S	Checksum error detected ⑥ — 4419
5	S	Station module arrangement changed — 4425
4	D	Telegram error in AS detected ① — 4417
3	D	Cycle abortion detected ① — 4428
2	D	Protocol error remote bus detected — 4427
1	D	Response from module missing ① — 4418
0	0	

ST

≥1

SST

Module not accessible from bus

Watchdog responded
Power ON
Voltage monitoring responded

Module not operating

Wrong firmware PROM
Hardware defect

⑤

SG

≥1   SSG

≥1 ③

≥1 ④

≥1

≥1

S = Static annunciations disappear automatically upon deactivation
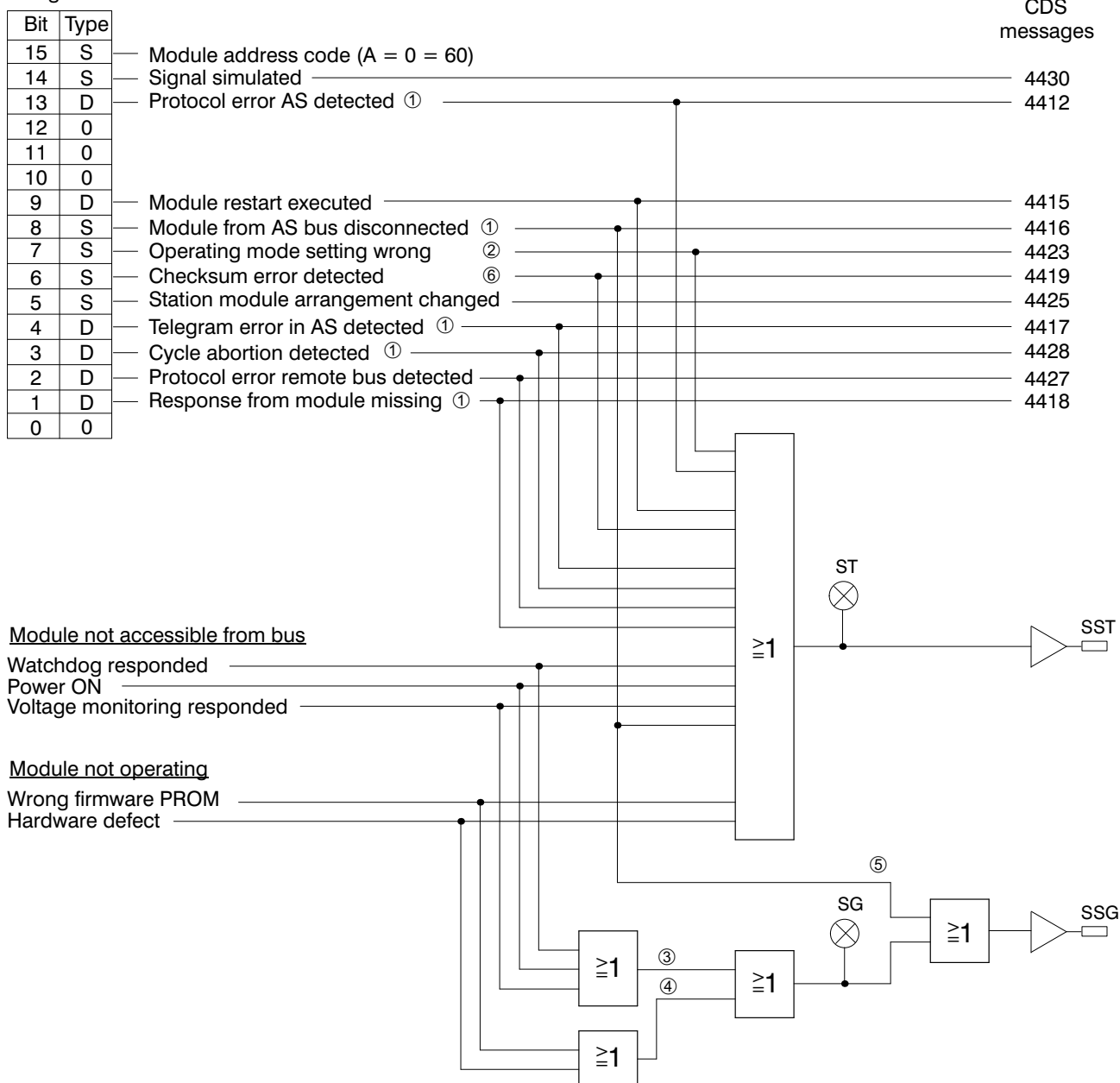D = Dynamic annunciations are cancelled after the contents of the diagnosis register has been transmitted
0 = Not used

① = For cause and associated module address see background diagnosis registers in Figs. 3 to 5
② = For cause see background diagnosis registers in Figs. 3 to 5
③ = Also triggers the output of the CDS message "AS restart executed" — 4410
④ = Also triggers the output of the CDS message "Response from AS missing" — 4204
⑤ = Cause of fault on another module; only SG lamp of disturbed module ON
⑥ = No redundancy changeover since a fault correcting function is activated on this module

Fig. 2: 88TK05 diagnosis messages using module address 62

Background
diagnosis register 225   **Cause of "Response from module missing" (62/246/1)**

Bit	Type
15	0
14	0
13	0
12	0
11	0
10	0
9	0
8	0
7	D
6	D
5	D
4	D
3	D
2	D
1	D
0	D

Bits 7–0: Module address (decimal) of last grant

Background
diagnosis register 227   **Cause of "Cycle abortion detected" (62/246/3)**

Bit	Type
15	D
14	D
13	D
12	D
11	D
10	D
9	D
8	D
7	D
6	D
5	D
4	D
3	D
2	D
1	D
0	D

Bits 15–8: Counter reading for number of cycle abortions

Bits 7–0: Modul address (decimal) of module
which fails to respond after having received a grant twice

S = Static annunciations disappear automatically upon deactivation
D = Dynamic annunciations are cancelled after the contents of the diagnosis register has been transmitted
0 = Not used

Fig. 3: Background diagnosis registers 225 and 227.

Background
diagnosis register 228 **Cause of "Telegram error in AS detected" (62/246/4)**

Bit	Type
15	D
14	D
13	D
12	D
11	D
10	D
9	D
8	D
7	D
6	D
5	D
4	D
3	D
2	D
1	D
0	D

Counter reading for number of telegram errors (bits 15–8)

Module address (decimal) of last grant (bits 7–0)

Background
diagnosis register 231 **Cause of "Operating mode setting wrong" (62/246/7)**

Bit	Type
15	0
14	0
13	0
12	0
11	0
10	0
9	0
8	0
7	0
6	0
5	0
4	D	No cyclic call 1.8
3	0
2	0
1	0
0	0

S = Static annunciations disappear automatically upon deactivation
D = Dynamic annunciations are cancelled after the contents of the diagnosis register has been transmitted
0 = Not used

Fig. 4: Background diagnosis registers 228 and 231.

Background
diagnosis register 232   **Cause of "Module from the AS bus disconnected" (62/246/8)**

Bit	Type
15	0
14	0
13	0
12	0
11	0
10	0
9	0
8	0
7	D
6	D
5	D
4	D
3	D
2	D
1	D
0	D

Module address (decimal) of the module disconnected

Background
diagnosis register 237   **Cause of "Protocol error AS detected" (62/246/13)**

Bit	Type
15	0
14	0
13	0
12	0
11	0
10	0
9	D
8	D
7	D
6	D
5	D
4	D
3	D
2	D
1	D
0	D

9 — Telegram contents not plausible
8 — Protocol violation

Module address (decimal) of last grant

S = Static annunciations disappear automatically upon deactivation
D = Dynamic annunciations are cancelled after the contents of the diagnosis register has been transmitted
0 = Not used

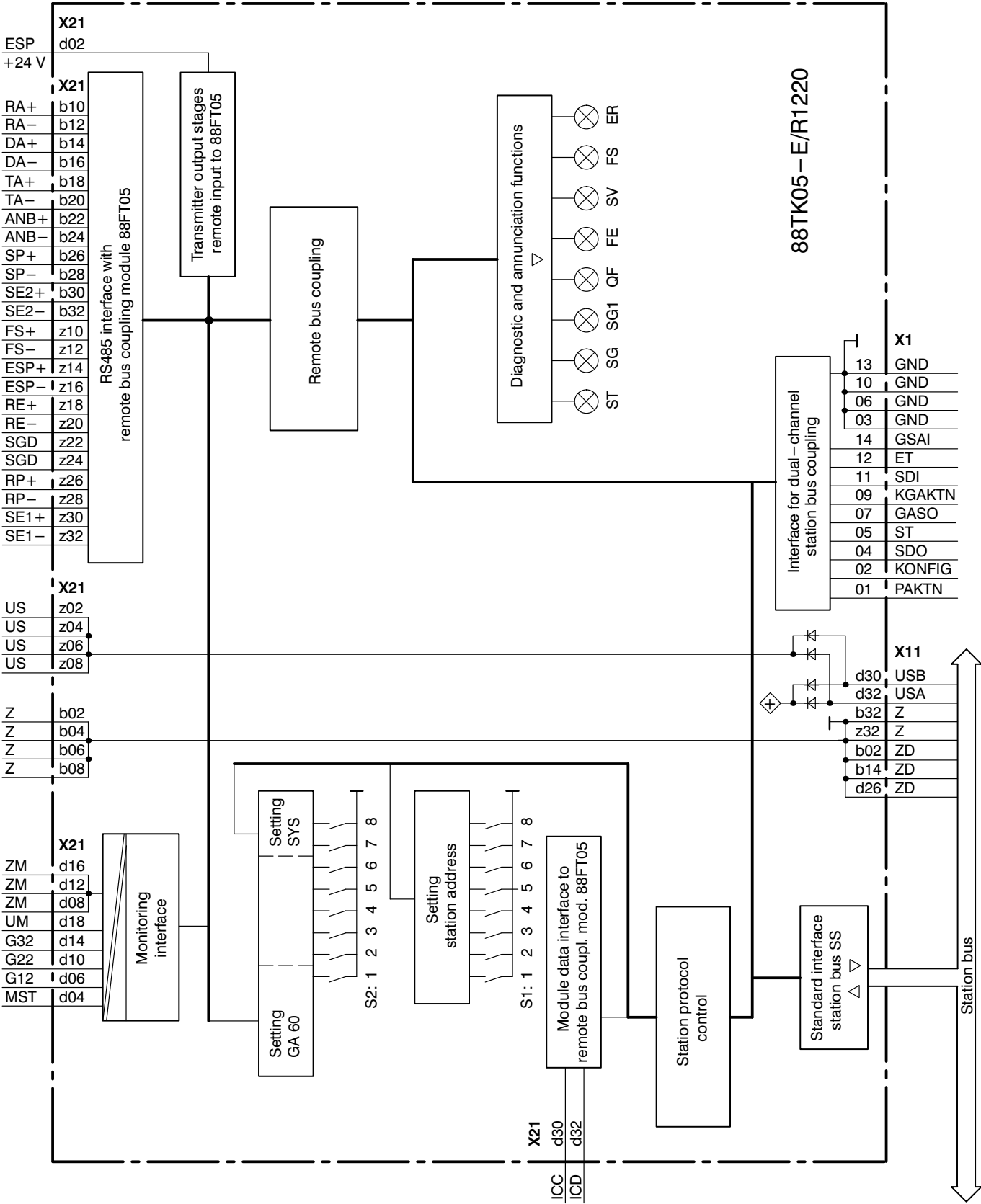Fig. 5: Background diagnosis registers 232 and 237.

Function diagram

Terminal designations

The p.c.b. is equipped with the connectors X1, X11 and X21. Connector X1 includes the interface for the dual−channel station bus coupling.
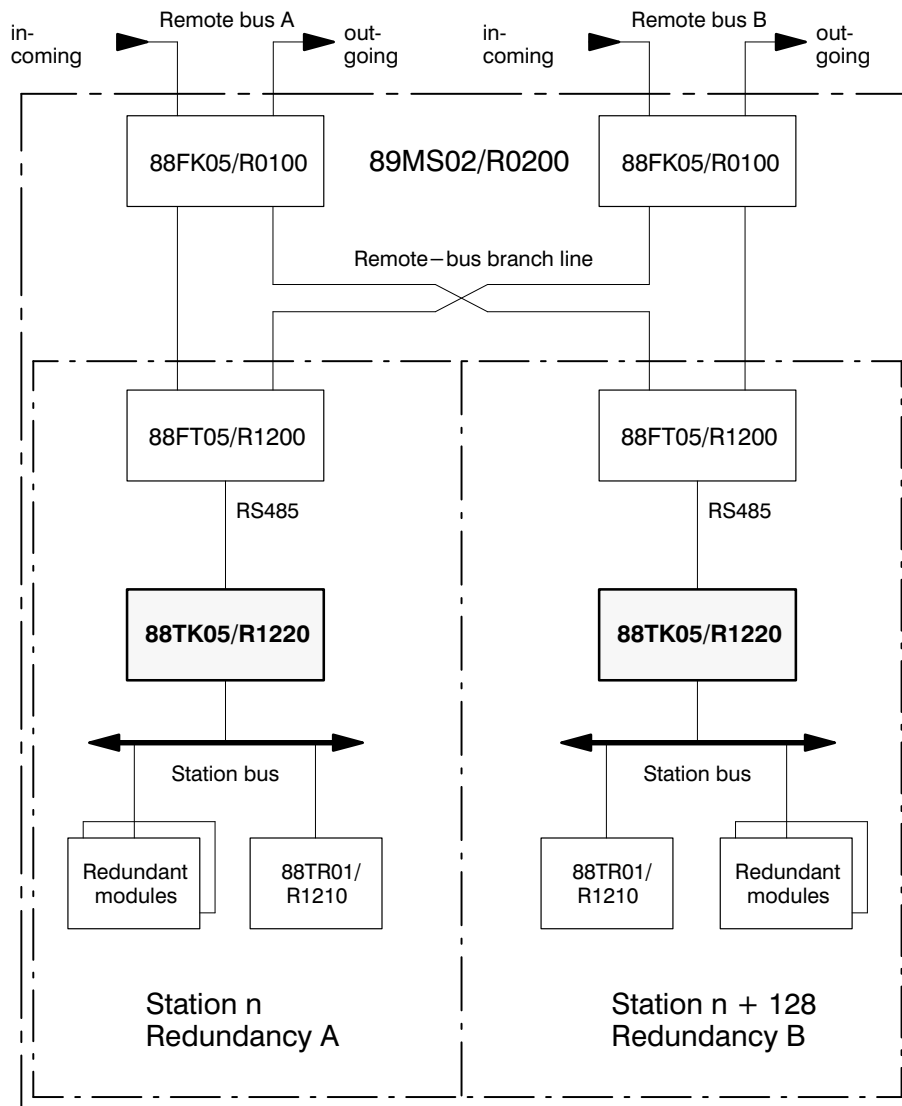
Connector X11 includes the standard interface for the station bus.

Connector X21 includes the RS485 interface, the module data interface for remote bus coupling module 88FT05, the power supply US for 88FT05 and the interface to the monitoring and flasher module 89NU01.

Block diagram 'Connection of stations'

Station bus coupling

```
in-         Remote bus A   out-        in-         Remote bus B   out-
coming                     going       coming                     going

  88FK05/R0100    89MS02/R0200    88FK05/R0100

              Remote-bus branch line

    88FT05/R1200                    88FT05/R1200

       RS485                           RS485

    88TK05/R1220                    88TK05/R1220

      Station bus                     Station bus

 Redundant      88TR01/         88TR01/      Redundant
 modules        R1210           R1210        modules

   Station n                    Station n + 128
   Redundancy A                 Redundancy B
```

Mechanical design

Board size:	6 units, 1 division, 160 mm deep
Connector:	X11, X21 acc. to DIN 41612 2 x 48−pole, edge connector type F
	X1 acc. to MIL−C−24308 1 x 15−pole, female connector type HDP 20
Weight:	approx. 0.5 kg

View of connector side:
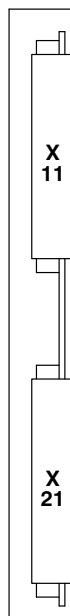
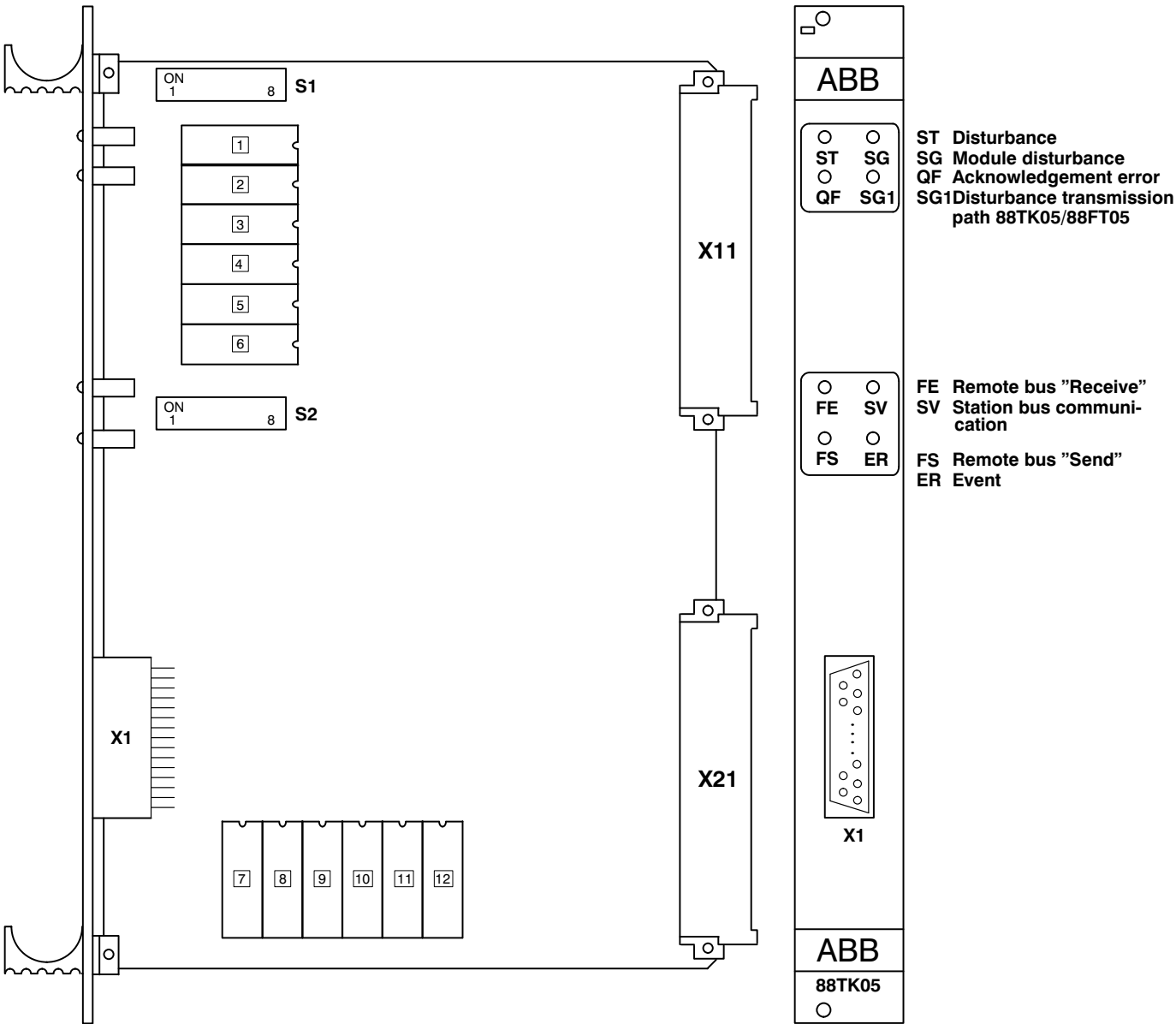**Contact assignments of connector X21**

View of contact side:

	d	b	z
02	ESP	Z	US
04	MST	Z	US
06	G12	Z	US
08	ZM	Z	US
10	G22	RA+	FS+
12	ZM	RA−	FS−
14	G32	DA+	ESP+
16	ZM	DA−	ESP−
18	UM	TA+	RE+
20		TA−	RE−
22		ANB+	SGD+
24		ANB−	SGD−
26		SP+	RP+
28		SP−	RP−
30	ICC	SE2+	SE1+
32	ICD	SE2−	SE1−

Contact assignments of connector X1

View of contact side:

01	PAKTN
02	KONFIG
03	GND
04	SDO
05	ST
06	GND
07	GSAO
08	
09	KGAKTN
10	GND
11	SDI
12	ET
13	GND
14	GSAI
15	

Side view and view of the front panel of the module

ST		**ST Disturbance**
ST SG		**SG Module disturbance**
QF		**QF Acknowledgement error**
QF SG1		**SG1Disturbance transmission path 88TK05/88FT05**

FE SV — **FE Remote bus "Receive"**
SV Station bus communi-cation

FS ER — **FS Remote bus "Send"**
ER Event

Memory modules:	Order number:(EPROM programmed)
1 = A101	GJR2393253Pxxxx
2 = A102	GJR2393254Pxxxx
3 = A103	GJR2393255Pxxxx
4 = A104	GJR2393256Pxxxx
5 = A105	GJR2393257Pxxxx
6 = A106	GJR2393258Pxxxx
7 = A401	GJR2393259Pxxxx
8 = A402	GJR2393260Pxxxx
9 = A403	GJR2393261Pxxxx
10 = A404	GJR2393262Pxxxx
11 = A405	GJR2393263Pxxxx
12 = A406	GJR2393264Pxxxx

Note on single PROMs:

The order number for the complete module includes the entire set of memory modules required for the basic program.

Note:

The number includes the position of the components on the p.c.b.

xxxx = Position number indicating the applicable program version.

Technical data

The following values apply in addition to the system data:

Power supply (on the module)

Operating voltage	24 V +/ − 25 %
Current consumption IS for approx.	166 mA
Power dissipation typ.	4 W

Monitoring interface

Input values

G12 − Disturbance power supply of cabinet The input uses the closed−circuit principle.	Ie = 5 mA Ue = 24 V
G22 − Thermostat responded	Ie = 5 mA Ue = 24 V
G32 − Cabinet door open	Ie = 5 mA Ue = 24 V
UM − Annunciation voltage	UM = 24 V

Output values

MST − General station disturbance	Ia = 6 mA Ua = 24 V

RS485 interface to the remote bus coupling module 88FT05

RS485 standard	
Transmission rate	1 MBaud
Termination resistor	100 Ohm
Passive differential signal voltage	400 mV
Max. length of connection between 88TK05/88FT05	1 m, cable 89IK01
Input ESP	Ie = 5 mA Ue = 24 V

Noise immunity (of station bus coupling)
in case of proper installation

ESD acc. to IEC 801/2	8 kV to front panel
EMC acc. to IEC 801/4	2 kV burst included in remote bus cable

ORDER DATA

Order No. of complete module:
Type designation: 88TK05−E/R1220   Order No: GJR2393200R1220

Technical data are subject to change without notice!

ABB