Module and Application Description

PROCONTROL P
Transfer

Coupling Module

coupling a PROCONTROL station
to the FDDI (Fibre Distributed Data Interface)

Publication No.
D KWL 6322 95 E, Edition 10/17

88TK50–E/R1210

Application

This module is used for coupling the PROCONTROL station to the PROCONTROL remote bus which uses an FDDI ring (distributed data interface based on optical–fibre technology) acc. to the ISO/IEC 9314 standard.

The distance between two stations connected to the FDDI ring must not exceed 2 km.

The overall length of the FDDI ring must not exceed 100 km !

The module also controls the operational activities necessary for the data exchange within the PROCONTROL station.

Data transfer on the FDDI ring is protected by the generator polynome specified in FDDI standard ISO 9314.

The PROCONTROL telegrams are provided with a specific CRC protection and are packed and transferred in FDDI frames. The hamming distance is d=6.

Features

The module is equipped with

- Two standard interfaces for the station bus,
- One standard interface with the FDDI ring based on ISO/IEC 9314,
- One interface for dual–channel station–bus coupling via a second coupling module,
- One potential–isolated monitoring interface for cabinet annunciations,
- One test and service interface,
- One potential–isolated input for deactivating the optical transceivers.

The module uses module addresses 60 or 61 (depending on whether it is used for single–channel or dual–channel operation) and module address 62 (cf. chapter 'Setting the station, system and module addresses').

It can be plugged into any slot of the PROCONTROL cabinet. The standard cabinets provide reserved slots.

The coupling module is suitable to be used with 24 V PROCONTROL modules.

Design of the module

The module essentially includes the following functions (cf. 'Function diagram'):

- FDDI system interface
- Station bus interface
- Station protocol control
- Send and receive shared memory
- Setting function for the station and system addresses and the operating mode
- Monitoring interface
- Interface for dual–channel station–bus coupling
- Diagnosis and annunciation functions

PROCONTROL remote–bus coupling

Sending from the station

For send data communication, the station protocol control offers two modes:

- Cyclic mode
- Event mode.

In cyclic mode, the station protocol control allocates the send permit (activated by cyclic calls) to the station modules, one after the other, allowing them to send their cyclic telegrams which are then stored in the send shared memory by the station–bus interface.

At intervals of approx. 30 msec, the FDDI system interface sends the cyclic telegrams available in the send shared memory, packed in FDDI frames, with broadcast addressing to the FDDI ring via the standard interface.

The number of telegrams to be transmitted per time interval is calculated by the 88TK50 based on the system parameters and the number of cyclic send telegrams from the station.

In event mode, the station protocol control (activated by event calls) grants a send permit to those modules, which have indicated an event, allowing them to send their event telegrams. These telegrams will be stored by the station–bus interface in the event–send FIFO. Entries in the event–send FIFO simultaneously update the entries in the cyclic send shared memory.

Within the token rotation time of the FDDI token, the FDDI system interface then sends the event telegrams available in the event–send FIFO, packed in FDDI frames with broadcast addressing, to the FDDI ring via the standard interface.

During this procedure, all telegrams are checked for accuracy as to formal criteria and to their contents after they have been transferred over the station bus.

In the case of a fault, the telegram is inhibited through the station–bus protocol control and, consequently, not sent onto the FDDI ring.

Sending to the station

The module receives all PROCONTROL telegrams, packed in FDDI frames which are transferred over the FDDI ring.

The FDDI data unit of a received frame determines, whether and in which receive shared memory the telegrams packed in the frame shall be made available to the station–bus interface for sending.

FDDI frames with packed event telegrams will be given priority.

When the event data are being distributed, the cyclic PROCONTROL receive shared memory for cyclic data is updated immediately so that no previous values will be transmitted when distribution from the cyclic receive shared memory is resumed.

A distinction is being made between FDDI frames with broadcast addressing and ones with destination addressing.

Telegrams with process data are transmitted by means of FDDI frames with broadcast addressing. Telegrams with list data are transmitted by means of FDDI frames with destination addressing.

This means that list data are received only in stations with the respective destination address.

The FDDI system interface unpacks the telegrams and makes the cyclic telegrams in the cyclic receive shared memory, the event telegrams in the event–receive FIFO and the list telegrams in the list–receive shared memory available to the station–bus interface for sending.

The cyclic telegrams in the cyclic receive shared memory are made available station–by–station one after the other which means that the cyclic telegrams will also be sent station–by–station over the station bus.

The formal accuracy of the received FDDI frames is checked based on a frame check sequence which is used to secure the telegrams packed in the FDDI frames.

If any error is detected in an FDDI frame addressed to the station, the telegrams of this frame will not be stored in the receive shared memory. The FDDI system interface, however, will initiate the following by setting the fault flag in the frame status field:

– In the case of a frame with event telegrams, the faulty frames received are repeated,
– In the case of a frame with cyclic telegrams, a new cyclic frame with the current data of the station will be transmitted.

The station–bus interface sends the telegrams filed in the receive shared memories over the station bus, the event telegrams taking priority.

On that occasion, formal accuracy of the telegrams is checked based on the check characters protecting the telegram contents (operation code, addresses, data) by the receiving modules.

If an error has been detected, these telegrams will not be evaluated.

The station cycle starts with a 'start cycle' telegram and ends with the 'start cycle' telegram of the next one.

The 'start cycle' telegram is generated by the 88TK50 after all cyclic send telegrams and all receive telegrams have been transferred once within the station.

Due to the interruptions caused by the transmission of event telegrams and list telegrams, the length of a station cycle is determined by the number of cyclic send telegrams of that specific station and of the other stations as well as by the number of event telegrams and list telegrams to be transferred.

PROCONTROL system parameters

The PROCONTROL system parameters define the data transmission from and to the station:

System parameters	Fixed value
Number of cyclic telegrams in the system	24 000
FDDI token rotation time (in msec)	3
Synchronous bandwidth for PROCONTROL (in % TRT)	85
Number of event telegrams per frame	10
Number of PROCONTROL stations	249
Number of events per second • Non-Recurring max. peak load • Basic load	 500 350

Station protocol control

Data transmission

The data transmission on the station bus is handled by a defined protocol controlled by the 88TK50.

All station modules are subject to this protocol, i.e. no module is allowed to participate in active data communication without permission from the protocol.

The protocol control mainly includes the following functions:

- Identifying those modules which intend to send data telegrams,
- Granting the permit for sending data telegrams over the station bus,
- Releasing or inhibiting a telegram transmitted over the station bus,
- Controlling the operating modes:

  Cyclic mode (transmission of the send telegrams of all modules in a station),

  Event mode (transmission of the event telegrams of all modules in a station),

  Cyclic distribution mode (transmission of the send telegrams received over the FDDI),

  Event distribution mode (transmission of the event telegrams received over the FDDI),

  List mode (transmission of the list telegrams).

Address transmission

The system and station addresses of a PROCONTROL station are set on the 88TK50 module.

In the operating modes 'Autonomous station (AS)' and 'PROCONTROL remote bus (FB)', the address set on switch S700 is used as the station address.

The 88TK50 sends this address information in a special telegram when the station is initialized as well as once per station cycle.

This ensures that all modules of one and the same PROCONTROL station are given identical system and station addresses, set on the 88TK50.

Setting the module, station, system addresses, as well as operating mode and module arrangement monitoring

The module, station and system addresses, as well as operating mode and module arrangement monitoring are set on the 88TK50 module.

Module address 62 is set automatically.

The module is equipped with two switches (S700 and S701).

Switch S700 is used for setting the station address (STA).

Switch S700:

Assignments S700	STA							
Contacts	1	2	3	4	5	6	7	8
Significance	1	2	4	8	16	32	64	128

Example	ON		D	D	D	D	D	D	
STA 129		D							D

Switch S701 is used for setting module addresses (GA) 60 or 61, system address (SYS) 0, 1, 2 or 3, the mode (BA): for 'autonomous station' (AS) or 'remote bus' (FB) as well as for activation or deactivation of 'module detection' (GE, i.e. function detecting which PROCONTROL station modules are plugged–in or removed).

Switch S701:

Assignments	GA	BA		GE			SYS	
Contacts	1	2	3	4	5	6	7	8
Significance							1	2

Example	ON								●
SYS01				●		●	●	●	

Example	ON		●						
BA AS				●		●	●		

Example	ON								
BA FB			●	●		●	●		

Example	ON	●							
GA 60				●		●	●		

Example	ON								
GA 61		●		●		●	●		

Example	ON	●							
GE aktiv				●	●	●	●		

Example	ON				●				
GE passiv		●		●		●	●		

Not assigned Contacts S701/3, S701/5 and S701/6, must be set to 'Not ON'.

In the case of single–channel station coupling, module address 60 must be selected.

In the case of dual–channel station coupling, both 88TK05 modules must have the **same** station addresses, system addresses and operating modes, however, **different** module addresses (60, 61) need to be set.

The station and system address settings are transmitted in a telegram to all modules of the PROCONTROL station (cf. paragraph on 'Station protocol control/address transmission').

Incorrect setting of switches S700 and S701 could result in malfunctioning of the module.

Incorrect setting of switches S700 and S701 will produce fault messages 'Operating mode setting wrong' (62/246/bit7) in the case of single–channel station–bus coupling or 'Partner module fault' (62/246/bit11) in the case of dual–channel station–bus coupling, and will result in permanent activation of LED 'ST'.

The exact cause of the fault can be determined by reading background diagnosis registers 231 and 235 (cf. Figure 3 to 6).

Standard FDDI interface

The standard FDDI interface is located on the module front (connectors X2 and X3).

The module is connected directly to the FDDI ring via connectors X2 and X3. According to the FDDI standard, this ring has to be designed as a double ring (optical–fibre ring 1 and optical–fibre ring 2) for redundancy reasons.

The FDDI interface consists of two disconnectable optical transceivers with integrated connectors, of a PHY A unit, of a PHY B unit and of a medium–access–control component (MAC).

The PHY B unit is assigned to connector X2, i.e. X2 includes the signal input from optical–fibre ring 2 and the signal output to optical–fibre ring 1.

The PHY A unit is assigned to connector X3, i.e. X3 includes the signal input from optical–fibre ring 1 and the signal output to optical–fibre ring 2.

Controlled by the FDDI protocol, the MAC component sends and receives the data either via optical–fibre ring 1 or optical–fibre ring 2.

Instructions for coupling to the FDDI:

Acc. to the ISO/IEC 9314 standard, the following type of connection is to be used:

- For distances of up to 2 km between two PROCONTROL stations, multi–mode optical–fibre cables with Duplex SC connectors

To avoid an incorrect connection between optical–fibre ring 1 and optical–fibre ring 2 during cabling, the optical cable always has to be connected to connector X2 and to connector X3.

Test and service interface

The test and service interface is located on the module front (connector X1).

It is used for test purposes only.

Monitoring interface

The module is equipped with three potential–isolated signal inputs MSP, MTE and MTK to which external disturbance annunciation signals can be connected. The general disturbance annunciation of the station can be put out via the isolated binary signal output MST.

The isolated binary signal output MSX is not used at the time.

Input MSP uses the closed–circuit principle for monitoring the cabinet power supply. This monitoring function allows to detect whether the power supply for the station modules has failed. If input MSP is not used, contact X21/z20 must be connected to Z, and contact X21/b20 to USA and USB.

Input MTE uses the open–circuit principle and is intended, for instance, for external cabinet temperature monitoring.

Input MTK uses the open–circuit principle. This input may be used for external door monitoring.

In case one of these disturbance signals are present, an entry is made into the diagnosis register and a signal is put out via binary signal output MST.

Interface for dual–channel station–bus coupling

The 88TK50 module is provided with an interface which allows dual–channel coupling of a station to the PROCONTROL remote bus (FDDI interface) via a second coupling module.

The interface for dual–channel station–bus coupling is connected to the interface of the partner module by plugging–in the partner module (into its reserved slot).

In the case of dual–channel station–bus coupling, both 88TK50 modules alternately control the protocol procedure within the station and data communication of the station via the PROCONTROL remote bus (FDDI interface) and the station bus.

After every four complete station cycles, the active module switches over to the partner module which has been passive so far.

In addition to the self–diagnosis features, the active module is being monitored by the passive partner for proper functioning. For this purpose, a cyclic data exchange takes place between both modules via the interface for dual–channel station–bus coupling. Thus, it is ensured that both modules are in operational condition.

If a malfunction is detected, the partner module will switch off the defective module's bus drivers connected to the station bus and to the PROCONTROL remote bus (FDDI interface).

The defective module must be replaced to re–establish the state of redundancy.

The fault condition is signalled to the PROCONTROL system by an entry in the diagnosis register of the active module and is indicated by the red LEDs ST and SG on the front panel of the defective module.

Exchange of 88TK50 modules in case of dual–channel station–bus coupling

In the case of a dual–channel station–bus coupling, bumpless exchange of modules is possible on–line and without any impairment of the ongoing station operation provided that the module is in the PASSIVE state.

The PASSIVE state is indicated by the following LED annunciation on the module front:

LED designation	Operating state	LED signal
FE	FDDI receiving	OFF
FS	FDDI sending	OFF or FLASHING

Procedure for module exchange:

1. The module to be replaced must be withdrawn while being in the PASSIVE state, with the optical cables connected.
2. Then, the optical cables have to be removed.
3. Plug the optical cables onto the new module.
4. Now, the new module may be plugged into its module slot, the optical cables being connected.

WARNING!

It is not admissible to withdraw a 88TK50 module without the optical cables being connected.

A second 88TK50 module may be installed into a station only after the 88TK50 module, which already exists in that station, has reached its ACTIVE state.

The ACTIVE state is indicated by the following LED signals on the module front:

LED designation	Operating state	LED signal
FE	FDDI receiving	STEADY LIGHT
FS	FDDI sending	STEADY LIGHT

Improper handling may cause failure of the station operation.

Diagnosis 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 remote bus (FDDI interface).

They also include message 'General disturbance of station detected' generated from the individual signals of the station modules.

The 88TK50 transmits its disturbance annunciation signals and diagnosis results in 2 diagnosis registers using register address 246.

The contents of both diagnosis registers are transmitted at the beginning of each cyclic call, and thus are stored in the cyclic send shared memory for being sent via the FDDI system interface.

Sequence:

– Diagnosis register for module address 60 in the case of single–channel station–bus coupling or

  Diagnosis register for module address 60 or 61 in the case of dual–channel station–bus coupling,

– Diagnosis register for module address 62

In the event mode, event messages of the 88TK50 are transmitted over the station bus and thus are stored in the event–send FIFO for being sent via the FDDI system interface.

The following types of disturbance are detected:

1. Internal module disturbances
2. Disturbances in data communication over the station bus and the PROCONTROL remote bus (FDDI interface)
3. Disturbance signals of other station modules (in the form of 'General disturbance of station detected')
4. Disturbance signals from the monitoring interface.

All types of disturbance lead to an activation of the binary signal output MST.

The types of disturbance (1 ... 3) are indicated on the front panel of the module (cf. chapter 'Disturbance annunciations on the module').

Disturbance type 4 is indicated through signal MST.

The contents of the diagnosis registers, the messages on the CDS and the annunciations ST and SG are shown in Figures 1 ... 2.

Disturbance annunciations on the module

On the module front, the following disturbances are indicated by red LEDs:

	LED designation
– Disturbance, general Types of disturbance 1 ... 3	ST
– Module disturbance of 88TK50 Type of disturbance 1	SG
– Processor halt	HLT
– Disturbance of ring redundancy	SR

Light–emitting diode ST indicates all disturbances of the module and disturbances of the data communication with the module.

After three undisturbed station cycles, light–emitting diode ST goes off.

Furthermore, ST is illuminated for approx. 20 sec when the module is being initialized or when the 88TK50 has disconnected a disturbed module from the station bus.

Light–emitting diode SG indicates module disturbances only.

Furthermore, SG is illuminated for approx. 20 sec when the module is being initialized.

Light–emitting diode HLT indicates that the FDDI system interface has stopped data transmission from and to the FDDI ring because of an internal error. Data transmission of the other stations in the FDDI ring is not affected in this case.

Light–emitting diode SR indicates that the FDDI ring redundancy is either disturbed or no longer present.

Status messages on the module

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

	LED designation
– FDDI receiving	FE
– FDDI sending	FS
– Start of station cycle	SZ
– Station–bus communication	SV
– Station–bus modules with events	ER

Light–emitting diode FE is illuminated when telegrams are being transmitted on the station bus and received via the FDDI ring.

Light–emitting diode FS is illuminated when telegrams of the station are being transmitted over the FDDI ring.

Light–emitting diode SZ is illuminated for approx. 100 msec when a new station cycle starts.

Light–emitting diode SV is illuminated when the send telegrams of the station are being transmitted over the station bus.

Light–emitting diode ER is illuminated from the moment when events have been detected until the event telegrams are being transmitted.

Receive monitoring

The receive monitoring function on the 88TK50 monitors the data received from the FDDI for faulty FDDI frames. If the receive monitoring function responds, the fault flag contained in each frame will be set.

This fault flag is processed by the sending 88TK50.

A frame with event telegrams will be repeated, if necessary, twice.

In the case of a frame with cyclic telegrams, the frame with the current data of the station will be regenerated and transmitted, if necessary, twice.

The 88TK50 indicates the disturbance by entry ”Acknowledgement error” (60/246/bit 8 or 61/246/bit 8) in its diagnosis register.

Monitoring of ring redundancy

The monitoring of the ring redundancy monitors the proper functioning of both optical rings of the FDDI rings. If the monitoring function responds, only one of the optical rings is still operational.

This status is indicated on the module front by red LED ’SR’.

ATTENTION!

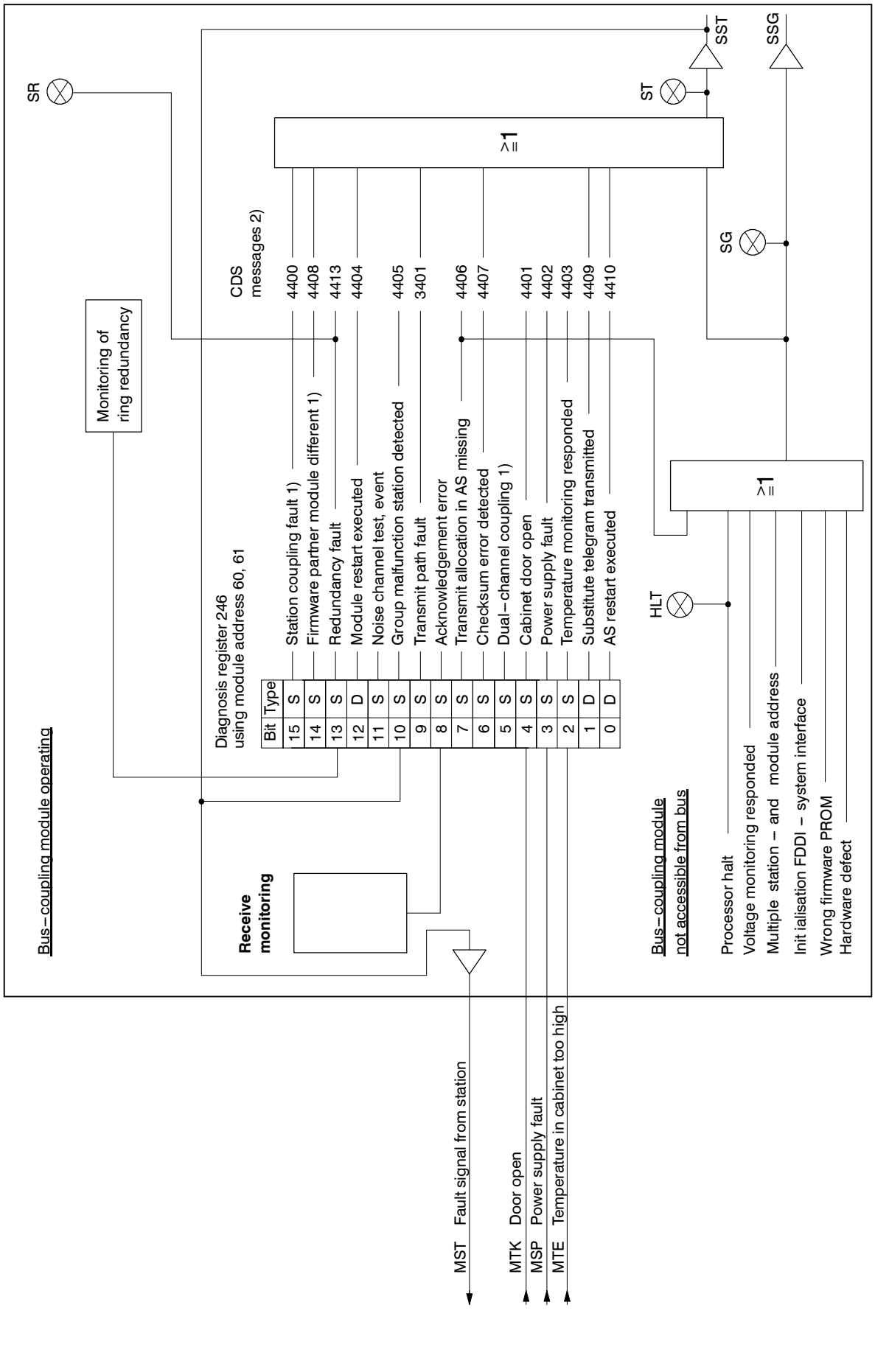
When red LED ’SR’ is illuminated:

– No station coupled directly to the FDDI ring may be switched off,
– No 88TK50 coupling module may be withdrawn,

because this would cause an interruption of the only optical ring that is still operational.

Based on the disturbance annunciations, the cause for the ring interruption must be identified and eliminated.

The cause could be a failure of the cabinet voltage supply, a defective 88TK50 module or a defective optical cable.



S = Static annunciations disappear automatically upon deactivation

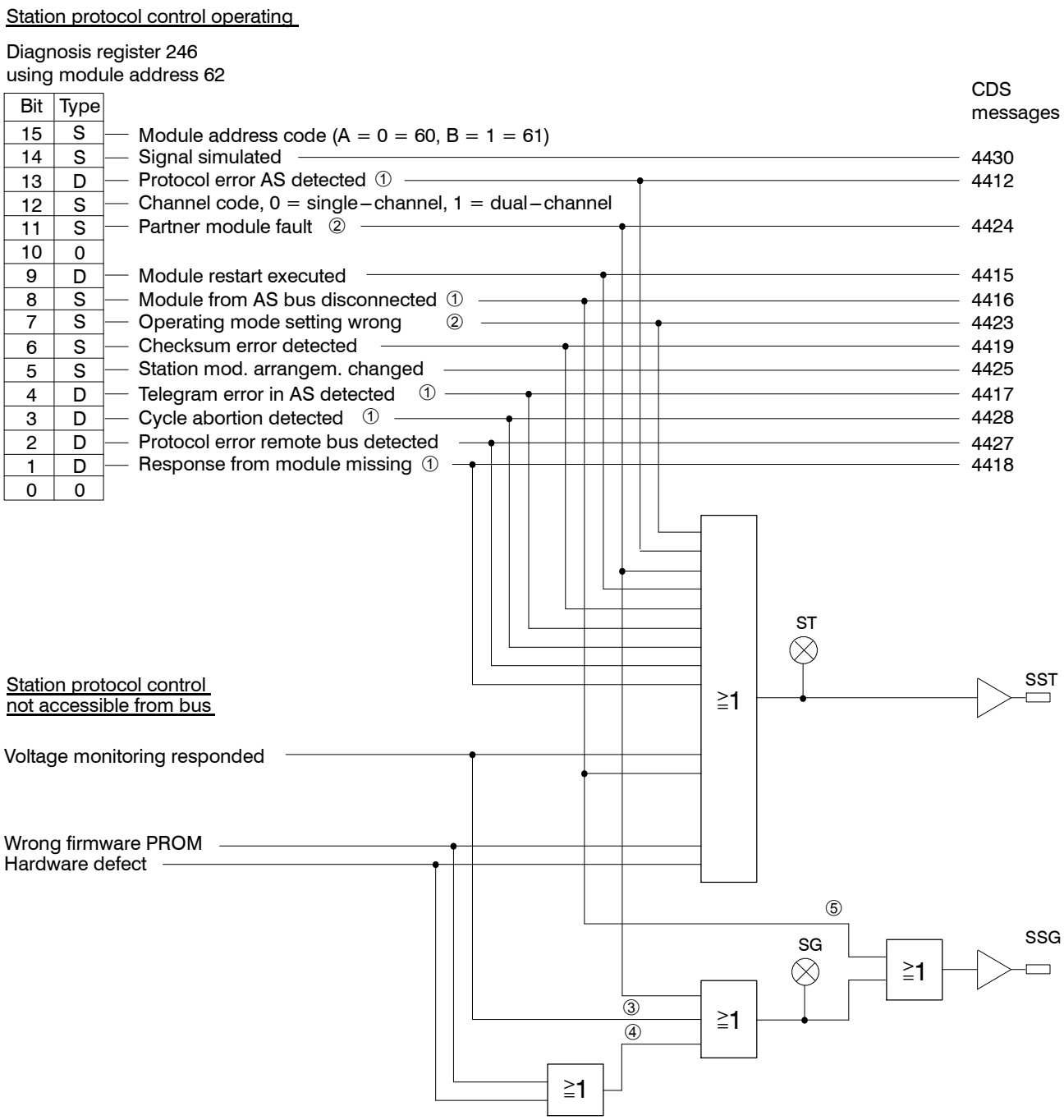
D = Dynamic annunciations are cancelled after the contents of the diagnosis register has been transmitted

0 = Not used

1) Only in the case of dual–channel station–bus coupling

2) The CDS station provides a description for every message number.
This message comprises:
– Explanations regarding cause and effect of the disturbance,
– Recommendations for elimination
Thus, fast disturbance elimination is ensured.

Figure 1: 88TK50 diagnosis messages using module addresses 60, 61



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 cf. background diagnosis register, Figures 3 to 5
② = For cause cf. background diagnosis register, Figures 3 to 5
③ = Also causes the output of CDS message "AS restart executed" ——— 4410
④ = Also causes the output of CDS message "Response from AS missing" ——— 4204
⑤ = Cause of the fault on other module; only SG lamp of disturbed module is illuminated

Figure 2: 88TK50 diagnosis messages using module address 62

Background diagnosis register 129: **Cause for 'Response from module missing' (62/246/1)** when module address 60 is set
145: **Cause for 'Response from module missing' (62/246/1)** when module address 61 is set

Bit	Type	
15	0	
14	0	
13	0	
12	0	
11	0	
10	0	
9	0	
8	0	
7	D	Module address (decimal) of last send permit
6	D	
5	D	
4	D	
3	D	
2	D	
1	D	
0	D	

Background diagnosis register 131: **Cause for 'Cycle abortion detected' (62/246/3)** when module address 60 is set
147: **Cause for 'Cycle abortion detected' (62/246/3)** when module address 61 is set

Bit	Type	
15	D	Counter of number of cycle abortions
14	D	
13	D	
12	D	
11	D	
10	D	
9	D	
8	D	
7	D	Module address (decimal) of module not responding after being granted a send permit twice
6	D	
5	D	
4	D	
3	D	
2	D	
1	D	
0	D	

D = Dynamic annunciations are cancelled after the contents of the diagnosis register has been transmitted
0 = Not used

Figure 3: Background diagnosis registers 129, 131, 145 and 147 are read using module address 62.

Background
diagnosis register 132: **Cause for 'Telegram error in AS detected' (62/246/4)** when module address 60 is set
148: **Cause for 'Telegram error in AS detected' (62/246/4)** when module address 61 is set

Bit	Type	
15	D	Counter of numbers of telegram errors
14	D	
13	D	
12	D	
11	D	
10	D	
9	D	
8	D	
7	D	Module address (decimal) of last send permit
6	D	
5	D	
4	D	
3	D	
2	D	
1	D	
0	D	

Background
diagnosis register 135: **Cause for 'Operating mode setting wrong' (62/246/7)** when module address 60 is set
151: **Cause for 'Operating mode setting wrong' (62/246/7)** when module address 61 is set

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 start–cycle telegram received
3	S	Discrepancy of P version of firmware PROMs
2	S	Autonomous station, FB reception
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

Figure 4: Background diagnosis registers 132, 135, 148 and 151 are read using module address 62.

Background diagnosis register

136: **Cause for 'Module from AS bus disconnected' (62/246/8)** when module address 60 is set
152: **Cause for 'Module from AS bus disconnected' (62/246/8)** when module address 61 is set

Bit	Type	
15	0	
14	0	
13	0	
12	0	
11	0	
10	0	
9	0	
8	0	
7	D	Module address (decimal) of disconnected module
6	D	
5	D	
4	D	
3	D	
2	D	
1	D	
0	D	

Background diagnosis register

139: **Cause for 'Partner module fault' (62/246/11)** when module address 60 is set
155: **Cause for 'Partner module fault' (62/246/11)** when module address 61 is set

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	S	Discrepancy of operating mode setting
3	0	
2	S	Hardware defect
1	S	Wrong station / system address setting
0	S	Wrong module address setting 60, 61

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

Figure 5: Background diagnosis registers 136, 139, 152 and 155 are read using module address 62.

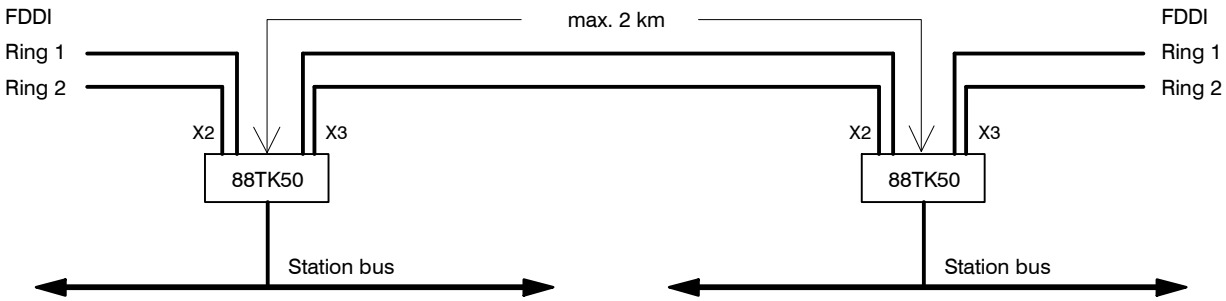
Background
diagnosis register 141: **Cause for 'Response from module missing' (62/246/1)** when module address 60 is set
157: **Cause for 'Protocol error AS detected' (62/246/13)** when module address 61 is set

Bit	Type	
15	0	
14	0	
13	0	
12	0	
11	0	
10	0	
9	D	Telegram contents not plausible
8	D	Protocol violation
7	D	Module address (decimal) of last send permit
6	D	
5	D	
4	D	
3	D	
2	D	
1	D	
0	D	

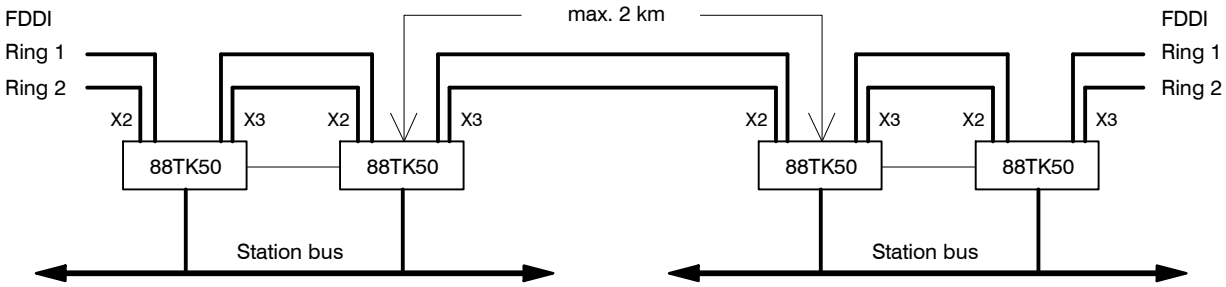
D = Dynamic annunciations are cancelled after the contents of the diagnosis register has been transmitted
0 = Not used

Figure 6: Background diagnosis registers 141 and 157 are read using module address 62.

Block diagram 'Connecting the stations'

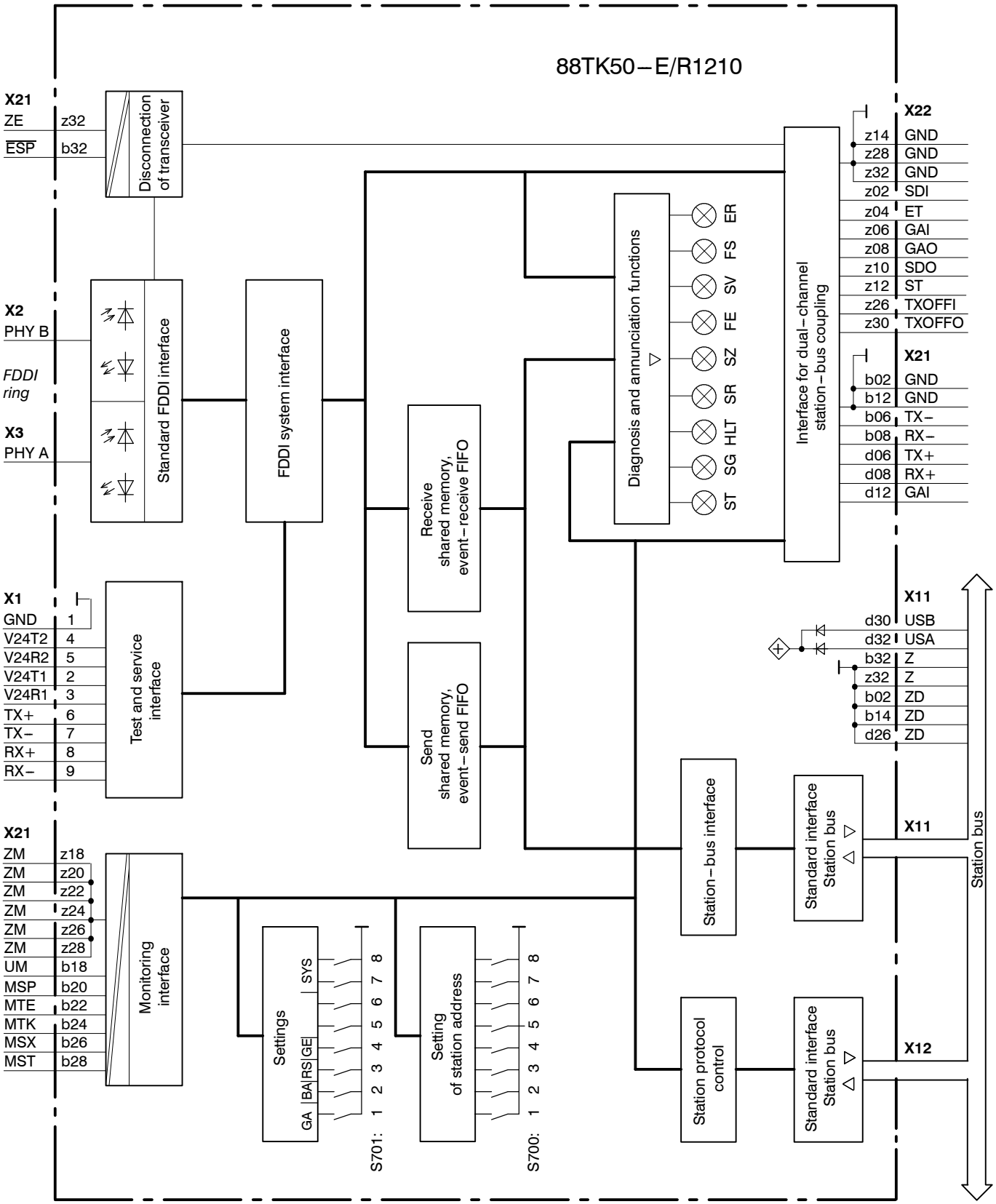


Single-channel station-bus coupling



Dual-channel station-bus coupling

Function diagram



Mechanical design

Board size: 6 units, 2 divisions, 160 mm deep

Connector: X11, X12, X21, X22 to DIN 41 612
4 x 48–pole edge connector, type F

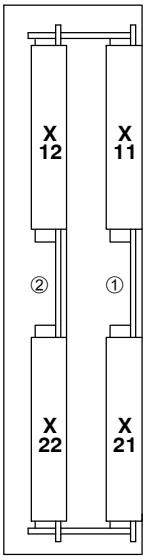
X1 acc. to MIL–C–24308
1 x 9–pole jack connector, type HDP20

X2, X3
2 x 2–pole multi–mode Duplex SC jack

Weight: approx. 0.8 kg

Both printed–circuit boards are linked mechanically and electrically.

View of connector side:



① Printed–circuit board 1
② Printed–circuit board 2

Contact assignments of connector X1

1	GND
2	V24T1
3	V24R1
4	V24T2
5	V24R2
6	TX+
7	TX–
8	RX+
9	RX–

Contact assignments of connector X21

View of contact side:

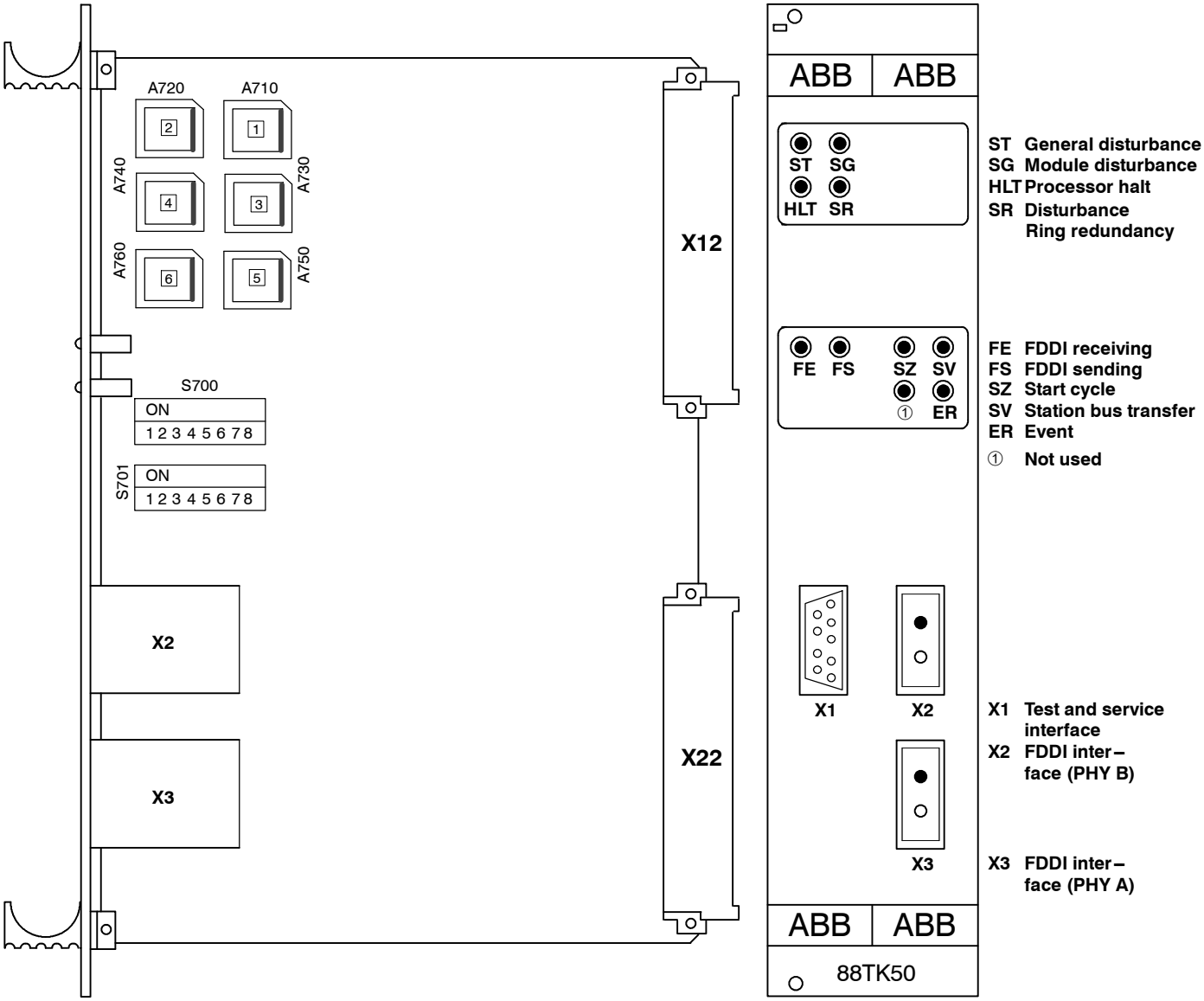
	d	*b*	*z*
02	BYOUT	GND	GND
04			
06	TX+	TX–	GND
08	RX+	RX–	GND
10			
12	GAI	GND	
14			
16			
18		UM	ZM
20		MSP	ZM
22		MTE	ZM
24		MTK	ZM
26		MSX	ZM
28		MST	ZM
30			
32		$\overline{\text{ESP}}$	ZE

Contact assignments of connector X22

View of contact side:

	d	*b*	*z*
02			SDI
04			ET
06			GAI
08			GAO
10			SDO
12			ST
14			GND
16			
18			
20			
22			
24			
26			TXOFFI
28			GND
30			TXOFFO
32			GND

Side view of printed–circuit board 2 as well as view of the module front



Memory modules:	Order number: (EPROM programmed)
1 = A710	GJR2397061Pxxxx
2 = A720	GJR2397062Pxxxx
3 = A730	GJR2397063Pxxxx
4 = A740	GJR2397064Pxxxx
5 = A750	GJR2397065Pxxxx
6 = A760	GJR2397066Pxxxx

Remarks on single PROMs:

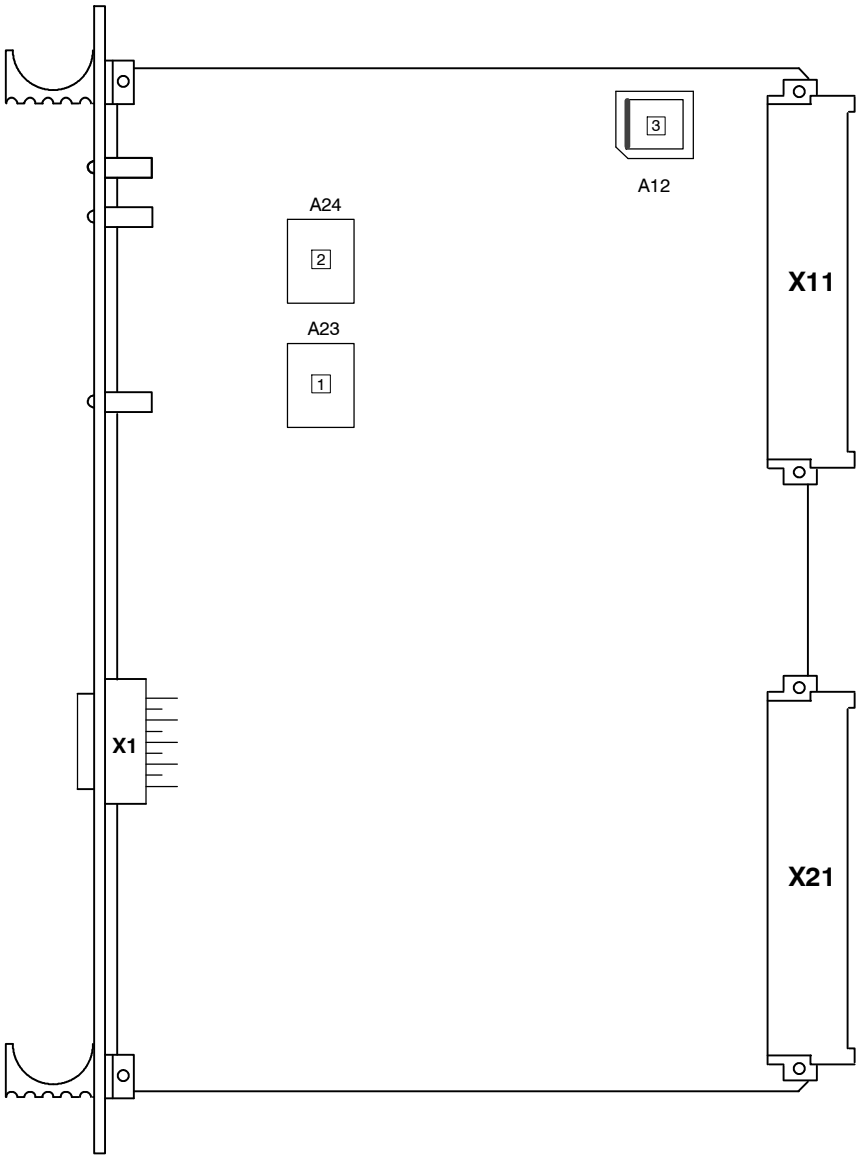
Under the order no. for the complete module, the complete set of memory modules for the basic program of the module will be delivered.

Note:

In addition to the component parts, the position on the printed–circuit board is indicated.

xxxx = Position number indicating the applicable program version.

Side view of printed–circuit board 1



Memory modules:	Order number: (Flash PROM programmed)
1 = A23	GJR2397042Pxxxx
2 = A24	GJR2397043Pxxxx
3 = A12	GJR2397041Pxxxx

xxxx = Position number indicating the applicable program version.

Technical data

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

Power supply

Operating voltage for module	USA/USB = 24 V
Current consumption	IS = 750 mA
Power dissipation	PV = 18 W
Reference potential for bus side	ZD = 0 V

Ambient conditions

Cf. PROCONTROL system specifications !

Module interfaces

X1	Test and service interface
X2, X3	FDDI interface acc. to ISO/IEC 9314
X11, X12	Station–bus interface
X21	Monitoring interface and Interface for dual–channel station bus–coupling
X22	Interface for dual–channel station bus–coupling

Test and service interface

Application	Test and service
Transmission protocol	Serial transmission according to RS232
Transmission rate	9600 baud
Transmission mode	8 data bits, 1 stop bit, NO parity, XOFF handshake
Transmission distance	Up to 15 m (without line amplifier)

FDDI interface acc. to ISO/IEC 9314

Application	Connecting the PROCONTROL station to the PROCONTROL remote bus
Transmission protocol	FDDI protocol with a token rotation time of 3 msec
Transmission rate	100 Mbit/sec
Transmission mode	Synchronous and asynchronous, non–restricted token
Type of connection	Single MAC–DAS
Transmission distance between 2 stations	Up to 2 km
Maximum number of stations	249
Extension of FDDI ring	Up to 100 km

Isolated monitoring interface

Isolation voltage	1.5 kV
Input values	
MSP – Disturbance of cabinet voltage supply The input uses the closed–circuit principle.	Ie = 8 mA, Ue = 24 V
MTE – Overtemperature monitor responded	Ie = 8 mA, Ue = 24 V
MTK – Cabinet door open	Ie = 8 mA, Ue = 24 V
ESP – Disconnection of transceiver	Ie = 8 mA, Ue = 24 V
UM – Annunciation voltage	UM = 24 V, IM = 250 mA
Output values	
MST – General station disturbance	Ia = 100 mA, Ua = 24 V
MSX – Not used at the time	Ia = 100 mA, Ua = 24 V

ORDERING DATA

Order no. for complete module

Type designation: 88TK50–E/R1210 Order number: GJR2397000R1210

Technical data are subject to change without notice!

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NOTE:

We reserve the right to make technical changes or modify the contents of this manual without prior notice. With regard to purchase orders, the agreed particulars shall prevail.ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document..