PROCONTROL P

Communication

Control Room Coupling Module

for Operating Sections of Groups and Drives, 4fold, Lamp Output 2.4 W or LED Display

87WF01 – E/R1515

Module and Application Description

Publication No.
D AT 1710 88 E, edition 09/90
Replacing D AT 1710 88 E, edition 06/88

Application

The module serves to couple control modules to the control room. It is used whenever the push–button commands to the control modules or lamp signals from control modules are transferred via the bus.

The module incorporates four function units with three pushbutton inputs and three lamp outputs each. Two function units can in each case be interconnected. Such a combination enables the module to communicate with control modules having four pushbutton inputs and four lamp outputs.

Pushbutton commands and lamp testing can be released either jointly for all function units through hardware inputs or separately for each function unit through the bus.

By altering a plug–in jumper each module output can be individually changed over from lamp operation to LED operation (see “Annunciation functions”).

Features

The module may be plugged into any multi–purpose processing station of the PROCONTROL bus system. It incorporates a standard interface to the PROCONTROL station bus.

The module checks telegrams received through the station bus for error–free transfer on the basis of their parity bits. The telegrams sent by the module to the station bus are assigned parity bits to ensure error–free transfer.

For communication with the operator’s console, the module requires the following voltage:

US Operating voltage +24 V
Split internally into the power supply for
US12 pushbuttons of function units 1 and 2
US34 pushbuttons of function units 3 and 4

The operating voltage US and the lamp outputs are related to the reference conductor Z.
The operating voltage UD+ is related to the reference conductor ZD.

The operating voltages US12 and US34 are short–circuit–proof with typically 100 mA at 24 V and therefore require no separate fuses.

The lamp or LED outputs are short–circuit–proof and are free from interaction.

The following malfunctions are indicated on the front of the module by light–emitting diodes:

– Module disturbance (ST)
– Loss of the voltage US12
– Loss of the voltage US34

Operating modes

The module’s four function units can operate either in the single or in the double mode. Changeover between operating modes is effected with switches.

Single mode

In single mode, each function unit operates separately. Three pushbuttons Tx1, Tx2 and Tx3 and three lamps Lx1, Lx2 and Lx3 can be connected to each function unit (x = No. of the function unit).

Double mode

In the double mode, function units 1 and 2, and/or 3 and 4 are combined. In this way, a fourth pushbutton input or a fourth lamp output is assigned to function units 1 and 3. The fourth pushbutton input corresponds to pushbutton input T21 and/or T41 while the fourth lamp output corresponds to lamp output L21 and/or L41 of function units 2 and 4.

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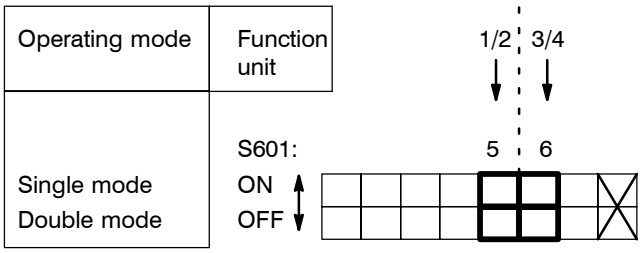
Mode selection

The operating mode to be selected depends on the type of standard functions to which the function units are connected. Allocation of the operating modes to the standard functions is shown in the following table.

Standard functions	Operating mode	
	Single	Double
ASS, ASE, ASM, ASI, ASP	x	
GSV, VW2, VW3	x	
SWV, HST, PIR2, PID2, SWI	x	
GSA, VW4, WS4		x
Use of individual pushbuttons	x	

For activating the standard functions TAW and TAZ, the operating mode to be selected depends on the standard function to be activated.

The modes are selected by means of switch contacts S601/5 and S601/6.



The defined operating mode is stored as binary information in a particular memory location and is made available to the control system operator station.

Data type selection

In PROCONTROL, the standard telegrams belonging to data types 12 and 14 are used to transfer the pushbutton commands through the bus. The data typedepends on the type of standard function to be activated.

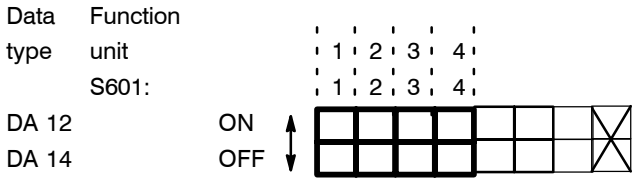
Attention should be paid to the fact that, when using the standard telegram of data type 14, various other functions are also activated depending on whether the pushbutton commands are located in the high byte or in the low byte.

The data type, and thus the assignment of the pushbutton inputs to the bit positions in the standard telegram, can be set for each function unit.

The following table shows the allocations of data types to standard functions.

Standard functions	Data type
ASS, ASE, ASM, ASI, ASP	12
GSV, GSA,	12
SWV, HST, PIR2, PID2, SWI	14 (High Byte)
VW2, VW3, VW4, WS4	14 (Low Byte)
Use of individual pushbuttons	12

The data type is selected by means of switch contacts S106/1 – 4



Activation of the signalling lamps LM (Lx3)

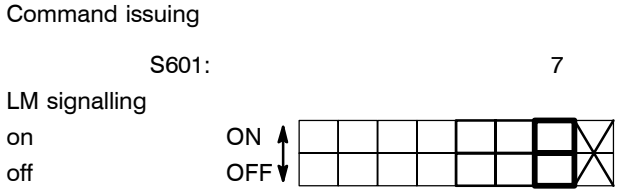
The LM signalling selector switch is active for data type 14 only. It ensures connection of the signalling logic to LM (Lx3). Refer to the table below for the settings applicable to the various function modules:

Standard function	LM signalling		Data type
	ON	OFF	
SWI, HST, PIR2, PID2, SWV1, SWV2	X		14 High Byte
VW2, VW3, VW4, WS4		X	14 Low Byte

Note:

Since the switch S601/7 acts on all function units, one and the same 87WF01 – E/R1515 may not activate VW2, VW3, VW4, WS4 and the above – mentioned control functions, too.

LM signalling with data type 14 is achieved by means of the switch S601/7.



Command functions

For all four function units, the pushbutton commands Tx1, Tx2 and Tx3 are always connected directly to the module (x = number of the function unit). In the double mode, the pushbutton input T21 and/or T41 is connected to function unit 2 and/or 4 as the fourth pushbutton input of function unit 1 and/or 3.

The pushbutton commands TF and TL may be connected jointly to the central inputs TF and TL for all function units. To connect a continuous release signal to the input TF, this input must be linked to US.

Alternatively, it is possible to preset the push–button commands TF, TL and TQ separately for each function unit via the bus. In this case, the central pushbutton input TF has no effect on the function unit concerned.

The pushbutton commands Tx1, Tx2, Tx3, TQ and TL are converted into standard telegrams of data type 12 or 14 depending on the data type selected, and are written into particular registers of the shared memory (see “data communication”).

Allocation of the pushbutton commands to the bit positions in the standard telegram is shown in the following table.

Type of Information	BA	DA	Address word				Data Word (Bit Address)														
			System	Station	Module	Register	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Pushbutton input (single mode)	E	12	a	a	a	0–3	0	0	0	TF	TQ	TH	T20	T10	0	0	0	0	0	0	0	SB
Module–specific designation						0	0	0	0	TF	TQ	T13	T12	T11	0	0	0	0	0	0	0	SB
						1	0	0	0	TF	TQ	T23	T22	T21	0	0	0	0	0	0	0	SB
						2	0	0	0	TF	TQ	T33	T32	T31	0	0	0	0	0	0	0	SB
						3	0	0	0	TF	TQ	T43	T42	T41	0	0	0	0	0	0	0	SB
Pusbutton input (single mode)	E	14	a	a	a	0–3	0	0	0	TF	0	TH	T20	T10	0	TF	T4	T3	T2	T1	0	SB
Module–specific designation						0	0	0	0	TF	0	T13	T12	T11	0	TF	0	T13	T12	T11	0	SB
						1	0	0	0	TF	TQ	T23	T22	T21	0	TF	0	T23	T22	T21	0	SB
						2	0	0	0	TF	TQ	T33	T32	T31	0	TF	0	T33	T32	T31	0	SB
						3	0	0	0	TF	TQ	T43	T42	T41	0	TF	0	T43	T42	T41	0	SB
Pushbutton input (double mode)	D	14	a	a	a	0/2	0	0	0	TF	0	TH	T20	T10	0	TF	T4	T3	T2	T1	0	SB
Module–specific designation						0	0	0	0	0	0	0	0	0	0	TF	T21	T13	T12	T11	0	SB
						FE1+2																
						2	0	0	0	0	0	0	0	0	0	TF	T41	T33	T32	T31	0	SB
						FE3+4																

DA = Data type
BA = Mode
a = Address may be chosen freely (depending on installation location)
SB = Disturbance bit
E = Single mode
D = Double mode
FE = Function unit

Annunciation functions

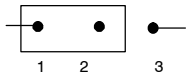
Lamp/LED activation

Each module output (L11...L43) is converted separately to LED mode by altering a plug–in jumper.

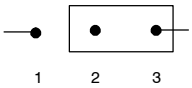
The LED output signal (default 10 mA/US = 24 V) can be altered by means of a resistor (R110, R120...R430) fitted onto solder pins.

Pin settings (X11, X12...X43):

Jumper inserted between 1 and 2:
Lamp operation 100 mA/US = 24 V



Jumper inserted between 2 and 3:
LED operation 100 mA/US = 24 V



Annunciations to the operator's console

The lamp outputs Lx1, Lx2 and Lx3 of each function unit are allocated permanently to the bit assignments of the lamp telegram of data type 24. In double mode, the lamp output L21 and/or L41 of function unit 2 and/or 4 is connected as a fourth lamp output of function unit 1 and/or 3.

The allocations are shown in the following table.

The lamp telegrams received are stored for each function unit according to the address. The lamp telegrams include all information about the lamps' desired operating state. Each item of information consists of up to 3 bits:

– No bit set: Lamp off

– BLS set: Flashing disturbance light

– BLL set: Running light

– DL set: Steady light

These control signals are used to switch the flashing frequencies to the lamp outputs via a lamp logic.

To this effect a suitable flashing voltage must be connected to input BLS. The running light voltage BLL is derived from BLS within the module.

Type of Information	DA	BA	Address word				Data Word (Bit Address)														
			System	Station	Module	Register	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Lamp outputs	24	E	a	a	a	64–67	0	0	0	BLL4	BLS4 L4	DL4	BLL3	BLS3 L3	DL3	BLL2	BLS2 L2	DL2	BLL1	BLS1 L1	DL1	SB
Module–specific designation						64	0	0	0	0	0	0		L13			L12			L11		
						65	0	0	0					L23			L22			L21		
						66	0	0	0					L33			L32			L31		
						67	0	0	0	0	0	0		L43			L42			L41		
Lamp outputs	24	D	a	a	a	64–67	0	0	0	BLL4	BLS4	DL4	BLL3	BLS3	DL3	BLL2	BLS2	DL2	BLL1	BLS1	DL1	SB
Module–specific designation						64	0	0	0		L21			L13			L12			L11		
						66	0	0	0		L41			L33			L32			L31		

DA = Data type

BA = Mode

a = Address can be chosen freely (depending on installation location)

SB = Disturbance bit

E = Single mode

D = Double mode

Special functions of signalling lamp Lx3

The disturbance annunciation lamp LM is allocated to annunciation lamp Lx3 for all standard functions with the exception of the preselection functions and the selector switch. Disturbance signalling by annunciation lamp LM is regardless of whether the lamp has been activated via the control room interface of a control module or by way of a control room coupling module. To ensure uniform signalling, annunciation lamp Lx3 is therefore provided with a special logic.

The annunciation lamp responds when:

– the module's diagnosis circuit responds
– the disturbance bit is set in the lamp telegram
– the voltages US12 and/or US34 fail

Whenever the annunciation logic responds, the annunciation lamp Lx3 is set to emit a flashing disturbance light unless a steady light is demanded in the lamp telegram. The two remaining lamps stay dark. The annunication lamp set is the one associated with the function unit to which the disturbance relates.

When a function unit is connected to the standard functions 'preselection' or 'selector switch', the annunciation logic is disabled by means of S601:7 (off).

Disturbance annunciations on the module

A light–emitting diode ST is provided on the front of the module to indicate disturbances; these are filed simultaneously in the diagnosis register.

Loss of the operating voltage US12 or US34 for the pushbutton commands for function units 1 and 2 and/or 3 and 4 is signalled by means of two further light–emitting diodes.

Data communication with the module

Data exchange between the module and the bus system takes place via a shared memory. Here, the incoming lamp and release telegrams (TF, TQ, TL) to be received by the module, and the pushbutton telegrams (DA12, DA14) to be sent out by the module, are buffered. The shared memory is equipped with source registers for telegrams to be sent and sink registers for telegrams to be received. The register numbers 0...3 are defined as source registers. The allocation of lamp and release telegrams to the shared memory's sink registers is determined by the control system operator station on the basis of user parameters. These user parameters are entered in the form of an address list.

Pushbutton commands

Depending on the operating mode (see operating modes), the allocation of pushbutton commands to the source registers is set permanently.

The following correlation applies:

Function unit	Register number	
	single mode	double mode
1	0	0
2	1	0
3	2	2
4	3	2

The bit positions of the individual pushbutton commands within the source register are defined by way of the selected data types (see data type selection).

Lamp signals

The lamp outputs of each function unit are allocated in the form of an address list to the standard telegram 'lamp signals' which is to be received. In this case, the source address of the lamp telegram to be received is allocated to each function unit.

Release telegram

The release telegrams (TF, TQ, TL) arriving through the bus system are also allocated to the pushbutton telegrams to be output, in the form of an address list. In this case, the source location address of the release telegram to be received is allocated to each function unit.

The release telegram is generated on an additional control room coupling module. For each function unit, the allocations listed below also apply to the conversion of pushbutton commands Tx1 ... Tx3 into a release telegram.

Type of Information	DA	BA	Address word				Data Word (Bit Address)														
			System	Station	Module	Register	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Release telegram	12	E	a	a	a	0–3	0	0	0	TF1	0	TQ	TL	TF	0	0	0	0	0	0	0	SB
Module–specific designation		a		a	a	0	0	0	0	TF	0	T13	T12	T11	0	0	0	0	0	0	0	SB
		a		a	a	1	0	0	0	TF	0	T23	T22	T21	0	0	0	0	0	0	0	SB
		a		a	a	2	0	0	0	TF	0	T33	T32	T31	0	0	0	0	0	0	0	SB
		a		a	a	3	0	0	0	TF	0	T43	T42	T41	0	0	0	0	0	0	0	SB

DA = Data type
BA = Mode
a = Address can be chosen freely (depending on installation location)
SB = Disturbance bit
TF1 = Pushbutton release for release telegram

Note:

The disturbance bit of the received release telegram is not evaluated.

Addressing

The address list for the lamp signals and release telegrams has the following format:

Addressing	Function unit	
AW1 = 1,120,54,2	1	Lamp telegram
AW2 =	2	
AW3 =	3	
AW4 =	4	
EW1 =	1	Release telegram
EW2 =	2	
EW3 =	3	
EW4 =	4	

Where:

1st number:	System No.	(0...3)
2nd number:	Multi–purpose processing station number	(1...249)
3rd number:	Module No.	(1...58)
4th number:	Register No.	(see function block description “register allocation”)

AW Memonics for addressing
EW

Address generation

The system and station addresses are specified jointly for all modules in a multi–purpose processing station by means of a station bus control module. The module address is also set automatically by plugging the module into the slot provided within the multi–purpose processing station.

Event generation

Normally, the module is requested cyclically by the PROCONTROL system to transfer the data stored in the shared memory's source registers.

If values change within the cycle time, this is treated as an "event".

The module recognizes the following occurrences as an event:

– Change in status of binary values (pushbutton commands and disturbance annunciations)

Depressing of the release pushbutton TF alone is not recognized as an event.

If an event occurs, cyclic operation is interrupted and the new values are transferred to the bus with priority.

Diagnosis

The received telegrams and the generation of the telegrams to be sent, as well as internal signal processing, are monitored in the module for error–free operation (self–diagnosis).

In the event of a disturbance, the type of disturbance is stored in the diagnosis register and a disturbance annunciation is sent simultaneously to the PROCONTROL system. After bus granting, the module transfers a diagnosis telegram containing the data stored in the diagnosis register.

It is also possible to scan the current status of the module and the data at any time from the control system operator station (remote diagnosis).

The diagnosis register can be called by specifying the complete address and the data type. The diagnosis register has the register number 246 and data type 0.

Disturbance bit

The module incorporates a feature for monitoring the incoming telegrams for cyclic renewal. If a telegram has not been renewed for a certain period of time, the module interprets this as a fault and a disturbance annunciation is stored in the diagnosis register (ST responds).

Reaction of lamp telegrams

If a disturbance bit is set in a lamp telegram or if the monitor for cyclic renewal of the input telegrams responds, annunciation lamp Lx3 (LM) of the corresponding function unit emits a flashing disturbance light.

Reaction of pushbutton telegrams

The disturbance bit of a pushbutton telegram is set if:

– the monitor for cyclic renewal of the release telegram responds
– the voltage US12 or US34 fails
– the process voltage US fails.

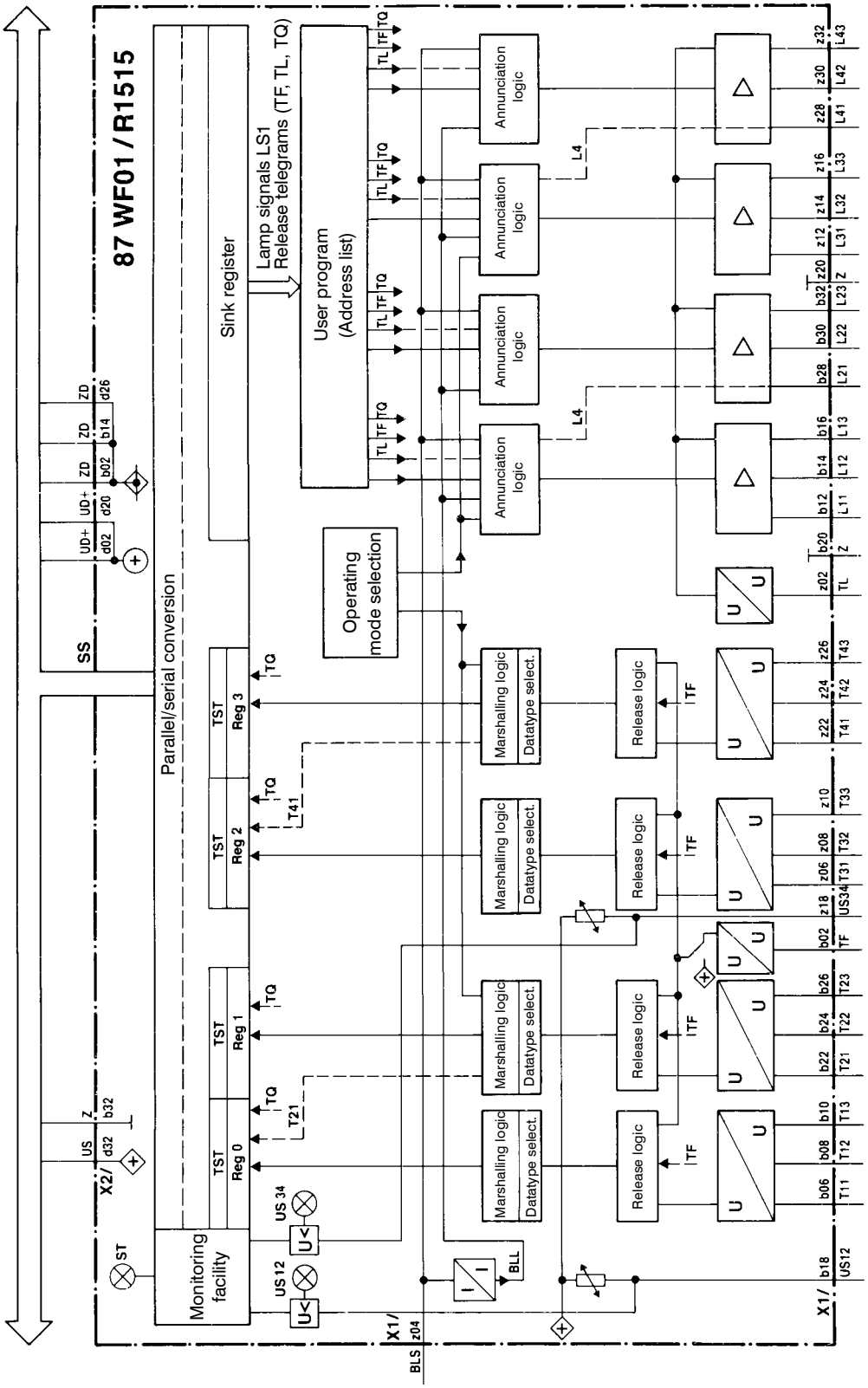
If the voltages US12 or US34 fail, the disturbance bit of the two pushbutton telegrams whose pushbutton commands are powered with the voltage concerned is set.

If the process voltage US fails, the bits in the standard telegrams allocated to the pushbutton commands are deleted and the disturbance bit is set.

Function diagram

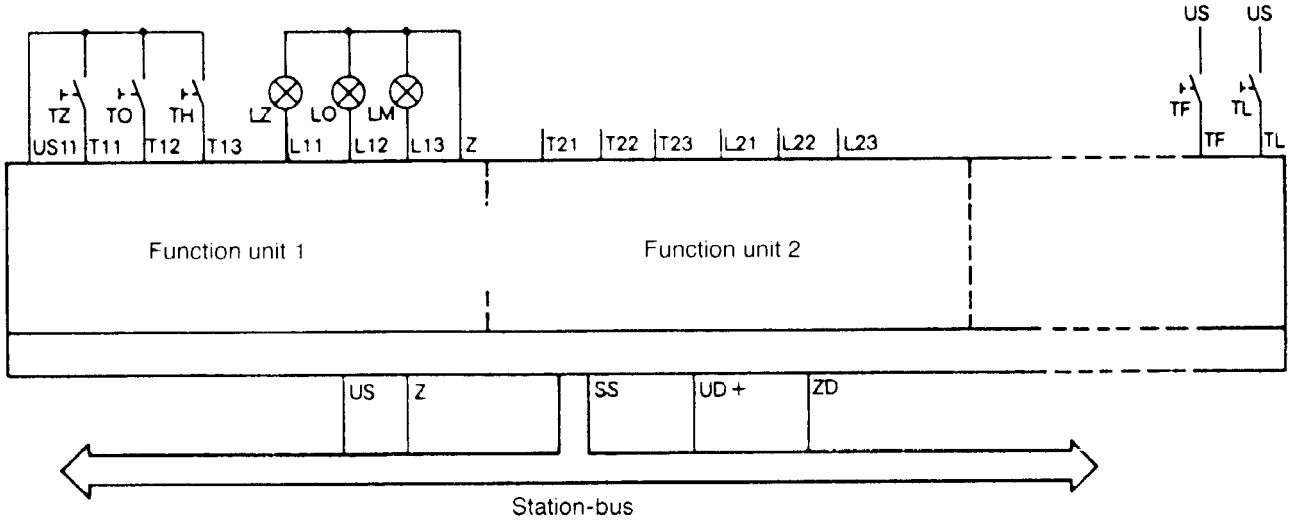
Terminal designations

The printed circuit board is equipped with connectors X1 and X2. Connector X1 incorporates all process inputs and outputs. Connector X2 includes the station bus connection (standard interface) and the operating voltages US and UD.

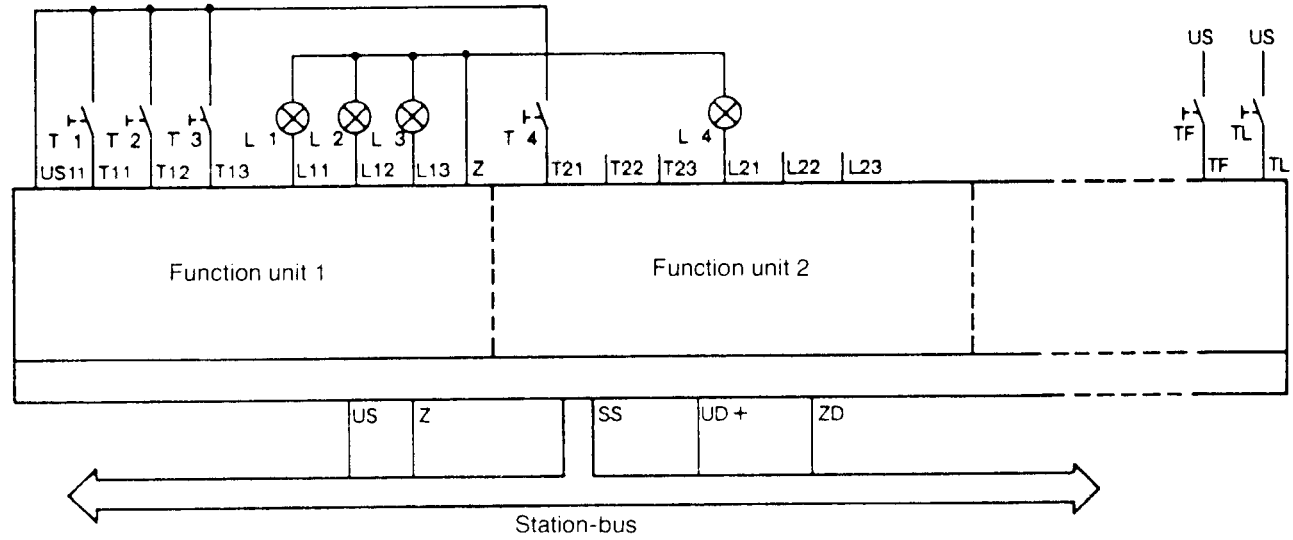


Connection diagrams

Single mode connection diagram
(standard function ASS)



Double mode connection diagram
(standard function VW4)



Mechanical design

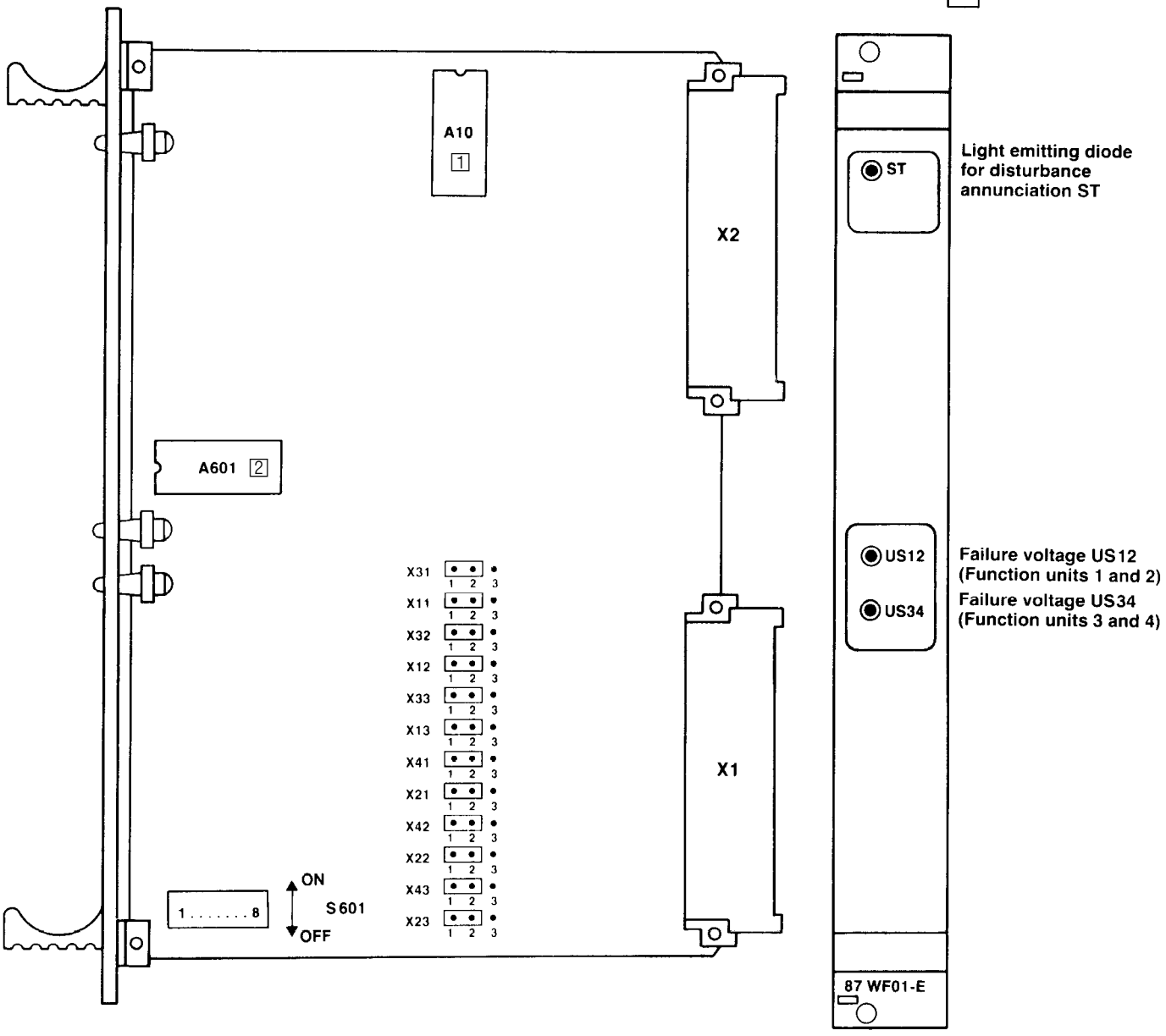
Board size: 6 units, 1 division, 160 mm deep

Connector: 1 x for station–bus connection,
48–pole, edge connector type F
(connector X2)

1 x for control room connection,
32–pole, edge connector type F
(connector X1)

Weight: approx. 0.6 kg

View of connector side:



1 Memory module, user program A10 (addresses)

2 Memory module, operating program A601

Note: A PROM of type 2732A is used as memory module for the user program. This module must normally be plugged in even if no user program is required.The positions of all jumpers are marked on the printed circuit board (lamp operation).

Technical data

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

Power supply

Operating voltage, process section	US	=	+24 V
Operating voltage, bus section	UD+	=	+5 V
Current consumption	IS	=	50 mA + lamp current
	ID+	=	560 mA
Power dissipation, typ.	Pv	=	5 W
Reference potential, process signals	Z	=	0 V
Reference potential, bus section	ZD	=	0 V

Input values

BLS	– Flashing disturbance light	0.5 NL
T11, T21, T31, T41	– Pushbuttons 1, function unit 1–4	1 NL
T12, T22, T32, T42	– Pushbuttons 2, function unit 1–4	1 NL
T13, T23, T33, T43	– Pushbuttons 3, function unit 1–4	1 NL
TF	– Pushbutton command, release	1 NL
TL	– Pushbutton command, lamp test	1 NL

Output values

Pushbutton operating voltage US12	24 V/100 mA, short–circuit–proof
Pushbutton operating voltage US34	24 V/100 mA, short–circuit–proof
L11, L21, L31, L41 – Lamps 1, function units 1–4	100 mA/LED typ. 10 mA at US = 24 V, short–circuit–proof
L12, L22, L32, L42 – Lamps 2, function units 1–4	100 mA/LED typ. 10 mA at US = 24 V, short–circuit–proof
L13, L23, L33, L43 – Lamps 3, function units 1–4	100 mA/LED typ. 10 mA at US = 24 V, short–circuit–proof

Up to four outputs may be short–circuited simultaneously.

ORDERING DATA

1. Complete module:

Type designation: 87WF01–E/R1515

Order number: GJR2372600R1515

The version 87WF01–E/R1515 (order number GJR2372600R1515) is a replacement for 87WF01–E/R1212 (order number GJR2344700R1212).

2. Plug–in memory modules:

Memory module	Position	Order number	Type
User program	A10	GJTN160145P2	2732A
Operating program	A601	GJR2351410Pxxxx	27C256

Technical data are subject to change without notice!

Pxxxx = Item number corresponding to the applicable revision status.

ABB Kraftwerksleittechnik GmbH

P. O. Box 100351, D–68128 Mannheim
Phone (0621) 381 2712, Telefax (0621) 381 4372
Telex 462 411 107 ab d

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