AMKASYN
Servo inverter AN/AZ/AW
Option card AZ-PS5-A
Programmable controller with ARCNET interface

Version: 2000/43
Part No.: 28699

AMK

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Important advice:

Touching of the electrical connections on the plug-in card must be avoided, otherwise electronic components could be destroyed through static discharge. Take plug-in card directly out of packing and insert into option slot 4 in the AZ module without using force. Then secure with screws below the card grip.

1 Programmable controller AZ-PS5-A

The option card AZ-PS5-A normally is plugged into slot 3 of central module AZ. It is secured in the front panel by a captive screw below the card grip against inadverted loosening.
The option card AZ-PS5-A then must be assigned to slot 3 in ID 32882 „Slot assignment“ in the basic system:

ID32882: xx xx 81 xx hex.
00 instead of xx if slot 1 and 2 are free.
If additional option cards are used in slot 1/2/ the corresponding card codes must be entered instead of xx.

Technical data: INTEL Processor 80960JT100, 100MHz
2 Mbyte Flash-ROM
128 kbyte Boot-Flash
512 kbyte RAM
512 kbyte battery-backed RAM
RS422 / RS485 interface (15-pole SUB-D)
RS232 Debug interface (USB)
Internal field bus interface

The AZ-PS5-A card is used as a programmable drive interface to solve tasks closely related to the drive. Data communication with the drive system takes place through the internal bus.
Binary and analog inputs/outputs and the AMK panel AB 202L can be used for process and user level communication. Optional fieldbus interface cards provide fieldbus communication capability.

The AZ-PS5-A is programmed in statement list (STL, similar STEP 5). Programming unit is a standard PC with the AMK PS programming software APROS. The instruction set contains statements for logic operations, counters and timers. Drive setpoint values (torque, speed, position) and parameter changes are commanded via AMK specific function blocks.

Among other things coordinated axis movements can be generated through Fast Functions with table interpolation.

The user PS program (max. 96 kB) and non volatile data blocks (max. 15 kB) are stored in the battery-backed RAM memory. The capacity of the Lithium battery is able to maintain the data for at least 5 years.

The storage life of a AZ-PS5-A card with stored PS program is limited up to a maximum of 5 years! If the battery is removed, all stored data are lost!

1.1 Description of the display and operator elements at the AZ-PS5-A front panel:

L1 (green): Not used
L2 (red): CPU Error
ER (red): PS Error
During a malfunction (PS ERROR state) this LED is blinking with a flashing rate of 1 second.
SP (red): STOP
In PS STOP state this LED is on
LO (green): see below
RN (green): RUN
In normal operation (PS RUN state) this LED is reset after the process image „INPUTS“ is formed and set again before the process image „OUTPUTS“ is transmitted, i.e. with increasing PS cycle time the LED brightness is decreasing. In PS STOP state LED „RN“ is off.

1.1.1 Switch positions:

SP: Stop (notched position)
The cyclic program execution is interrupted.

RN: Run (notched position), **switch position for normal operation**.
Normal cyclic PS program execution.

RS: Reset (momentary contact)
PS RESET is initiated, then automatic PS START (state RUN)

Additional PS RESET (RS) Functions:

PS RESET (RS) function 1: Erase of all data blocks in the in battery backed RAM.

PS RESET (RS) function 2: Erase of the actual PS project (and loading of the user PS project stored on the system EPROM, if existing).

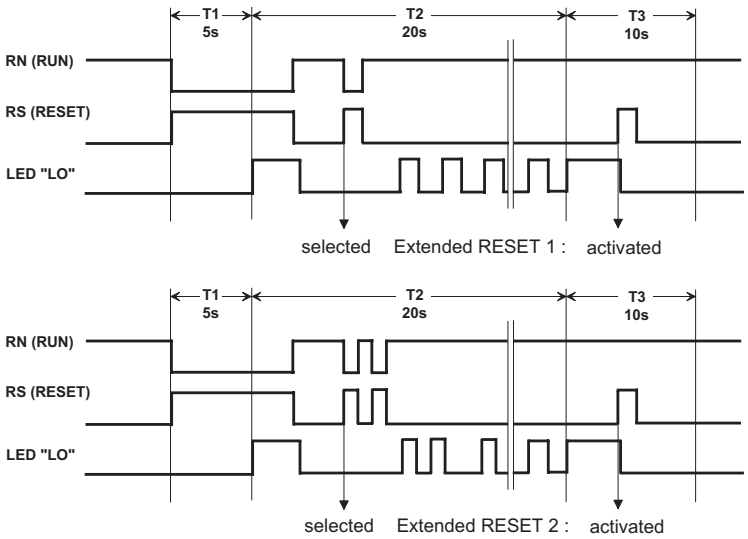
The RESET (RS) switch position must be pressed for more than 5s (T1) to initiate these extended functions. After this time the green LED „LO“ is turned on. Now the RESET switch must be released (back to RN position)

By a single operation of the RESET function 1 is selected, by a double operation extended PS RESET function 2 is selected.

LED “LO“ is reset, than extended function 1 is handshaked by a single flash of LED “LO“, extended function 2 by a double flash.

After T2 (20s) is elapsed LED “LO“ is constantly turned on for 10s (T3). The selected extended RESET function is activated by pressing RESET (RS) once more within this time.

A normal PS RESET and restart is initiated if RESET (RS) switch position is pressed for less than 5s or if the times T2/T3 are elapsed without selecting and activating one of the extended RESET functions via RESET (RS) switch.



1.1.2 Jumpers

The on-board jumpers have no meaning for the user.

1.1.3 Backup battery

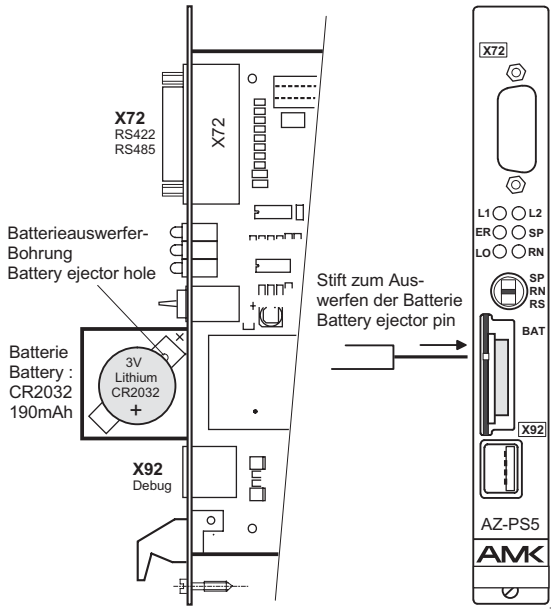
The AZ-PS5-A memory is battery-backed by a 3V Lithium battery Type CR2032. With power on the battery voltage is monitored. If the battery voltage is too low a PS error message is output:
Error code 2816 „PS option error“, PS Error module: 120, Error-No: 1.
From this time the battery capacity is still sufficient to maintain the memory for 1 week! To avoid loss of data the battery must be exchanged immediately!

1.2 Battery change

Battery change is only permissible with system POWER ON!

Battery Type:
3V Lithium CR2032

1. During battery change the power supply must be ON!
2. Carefully press out the old battery with a suitable ejector pin. Carefully press in the new battery into the holder. Pay attention to battery polarity: The battery designation (CR2032 +) must be visible. Keep the battery circumference absolutely clean, don’t touch it!
3. Now Power OFF and ON again.



AZ-PS5 Serial interface: RS422 (RS485 capable)
X72 Connector pin assignment:
(15 pole female D-SUB)

Pin	Signal	Line	Type	Meaning
1	PE			Shield
2	TxD-	O	RS422	Transmit Data-
3	RxD-	I	RS422	Receive Data-
4	RTS	O	RS422	Request to Send+
5	CTS	I	RS422	Clear to Send+
6	TxD-	O	RS422	Contact for RS485: TxD- → RxD-
7	GND			Signal Ground
8	TxD	O	RS422	Contact for RS485: TxD → RxD
9	GND			Signal Ground
10	5P			5 Volt supply
11	MP3	I	TTL	Disable RS485 termination
12	TxD	O	RS422	Transmit Data+
13	RxD	I	RS422	Receive Data+
14	RTS-	O	RS422	Request to Send-
15	CTS-	I	RS422	Clear to Send-

1.3 RS485 operation

For RS485 operation bus termination is required at the beginning and at the end of the transmission line. An on-board analog switch is prvided to activate the bus termination resistors at the last bus station. For the remaining bus stations the bus termination must be disabled. For this in SUB-D connector X72 Pin 11 (MP3) must be connected to +5V (Pin 10 / 5P). Without this jumper (default) the bus termination is always active.

DEBUG interface X92
(4 pole, male USB plug connector,
AMK interface cable, part No.: 28265)

Only for AMK development / service use.

Pin	Signal	Typ	Verwendung
1	5P	Power	5 Volt Versorgung
2	RxD	RS232	Receive Data
3	TxD	RS232	Transmit Data
4	GND	GND	Signal Ground
5,6	PE	Shield	Abschirm

1.4 AMK Fieldbus interface X2

The optional interface card for INTERBUS-S, PROFIBUS-DP, ARCNET, CAN, SERCOS is connected to the AZ-PS5 via bus connector X2.

1.5 ARCNET interface card AZ-ARC

Basic for the ARCNET interface card is the ARCNET controller COM 20020. Through this interface card the AMKASYN drive system is connected to the ARCNET bus.

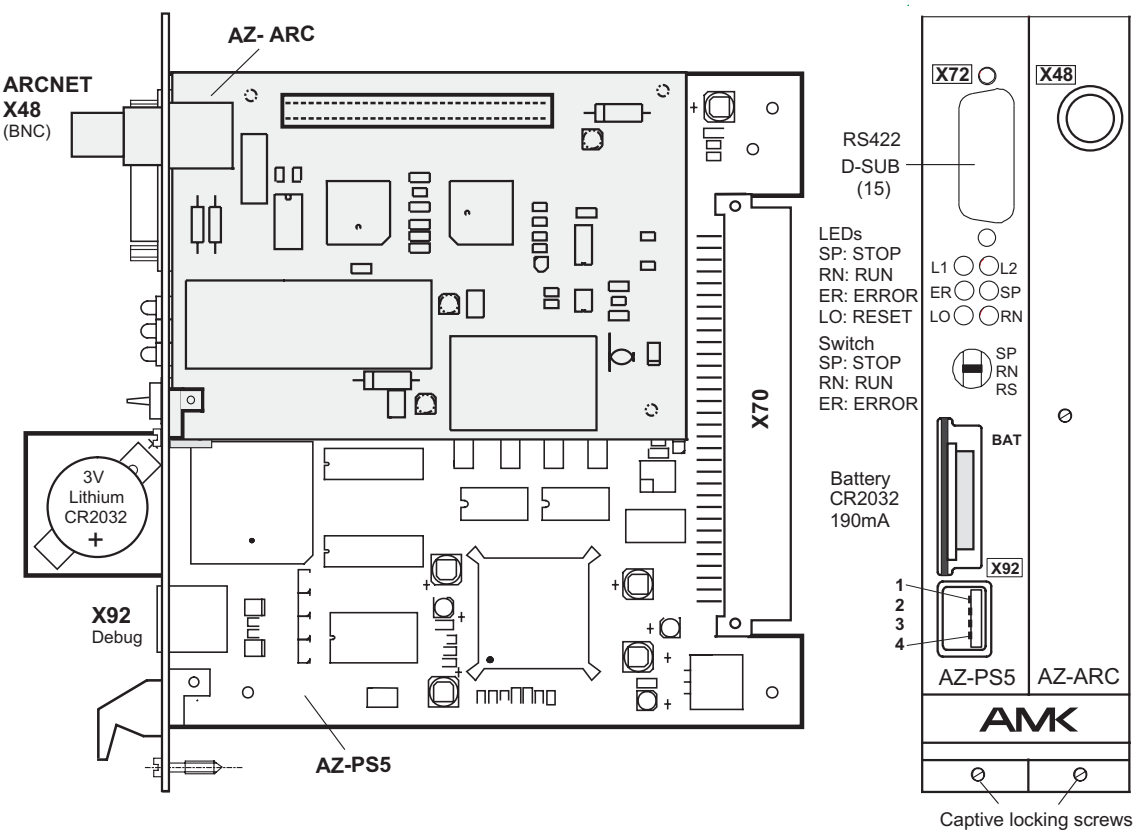
The interface card features:

- BUS/STAR topology (no bus termination resistor on board, compare section „bus topology“)
- Network connection through „High impedance Tranceiver HYC9088A“
- BUS connection via BNC coaxial jack, coaxial cable type RG-62U

The following parameters can be set:

- Selectable Baud rate between 2.5 Mb/s and 156.25 KB/s.
- Timeout time reduced by factor 3 for short BUS length.
- Reduced timeout time during transmission.

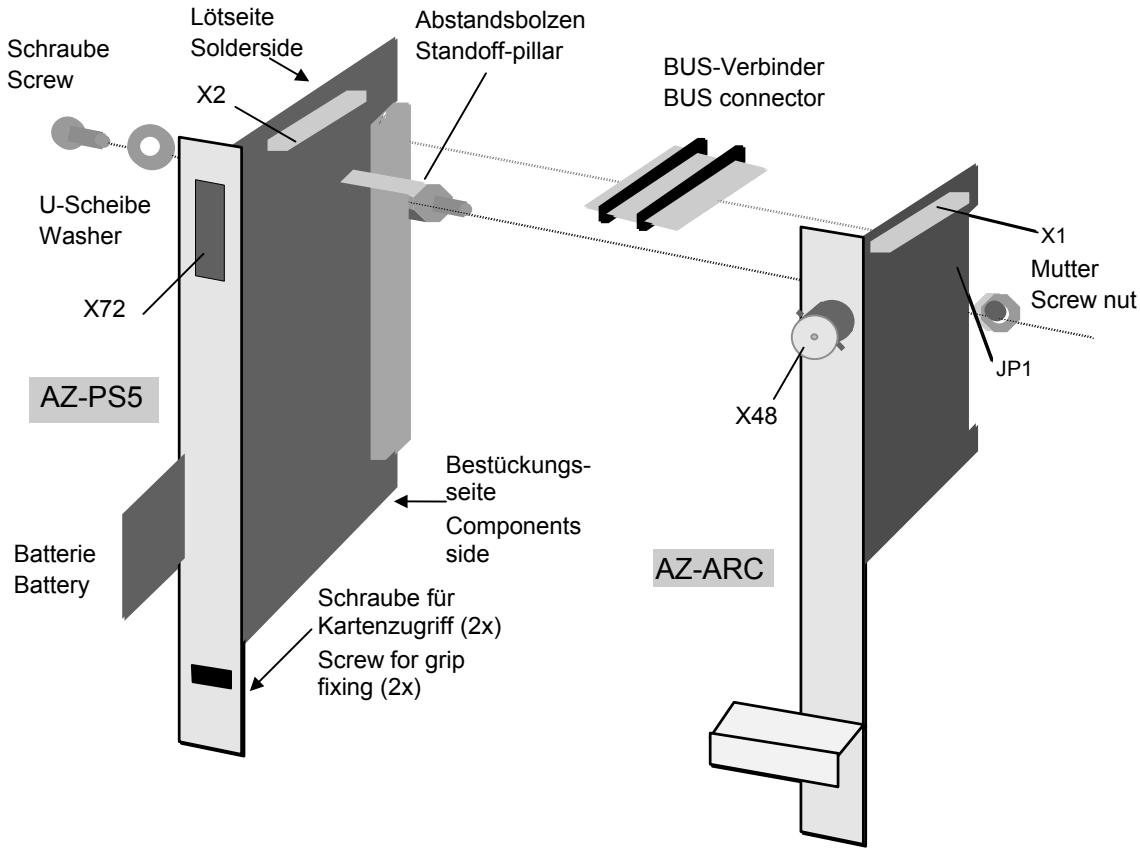
1.6 Programmable controller card AZ-PS5-A



For option card AZ-PS5-A (programmable controller with ARCNET interface) is valid:

- Condition: AZ-PS5 system software version ≥ V02.13
- A maximum of 32 users can communicate with the AZ-PS5-A card.
- Access to programmable controller PS and basic drive system is possible (Inputs/Outputs/Flags, data blocks, drive commanding, ...)
- Settings: Node address through ID32949, Baud rate through ID32941 (Access to these ID-Nos. is only possible via the protected „SERVICE“/„SERCOS PARAMETER“ menu!)

1.7 Assembly: AZ-PS5 and AZ-ARC as AZ-PS5-A module



1.8 AZ-PS5-A ESD-Protection/Installation:

Please do not touch the electrical connections or the exposed contacts on the front or backside of the plug-in circuit boards. Static-electricity due to handling of the boards can destroy the board level components. Please make sure the person handling the boards has proper PE-ground connection to reduce static-electricity.

Please insert the plug-in board directly from the packaging into slot 3 in the AZ-module without using force and secure the board with the captive screws underneath the card-holder.

Inappropriate handling of the board can lead to a short-circuit in the battery power supply, which could cause a loss of stored data in the user program.

- Never lay the board on a conductive surface (metal table top).
- Avoid touching the front or back side of the board.
- During the insertion of the plug-in board into the slot of the AZ-module it is imperative that the solder side of the board does not make contact with the frontcover of already inserted boards. If necessary remove the other board first before installing the AZ-PS5-A card.

1.8.1 Sequence for exchange procedure of the AZ-PS5-A card:

1. Make sure the AMKASYN-system is without power.
2. Remove front cover on AZ-module.
3. Remove external connections to the to be exchanged AZ-PS5-A card (slot 3 and 4).
4. If existing: Remove external connections to the plug-in board in slot 2.
5. Unscrew the captive screws which hold the boards in place (slot 2, 3 and 4).
6. Remove the plug-in board from slot 2 by the card holder and lay it on a nonconductive surface (bubble wrap etc.).
7. Remove the AZ-PS5-A card by the card holder and lay on a nonconductive surface (bubble wrap etc.).
8. Take the new AZ-PS5-A card out of the packaging. Only handle it by the front card holder or by the front cover.
9. Insert this new AZ-PS5-A card into slot 3 in the AZ-module and secure it with the captive screws.
10. Replace the other option card again, if removed under 6.
11. Connect all external connections removed under 3. and 4. again and secure the wiring.
12. Download user PS program to AZ-PS5-A via programming software APROS (only if new card was inserted without PS program).

2 ARCNET

Messages (PDUs: Process Data Units) are used for communication with the AMKASYN system via ARCNET. These PDUs have to comply with the SBUS protocols specified by AMK.

2.1 SBUS protocol structure

All PDU messages via SBUS are structured as follows:

Byte No.			
0	empf_phys	Physical PDU receiver	\
1	empf_log	Logical PDU receiver	|
2	send_phys	Physical PDU transmitter	|
3	send_log	Logical PDU transmitter	> PDU head
4, 5	pdu_len	PDU length (head + user data)	|
6	komm_code	Commanding code	|
7	attribut	Supplementary information	/
n	User data	Command specific parameters	PDU data
n + 8			

2.2 General structure of a SBUS PDU

A PDU always consists of PDU head (8 byte length) and an optional user data part, which can be up to 132 bytes long (maximum PDU length: 8 + 132 bytes = 140 bytes). The PDU head contains communication specific data as receiver address, transmitter address, length, etc.

Each address (receiver and transmitter) is partitioned in the „physical“ and the „logical“ component. The physical rceiver is always the node (SBUS station) to which the message is addressed. Within a physical station several logical users can exist. They are client and server, message transmission then is between logical users.

PDUs are differentiated by the user through the command code. The attribute contains different supplementary information. User data and supplementary information can only be developed out of the command code assigned to the logical user.

The AMKASYN system is one ARCNET station (node). It contains the following logical users:

- Basic drive system with drive diagnostic
  drive commanding
  drive data/parameter management
  drive data indication (actual/setpoint values, messages, status bits, manufacturer data, operating hours counter, ...)
- Option card AZ-PS5 with PS I/O / Flag / Data block management

The AMK „SBUS documentation“ supplies additional SBUS related information.

AMK specific function block FB213 on AZ-PS5-A is supporting SBUS-PDU transmission and reception (c.f. PS documentation „FB213 Transmit/Receive of SBUS-PDUs“).

The documentation „PS Server, SBUS protocols“ contains the SBUS protocols for I/O / Flag / Data block management, used on the AZ-PS5-A for ARCNET communication.

2.3 SBUS-PDU Transmission via ARCNET

In „short“ telegrams the SBUS-PDUs are transmitted via ARCNET as user data.

Two variants have been realized to embed the SBUS-PDUs into the ARCNET protocol (c.f. section „Parameter setting for interface“, bit „0“):

- Transmission of the pure SBUS-PDU via ARCNET
- SBUS-PDUs embedded into the ARCNET 7FH protocol.

ARCNET telegram structure for pure SBUS-PDUs transmission:

Byte No:			
0	SID	ARCNET transmitter address	
1	DID	ARCNET Receiver address	
2	CNTS		
	:		
	:		
	:	with: n = PDU length	
256-n	empf_phys	Physical SBUS receiver	\
256-n+1	empf_log	Logical SBUS receiver	|
256-n+2	send_phys	Physical PDU transmitter	|
	send_log	Logical PDU transmitter	> SBUS
	pdu_len	PDU length (head + user data)	| PDU head
	komm_code	Command code	|
	attribut	Supplementary information	/
		SBUS	SBUS
	User data	Command specific parameters	PDU-data
255			
256			

2.4 ARCNET telegram structure for pure SBUS-PDUs transmission

With the second variant the SBUS protocol is embedded into a specific protocol frame (7FH protocol). ARCNET telegram structure for 7FH protocol:

Byte No:			
0	SID	ARCNET transmitter address	
1	DID	ARCNET receiver address	
2	CNTS		
	:		
	:		
	:	with: n = PDU length + 7	
256-n	7F identifier	7FH identifier	\
256-n+1	job number	Job number (2 byte)	| 7FH-
			|
256-n+3	direction	Direction	> Protocol-
256-n+4	type	Telegram type	| head
256-n+5	length	length (2 byte)	|
			/
256-n+7	empf_phys	Physical SBUS receiver	\
256-n+8	empf_log	Logical SBUS receiver	|
256-n+9	send_phys	Physical PDU transmitter	|
	send_log	Logical PDU transmitter	> SBUS
	pdu_len	PDU length (head + user data)	| PDU head
	komm_code	Command code	|
	attribut	Supplementary information	/
	User data	SBUS Command specific parameters	SBUS PDU data
255			
256			

ARCNET telegram structure for 7FH protocol

3 Parameters for ARCNET communication

3.1 ARCNET user addressing

ARCNET users communicating with the AMKASYN system can have each node address (Node-ID) between 1 and 255. For the AMKASYN system itself only **node addresses between 12 and 255** are permissible. **ID32949** is used to define the node address for the AMKASYN system. With jumper „JP1“ not set, node address must be entered into byte 3, if jumper „JP1“ is set, the node address must be entered into byte 2. A maximum of 32 ARCNET stations may communicate with the AZ-PS5-A card.
ID32949:

Byte 3	Byte 2	Byte 1	Byte 0
ARCNET Node ID, if JP1 not set	ARCNET Node ID, if JP1 is set		

3.2 Parameter setting for interface

Through **ID32941** different interface parameters can be set for ARCNET:

Bit 0 = 0: ACRNET pure SBUS-PDU transmission
1: ARCNET 7F Protocol selection
Bit 3/2/1: ARCNET transfer rate:

Bit 3	Bit 2	Bit 1	Description
0	0	0	Transfer rate 2,5 Mb/s (Default)
0	0	1	Transfer rate 1,25 Mb/s
0	1	0	Transfer rate 625 Kb/s
0	1	1	Transfer rate 312,5 Kb/s
1	0	0	Transfer rate 156,25 Kb/s
1	0	1	reserved
1	1	0	reserved
1	1	1	reserved

Bit 4 = 0: No RESET of the ARCNET interface module after reconfiguration
1: RESET of the ARCNET interface module after 4 reconfiguration attemps, caused by this module
Bit 5 = 0: reserved
Bit 6 = 0: Timeout during transmission after 128 (Default) negative acknowledgements (NACK)
1: Timeout during transmission after 4 negative acknowledgements (NACK)
Bit 7 = 0: reserved

4 PS5 Image

If the ARCNET interface card AE-ARC is used linked to the programmable controller AZ-PS5-A the ARCNET interface is initialized and monitored independently by the system program according to the settings in ID32941 and ID32949. Via a status flag byte the state of the communication interface is transfered to the PS user program. Depending of jumper JP1 the following flag bytes are used:

JP1 not set: MB 227 is status flag byte
JP1 set: MB 226 is status flag byte

For healthy condition of the communication interface the content of the used status flag byte is „0“.

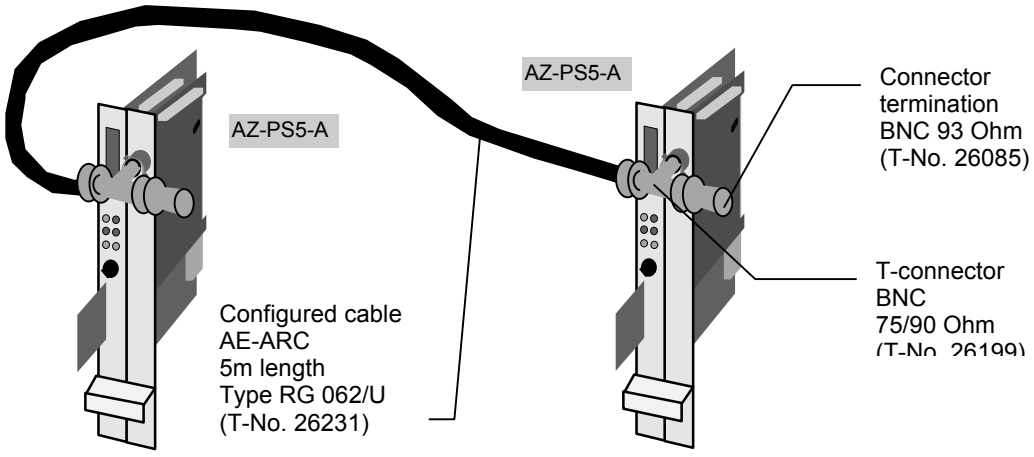
Flag bits meaning on status flag byte for ARCNET interface status:

Bit 0 = 1: Connection error
Bit 1 = 1: Transmission error
Bit 2 = 1: Timeout during transmission (RESET through user required!)
Bit 3 = 1: This ARCNET interface module confuses the network as a whole. Therefore it was separated from the network.
Bit 4 = 1: ARCNET controller error
Bit 5 = 1: SBUS telegram received via ARCNET is longer than 140 bytes
Bit 6 = 1: Node address ID32949 is invalid or already existing in the network
Bit 7 = 1: ARCNET initialization error

Reconfigurations initiated by this interface module are indicated by the AZ-PS5-A in output word AW 200.

5 Bus Topology

On the drawing below two AMKASYN systems with option card AZ-PS5-A each are linked together using a bus cable with two T-adapters. The bus has to be terminated with 93 Ohm resistors.



ARCNET Topology

6 Imprint

Title **PDK_028699_AZAW_Option_AZPS5A_en**

Purpose **Hardware description option card AZ-PS5-A**

Part number **28669**

History

Publication date
2000/43

Reservation Modifications to the content of the documentation and the delivery options for the products are reserved.

Service Tel. no. **+49/(0)7021 / 5005-191, Fax -193**

Office hours:
Mon.-Fri. 7:30 - 16:30, on weekends and public holidays the phone number of the standby service personnel is available on the answering machine.

You can assist us in finding a fast and reliable solution for the malfunction by providing our service personnel with the following:

- Information located on the ID plate of the devices
- The software version
- The device setup and the application
- The type of malfunction, suspected cause of the failure
- The diagnostic messages (error codes)

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