

Operating Instructions

for the

PLUGSYS®Module

EIM EXTERNAL INPUT MODULE Type 673

(Version: 2.2 / Beha, printed: July 22, 2002)

Contents	Page
1. Introduction, manufacturer's details	1
2. Safety note	1
3. General description	2
4. Construction	2
5. Function	3
5.1 Signal inputs	3
5.2 Gain adjustment	3
5.3 Block diagram for one channel	3
6. Description of the controls	4
7. First start-up	5
7.1 Jumper settings on the circuit board	5
8. Faults, causes and remedies	7
9. Example of application	9
10. Installing the EIM in the PLUGSYS housing	10
11. Installation of the EIM-B on the rear of a rack housing	10
11.1 Jumpers on the extra card	11
11.2 Conversion EIM-B from the front to the rear of the housing	11
12. Details of signal lines of the PLUGSYS system bus	13
12.1 Power supply	13
12.2 Analogue signal bus lines (AV1 to AV16)	13
12.3 Analogue multiplex signal output (AM)	13
13. The 96-pin connector to the PLUGSYS system bus	14
14. Maintenance and cleaning	14
15. Transport and storage	15
16. CE Declaration of Conformity	15
17. Technical data	15

1. Introduction, manufacturer's details

These Operating Instructions describe the operation and use of the **EIM** Module Type 673. It is part of the equipment and should be kept close to it.

All the information in these Instructions has been drawn up after careful examination but does not represent a warranty of product properties. Alterations in line with technical progress are reserved.

This PLUGSYS® module is manufactured by:

HUGO SACHS ELEKTRONIK-
HARVARD APPARATUS GmbH
Gruenstr. 1,
79232 March-Hugstetten
Germany

Phone (Germany): 07665-9200-0
(others): int. + 49 7665-9200-0

Fax (Germany): 07665-9200-90
(others): int. + 49 7665-9200-90

eMail: sales@hugo-sachs.de

Copyright

This product and the corresponding documentation are protected by copyright. All rights reserved. This document must not be copied, photocopied, reproduced or translated, either as a whole or in parts, without prior written agreement by HUGO SACHS ELEKTRONIK-HARVARD APPARATUS GmbH, March/Hugstetten, Germany.

Trademark

PLUGSYS is a registered trademark of HUGO SACHS ELEKTRONIK-HARVARD APPARATUS GmbH, March/Hugstetten, Germany.

2. Safety note



Important: This equipment is not suitable for operation in hazardous areas and/or in a flammable atmosphere.

This equipment is designed exclusively for animal experiments.
Not for humans use!

3. General description

The HSE EIM External Input Module Type 673 is a universal 4-channel d.c. input amplifier for feeding signals into the PLUGSYS measuring system. It consists of the two sub-modules EIM-A and EIM-B.

It is used to input external measuring signals and to adapt their voltage range to the PLUGSYS voltage level of ± 10 V (e.g. for flow signals from a flowmeter or force signals from an external bridge amplifier). The input voltage range is ± 0.1 to 10 Volt (referred to a signal output voltage of ± 10 Volt) with a signal bandwidth of 0 to 3 kHz. For operation the EIM has to be installed in a PLUGSYS housing. The power supply is provided from the system bus.

4. Construction

The EIM External Input Module Type 673 consists of two sub-modules designed for the PLUGSYS measuring system. They are the modules EIM-A (Adjust, Type 673/2) and EIM-B (BNC sockets, Type 673/3). Each of the modules occupies one slot, with module EIM-B mounted on the front panel or by means of an additional card on the back of a rack-mounting housing. Module Adjust (EIM-A) occupies 1 slot on the front, corresponding to 1 x 4 E units (20.2 mm). The connection to the PLUGSYS measuring system is arranged through the PLUGSYS system bus. The assignment of the output signals can be freely selected by jumpers for each of the channels. The power supply is also provided from the PLUGSYS system bus. The EIM can be supplemented by the extra module "SUPPRESSION for the EIM Type 673/1". This extra module provides for zero shifts on the input signals. Any signal ranges which are of no interest to the measurement can be suppressed.

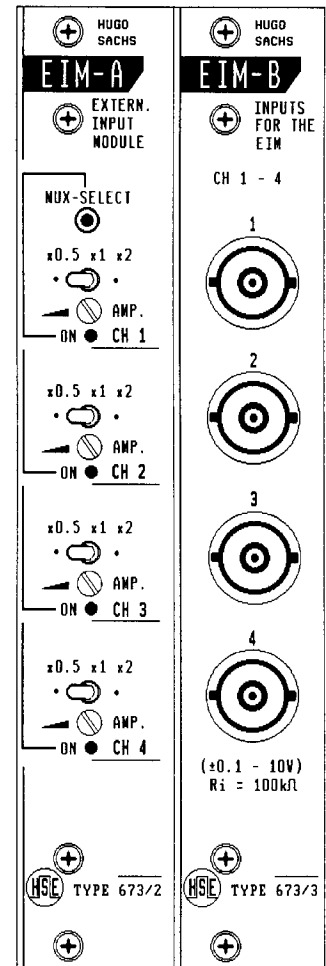


Fig. 2: Front panel EIM-A and EIM-B

Installation modes

Module EIM-A is always mounted on the front of the housing so that all adjustments can be made easily. If the housing has a sufficient number of free slots, module EIM-B is also installed on the front. In special cases where there is not sufficient space on the front, or if the rack housing is mounted in a complete rack together with other equipment, the module EIM-B is mounted on the back of the housing. By using a special card with input amplifier it is possible to feed in the signal through a module EIM-B Type 673/3 from the back of the housing. The module EIM-B is screwed to the extra card and mounted on the housing back. (Note: this is only possible on the rack housing !) See also Section 11, "Rear mounting of the EIM-B on the rack housing".

5. Function

5.1 Signal inputs

The external signals are fed in through four BNC sockets on the front panel of module EIM-B Type 673/3 (this module can also be mounted on the back by means of two extra cards). The input voltage range is ± 0.1 to 10 Volt referred to a signal output voltage of ± 10 Volt. The input impedance (R_i) is constant at 100 kOhm. The inputs are not isolated from each other. The reference zeroes of the inputs are linked together internally.

5.2 Gain adjustment

The gain is adjusted separately for each channel on the front panel of module EIM-A Type 673/2 through the selector switch "x0.5 - x1 - x2", or continuously using a multi-turn trimmer on the front panel marked AMP. A further adjustment of the gain can be made through jumpers on the circuit board. See Section 7.1 "Jumper adjustments on the circuit board".

5.3 Block diagram for one channel

The block diagram below indicates the signal path for one channel of the External Input Module. The input signal is taken from the BNC input socket through the amplitude attenuator (multiturn trimmer potentiometer) to the input of the preamplifier. The gain can be selected here through the front selector switch to be x0.5, x1, x2. The amplifier which follows can have its gain changed from x10 to x100 by means of a jumper. The output of this amplifier is linked through jumpers on the circuit board to an analogue bus line of the PLUGSYS system bus.

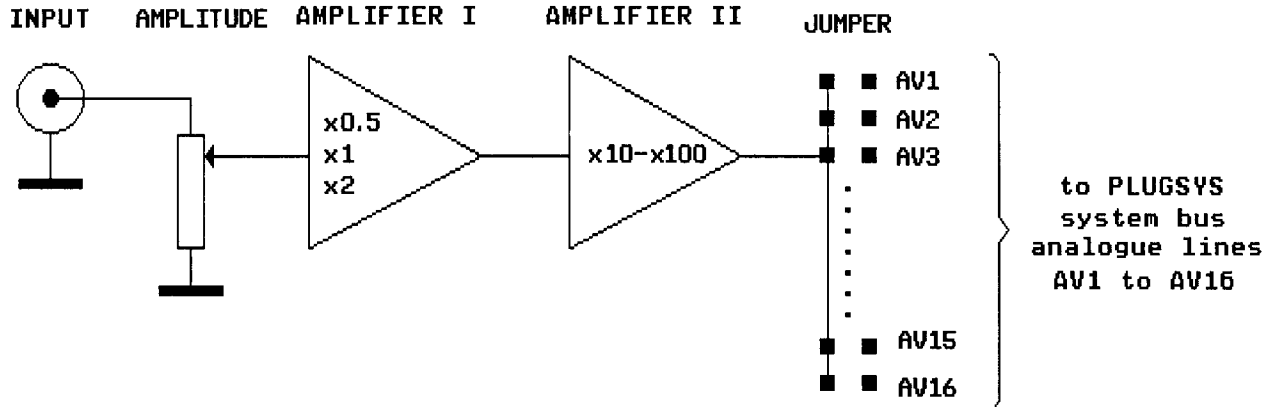


Fig. 3: Block diagram for one channel

6. Description of the controls

(1) MUX-SELECT key

Pressing the MUX-SELECT key once switches the output signal CH 1 of the External Input Module to the signal line AM (Analogue Multimeter on the PLUGSYS system bus). The key function is self-maintained. To indicate the setting the LED "ON" in the field of CH 1 (Fig. 4, Item 4) on the front panel lights up. The line RDVM (Reset Digital Voltmeter Multiplex) is activated at the same time. This ensures that the PLUGSYS module which had previously been selected disconnects the AM signal line (Analogue Multimeter). In this way the output signals of the individual amplifier modules can be switched to a central analogue or digital indication unit (e.g. DVM Digital Voltmeter Module Type 666). If a Recorder Output Module ROM Type 670 is installed in the PLUGSYS, it is possible to monitor any signal in the PLUGSYS system on a recorder channel. For this purpose the MUX output of the Recorder Output Module is linked to a recorder. This function permits simple checking of the signal by switching each signal in turn to the recorder through pressing the MUX key. To change from CH1 to CH2, CH3 etc. the MUX-SELECT key has to be pressed again.

(2) Switch x0.5 x1 x2

This switch is used to double or halve the gain. This permits simple gain change without altering the setting of a recorder in case the signal amplitude on the recorder is too large or too small. In order to permit halving or doubling of the gain, this switch should normally be set to the centre position x1 at the beginning of a measurement.

(3) Trimmer potentiometer AMP

This potentiometer is used for fine adjustment of the gain. Maximum gain corresponds to fully clockwise rotation of the potentiometer. If the potentiometer is turned fully anticlockwise the gain is reduced to 1/20. The overall gain depends on the position of the selector switch "x0.5 x1 x2" and on the setting of the internal jumpers. The gain for each channel can be selected between x10 and x100 (see Section 7.1).

Example:

Trimmer fully anticlockwise, switch in position x1, internal jumper on x10:

$$\text{gain} = 1/20 \times 1 \times 10 = 0.5$$

Trimmer fully clockwise, switch in position x1, internal jumper on x10:

$$\text{gain} = 1 \times 1 \times 10 = 10$$

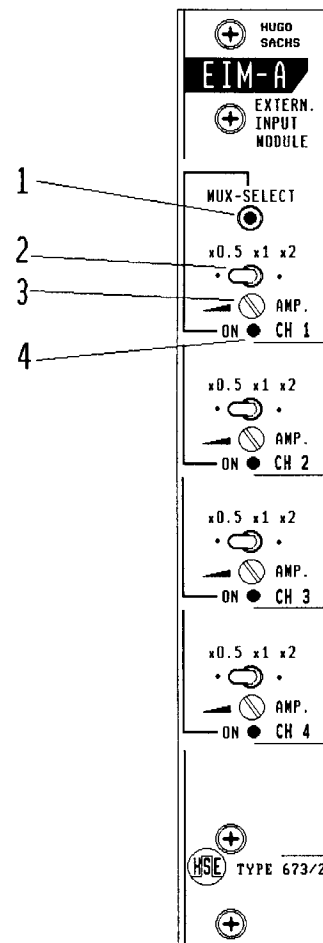


Fig. 4: Controls on the EIM-A

(4) LED MUX-SELECT ON

This LED indicates that the channel selected at present (here CH1) is switched to line AM (Analogue Multimeter). After pressing the MUX-SELECT key this LED lights up and the signal of the first channel CH1 is switched to a built-in Digital Voltmeter DVM Type 666 or can be taken off the MUX OUT socket on the Recorder Output Module.

7. First start-up

When the External Input Module is started up for the first time the following settings should be made: Switch "x0.5 x1 x2" on x1, trimmer AMP fully clockwise. This gives a gain of 10. If this should prove insufficient, the appropriate jumper on the circuit board has to be set to x100. (see Section 7.1). If the gain is too high, the AMP trimmer can be turned anticlockwise to reduce the gain to 1/20. The switch "x0.5 x1 x2" should remain on x1 in order to provide the facility of halving and doubling the amplitude.

7.1 Jumper settings on the circuit board

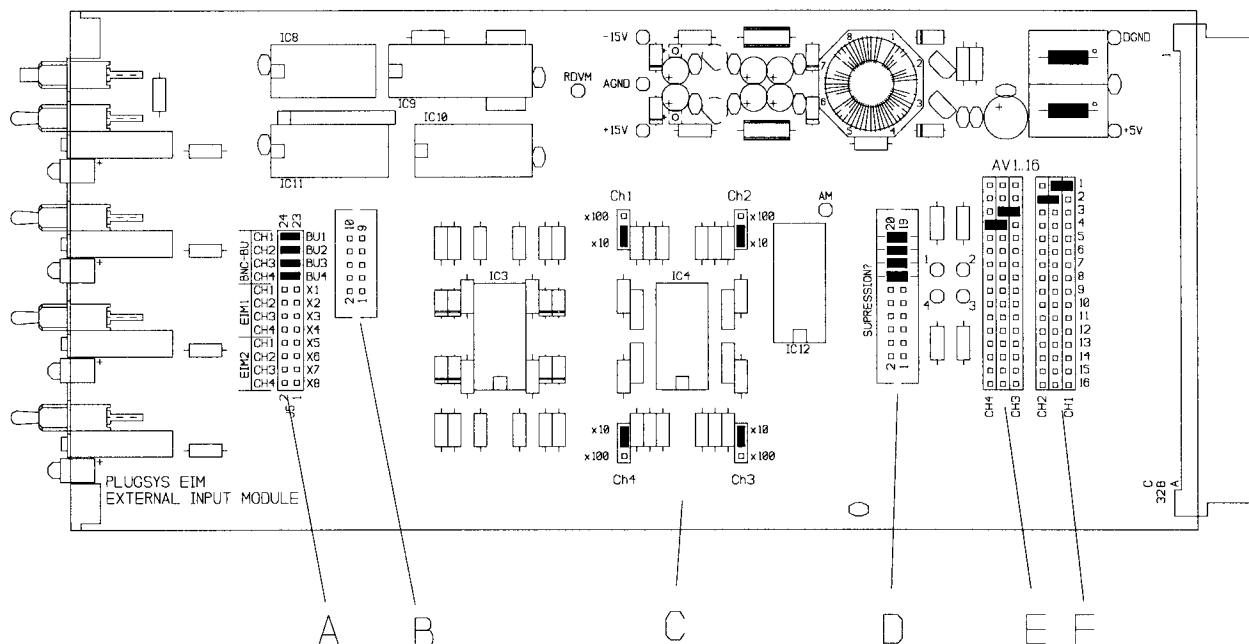


Fig. 5: Jumpers on the circuit board.

A: select inputs, **B:** signal inputs on front-mounted EIM-B, **C:** select gain,
D: connection to add-on module EIM-S (suppression) Type 673/1 or 4 link jumpers,
E and F: connect output signal to system bus

For the correct operation of the External Input Module Type 673 it is essential to make the settings below using jumpers on the circuit board.

(1) Assignment of the links J5 (Fig. 5 A)

These jumpers determine the connection of module EIM-B (BNC sockets) to module EIM-A (Adjust). The setting shown in Fig. 5 applies to a front-mounted module EIM-B. In this configuration the module EIM-B is linked through a ribbon cable to the connector (Fig. 5 B). For a rear-mounted EIM-B these jumpers have to be placed on the pins marked X1 - X8. Either one or two EIM-B modules can be installed on the back of the rack housing. Connection to them is made through the so-called X-lines of the system bus. Only 8 of these lines are available. The X-lines must also be configured on the extra card for rear installation.

When installing the first EIM-B the jumpers should be set on X1 - X4, for the second EIM-B on X5 to X8. These settings must also be made on the corresponding EIM-A. When using 2 EIM-B modules it is important to note the assignment to the appropriate EIM-A. A suitable marking should be arranged on the front panel. The line above the Type No. on each front panel can be used for marking. The numbering I, II or similar should be made there.

- (2)** Jumpers for the gain settings x10, x100 on the individual channels (Fig. 5 C). The module is normally supplied from the factory with these jumpers set to x10. The jumpers can be changed over to x100 if necessary.
- (3)** Jumpers on the connector for the suppression module (Fig. 5 D). If the suppression module is not connected up, the four jumpers must be set as shown at Fig. 5 D. If the suppression module is fitted, these four jumpers have to be removed in order to obtain space for the connector to this module. The 20-pin connector of the suppression module (EIM-S Type 673/1) is then fitted in place of the jumpers. (Note: observe the correct polarity! The "1" of the connector is marked with an arrow !)
- (4)** Jumpers for the signal outputs of the channels 1 to 4. Assignment of each of the output signals CH1 - CH4 to one of the analogue channels AV1 to AV16 of the system bus. Note that it is the centre pins which make the connection to the PLUGSYS bus. The setting shown in Fig. 5 E and F switches channel 1 (CH1) to the analogue bus line AV1. CH2 on AV2, CH3 on AV3 and CH4 on AV4.

Note: It is important to ensure that no AV line is linked to 2 channels since the outputs would then act in opposition to each other. This leads to interaction between the channels and signal distortion, and therefore large errors.

8. Faults, causes and remedies

No output signal at the recorder

Causes:

- cable not connected to recorder
- input cable not connected to EIM-B
- jumper AV1 - 16 set to the wrong AV channel
- connection made to wrong BNC socket on the EIM-B
- gain set too low
- recorder setting incorrect

Remedy:

- check cable connection from external unit to EIM-B
- is cable connected to the correct BNC socket?
- check recorder setting !
- check gain setting, check setting of switch "x0.5 x1 x2" and AMP trimmer

Amplitude of output signal too large

Causes:

- recorder setting incorrect
- gain on EIM-A set too high
- input signal too large

Remedy:

- check recorder setting
- check size of input signal to the recorder
- check size of input signal at the EIM-B
- check gain setting, check setting of switch "x0.5 x1 x2" and AMP trimmer. Check jumper setting

Interference between signals or superposition of inputs

Cause:

- duplicated connection to AV channels

Remedy:

- check channel connections
- check jumpers to Fig. 5 **E** and **F**. None of the AV lines must have two inputs.

Distortion of signals

Cause:

- duplicated connection to AV channels
- distorted input signal
- amplifier overloaded
- signal amplitude set too high

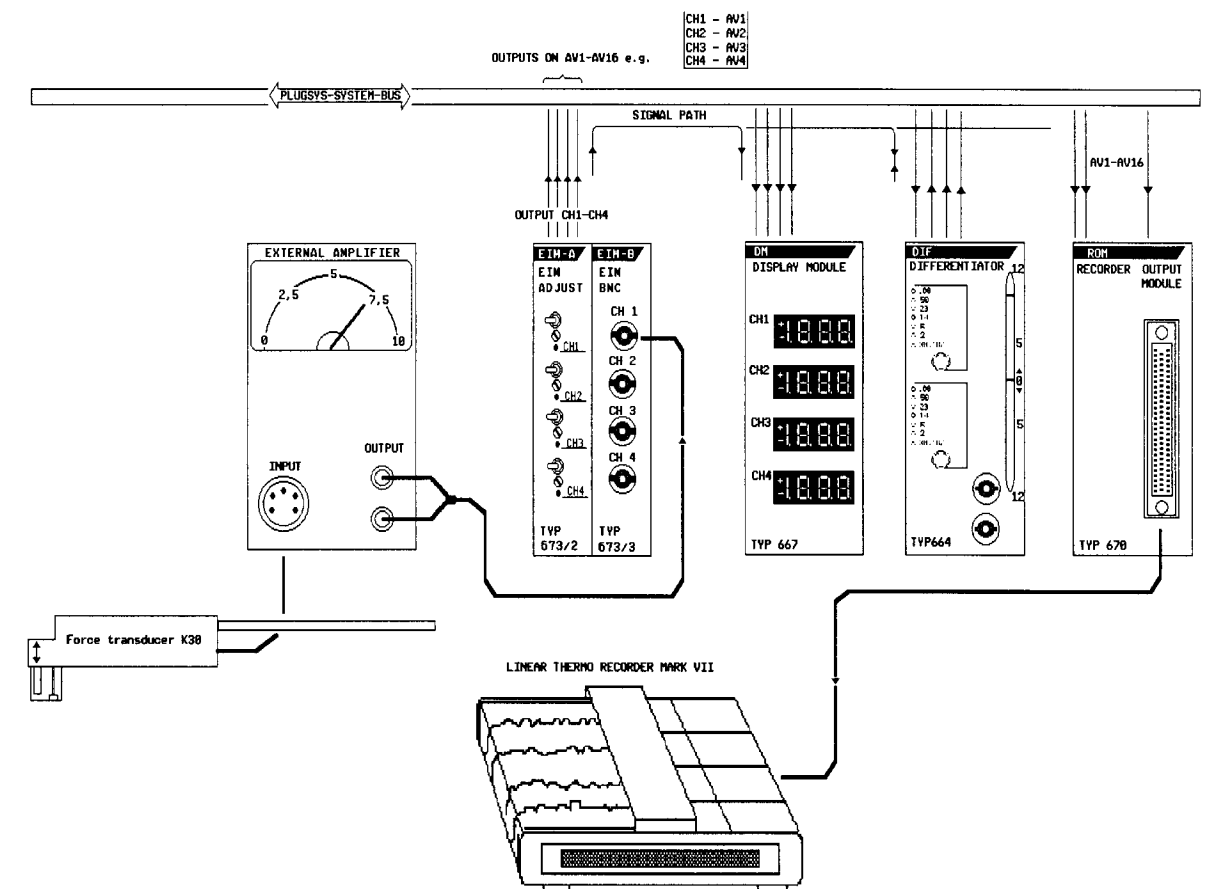
Remedy:

- check channel connections
- check jumpers to Fig. 5 **E** and **F**. None of the AV lines must have two inputs.
- check input signal with an oscilloscope
- check gain settings

9. Example of application

The application described below illustrates, using a bridge amplifier as example, how an external signal amplifier (e.g. bridge unit or flowmeter) can be connected to the PLUGSYS measuring system using the EIM Type 673.

- (1) The output signal of the external amplifier is connected to the input of the EIM-B (in this example to input CH-1).
- (2) The output signals of the EIM are fed into the PLUGSYS system bus on the analogue lines AV1 to AV4 in accordance with the jumper settings.
- (3) The four output signals of the EIM are connected through the PLUGSYS system bus to a DM Display Module Type 667 to monitor the external signals. The assignment of the AV lines to the four displays is made similarly by setting jumpers on the circuit board of the DM.
- (4) The differentiator module Type 664 as computing amplifier takes the signal from the system bus (CH1) and in turn feeds the computed output signal into the system bus.
- (5) All signal voltages AV1 to AV16 are passed from the ROM Recorder Output Module Type 670 through a common cable to the recorder.



10. Installing the EIM in the PLUGSYS housing

The function module EIM consists of the sub-modules EIM-A and EIM-B. It is independent of slot position and can therefore be fitted in any slot. The assignment of the outputs is selected on the module EIM-A through jumpers (see description of the jumper settings on the circuit board, Section 7.1).

- (1) Ensure first that the equipment is switched off. Remove the mains supply cable from the back of the housing.
- (2) Take off the front frame of the PLUGSYS housing. After removing the fixing screws (right and left side in the front frame) the frame can be taken off the housing (this step is omitted in the case of the rack housing). Remove the blank panels.
- (3) **Note:** before the module is fitted in its slot it is necessary to make the internal settings on the board of the function module.
- (4) The module EIM-A is inserted in the housing along the guide rails and secured in the housing with two fixing screws. The module EIM-B can be installed directly next to the module EIM-A or alternatively by means of an extra card on the back of a rack housing. If the module EIM-B is mounted on the front its front panel must be placed to the right next to the module EIM-A and linked up through the ribbon cable. (For rear mounting see Section 11.)
- (5) Fit the front frame back into position (omitted in the case of the rack housing).
- (6) Document the input and output signals.

11. Installation of the EIM-B on the rear of a rack housing

In the case of a rack housing it is possible to install the module EIM-B at the back of the housing by means of two extra cards. This transfers the input cables from the front of the housing to the back and an additional narrow slot becomes available at the front for each EIM-B. Either one or two EIM-B can be installed at the back. One of the extra cards has a separate input amplifier which is linked through a ribbon cable to the second card. This cable runs from the back of the unit and is plugged on a bus connector of the mother board. Next it is necessary to position 4 jumpers to select the signal lines. The connection of the rear EIM-B to the system bus and the EIM-A is provided by the X-lines of the PLUGSYS system bus. A maximum of 8 X-lines are available, of which four are used for each EIM-B.

11.1 Jumpers on the extra card

The connection of the rear-mounted EIM-B to the system bus and the front-mounted EIM-A is provided by the X-lines of the PLUGSYS system bus. A maximum of 8 X-lines are available, of which four are used for each EIM-B. The X-lines X1 to X4 should be used for the first EIM-B (Fig. 7 **C**), the X-lines X5 to X8 (Fig. 7 **B**) for the second EIM-B.

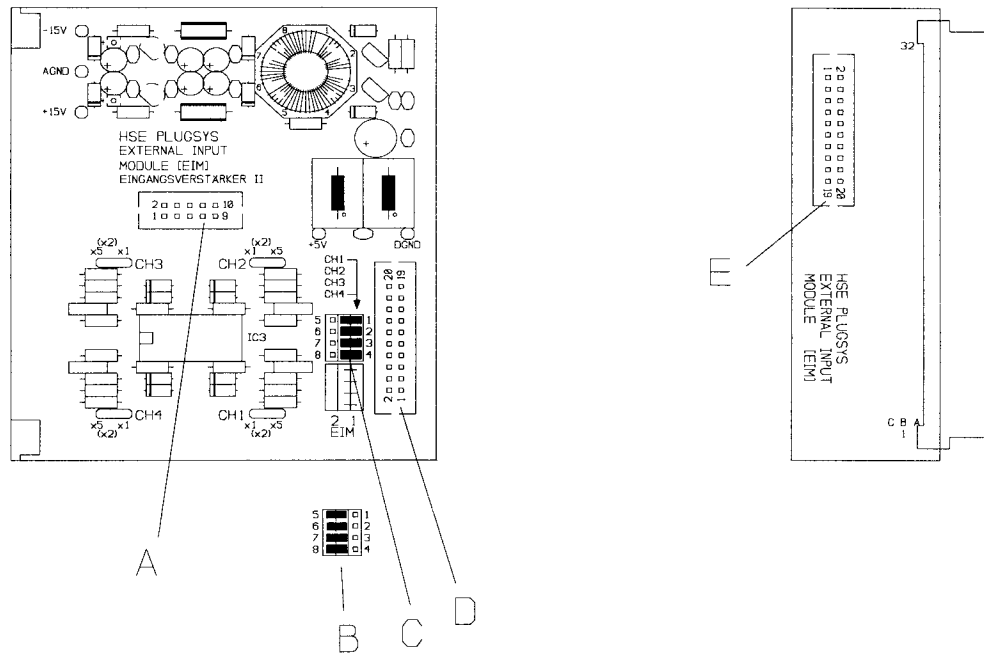


Fig. 7: Extra card 1

Extra card 2

11.2 Conversion EIM-B from the front to the rear of the housing

- (1) Switch off the unit, pull out the mains plug !
- (2) Release the top and bottom fixing screws on modules EIM-A and EIM-B, remove the screws and pull the modules out of the housing.
- (3) Separate the module EIM-B from the EIM-A by pulling of the connecting cable.
- (4) Screw the front panel of the EIM-B on the extra card 1 and connect the link cable to the connector (Fig. 7 **A**); observe the correct polarity (1 on the connector is marked with an arrow).
- (5) Position the jumpers according to Section 11.1.
- (6) Link the two extra cards with the ribbon cable supplied (Fig. 7 **D** with **E**). Observe the correct polarity.
- (7) Unscrew the blank panels on the back of the rack housing.
- (8) Plug the extra card 2 from the back on an unused connector of the bus board.

- (9) Fit the front panel of the EIM-B with the fixing screws.
- (10) Screw the blank panels on the rear back into position.
- (11) On the module EIM-A place the jumpers on the connector J5 from BU1 - BU4 to X1 - X4. When installing a second EIM-B place the jumpers from BU1 - BU4 to X5 - X8.
- (12) Insert the EIM-A into the housing and screw the front panel into position. Then screw the blank panels back into position.

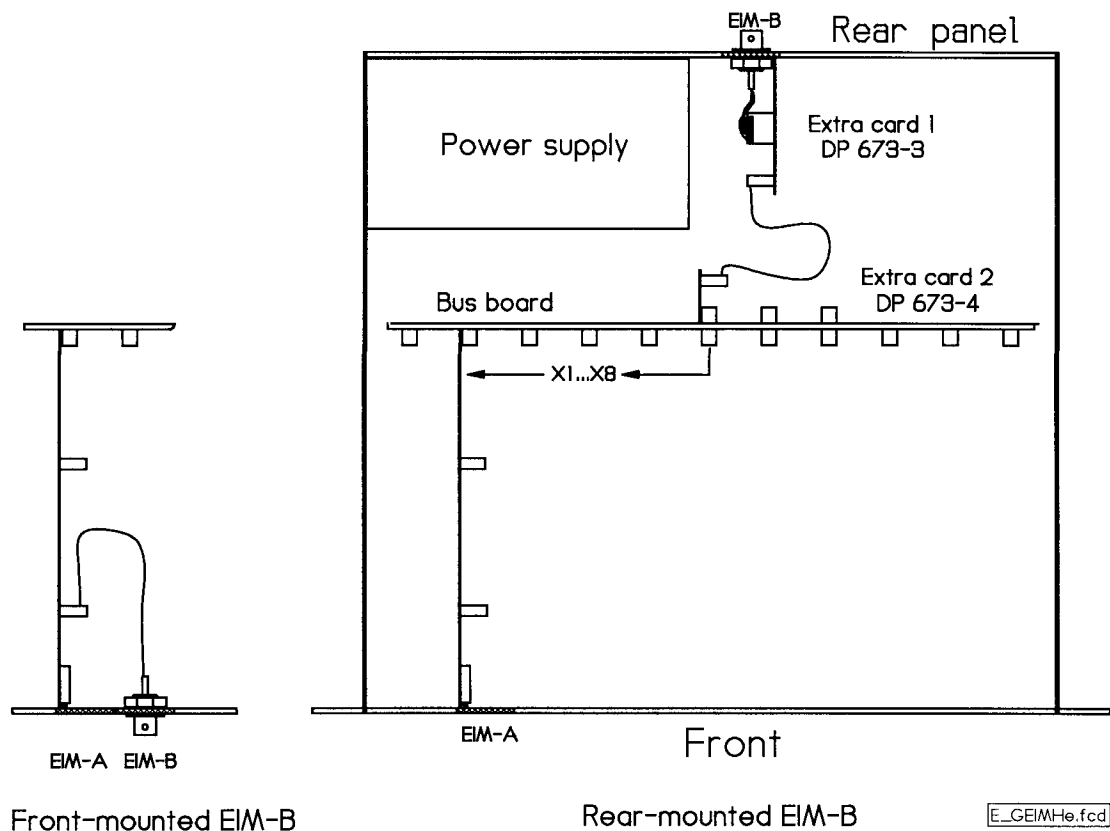


Fig. 8: Moving EIM-B from the front to the rear of the housing

12. Details of signal lines of the PLUGSYS system bus

12.1 Power supply

+5 Volt	Supply for the digital circuits and the DC - DC converters (for supplying analogue circuits).
D-GND	Reference zero of 5 Volt supply
A-GND	Reference zero of the analogue supply voltages and the input and output signals.
SHIELD	Ground (mains ground potential), only provided for screening. Do not use as ground connection.

Important: The reference zeroes of the individual voltages are connected together at a single central point on the terminator module inside the PLUGSYS housing (A-GND with D-GND with SHIELD, star ground connection).

12.2 Analogue signal bus lines (AV1 to AV16)

The analogue signal lines AV1 to AV16 (analogue bus) are used as input and output lines between the function modules of the PLUGSYS measuring system. The maximum signal voltage is ± 10 Volt. The assignment of the inputs and outputs is determined by jumpers on the function modules. The operation of the modules is therefore independent of the slot position on the system bus.

12.3 Analogue multiplex signal output (AM)

Analogue output signal ± 10 Volt. A key (MUX ON) on the front panel of the module is used to pass the output signal of the amplifier circuits to the AM (Analogue Multimeter) signal line. The key function is self-maintained. The line RDVM (Reset Digital Voltmeter Multiplex) is activated at the same time to ensure that the circuit which had been selected previously releases the AM (Analogue Multiplex) signal line. This provision allows the output signals of the individual amplifier circuits to be switched to a central analogue or digital display unit (e.g. DVM Digital Voltmeter module of the PLUGSYS). When the equipment is switched on, a POWER-UP RESET signal is generated which disconnects all analogue multiplex outputs.

13. The 96-pin connector to the PLUGSYS system bus

VG connector, 96-pin, rows a, b and c used

Row a	Pin No.	Row b	Pin No.	Row c
D-GND	1	D-GND	1	D-GND
A-GND	2	A-GND	2	A-GND
+ ANALOG	3	+ ANALOG	3	+ ANALOG
- ANALOG	4	- ANALOG	4	- ANALOG
DB-0	5	DAV	5	TRIGGER 1
DB-1	6	NRFD	6	TRIGGER 2
DB-2	7	NDAC	7	TRIGGER 3
DB-3	8	R/W	8	TRIGGER 4
DB-4	9	DS-1	9	RDVM
DB-5	10	B-INT	10	AM
DB-6	11	DV-1	11	AV-1
DB-7	12	DV-2	12	AV-2
CS-0	13	DV-3	13	AV-3
CS-1	14	DV-4	14	AV-4
CS-2	15	DV-5	15	AV-5
CS-3	16	DV-6	16	AV-6
GS-0	17	DV-7	17	AV-7
GS-1	18	DV-8	18	AV-8
GS-2	19	DV-9	19	AV-9
DS-2	20	DV-10	20	AV-10
/RESET	21	DV-11	21	AV-11
TAKT	22	DV-12	22	AV-12
X-1	23	X-6	23	AV-13
X-2	24	X-7	24	AV-14
X-3	25	X-8	25	AV-15
X-4	26	X-9	26	AV-16
X-5	27	X-10	27	CAL
POWER-0	28	POWER-0	28	POWER-0
POWER-1	29	POWER-1	29	POWER-1
POWER-2	30	POWER-2	30	POWER-2
SHIELD	31	SHIELD	31	SHIELD
+5 VOLT	32	+5 VOLT	32	+5 VOLT

14. Maintenance and cleaning

The PLUGSYS module does not really require any maintenance. The front panel can be cleaned if necessary with a moist cloth (not too wet). It is safer to pull out the mains plug before cleaning !

The PLUGSYS housing should be protected against splash water and saline solutions, otherwise there is a danger of damage to some of the components and a possibility of short-circuit !

15. Transport and storage

In order to avoid damage during transport in case the unit has to be returned to the factory the PLUGSYS housing should be packed inside a suitably large carton (the carton should be somewhat larger so that sufficient padding such a polystyrene, foam rubber and similar can be placed around the housing to absorb any shocks). When forwarding individual modules it is important that they are also carefully packed, preferably in an anti-static foil or bag.

16. CE Declaration of Conformity



This product and accessories conform to the requirements of the Low-voltage Directive 73/23 EEC as well as the EMC Directive 89/336 EEC and are accordingly marked with the CE mark. For conformity to the standards during operation it is essential that the details in the instructions provided are observed.

17. Technical data

Inputs	4 signal inputs through BNC sockets on the front panel of module EIM-B. The maximum input signal voltage is ± 10 Volt with an input impedance of 100 kOhm.
Gain	adjustable 0.25x to 100x through switch x0.5, x1, x2 and multi-turn trimmer on the front panel, also 10x - 100x changeover through jumpers on the circuit board, corresponding to a maximum input voltage range of ± 0.1 to 10 Volt
Outputs	the signal outputs are fed through jumpers on the circuit board directly into the bus board of the PLUGSYS measuring system. The output impedance is 100 Ohm.
Supply	+5 Volt 300 mA from the PLUGSYS measuring system
Ambient conditions	operating temperature: 10 to 40°C rel. humidity: 20 to 80%, no condensation storage temperature: -20 to +60°C

Mechanical data

Dimensions	two 19 inch plug-in modules width 2 x 4 E (20.2 mm) height 3 U (127.5 mm) depth Euroboard (220 mm)
Connector	DIN 41612, 96-pin, VG
Weight	170 g
Accessories	4 input cables, 1 small screwdriver and Operating Instructions