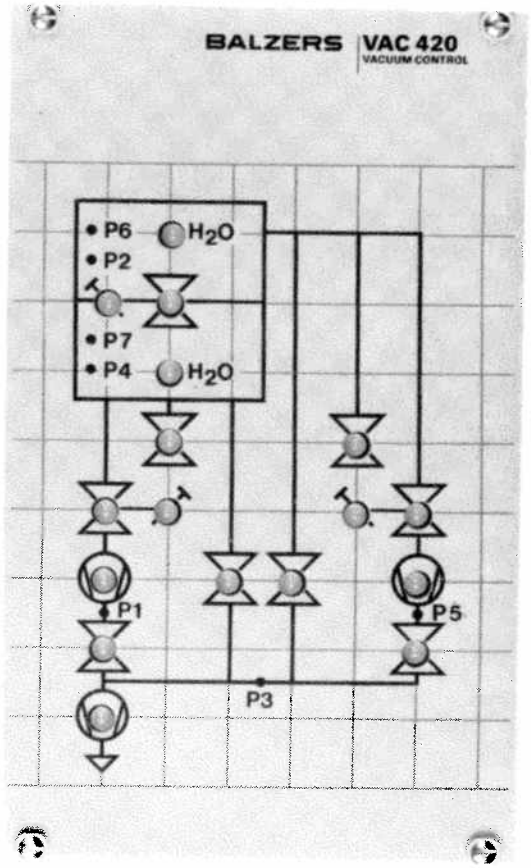
BALZERS

OPERATING INSTRUCTIONS

MIMIC-DIAGRAM MD 420

TABLE OF CONTENTS:



Comment: This photo is just one example of many possibilities.

1. INTRODUCTION

The mimic diagram "MD 420" is used for representing process sequences by means of a mimic panel and LEDs.

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BG 800 196 BE

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2. CHARACTERISTICS

- Up to 32 process stations indicatable with 2-color LEDs, or
  Up to 64 process stations indicatable with 1-color LEDs

- 2-Color LEDs with green/red indication

3. SPECIFICATIONS

Designation:	MD 420 Diagram No. BG 541 193 -S (2-color LEDs) Diagram No. BG 541 194 -S (1-color LEDs)
Dimensions:	116 x 173 mm
Power input:	+5V +/- 5% / max. 300mA (external supply)
Addressing range:	I/O page according to setting on MM 420
Register:	2 Registers with 8 bits each, write only
Data transfer:	8 bits (lower byte), write only
Connector J1:	Multipoint connector for indirect SCOTCHFLEX ribbon cable connection, 16 pins.
Faston +5V;GND:	Power inlet (min. 0.25 mm2)

4. DESCRIPTION

(Refer to block diagram in the Appendix)
The mimic diagram contains the electronics for controlling up to 64 LEDs.
It is connected to the bus system via the console CS 420.
The mimic diagram is controlled by an integrated LED driver system. It contains an 8x8 RAM memory for storing the process states to be displayed in an 8x8 LED matrix.

5. CONFIGURATION

5.1 Factory setting

The device address is set on the MM 420 in conjunction with the keyboard.
-> Mimic diagram address: 175 044....175 046

5.2 LED configuration

The LED configuration depends on the mimic diagram to be represented and can be found in the corresponding layout drawing.

6. INSTALLATION

6.1 Installation in the SC-420

The MD 420 is installed on the front of the chassis, next to the console.

6.2 Connections

For pin assignment refer to diagram BG 541192-S.

- Connector J1: Connection of the 16-conductor flat cable to the multifunction modules MM 420.

- Faston +5V; GND: Connection of the +5V supply voltage from the terminal block on the BS 420.

7. PROGRAMING

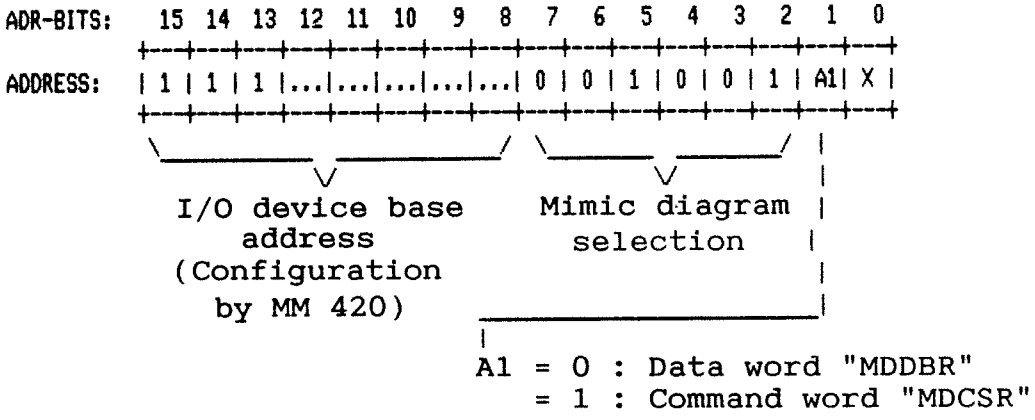
(Refer to block diagram in the appendix)
The mimic diagram or the LED driver system respectively work with two 8-bit write-only registers, a DATA REGISTER MDDBR, and a COMMAND REGISTER MDCSR.

- Command register:
  The command register stores the transmitted command word and initiates the commands contained therein.

- Data register:
  The data register actually consists of an 8x8 bit RAM memory in which the states of LEDs or processes are stored in an 8x8 matrix. The data word contains the row information of an entire matrix column. It is generated with an internal address counter which increments automatically by one for each data word operation and which is automatically reset to "0" for each command word operation.
  When new data are to be entered into the memory, the complete matrix must always be rewritten and this function be initiated with a command word (for resetting the address counter). This must be followed sequentially by the data words for columns 0..7. At the start of a data exchange, the mimic diagram is switched off (dark) and only switched on again after the last data word (column 7). A data exchange that has been started can be terminated and be displayed.

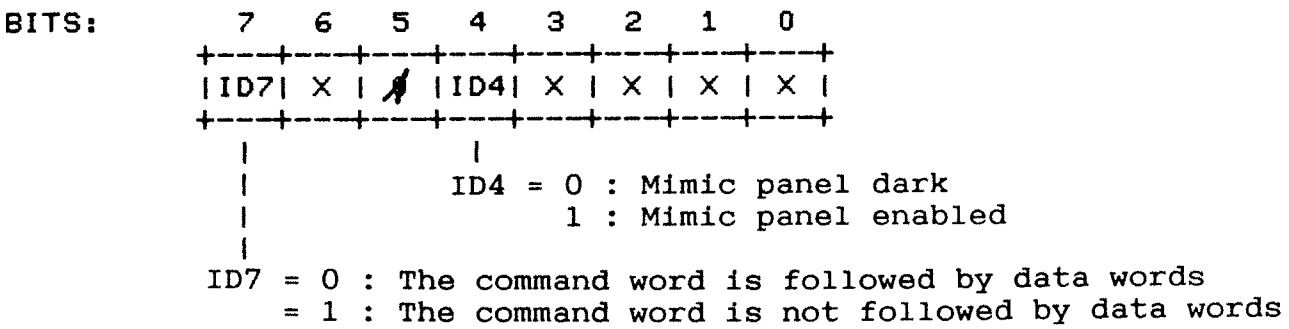
7.1. Addressing

The addresses are decoded on the MM 420 in conjunction with the keyboard. The address block is split up on the console with the address bit "A2".



7.2. Command word "MDCSR"

The command word has an 8-bit format (lower byte) and is "write-only". It determines the operating mode of the LED driver system and automatically resets the RAM address counter (column indicator) to zero for each output.



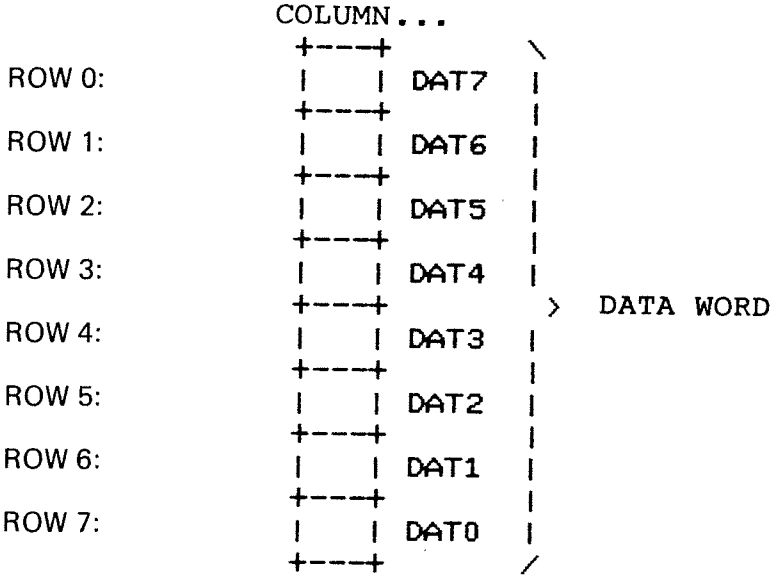
Note : A read of the command word address is feasible, however it supplies invalid data.

7.3. Data word "MDDBR"

The data word has an 8-bit format (lower byte) and is write-only. It contains the row information of a LED column. The LED assignment in the mimic diagram corresponds programmatically to the corresponding position in the matrix.

- Single-color LEDs:
  If single-color LEDs are used, the diode number in the configuration drawing also corresponds to the matrix position.
  Diode number: "D 25"
  II__row number
  I___column number

- Two-color LEDs:
  When two-color LEDs are used, the position in the matrix must be determined based on the configuration drawing and the diagram. From a programming viewpoint, two-color LEDs are treated as two separate single-color LEDs, i.e. the colors red and green have different position numbers in the matrix. The row position remains the same for both colors, however the column number for the color GREEN is higher by one than the column for RED.
  E.g. D1: -> Color red = position "00"
  Color green = position "10"
  II__row number
  I___column number



1 = LED ON
0 = LED OFF

Note: A read of the command word address is feasible, however it supplies invalid data.

8. MAINTENANCE

8.1. Periodic maintenance

The MD 420 requires no maintenance.

8.2. Troubleshooting

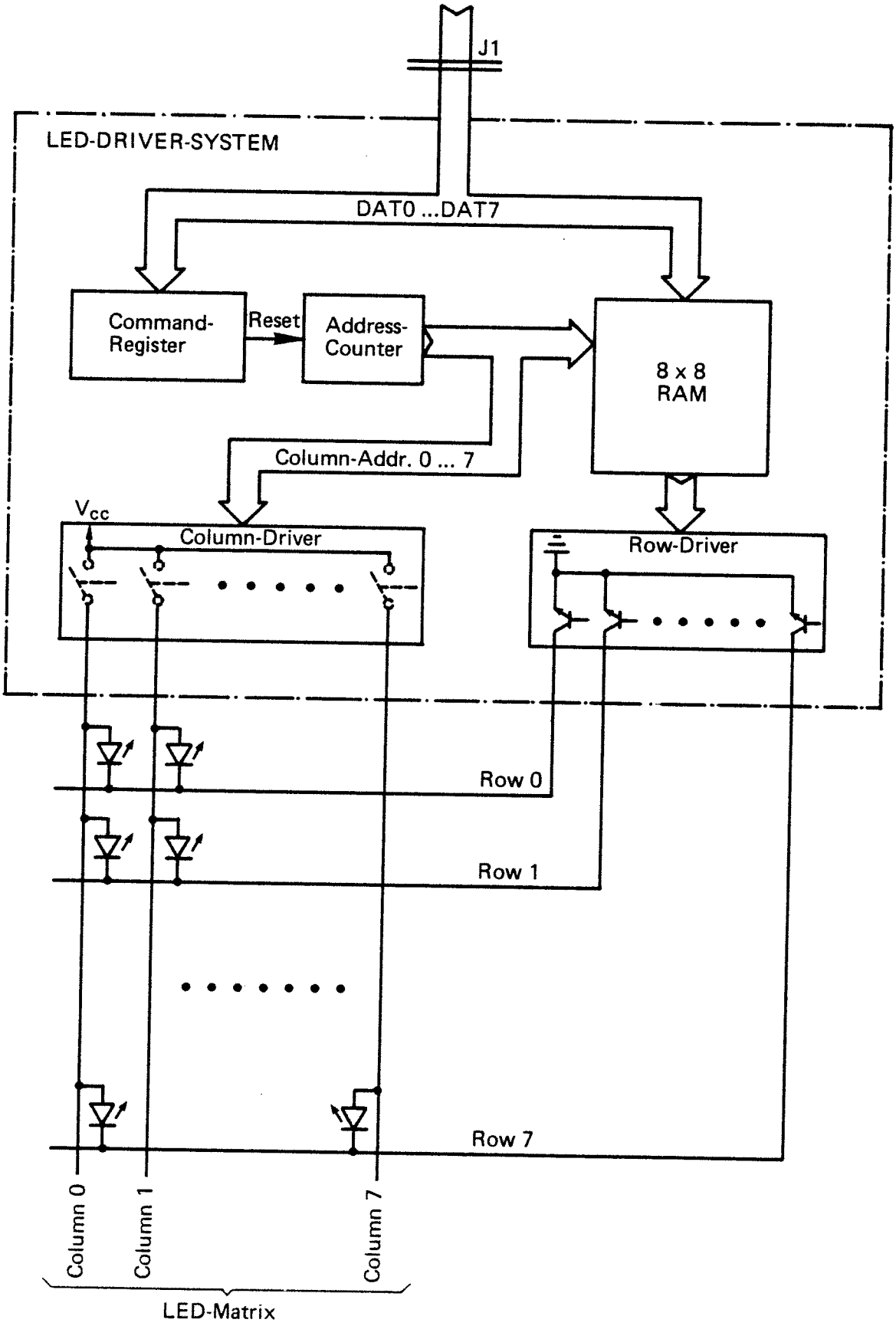
If the complete mimic panel is dead, the connections to the console and the power supply should be checked first.
For testing individual LEDs, a service module is included in certain program packages. On units without service mode, the individual LEDs can be readily tested by means of an ODT.

9. DETAILED DESCRIPTION

(Refer to diagram BG 541 193 -S as well as the block diagram in the appendix)

Power to the MD 420 must be supplied separately from an external source to the Faston pins.
The control and data signals for the LED driver system N1 are supplied directly from the console via the flat cable. The select signal "CS-MD L" is prepared on the console together with the inversion of the data line "DAT 7 L" in order to obtain a uniform data word for controlling all LEDs.
The address line "ADR 1H" is used for differentiating between command and data words (high = command word) and is connected directly to the LED driver system.
The LEDs are controlled in multiplex mode, i.e. each column is connected individually to the supply voltage and the LEDs to be controlled are turned on via the rows. This process is cyclically repeated for each column until it is stopped with a new command word, and reenabled after completion of the data exchange.

APPENDIX A: block diagram MD-420

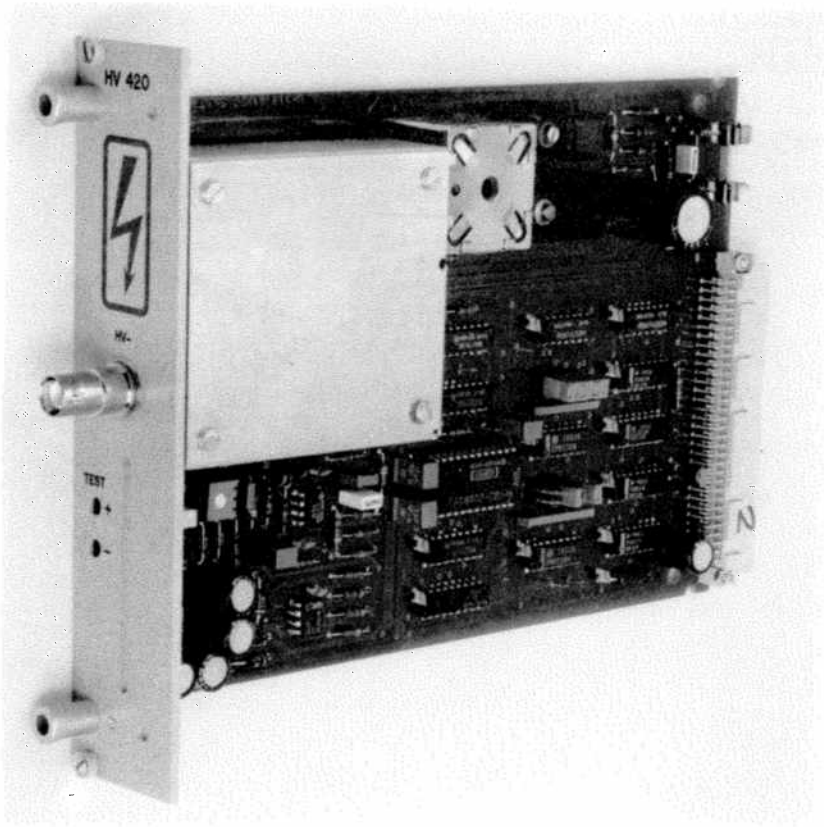


BALZERS

OPERATING INSTRUCTIONS

SEM High voltage supply — HV 420

TABLE OF CONTENTS:



1. INTRODUCTION

The HV 420 plug-in pc board produces the high voltage required by the SEM secondary electron multiplier in the quadrupole mass spectrometer. Its bus interface allows the high voltage value to be programmed and the status to be queried.

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BG 800 230 BE

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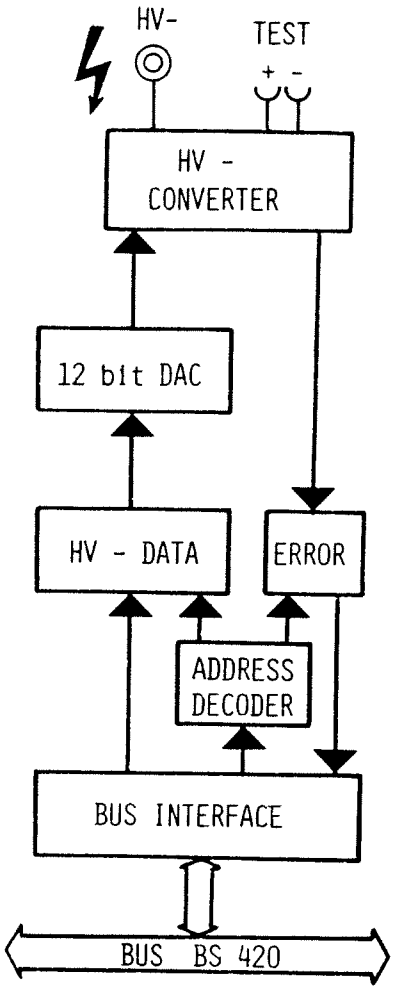
2. FEATURES

- Generation of 0 ... -3.5 kV of high voltage for the SEM
- 12 bit D/A converter
- 1 V/bit resolution
- Automatic initialization
- Fault report in the event of an overload
- Current limitation to protect the HV 420 and the SEM

3. SPECIFICATION

General	
Designation	HV 420
Schematic-Diagram Nr.	BG 541 330 -S
Parts list Nr. (Order Nr.)	BG 546 040 -T
Drawing Nr.	BG 546 041 -Z
Board format	SC 420
Space requirements	2 slots
Fuse F1	200 mA slow blowing
Voltage supply	5 V typ 0.4 A +24 V max. 0.15 A -24 V max. 0.05 A
Bus interface	
Addressing range	whole I/O page
Bus load	1 DC / 1 AC load
Register	1 word HVDAER (HV DAta/ERror)
Data format	12 bit "unsigned"
Data transfer	DATO/DATI, no byte transfers
Initialization	BINIT sets HV to 0 V
HV output	
Output voltage	0 V ... -3500 V referred to QMA-GND
Resolution	1 V / bit
Setting time	0.8 s to 0.1 %
Noise/ripple	< 10 mVpp
Permissible load	> 15 MOhm
Current limitation	< 1 mA
Inner resistance	620 kOhm
Ground	to QMA (via HV cable)
Potential separation	100 Ohm / 0.5 V max. between chassis and QMA-GND.
Connector	SHV type.
HV test connection	+1 V / -1 kV, inner resistance 2 kOhm

4. DESCRIPTION



The data received from the bus interface are stored in the HV-DATA register and converted to an analog signal in the 12 bit DAC. This signal is used to control the HV converter.

The HV converter converts the +24 V to the regulated high voltage "HV-".

The high voltage, divided by 1000 and inverted, is applied to the "Test" output.

This allows the high voltage to be tested with a simple voltmeter (+1 V readout for -1 kV).

In the event of an overload, the HV generator produces an error signal which can be read at any time from the bus interface.

5. CONFIGURATION

Refer to layout plan for the jumper positions. (Appendix A).

5.1 Factory configuration

HV 420 standard address:

Address octal	Jumpers A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1
175400	OUT	OUT	IN	OUT	OUT	IN	IN	IN	IN	IN	IN	IN

5.2 Addressing

The HV 420 can be addressed in the entire I/O address range (160000 ..... 177776)

Jumpers A1 ... A12 are used to assign the address.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bits
1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	0	Address
–	–	–	A	A	A	A	A	A	A	A	A	A	A	A	–	Jumper-
–	–	–	12	11	10	9	8	7	6	5	4	3	2	1	–	Nr.

Address bit = 0 : Jumper inserted
= 1 : Jumper not inserted

6. INSTALLATION

WARNINGS

Before undertaking any manipulations on the HV 420, be sure that the control unit has been disconnected from the mains power and that any external voltage sources have also been disconnected.

The HV 420 runs on fatal levels of high voltage. When operating this unit, care must be taken that the pc board and the components mounted cannot be touched.

Read and observe the instructions in the section "installing modules" in the SC 420 operating instructions

The HV 420 interrupts the BIAK/DAM chain. For this reason it must always be installed after the interrupt/DMA-capable modules.

7. PROGRAMMING

The HV 420 interface consists of the HVDAER data/error register. The set point for the high voltage is written in the HVDAER by the DATO transfer.

HVDATA = HV + 80

HVDATA: set point to be entered
HV : high voltage in volts (0 ... 3500 V, unsigned)
80 : 80 V zero point offset

The offset makes sure that the generator is turned off during the initialization or when HVDATA = 0.

HVDAER (175400)																Address
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit Nr.
x	x	x	x	0	0	0	0	0	0	0	0	0	0	0	0	0 V (^0)
x	x	x	x	.	.	.	.	.	.	.	.	.	.	.	.	...
x	x	x	x	.	.	.	.	.	.	.	.	.	.	.	.	Offset
x	x	x	x	.	.	.	.	.	.	.	.	.	.	.	.	...
x	x	x	x	0	0	0	0	0	1	0	1	0	0	0	0	0 V (^120)
x	x	x	x	0	0	0	0	0	1	0	1	0	0	0	1	-1 V (^121)
x	x	x	x	.	.	.	.	.	.	.	.	.	.	.	.	...
x	x	x	x	.	.	.	.	.	.	.	.	.	.	.	.	...
x	x	x	x	1	1	0	1	1	1	1	1	1	1	0	0	-3,5 kV (^6774)

Comments: – x = irrelevant
– (^ ...) = octal value
– HBDATA > 3.5 kV can trigger error report

The status of the error flag can be read with DATI

HVDAER (175400)																Address
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit Nr.
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	HV o.k.
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	HV Error

HV error means: – output is overloaded
– the set point has not been reached
– defect in the HV 420

8. MAINTENANCE

Remove all dust by carefully blowing out with compressed air. How often this must be done depends on the operating conditions.

8.1 Troubleshooting

Applies for the QMS 420 (with CS 420 console, Program Nr. BG 528 810 -T)

WARNING

Before any manipulations are undertaken on the HV 420, the unit must be disconnected from the mains power supply. External voltage sources must also be definitely disconnected. The module produces dangerous levels of high voltage.

Procedure when the **HV 420 ERROR display appears**

- Turn off the QMS 420 (Power OFF)
- Remove plug connector "HV-" from the back panel
- Turn on the QMS 420 (Power ON)
- Program the SEM voltage to the desired value
- SEM ON
- If the "HV 420 ERROR** is no longer displayed, check the connection cable, the plugs and the SEM for resistance (> 15 MOhm, at 3.5 kV).

When the **HV 420 ERROR message is still displayed:**

- Connect a voltmeter (Ri > 100 kOhm) to the "test" recepticle
- Compare the voltmeter reading with the SEM voltage entered (1 V for -1 kV).
- If there is no output voltage, check fuse F1 on the HV 420.
- If the read out is correct, the fault is in the HV 420.
- If the read out is too low, the fault is in the HV 420.

Procedure whtn the **HV 420 ERROR does not appear:**

- If there is suspicion that the HV 420 has failed, such as in the case of poor SEM sensitivity, check the set point and the "test" connection output as described above. If there is a deviation, the HV 420 is faulty.
- There is also the (slight) possibility that the high voltage is not ok even when the above test is ok. This can be checked by making a direct measurement on the "HV-" recepticle. Use an instrument suited for -5 kV (Ri > 15 MOhm) and proceed with the **necessary caution!!!!**

9. DETAILED DESCTIPTION

(see diagram BG 541 330 -S)

BUS INTERFACE:

The bus interface consists of bus transveiver N3, bus receivers N2, N4, N5 as well as the reply generation. EN-DRIVE switches N3 to transmit when an error query is made. BRPLY is generated by STATUS-IN or HVDATA.

ADDRESS DECODER:

With the HV 420 address the decoders (N7 and N8) generate the ADR-MATCH signal. This, together with SYNCH and the output from the BS7 flip flop form HVDAER (TP7).

HV DATA register:

Consists of N10, N12 and N13 and stores the DAL0 ... DAL11 data upon receipt of a HVDATA impulse. HVDATA is formed from DOUT and HVDAER.

ERROR register:

The D- flip flop (N9) serves as the register. It stores the error signal upon receipt of STATUS-IN and transmits it as DAT0 to the BUS transceiver (N3). The STATUS IN impulse occurs at N6/6 from DIN and HVDAER.

D/A CONVERTER:

The 12 bit DAC (N11) converts the data stored in the HV-DATA register into a corresponding VOUT analog signal (TP 18). Resistor R5 determines the -0.2 V offset voltage. The VOUT output voltage is between -0.2 ... +9.8 V.

SERVO AMPLIFIER:

Designed as a PID controller, it compares the divided and filtered reference voltage (VOUT) at TP1 and the HV-VALUE actual value and uses the result to control the CONVERTER.

ERROR DETECTOR:

The error detector monitors the output voltage from the servo amplifier. If +10.6 V is exceeded, it sends an ERROR signal to ERROR-FF.

CONVERTER:

This a controllable, self-oscillating push-pull converter. Its frequency is approx. 35 kHz. The amplitude is controlled by the servo amplifier by varying the base current of H3 and H4.

SHORT CIRCUIT PROTECTION:

This circuit minitors the current flowing through R18 into the primary winding of T1. It limits the current to approx. 110 mA by reducing the converter drive current.

OUTPUT FILTER:

Consists of a voltage doubler made up of C16, D6, C7 and C17 as well as a following RC low pass and protective resistor R30.

R35, C22, D10 and D11 determine the reference potential and serve as a protective circuit.

MEASURE AMPLIFIER:

This is a differential amplifier which divides the output voltage by 1000. It suppresses ground potential differences between Analog-GND and QMA GND.

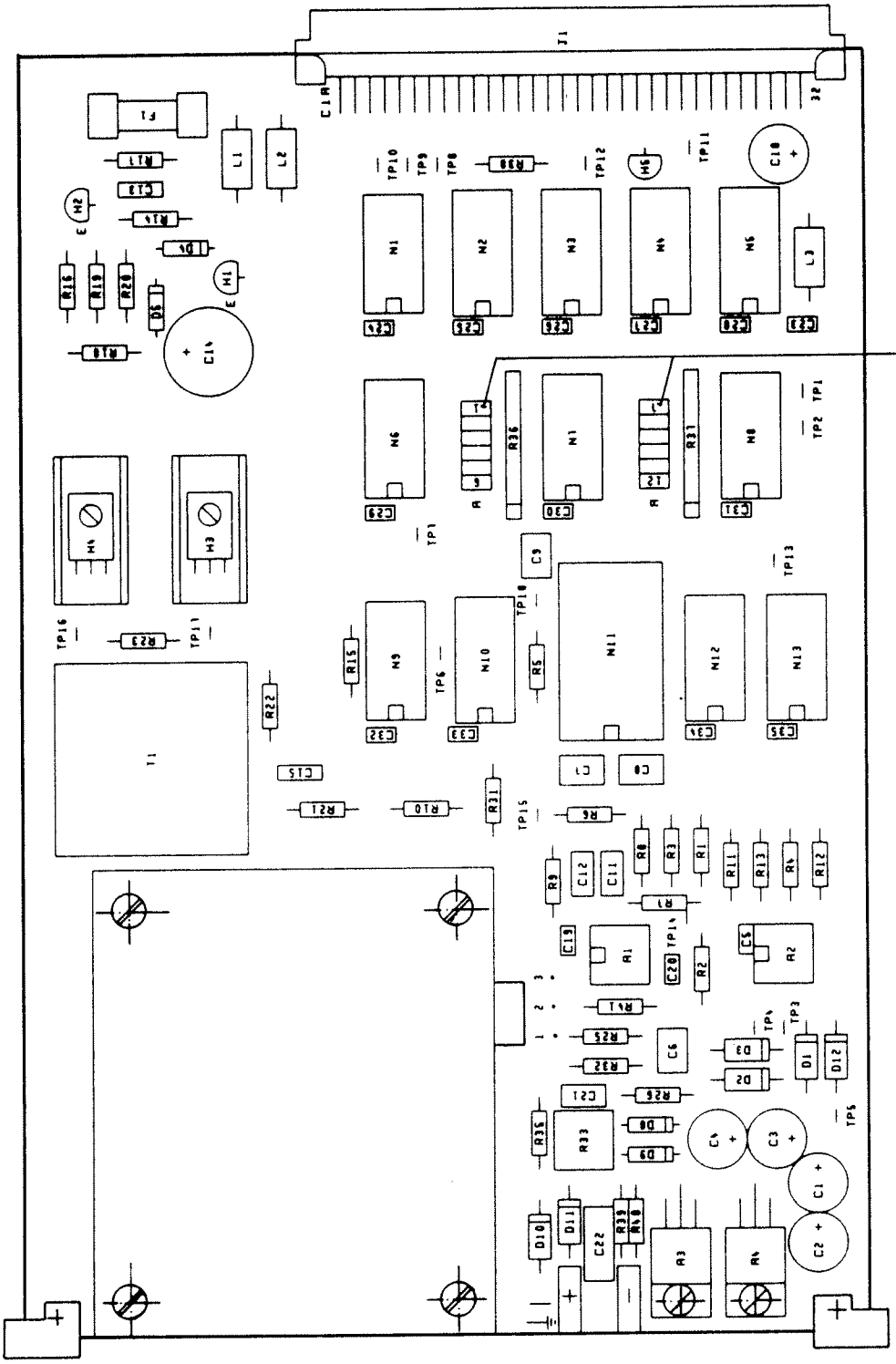
The high voltage can be adjusted to -3.5 kV with 3.5 V at the TEST recepticle by the GAIN trimmer.

+/- 15 V REGULATOR:

The +/- 15 V voltage for the analog part is produced by the series regulators N1 and N2 from the +/- 24 V voltage supply.

10. ACCESSORIES

- SEM cable, length 3 m: BG 541 978 -T
- SEV cable, length 10 m: BG 541 979 -T


Address-
Jumpers