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DEFLECTION CONTROL

ASG 04

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I. EQUIPMENT DESCRIPTION

1. General

Use :

The Deflection Control ASG 04 generates the control voltages for deflection units. The output signal levels range up to ± 10 V DC and AC for the X and Y deflection.

By means of the Modules AFB 01 or AFB 02 a remote control is possible. Furthermore all functions of the control equipment can be operated in position "Automatik" by an appropriate computer.

Another Auxiliary Module ASV 01 is provided for the two-component evaporation by one gun.

2. Function

2.1 Main Printed Circuit Board AGE 1 :

The Main Printed Circuit Board AGE 1 is containing all elements required for generating the DC deflection signals.

This comprises the adjustment potentiometers for the X and Y DC voltage signals, the ± 10 V voltage regulator. Four adjustment potentiometers allow for limiting the output signals in ± X and ± Y direction.

Furthermore provisions are made for two differential inputs for external signal sources, the levels optionally being ± 10 V or ± 20 mA.

There is also an input for switch-over to remote control.

2.2 Sub-Board AFG 1 : (Function Generator)

On this board a delta wave function and derived from that a sine wave function is generated. The VCO (A2) (voltage controlled oscillator) is serving as oscillator. By "Hand" (manual) operation the frequency can be selected by means of the adjustment potentiometer behind the front panel. If operation is done in mode "Automatik", the frequency selection is effected via computer input.

The frequency variation feasible is approximately 1 : 40 whereby the capacitors C_4 and C_3 are determining the range. (By C_4 = 1500 pF f is approximately 10...400 Hz.)

If the Solder Bridge LB1b is closed, the oscillator feeds the Binary Counter A1, the outputs of which control the digital-to-analog converter A6. At the output of A6 is a stepped delta function of $\pm$ 10 V max. value with a resolution of 128 steps. By means of a buffer amplifier and a sine former, respectively, selectable by S1, the output can be a delta or sine function.

If an oscillator is used for each X and Y direction, rectangular surfaces can be illuminated by the electron-beam.

Very often, however, circular deflection functions are required. In this case the Y function generator is also fed by the oscillator of the X generator. Doing that the Solder Jumper LB 1a in the Y generator has to be closed. In addition LB4 has to be jumpered, if a 90° synchronous pulse is to be coupled. As the sine forming is independent of the frequency, the 90° phase shift between X and Y voltage is always guaranteed.

2.2.1 Sub-Board AFG 2

This sub-board was developed for simple deflection applications allowing for an oscillation in X and Y direction. As the functions originate from one generator, a 90° phase shift for circular deflection functions is implemented. The frequency range with the components mounted as mentioned above is 25 Hz....1 kHz.

2.3 Sub-Board ARE 1
(Computer Input Board)

On Board ARE 1 there are the computer control inputs. These inputs are provided for X and Y DC and AC deflection. Additionally setting the limits in both directions is possible. The oscillator frequencies f_x and f_y are also controllable by the computer.

2.4 Sub-Board AHK 1
(High Voltage Compensation)

Sub-Board AHK 1 is used if an automatic correction of the deflection is required for deviations of the high voltage supply. By means of the actual value of the high voltage the deflection voltage is influenced accordingly by a compensation circuitry.

In this case the Solder Jumpers LB4 and LB 7 on the Main Printed Circuit Board AGE 1 have to be removed.

3. Auxiliary Equipment

3.1 Remote Control AFB 01

If changing over from one working position (e.g. heating of fusing bath) to another (e.g. fusing of electrode) is required, it can be done by the Auxiliary Module AFB 01. Apart from the frequency adjustment all operating elements for X and Y deflection are available in the same order as on the Control Module ASG 04. By grounding the output d13 of ASG 04 the control is switched to take over the target values of the front panel of AFB 01.

3.2 Remote Control AFB 02

The function of this remote control is the same as of AFB 01. However, the front panel operating elements are replaced by a little control box provided with front panel connector and interconnecting cable.

3.3 ASV 01, so called Bounce Module

If a gun is used for simultaneous material processing in two positions, the Module ASV 01 serves for switching over between the Deflector Control Module ASG 04 and the Remote Control Module AFB 01. It is generating square control pulses of adjustable frequency (approximately 10 to 100 Hz) and variable pulse width. By this module the energy distribution between two positions can be continuously varied by turning the knob t_A / t_B.

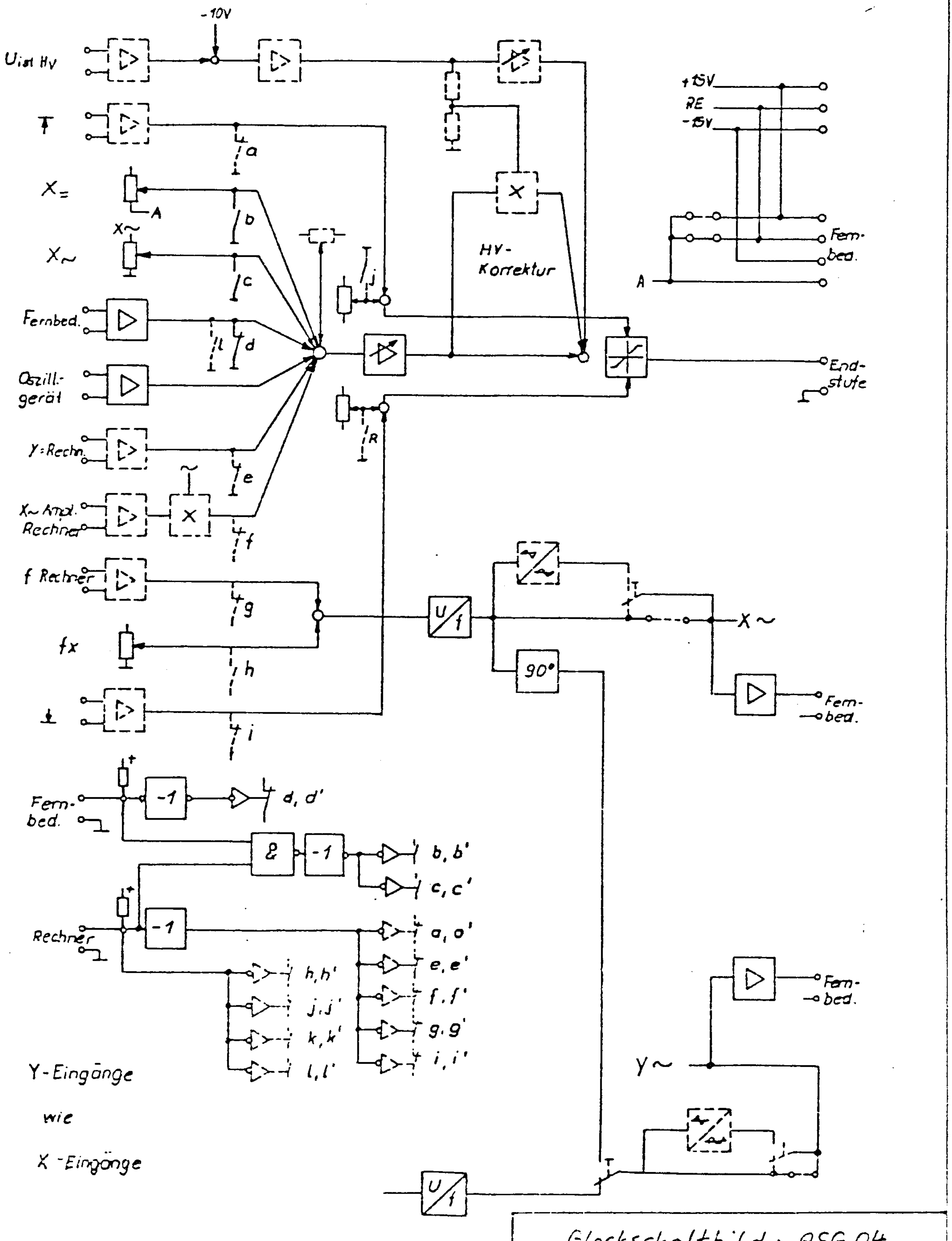
4. Technical Data

4.1 Electrical Data

Positive supply voltage		+ 15 $V_=$	
current	approx.	100 mA	
Negative supply voltage		- 15 $V_=$	
current	approx.	60 mA	
Analog output current load up to max.		± 5 mA	
Digital input manual/remote control		+ 10...+24 $V_=$ 0...+ 6 $V_=$	"Hand" "Fernbedienung"
Digital input manual/automatic		+ 10...+24 $V_=$ 0...+ 6 $V_=$	"Hand" "Automatik"
Power dissipation	approx.	2.5 W	
Temperature range		0...50° C	

4.2 Mechanical Data

Front panel	12 TE ≙ 60.96 mm width 128.40 mm height
PCB Europa format with 48-pin connector, type F according to DIN 41 612	100 x 160 mm



Blockschaltbild: ASG 04

II. OPERATING INSTRUCTIONS

1. Main Printed Circuit Board AGE 1 :

The main PCB provides all elements for a DC controlled deflection.

By means of two Solder Jumpers, LB1 on PCB AGE 1 and Lb 1 on Potentiometer Board APT 1 the deflection range can be set. Jumpering "a" means a range of 0...10 V and jumpering "b" means a variation range of -10...+10 V. The internal adjustment potentiometers are pre-aligned. Fine adjustment of the X calibration point can be done by R10 and of the Y calibration point by R9, whereby the X and Y Front Panel Control R1 has to be set to zero.

The alignment of the X end-scale deflection can be effected on R6, for the Y end-scale deflection on R5 provided that the X and Y Front Panel Controls R1 are set on maximum deflection and on the required deflection, respectively.

The Solder Jumpers Lb 4 and Lb 7 are closed. (They are only to be opened when using the PCB AHK 1 - high voltage compensation.) Likewise the Solder Jumpers Lb6 and Lb5 are closed. (They are only to be opened if the PCB ARE 1 computer input is inserted.) By means of the Adjustment Potentiometer R11 the negative limit value and by R12 the positive limit value are adjusted.

The Y limit value is effected on the positive side on R 17 and on the negative side on R18. The limit range varies on either side between approximately 2 V and 12.5 V. Measuring of the output voltages at Connector X1 can be done at Pin b6 (X output) against Pin b8 (ground) and at Pin d6 (Y output) against Pin d8 (ground).

2. Sub-Board AFG 1 :

The sub-board "Funktionsgenerator" (function generator) generates a delta wave function, a sine wave function, and when LB5 is open, both functions in a way similar to the full wave rectifier. (This special function is required for generation of half and quarter circles.)

The component A8 in the operation modes "Hand" (manual) and "Fernbedienung" (remote control) switches the voltage tapped from the Adjustment Potentiometer R3 (f_x adjustment through a hole in the front panel) to the input of the Voltage Controlled Oscillator A2. The square wave oscillator voltage generated can be measured on the test socket X6. Position C4 shows the frequency-determining capacitor to which Capacitor C3 can be switched in parallel via Solder Jumper Lb2 and Lb3.

The oscillator frequency is fed into the Binary Counter A1 via the closed Solder Jumper Lb 1b and from there to the digital-to-analog Converter A6 via an EXOR logic. At the output Pin 14 of A6 there is a delta wave function of ± 10 V peak value. (If Lb5 opened - as already mentioned - only of + 10 V peak value.) This function can be measured on the Test Socket X3. At the same time the delta wave function is transformed into a sine wave function in the amplifier A7 provided with diode feedback network. On the Test Socket X4 the sine and delta wave functions, respectively can be measured depending on the position of Switch S1. For the X oscillation the Sub-Board AFG 1 is placed into Insertion Slot X3a/X3b and for the Y oscillation into Insertion Slot X4a/X4b.

Both generators work independently of each other using the above mentioned solder jumper positions. The deflection images thus resulting are rectangular illuminated areas like a television screen. If a circular deflection line of the beam is needed, the second generator has to be coupled to the first one. The second oscillator is not required. By closing the Solder Jumper L1a the oscillator frequency of the X oscillator is fed directly into the Y function generator. In addition by closing the Solder Jumper Lb4 a 90° synchronous pulse is provided by the X generator into the Y generator. Now the X and Y functions have the same frequency as well as the 90° phase shift required for circular functions.

2.1 Sub-Board AFG 2 :

(X - Y Function Generator)

A function generator (N 1) generates on this board a sinusoidal function of an adjustable frequency, wave form and phase.

The frequency range of approximately 1 : 40 can be utilized by the Adjustment Potentiometer R5 ("f"). Changing the Capacitor C4 enables a shifting of the lower limit down below 0.1 Hz and the upper limit to more than 100 kHz. As the sine generation is effected by diode forming derived from a sine wave voltage, by means of the Potentiometer R4 ("K") a limited correction of the wave form can be made. The phase of the Y output with reference to the X output is adjustable by R11 ("φ"). This adjustment possibility is very important for the deflection using guns which show electrical or mechanical differences of the deflection systems in order to get again a circular deflection on the target work piece.

Two Potentiometers R12 ("X") and R17 ("Y") allow for adjustment to a peak value for example of 10 V of the board's output signals. Measuring of the wave form can be done on the Test Socket X3 (generator output), X5 (X output), X4 (Y output) against X6 (control ground).

3. Sub-Board ARE 1 :

On this board are the inputs to which computer or other external signal sources can be connected. The inputs provided are differential inputs for voltages up to ± 10 V. Further in each input a burden resistor of 500 Ω/0.5W can be inserted in order to process current signals up to ± 20 mA.

Inputs :

X1, z4 and X1, b2	X=	-	input
X1, b26 and X1, d26	Y=	-	input
X1, z10 and X1, d10	X~	-	input
X1, z22 and X1, d24	Y~	-	input
X1, b4 and X1, d4	X	-	limit positive side
X1, z8 and X1, z6	X	-	limit negative side
X1, b24 and X1, z24	Y	-	limit positive side
X1, z26 and X1, d28	X	-	limit negative side
X1, b22 and X1, d22	X	-	frequency adjustment
X1, z18 and X1, d20	Y	-	frequency adjustment

The signals applied to these inputs will become effective if a zero signal will be put to X1, b18. In this case the signals of the front panel potentiometers are disconnected by switches. The Solder Jumpers Lb5 and Lb6 on the Main PCB AGE 1 have to be opened when using the Sub-Board ARE 1.

4. Sub-Board AHK 1 :

As the deflection angle of an electron-beam is depending not only on the deflection current but also on the generating high voltage, a board is used for correcting the deflection current when the high voltage is changing.

The input signals on X1, b10 and X1, z12 (or X1, d12 and X1, b12) are the high voltage actual value. In order to correct the deflection angle the deflection current has to be proportional to $\sqrt{U}$. This is done by forming $\frac{1}{2} U_{target} + \frac{1}{2} U_{actual}$ and by influencing appropriately the deflection current via a multiplier. (Thereby the Solder Jumpers Lb4 and Lb7 have to be opened!) In order to compensate permanent magnetic fields the Adjustment Potentiometer R1 and for adjusting the amplification R2 are provided. (Accordingly R3 and R4 for the Y deflection.)

Closing the Solder Jumper Lb 1b (and Lb 4b, respectively) the deflection signal can be directly modulated by the input voltage thus enabling a wobble of the beam deflection by external signals.

5. Auxiliary Module ASV 01 - "Springstrahlschalter"

This bounce beam switch is concerning a square wave generator serving for deflecting an electron-beam on two working positions.

The Module ASV 01 consists of the oscillator, the frequency of which is adjustable within the range of approximately 1 : 50 by means of the front panel potentiometer.

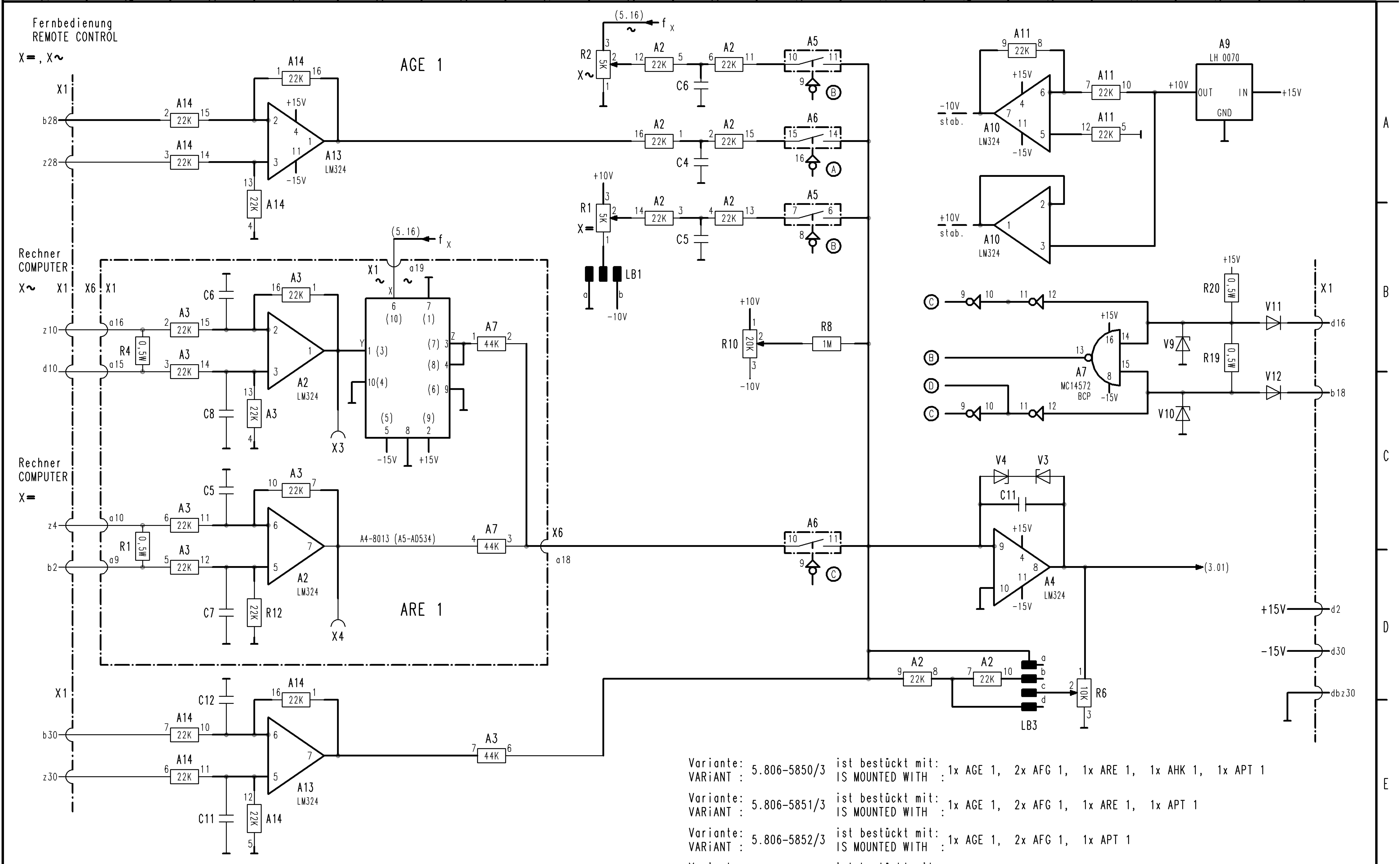
Frequency determing capacitors are C1 and C2 which can be switched in parallel by Solder Jumper Lb4. ($C1 + C2 = 1.1\ \mu F$, $f \approx 1...50$ Hz).

The delta wave function generated in the oscillator is measurable on the Test Socket X11 and is also fed to the Connector X1, d6 via a buffer. R3 is provided for adjusting the amplitude (10 Vs) and R4 for frequency fine tuning.

By another amplifier a square wave voltage with variable pulse ratio can be gained from the delta wave function in conjunction with a variable DC voltage. According to the adjustment of the Front Panel Control R1 the dwell time ratio "t_A / t_B" is continuously variable from 0 : 1 to 1 : 1 and again to 1 : 0. Closing of Lb 3a cuts the adjustment range from 0 : 1 to 1 : 1.

The output signal (X1, z4) is continuously switching the Deflection Module ASG 04 (X1, d18) between the operating modes "Hand" and "Fernbedienung".

In order to adjust both beam positions, the potentiometer (t_A / t_B) has to be turned to the end-scale (pos. A) and on Control Module ASG 04 the required DC and AC deflection parameters have to be set. On position B (end-scale on the opposite side) the deflection parameters on the front panel of Module AFB 01 can be selected. Subsequent to these adjustments the energy distribution between the positions A and B can be changed continuously by turning the potentiometer (t_A / t_B).



Variante: 5.806-5850/3 ist bestückt mit: 1x AGE 1, 2x AFG 1, 1x ARE 1, 1x AHK 1, 1x APT 1
VARiANT : IS MOUNTED WITH :

Variante: 5.806-5851/3 ist bestückt mit: 1x AGE 1, 2x AFG 1, 1x ARE 1, 1x APT 1
VARiANT : IS MOUNTED WITH :

Variante: 5.806-5852/3 ist bestückt mit: 1x AGE 1, 2x AFG 1, 1x APT 1
VARiANT : IS MOUNTED WITH :

Variante: 5.806-5853/3 ist bestückt mit: 1x AGE 1, 1x ARE 1, 1x APT 1
VARiANT : IS MOUNTED WITH :

Variante: 5.806-6176/3 ist bestückt mit: 1x AGE 1, 1x APT 1
VARiANT : IS MOUNTED WITH :

Bearb.	27.09.2000	B. Stolinski
Verantw.	27.09.2000	G. Habermehl
Geprüft	27.09.2000	G. Habermehl

Beschreibung/DESCRIPTION
Ablenksteuergerät ASG 04
DEFELECTION CONTROL MODULE ASG 04

LEYBOLD SYSTEMS GmbH
HANAU

Zeichnung Nr./DRAWING NO. 5.802-3578/3

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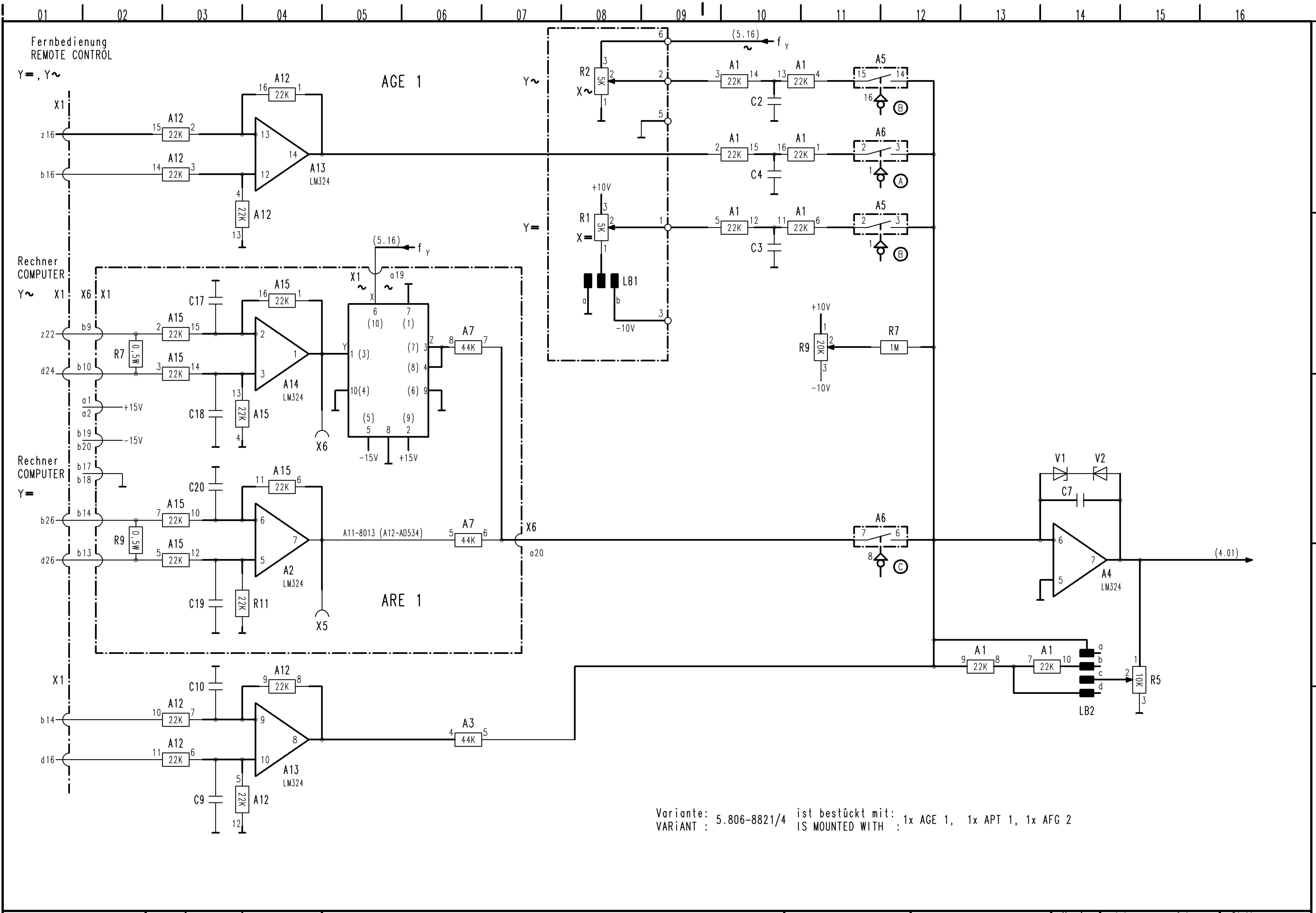

Variante: 5.806-8821/4 ist bestückt mit: 1x AGE 1, 1x APT 1, 1x AFG 2
VARiANT : IS MOUNTED WITH : 1x AGE 1, 1x APT 1, 1x AFG 2

	Bearb.	27.09.2000	B. Stolinski	Beschreibung/DESCRIPTION	LEYBOLD SYSTEMS GmbH	Zeichnung Nr./DRAWING NO.	Version VERSION	Anlage GROUP	Ort PLACE	Blatt SHEET	von OF
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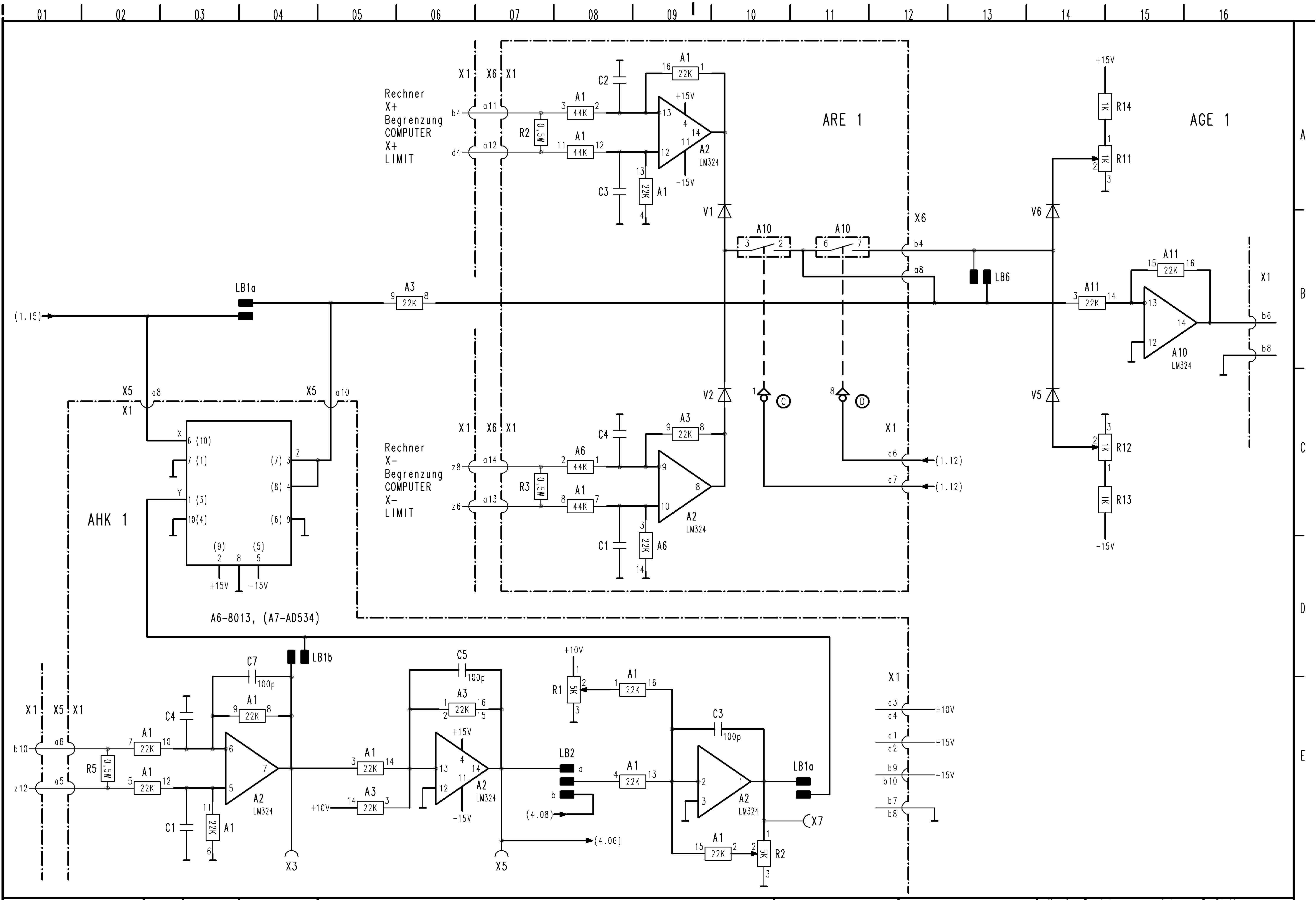
	Geprüft	27.09.2000	G. Habermehl	DEFELECTION CONTROL MODULE ASG 04	LEYBOLD	5.802-3578/3	00	=	+	2	5



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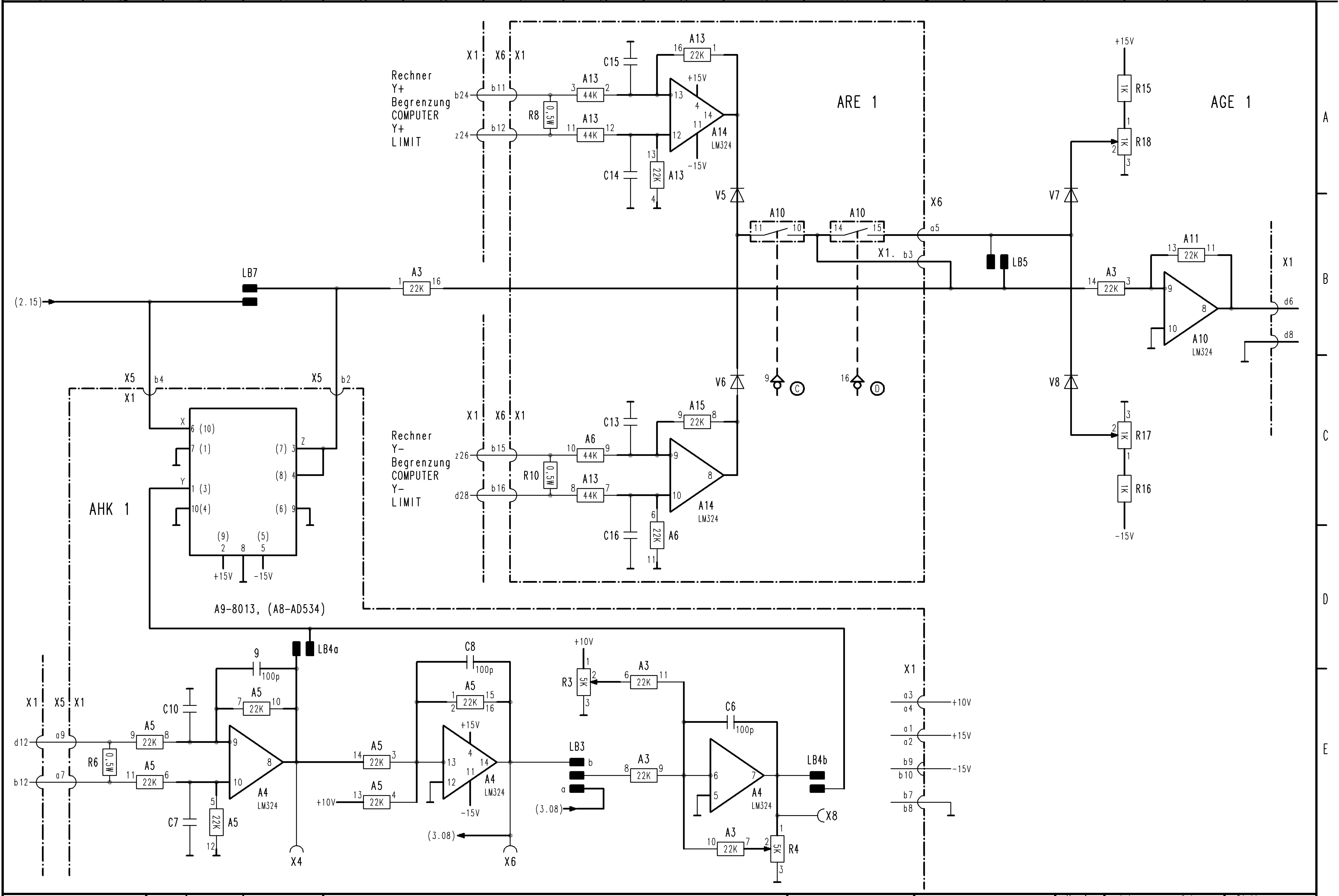

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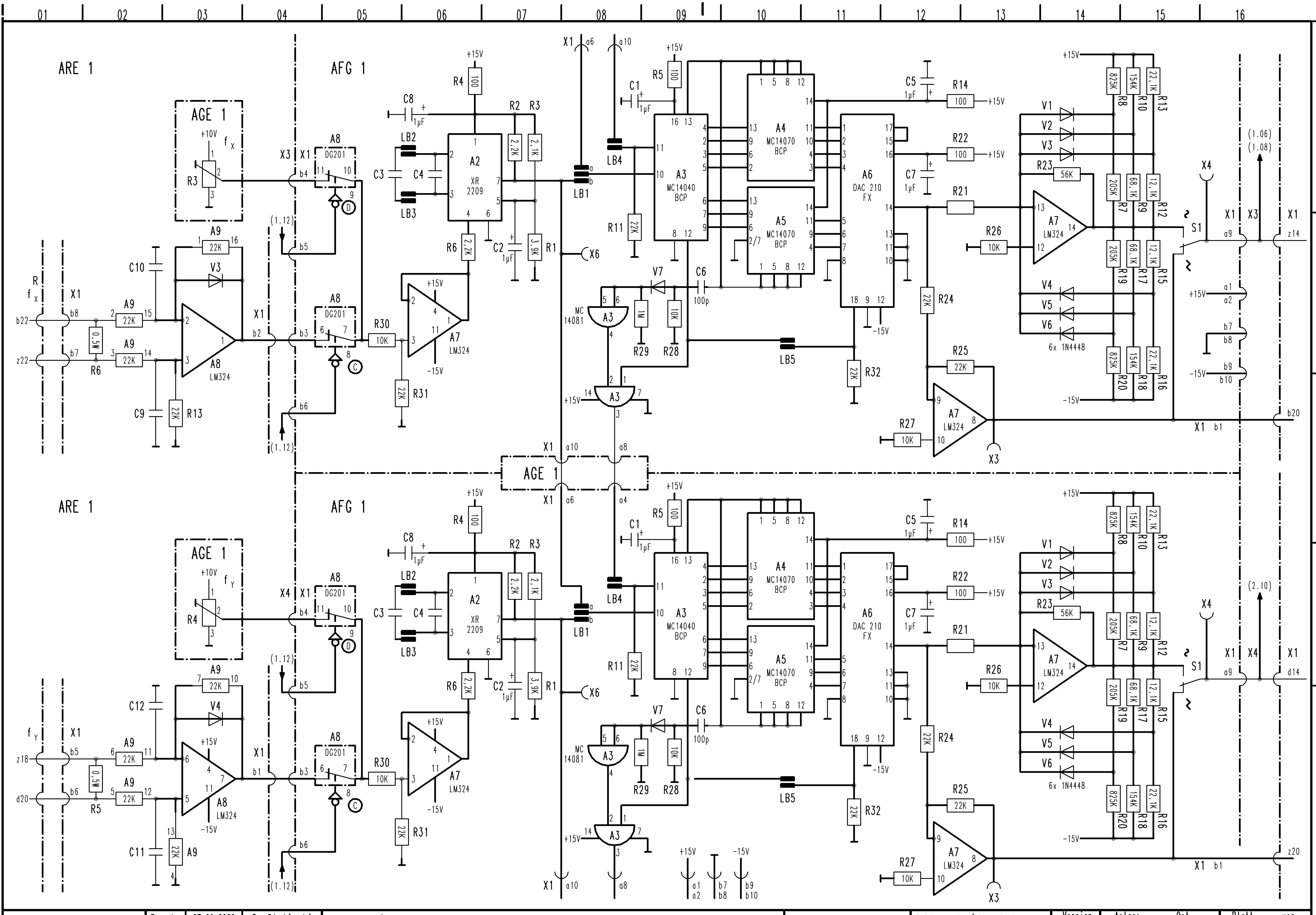

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