

Brüel & Kjær

Measuring Amplifier Type 2606

valid from serial no. 454879

0037 - 0079



Service

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0037 — 0079

Consisting of:

2606	page	date	Printed Circuit Boards:	page	date
Technical Description	1-1	7.73	ZE 0017 25 dB Amplifier	1	3.73
- -	1-2	7.73	ZE 0018 25 dB Amplifier	2	3.73
Checking Procedure	2-1	7.73	ZE 0020 50 dB Amplifier		
- -	2-2	7.73	ZF 0005— Attenuator	1	3.73
Meter Circuit	3-1	7.73	0008 Attenuator	2	3.73
- -	3-2	7.73	ZF 0009 LP Filter	1	3.73
Output Amplifier	4-1	7.73	0010 20 dB Amplifier		
- -	4-2	7.73			
Input Amplifier	5-1	7.73	ZG 0005 +12.6 V Regulator	1	3.73
- -	5-2	7.73	ZG 0007 DC-AC Converter		
Weighting Network	6-1	7.73	ZG 0008 +140 V and Pol. Regulator	2	3.73
			ZG 0074 ±20 V Regulator		
Circuit Diagram with Parts List	7-1	7.73	ZH 0011 Overload Indicator I	1	7.73
			ZH 0012 Overload Indicator II		
			ZH 0013 Gain Circuit		
			ZH 0016 Interconnecting Board	1	7.73
				2	7.73
			ZI 0002 Reference Circuit	1	3.73
			ZL 0002 44 dB Amplifier	1	3.73
			ZL 0007 Phase Inverter		
			ZL 0039— Meter Circuit	1	3.73
			0042 Meter Circuit	2	3.73
			ZS 0167 Weighting Network	1	3.73

Trouble Shooting

If any faults occur please check the instrument according to the Checking Procedure.

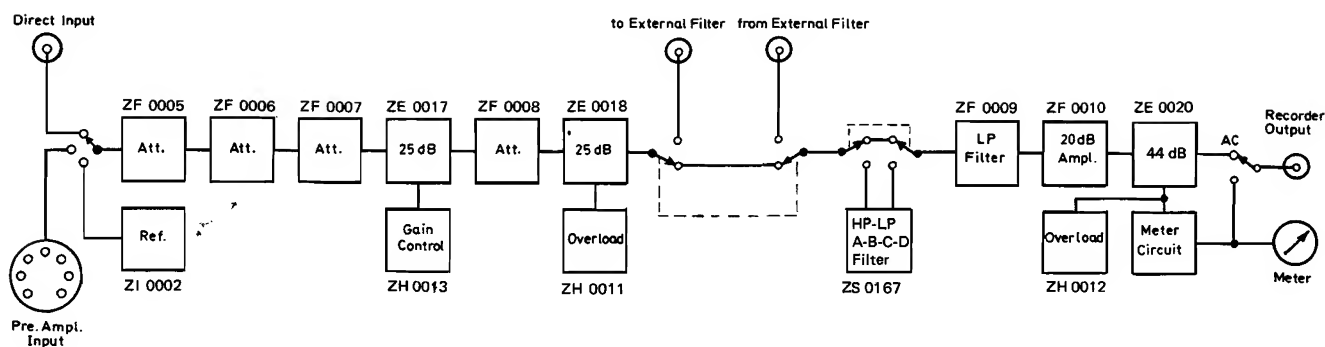
When a fault has been traced and corrected, the voltages and adjustments influenced by the correction must be rechecked. The complete instrument should then be tested according to the Checking Procedure to make sure that all basic functions are operative.

The tolerances given in these notes are intended for use as guide for adjustments.

Before correcting any apparent deviation make sure that the measuring instrument has tolerances small enough not to affect the measurement.

Spare Parts

Please state type and serial number of the Measuring Amplifier when ordering spare parts.



Amplifier section

The first stage of the Input amplifier is a 0 – 90 dB attenuator, which is positioned on three circuit boards, ZF 0005, ZF 0006 and ZF 0007.

The Input attenuator is followed by a low noise 25 dB amplifier ZE 0017 with protection diodes across the input.

Then comes a 0 – 30 dB attenuator ZF 0008 and another 25 dB amplifier ZE 0018.

The resulting Input Amplifier has an amplification of 50 dB and a 0 – 120 dB attenuation.

Furthermore the first 25 dB amplifier can be sensitivity adjusted by means of a "Gain Control" (–12 dB), "Direct Sens." and a "Preamp. Sens." each having an adjustment range of + 4 to – 10 dB in respect to normal sensitivity.

An overload indicator ZH 0011 is connected to the output of ZE 0018 in order to indicate when the output voltage is more than 13 dB above 1 V.

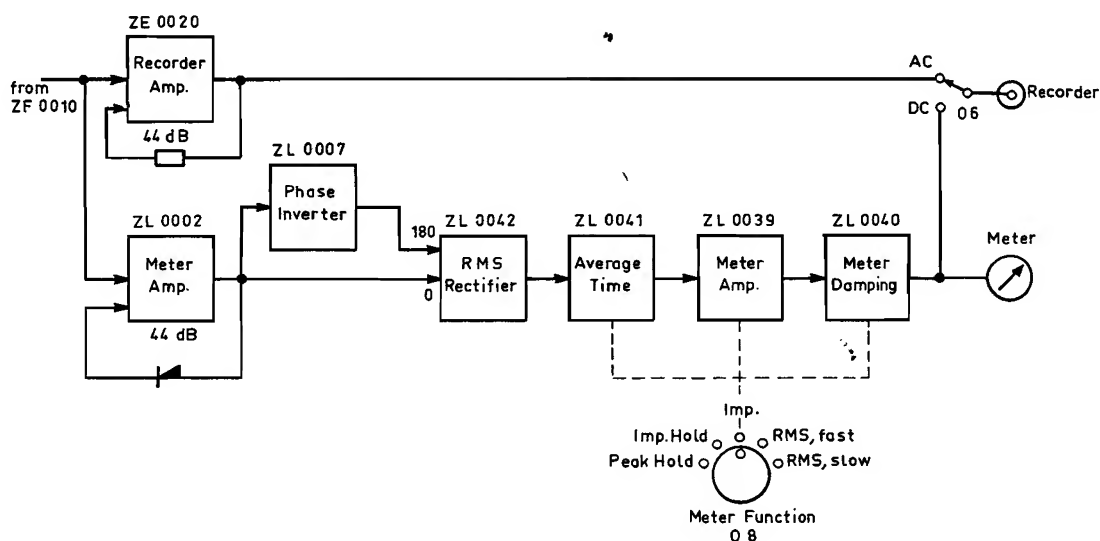
The output of ZE 0018 being low impedance is meant to feed a filter.

The Output Amplifier section consist of a 0 – 20 dB attenuator with a 300 kHz LP filter ZF 0009, a 20 dB amplifier with a 0 – 30 dB attenuator ZF 0010 and a 44 dB output amplifier located on ZE 0020.

This gives a resulting amplification of 64 dB and an attenuation of 0 – 50 dB.

An overload indicator ZH 0012 is connected to the output of ZE 0020.

The last section of the whole amplifier is the Meter section which is later discussed.

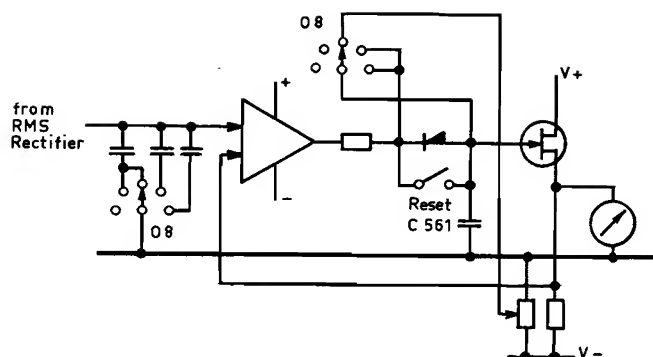


Meter Section

The Meter Section of 2606 consist basically of a Meter Amplifier, a RMS rectifier and a Meter Function circuit.

The signal is first amplified in ZL 0002. To have a large operation temperature range silicon diodes are used in the RMS rectifier ZL 0042.

These diodes have a relatively large voltage drop causing nonlinearities in the signal and to compensate for this the Meter Amplifier ZL 0002 uses the same type of diodes in the feedback loop, so a correct signal is passed on to the meter.

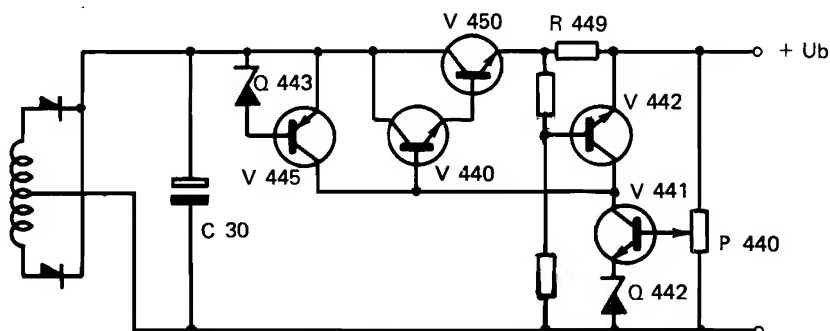


The Meter Function switch selects the different modes. In Hold position the input voltage charges up the capacitor C 561 through a diode. If the signal decreases the diode will cause the voltage across C 561 to be stored. The hold action can be released by the Reset switch. In RMS positions the diode is shortcircuited by the Meter Function switch.

The recorder output signal can be AC or DC dependent of the setting of O 6. Due to the unlinear feedback in Meter Amplifier ZL 0002 an amplifier with a linear feedback ZE 0020 is used as output amplifier for AC recording.

Power Supply

Simplified Diagram of a Voltage Regulator.



The instrument can be powered either from a Power Line which has 100, 115, 220 or 240 V AC 50 – 400 Hz or from a DC Supply of 12 V.

Thus the mains transformer T 1 has two primary windings, one meant for the Power Line operation the other one meant for the 12 V DC Supply which is chopped in a DC/AC Converter ZG 0007.

Connected to the secondary of T 1 there are different rectifier circuits giving different D.C. Voltages which are applied to the Voltage Regulators ZG 0005, 0008 and 0074

These Voltage Regulators are almost identical and their function can be seen from the simplified diagram below.

The function of this Regulator type is that a fixed voltage across Q 442 is compared with the voltage on the base of V 441. A certain difference between these two voltages will give a certain current through V 441. V 445 can be regarded as a collector impedance for V 442 and thus we will have a voltage on the base of V 440 and V 450 of approx. the same value as the output voltage. Now if the output voltage drops, the voltage difference between base and emitter of V 441 will be smaller, the current through V 441 smaller and the base voltage of V 440 and V 450 and the output voltage higher and thus it will regulate until a stabilized condition all the time.

Actually V 445 is not an ordinary collector impedance for V 441, but a constant current source, which means that if we have a constant current through V 441 its collector voltage will be constant as well as independent of hum or instability across C 30.

Furthermore the Regulator is overload protected by means of V 442 and R 449. V 442 is coupled as a variable impedance from base to emitter of the emitter-follower V 440, 450 and regulated by the bias achieved from the current through R 449. When the impedance of V 442 grows smaller V 440, 450 will be off-biased so that the output voltage and current drops.

The output voltages from the different Regulators can be seen on the circuit diagram and adjusted on the respective circuit boards. If large adjustments are found necessary the circuits should be examined for faults before any adjustment.

The DC/AC Converter ZG 0007 oscillates with a frequency of approx. 60 Hz and the real oscillatortransformer is T 2.

Adjustment of:

+ 20 V	on V 450 _E	at P 440
+ 12.6 V	on V 383 _E	at P 380
+ 200 V	on Pol. Voltage	at P 420

2.1. Sensitivity

- | | | |
|----|--|--|
| a. | GAIN CONTROL: "Cal."
POWER: "On"
INPUT: "Direct"
INPUT ATTENUATOR: "0.1 V"
OUTPUT ATTENUATOR: "x 1"
METER FUNCTION: "RMS—Fast"
RECORDER: "AC"
FILTERS: "All released" | Input signal to "Direct Input" 0.1 V, 1000 Hz.
Adjust "Sens." for full scale deflection on the meter. (Adjustment range for "Sens." adj. approx. +4, -10 dB).

Output voltage on "Recorder" 5 V RMS \pm 0.5 dB. |
| b. | RECORDER to "DC" | Output voltage approx. 0.9 V DC. (Measured with a High Impedance Voltmeter.) |
| c. | FILTERS to "A — B — C — D" | Deflection on the meter: 0.1 V \pm 0.2 dB. |
| d. | FILTERS to "Ext." | Output voltage on "Ext. Filter In" socket: 1 V \pm 0.5 dB |

2.2. Frequency Response

INPUT: "Direct"
FILTERS: "All released"
METER FUNCTION: "RMS—Fast"

Input signal to "Direct Input": 1000 Hz. Adjust the input voltage for an 18 dB deflection on the meter.
Vary the frequency from 2 Hz to 200 kHz. Deflection: 18 dB \pm 0.5 dB.
From 10 Hz to 50 kHz the tolerance is \pm 0.2 dB (+ tolerance of the LF Generator).

2.3. Meter Function

- | | | |
|----|--|---|
| a. | INPUT: "Direct"
FILTERS: "All released"
METER FUNCTION: "RMS—Fast" | Input signal to "Direct Input": 1000 Hz. Adjust the input voltage for a 15 dB deflection on the meter. |
| b. | METER FUNCTION to "Impulse" | Meter deflection: 15 dB \pm 0.1 dB.
Disconnect the input signal and check that the deflection drops 8.6 dB in 3 sec. \pm 0.5 sec. |
| c. | METER FUNCTION to "Imp. Hold" | Connect the previous input signal and shortly depress "Reset".
Meter deflection: 15 dB \pm 1 dB.
Disconnect the input signal and check that the deflection drops max. 1.5 dB in one minute. |
| d. | METER FUNCTION to "Peak Hold" | Check as for item c, but meter deflection: 18 dB. |

2.4. Overload Indicators

- | | | |
|----|---|---|
| a. | GAIN CONTROL: "Cal."
INPUT: "Direct"
INPUT ATTENUATOR: "0.1 V"
OUTPUT ATTENUATOR: "x 1"
FILTERS: "All released"
METER FUNCTION: "RMS—Fast" | Input to "Direct Input": 1 kHz, 0.1 V RMS corresponding to full scale deflection.

Raise the input signal to 11 dB above 0.1 V: No overload indication.
Raise the input signal to 13 dB above 0.1 V: "Input Overload" indication. |
| b. | FILTERS to "Ext." | Input to "Ext. Filter Out": 1 kHz, 1 V RMS corresponding approx. full scale deflection.

Raise the input signal to 11 dB above 1 V: No overload indication.
Raise the input signal to 13 dB above 1 V: "Output Overload" indication. |

2.5. Noise

GAIN CONTROL: "Cal."
INPUT: "Direct"
INPUT ATTENUATOR: "3 mV"
OUTPUT ATTENUATOR: "x 0.01"
FILTERS: "All released"
METER FUNCTION: "RMS—Fast"

Max. meter deflection for correctly adjusted sensitivity: 14 μ V.
Max. meter deflection with shortconnected input: 7 μ V.

2.6. Reference

- | | | |
|----|--|--|
| a. | GAIN CONTROL: "Cal."
INPUT: "Direct"
INPUT ATTENUATOR: "0.1 V"
OUTPUT ATTENUATOR: "x 1"
FILTERS: "All released"
REF.: "50 mV RMS" | Check the adjustment range of "Sens." and "Gain Control" which should be 10 dB for "Gain Control" and 14 dB for "Sens."

Leave "Gain Control" in position "Cal." and adjust "Sens." for a deflection to the ref. mark on the 2606 meter scale. |
| b. | REF.: released | Input signal to "Direct Input": 1 kHz, exactly 100 mV.
Meter deflection: 100 mV \pm 1% |

2.7. Sensitivity with Microphone

GAIN CONTROL: "Cal."
 INPUT: "Preamp."
 INPUT ATTENUATOR: "0.1 V"
 OUTPUT ATTENUATOR: "x 1"
 FILTERS: "All released"
 REF.: "50 mV RMS"

REF.: released
 INPUT ATTENUATOR: "3 V"

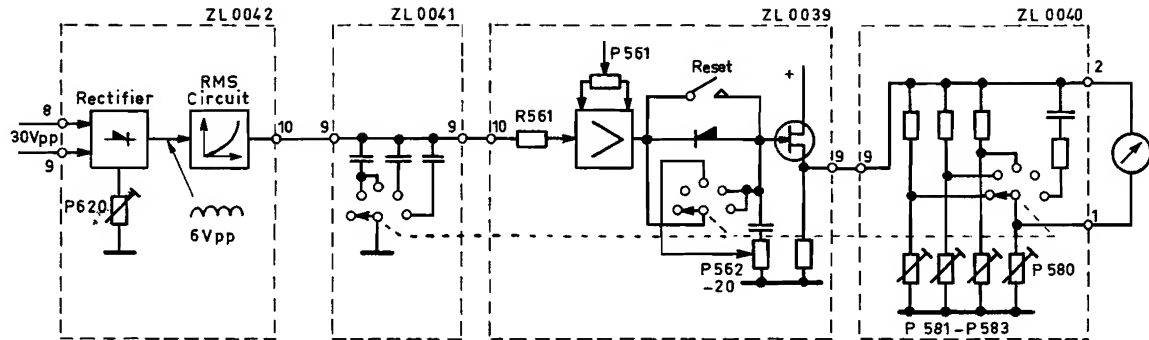
Adjust "Preamp. Sens." to the correct sensitivity of the microphone and connect a Microphone preamplifier to "Preamp. Input".

Check the sensitivity with a Pistonphone Type 4220 or a similar well known sound source. The meter deflection on Type 2606 should be equal to the Sound Pressure Level produced by the pistonphone.
 (Remember corrections for the actual static pressure). Tolerance: 0.2 dB (Pol. voltage $200\text{ V} \pm 1\text{ V}$).

The following table tells what to care about when replacing printed circuit boards with components:

By replacement of:

ZE 0017	25 dB Amplifier	Check items 5.1 to 5.8
ZE 0018	25 dB Amplifier	Check items 5.1 to 5.8
ZE 0020	50 dB Amplifier	Check items 4.1 to 4.7 and 3.1
ZF 0005	Attenuator	No adjustment necessary
ZF 0006	Attenuator	Check item 5.3
ZF 0007	Attenuator	Check item 5.3
ZF 0008	Attenuator	Check item 5.3
ZF 0009	LP Filter	Check items 4.2 and 4.3
ZF 0010	20 dB Amplifier	Check items 4.3 and 3.1
ZG 0005	+ 12.6 V Regulator	Adjust P 380 for + 12.6 V on V 383 _E
ZG 0007	DC/AC Converter	No adjustment necessary
ZG 0008	+ 140 V and Pol. Volt. Reg.	Adjust P 420 for Pol. Volt. $200\text{ V} \pm 1\text{ V}$ and check + 140 V
ZG 0074	$\pm 20\text{ V}$ Regulator	Adjust P 440 for + 20 V on V 447 _E and check -20 V on V 446 _E
ZH 0011	Overload Indicator	Check item 5.4
ZH 0012	Overload Indicator	Check item 4.4
ZH 0013	Gain Circuit	Check item 5.7
ZI 0002	Ref. Oscillator	Check item 5.7
ZL 0002	Meter Amplifier	Check items 3.1 to 3.5
ZL 0007	Phase Inverter	Check item 3.2.
ZL 0039	Meter Amplifier	Check items 3.1 to 3.5
ZL 0040	Meter Damping	Check items 3.1 to 3.5
ZL 0041	Average Time	Check items 3.1 to 3.5
ZL 0042	RMS Rectifier	Check items 3.1 to 3.5
ZS 0167	Weighting Network.	Check item 6.2



3.1. Sensitivity Check

- INPUT: "Direct"
INPUT ATTENUATOR: "1 V"
OUTPUT ATTENUATOR: "x 1"
FILTERS: "All released"
METER FUNCTION: "RMS-Fast"
AC-DC: "AC"
- METER FUNCTION to "Imp. Hold"

Input signal to "Direct Input": 1000 Hz. Adjust the input to exactly 5 V RMS on "Recorder" output.

Meter deflection: Exactly 1 V (full scale).

Depress "Meter Reset" and release it again.
Meter deflection: $1 \text{ V} \pm 0.05 \text{ dB}$.

3.2. Sensitivity Adjustment

- INPUT: "Direct"
INPUT ATTENUATOR: "1 V"
OUTPUT ATTENUATOR: "x 1"
FILTERS: "Ext."
METER FUNCTION: "RMS-Fast"
AC-DC: "AC"
- METER FUNCTION to "Impulse"
FILTERS: "All released"
- METER FUNCTION to "RMS-Fast"
- METER FUNCTION to "Impulse"
- METER FUNCTION to "Imp. Hold"
- METER FUNCTION to "Peak, Hold"

Meter deflection: 0 V.
If necessary adjust P 561 (on ZL 0039).

Turn P 562 (on ZL 0039) fully counterclockwise and then clockwise until the meter deflection is just below 0 V.

Input signal to "Direct Input": 2 kHz, 1 V.
Check with an oscilloscope that the tops of the rectified signal on the cathodes of Q 624, 625 are equal.
If necessary adjust P 640 (on ZL 0007).

Change the signal frequency to 200 kHz and check the curve again.
If necessary adjust C 640 (on ZL 0007).

Adjust the input voltage at 2 kHz for exactly 5 V on "Recorder" output.
Adjust P 580 (on ZL 0040) for full scale deflection.

Adjust P 583 (on ZL 0040) for full scale deflection.

Depress "Reset" shortly. Adjust P 582 (on ZL 0040) for full scale deflection.

Decrease the input voltage 3 dB.
Depress "Reset" shortly.
Adjust P 581 (on ZL 0040) for full scale deflection.

3.3. Overshoot

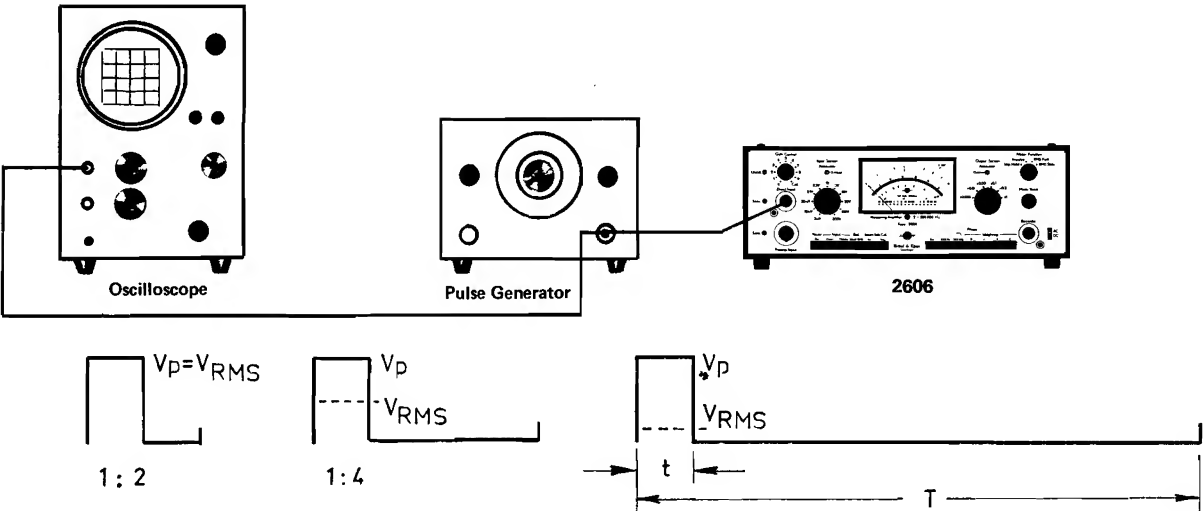
INPUT: "Direct"
INPUT ATTENUATOR: "1 V"
OUTPUT ATTENUATOR: "x 1"
FILTERS: "All released"
METER FUNCTION: "RMS—Fast"

Input signal to "Direct Input": 1000 Hz.
Adjust the input voltage for a 16 dB deflection on the meter.
Disconnect the input signal shortly and check the overshoot when reconnecting.
Overshoot: 0.1 — 1.1 dB for "RMS fast"
0.1 — 1.6 dB for "RMS slow"

3.4. Meter Decay Time Constant

- a. INPUT: "Direct"
INPUT ATTENUATOR: "1 V"
OUTPUT ATTENUATOR: "x 1"
FILTERS: "All released"
METER FUNCTION: "Impulse"
- b. METER FUNCTION to "Imp. Hold"

Input signal to "Direct Input": 1000 Hz.
Adjust the input voltage for a 18.7 dB deflection on the meter.
Disconnect the input signal and measure the time it takes the pointer to decrease from 18.7 to 10 dB.
Decay time: 3 sec ± 1 sec.
Connect the input voltage and adjust for a 20 dB deflection.
When the input signal is disconnected the meter deflection must not decrease more than 0.5 dB/20 sec. (at 25°C).



3.5. Check of RMS Indication

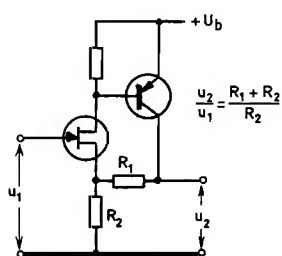
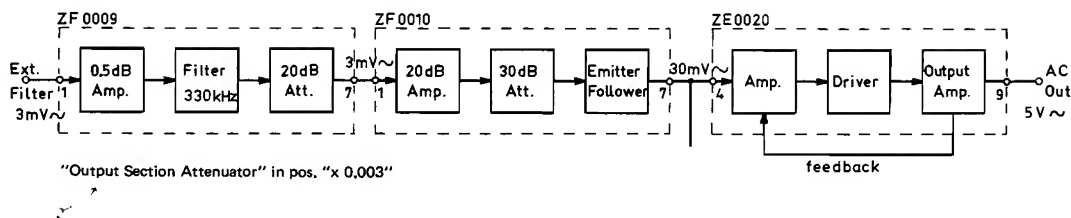
INPUT: "Direct"
INPUT ATTENUATOR: "1 V"
OUTPUT ATTENUATOR: "x 1"
FILTERS: "All released"
METER FUNCTION: "RMS Fast"
AC—DC: "AC"

At a pulse duration of 0.1 msec. and a ratio of 1:2 the input voltage to 2606 should be adjusted to give a 10.2 dB deflection.
Check the indication for various pulse ratios according to following scheme.

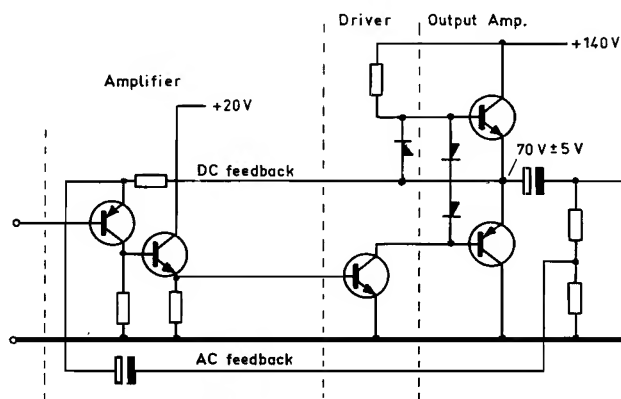
OUTPUT ATTENUATOR	$\frac{t}{T}$	$\frac{V_p}{V_{RMS}}$	Deflection dB
x 1	1:2	1	10.2
x 0.3	1:5	2	18.1 ± 0.5
x 0.3	1:10	3	15.6 ± 0.5
x 0.3	1:26	5	11.7 ± 0.5
x 0.1	1:100	10	16 ± 0.5
x 0.1	1:200	14	13 ± 1.0
x 0.1	1:400	20	10 ± 1.0
x 0.1	1:900	30	6.5 ± 1.5

If the indication is out of specification P 620 could be adjusted experimentally but then the whole sensitivity adjustment should be carried out according to item 3.2.

Block Diagram of the Output Amplifiers



Simplified Diagram of Amplifier used in ZF 0009 and ZF 0010.



Simplified Diagram of the Amplifiers used in ZE 0020, ZL 0002 and ZL 0007.

4.1. Sensitivity

FILTERS: "Ext."
OUTPUT ATTENUATOR: "x 1"
AC-DC: "AC"

Input signal to "Ext. Filter Out": 1 kHz, 1 V RMS.
"Recorder" output: $5 \text{ V} \pm 0.5 \text{ dB}$
If not check the 30 mV on V 360 emitter (ZF 0010).

4.2. Frequency Response

FILTERS: "Ext."
OUTPUT ATTENUATOR: "x 1"
AC-DC: "AC"

Input signal to "Ext. Filter Out": 1 kHz. Adjust the input voltage to give 5 V on "Recorder" output.

Vary the frequency from 2 – 200000 Hz.

"Recorder" output: $5 \text{ V} \pm 0.2 \text{ dB}$

If necessary adjust L 280 (on ZF 0009) at 200000 Hz.

At an input frequency of 500 kHz the "Recorder" output voltage should be $15 \text{ dB} \pm 3 \text{ dB}$ below 5 V.

4.3. Output Attenuator

FILTERS: "Ext."
OUTPUT ATTENUATOR: "x 1"
METER FUNCTION: "RMS—Lin."
AVERAGING TIME: "Fast"

Input signal to "Ext. Filter Out": 1 kHz. Adjust the input voltage for an 18 dB deflection on the meter.

Check the steps of the output attenuator compared to the attenuator of the LF Generator or a special Attenuator Box.

Tolerance: $\pm 0.1 \text{ dB}$ (+ tolerance of the LF Generator attenuator).

At 200 kHz the tolerance is $\pm 0.2 \text{ dB}$.

4.4. Overload Indicator

OUTPUT ATTENUATOR: "x 0.1"
FILTERS: "Ext."
AC-DC: "AC"

Input signal to "Ext. Filter Out": 1 kHz. Adjust the input voltage to give 56 V_p on "Recorder" output.

The "Output Section Overload" should indicate overload within ± 0.5 dB of this condition. From 50 kHz to 200 kHz within 0.8 dB.

Check at 200 kHz if the indication is still correct and with an oscilloscope that the output voltage has not yet been limited.

If necessary adjust P 480 (on ZH 0012) until correct indication.

4.5. Output Impedance

OUTPUT ATTENUATOR: "x 1"
FILTERS: "Ext."
AC-DC: "AC"

Input signal: 1 kHz. Adjust the input voltage to give exactly 5 V on "Recorder" output.

Load the "Recorder" output with a resistor of 1 kΩ.

The "Recorder" voltage should drop max. 0.5 dB corresponding an output impedance of 50 Ω.

The above mentioned check should be made at 200 kHz as well.

4.6. Distortion

OUTPUT ATTENUATOR: "x 1"
FILTERS: "Ext."
AC-DC: "AC"

Input signal to "Ext. Filter Out": 1 kHz. Adjust the input voltage to give 5 V on "Recorder" output.

Measure the distortion at 1 kHz: max. 0.1%.
50 kHz: max. 0.3%.

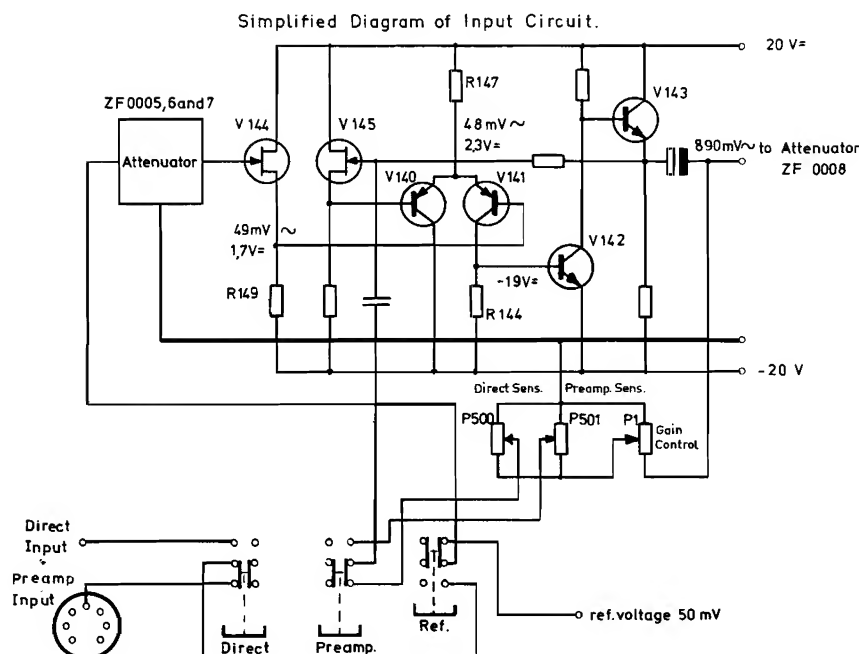
4.7. Noise and Hum

FILTERS: "Ext."
AC-DC: "AC"

Shortconnect "Ext. Filter Out" socket.
Connect a Frequency Analyzer to "Recorder" output.

Check noise and hum according to following scheme:

	FILTERS				
	all released			22.4 Hz	22.4 kHz
OUTPUT ATTENUATOR: "x 0.003"	20 mV	10 mV	20 mV	80 mV	80 mV
OUTPUT ATTENUATOR: "x 1"	1 mV	1 mV	1 mV	3 mV	3 mV
Frequency Analyzer to:	50 Hz	100 Hz	150 Hz		
	Selective			linear	



5.1. Sensitivity

GAIN CONTROL: "Cal."
INPUT: "Direct"
INPUT ATTENUATOR: "0.1 V"
FILTERS: "Ext."

Input signal to 2606 "Direct Input": 1 kHz – 100 mV.
Output voltage on "Ext. Filter In" socket: $1 \text{ V} \pm 0.5 \text{ dB}$ (for correctly adjusted sensitivity).
The DC voltage on "Ext. Filter In" socket should be $1 \text{ V} \pm 1.5 \text{ V}$.

5.2. Frequency Response

GAIN CONTROL: "Cal."
INPUT: "Direct"
INPUT ATTENUATOR: "0.1 V"
FILTERS: "Ext."

- Connect an LF generator directly to an electronic voltmeter and check the frequency response of these two instruments alone. Evt. note the deviation from linear.
- Input signal to "Direct Input": 1 kHz adjusted to give 1 V on "Ext. Filter In" socket.

Vary the frequency from 2 Hz to 200 kHz.
Voltage on "Ext. Filter In" socket: $1 \text{ V}^{+0.1}_{-0.2} \text{ dB}$ (+ tolerance of the voltmeter).
If necessary adjust C 160 at 200 kHz (ZE 0018).

5.3. Input Attenuator

GAIN CONTROL: "Cal."
INPUT: "Direct"
INPUT ATTENUATOR: "0.1 V"
FILTERS: "Ext."

Input signal to "Direct Input": 1 kHz. Adjust the input voltage to give 1 V on "Ext. Filter In" socket.
Check the steps of the input attenuator compared to the attenuator of the LF generator or a special attenuator box.
Tolerance: $\pm 0.1 \text{ dB}$ (+ tolerance of the LF generator attenuator).
At 200 kHz the tolerance is $\pm 0.2 \text{ dB}$.
If necessary adjust C 220 – 223 (ZF 0006).

5.4. Overload Indicator

GAIN CONTROL: "Cal."
INPUT: "Direct"
INPUT ATTENUATOR: "0.1 V"
FILTERS: "Ext."

Input signal to "Direct Input": 1 kHz. Adjust the input voltage to give 1 V on "Ext. Filter In" socket.
The "Input Section Overload" should indicate overload within $\pm 0.5 \text{ dB}$ of this condition.
Check at 200 kHz if the indication is still correct and with an oscilloscope that the output has not yet been limited.
If necessary adjust P 460 (on ZH 0011) until correct overload indication.

2606.5 Input Amplifier

5.5. Output Impedance

GAIN CONTROL: "Cal."
INPUT: "Direct"
INPUT ATTENUATOR: "0.1 V"
FILTERS: "Ext."

Input to "Direct Input": 1 kHz. Adjust the input voltage to give 1 V on "Ext. Filter In" socket.
Load the socket with a resistor of 200 Ω .

The "Ext. Filter In" output voltage should drop max. 0.5 dB corresponding to an output impedance of 10 Ω .

The above mentioned check should be made at 200 kHz as well.

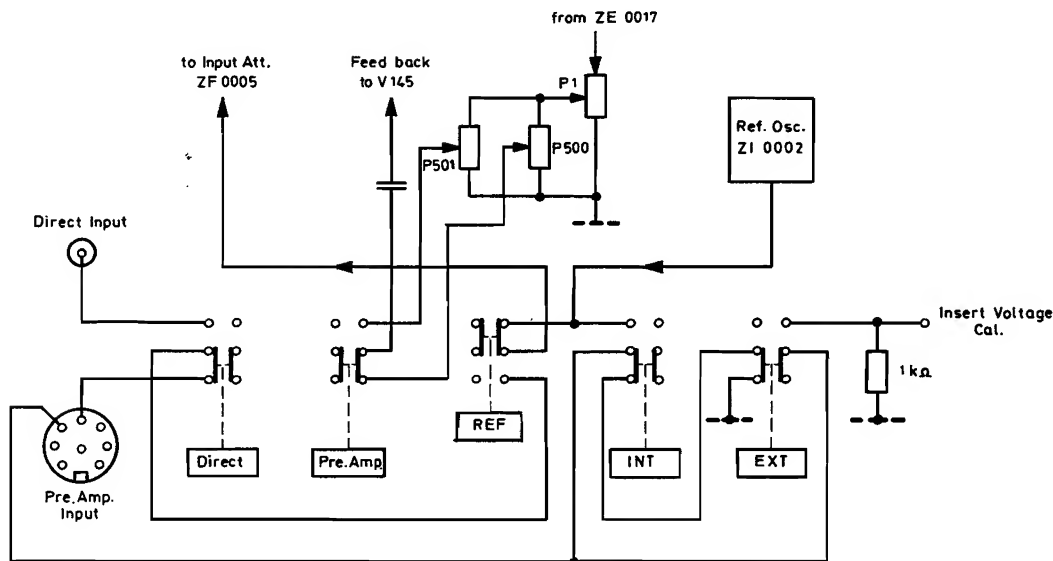
5.6. Distortion

GAIN CONTROL: "Cal."
INPUT: "Direct"
INPUT ATTENUATOR: "0.1 V"
FILTERS: "Ext."

Input signal to "Direct Input": 1 kHz. Adjust the input voltage to give 1 V RMS on "Ext. Filter In" socket.

Measure the distortion at 1 kHz: max. 0.01%.
50 kHz: max. 0.03%.

Simplified Diagram of the Calibration Facilities



5.7. Reference

- GAIN CONTROL: "Cal."
INPUT: "Direct"
INPUT ATTENUATOR: "0.1 V"
OUTPUT ATTENUATOR: "x 1"
FILTERS: "All released"
METER FUNCTION: "RMS—Fast"

Input signal to "Direct" input: 1 kHz exactly 100 mV.
Adjust "Direct Sens." to full scale deflection.

- REF. to "50 mV RMS"

The 2606 meter should deflect to the ref. mark.
If necessary adjust P 520 on Z1 0002.

Check the frequency and evt. the distortion with a Frequency Analyzer connected to the housing of V 520. (Z1 0002)

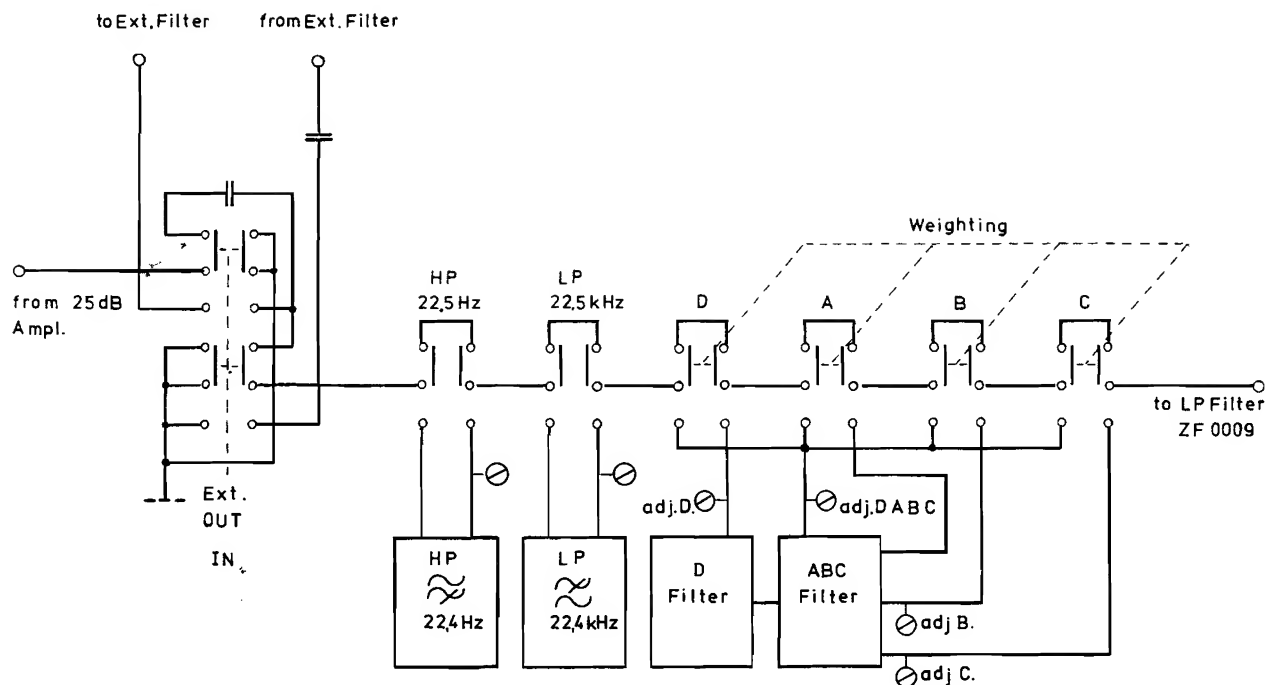
Frequency: 1000 Hz. Distortion: max. 2%.

5.8. Hum

GAIN CONTROL: "Cal."
INPUT: "Direct"

Measure the hum at the "Ext. Filter In" socket selectively according to following scheme:

INPUT ATTENUATOR	Input shortconnected			Input open		
	50 Hz	100 Hz	150 Hz	50 Hz	100 Hz	150 Hz
3 mV	250 μ V	100 μ V	250 μ V	630 μ V	630 μ V	630 μ V
10 mV — 300 V	80 μ V	35 μ V	80 μ V	210 μ V	210 μ V	210 μ V



6.1. Network Level at 1000 Hz

- a. INPUT ATTENUATOR: "30 mV"
REF.: "50 mV"
OUTPUT ATTENUATOR: "x 1"
METER FUNCTION: "RMS-Fast"
FILTERS: All released

Adjust "Gain Control" to 18 dB deflection on the meter.

Check if the deflection is 18 dB \pm 0.2 dB in all Filter positions.

If not adjust:

22.4 Hz	filter level	by P 701	
22.4 kHz	filter level	by P 700	
A-B-C-D	network levels	by P 705	on ZS 0167
B	network level	by P 704	
C	network level	by P 703	
D	network level	by P 702	

6.2. Network Characteristic

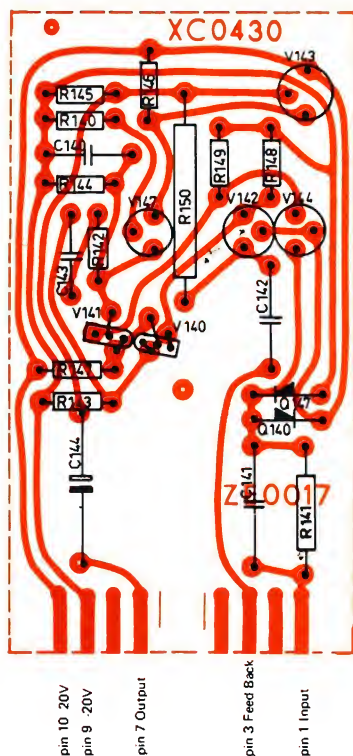
GAIN CONTROL: "Cal"
INPUT ATTENUATOR: "0.1 V"
INPUT: "Direct"
OUTPUT ATTENUATOR: "x 1"
METER FUNCTION: "RMS-Fast"

Input signal to "Direct Input": 1000 Hz. Adjust the input voltage for an 18 dB deflection.

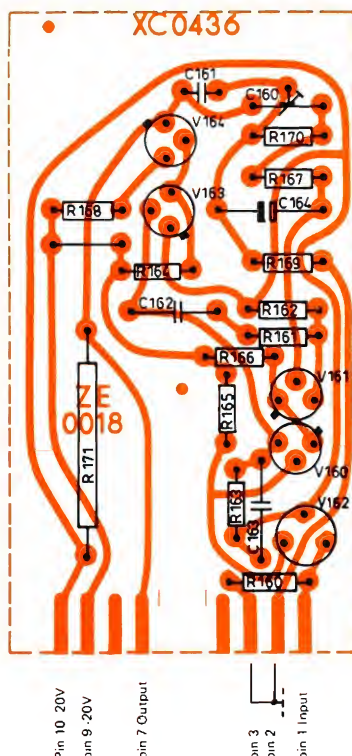
Check the network characteristic according to following scheme:

Freq. Hz	Curve D		Curve A		Curve B		Curve C	
	Meter Defl.	OUTPUT ATT	Meter Defl.	OUTPUT ATT	Meter Defl.	OUTPUT ATT	Meter Defl.	OUTPUT ATT
16	11.5 – 17.5	x 0.03	∞ – 4.3	x 0.01	6.5 – 12.5	x 0.1	16.5 – 22.5	x 0.3
31.5	8.9 – 11.9	x 0.1	7.1 – 10.1	x 0.03	9.4 – 12.4	x 0.3	13.5 – 16.5	x 1
63	14.9 – 17.9	x 0.1	10.3 – 13.3	x 0.1	17.2 – 20.2	x 0.3	15.7 – 18.7	x 1
125	11 – 13	x 0.3	10.9 – 12.9	x 0.3	12.8 – 14.8	x 1	16.8 – 18.8	x 1
250	15.1 – 17.1	x 0.3	8.4 – 10.4	x 1	15.7 – 17.7	x 1	17 – 19	x 1
500	17 – 19	x 0.3	13.8 – 15.8	x 1	16.7 – 18.7	x 1	17 – 19	x 1
1000	17 – 19	x 0.3	17 – 19	x 1	17 – 19	x 1	17 – 19	x 1
2000	13 – 15	x 1	18.2 – 20.2	x 1	16.9 – 18.9	x 1	16.8 – 18.8	x 1
4000	17.9 – 19.9	x 1	18 – 20	x 1	16.3 – 18.3	x 1	16.2 – 18.2	x 1
8000	11 – 15.5	x 1	13.9 – 18.4	x 1	12.1 – 16.1	x 1	12 – 16.5	x 1
16000	∞ – 16.6	x 0.3	∞ – 14.4	x 1	∞ – 12.6	x 1	∞ – 22.5	x 0.3
20000	∞ – 12.9	x 0.3	∞ – 11.7	x 1	∞ – 19.9	x 0.3	∞ – 19.8	x 0.3

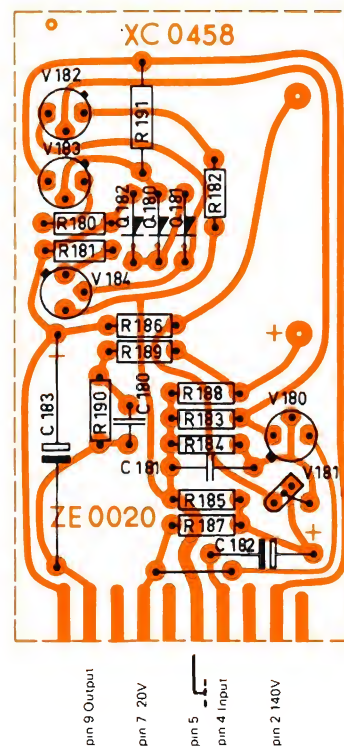
22.4 Hz Filter: Deflection 15 dB \pm 0.5 dB at 22.4 Hz.
22.4 kHz Filter: Deflection 15 dB \pm 0.5 dB at 22.4 kHz.



ZE 0017 25 dB Amplifier



ZE 0018 25 dB Amplifier



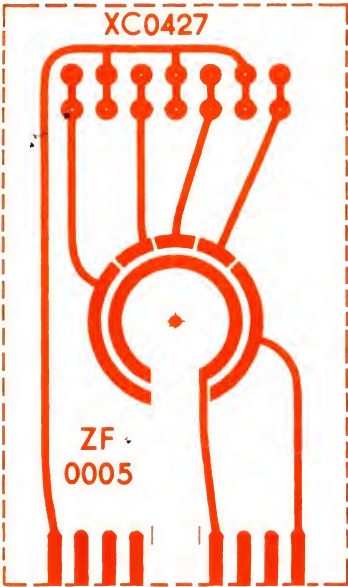
ZE 0020 44 dB Amplifier

CIRCUIT DIAGRAM REF.	COMPONENT TYPE				STOCK REF.	CIRCUIT DIAGRAM REF.	COMPONENT TYPE				STOCK REF.	
ZE 0017 25 dB Amplifier						R 160	Carbon	1/8 W	10%	10MΩ	RA 0025	
C 140	Polystyrene	470 pF/125 V	CT 1111			R 161	-	1/4 W	5%	470 Ω	RB 2470	
C 141	Polyester	22 nF/400 V	CS 0105			R ₁ 162,163	-	-	-	4.7 kΩ	RB 3470	
C 142	-	0.15 μF/100 V	CS 0337			R 164	-	-	-	10 kΩ	RB 4100	
C 143	Polystyrene	620pF/125 V	CT 1109			R 165	-	-	-	47 kΩ	RB 4470	
C 144	Electrolytic	25 μF/ 25 V	CE 2002			R 166	-	-	-	68 kΩ	RB 4680	
						R 167	-	-	-	470 kΩ	RB 5470	
Q 140,141	Silicon	50 V/150 mA	BAX 13	QV 0223		R 168	Metal	-	1%	182 Ω	RF 2182	
						R 169	-	-	-	619 Ω	RF 2619	
						R 170	-	-	-	11 kΩ	RF 4110	
R 140	Carbon	1/4 W	5%	47 Ω	RB 1470	R 171	Carbon	1/2 W	2%	800 Ω		
R 141	Metal	-	1%	8.25 kΩ	RF 0118							
R 142	-	-	-	475 Ω	RF 2475	V 160,161	Silicon	NPN		BC 107	VB 0032	
R 143,144	-	-	-	2.21 kΩ	RF 3221	V 162	F.E.T.	N		E 102 Sel.	VB 1024	
R 145	-	-	-	3.09 kΩ	RF 3309	V 163,164	Silicon	PNP		2 N 2905	VB 0059	
R 146	-	-	-	5.62 kΩ	RF 3562			Printed Circuit Board			XC 0436	
R 147	-	-	-	26.7 kΩ	RF 4267	ZE 0020 Amplifier						
R 148	-	-	-	39.2 kΩ	RF 4392	C 180	Ceramic		1 pF/400 V		CK 0100	
R 149	-	-	-	60.4 kΩ	RF 4604	C 181	Polystyrene		100 pF/125 V		CT 1133	
R 150	Carbon	1/2 W	10%	20MΩ		C 182	Electrolytic		12.5 μF/ 25 V		CE 0416	
V 140,141	Silicon	PNP	2 N 4289	VB 0049		C 183	-		20 μF/100 V		CE 0602	
V 142,143	-	NPN	BF 173	VB 0065		C 184	-		400 μF/ 10 V		CE 0305	
V 144,145	F.E.T. (paired)	N	E 102	VB 1010								
	Printed Circuit Board			XC 0430								
ZE 0018 Amplifier						Q 180,181	Silicon	100 V/300 mA	BAX 16	QV 0217		
						Q 182	-	100 V/225 mA	EC 401	QV 0213		
C 160	Ceramic trim.	6—25 pF/250 V	CV 0037									
C 161	-	10 pF/400 V	CK 1100									
C 162	Polystyrene	200pF/125 V	CT 1118									
C 163	-	620pF/125 V	CT 1109									
C 164	Electrolytic	12.5 μF/ 25 V	CE 0416									

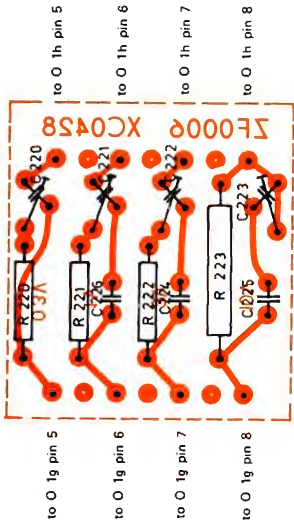
ZE 0017 — 0018 — 0020 Amplifiers

R 180	Carbon	1/4 W	5%	22 Ω	RB 1220
R 181	-	-	-	56 Ω	RB 1560
R 182	-	-	-	120 Ω	RB 2120
R 183	-	-	-	1 k Ω	RB 3100
R 184	-	-	-	10 k Ω	RB 4100
R 185	-	-	-	100 k Ω	RB 5100
R 186	-	-	-	470 k Ω	RB 5470
R 187	-	-	-	820 k Ω	RB 5820
R 188	Metal	-	1%	464 Ω	RF 2464
R 189	-	-	-	4.64 k Ω	RF 3464
R 190	-	-	-	95.3 k Ω	RF 4953
R 191	Carbon	1/3 W	5%	31.6 k Ω	

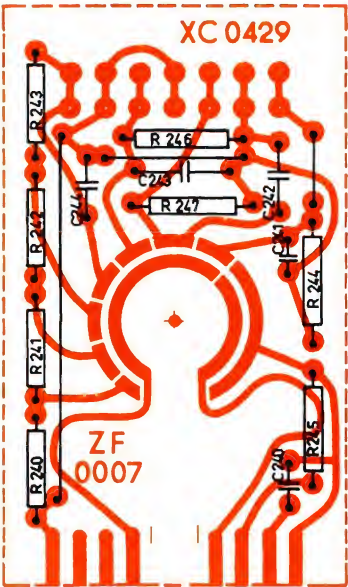
V 180	Silicon	NPN	BC 107	VB 0032
V 181	-	PNP	2 N 4289	VB 0049
V 182,183	-	NPN	BF 178	VB 0052
V 184	-	PNP	MM 4003	VB 0068
	Printed Circuit Board			XC 0458



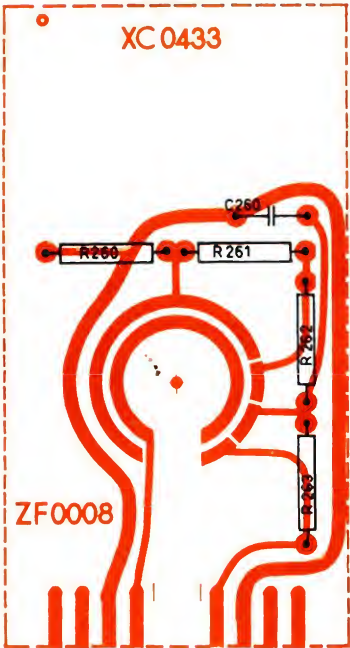
ZF 0005 Attenuator



ZF 0006 Attenuator



ZF 0007 Attenuator



ZF 0008 Attenuator

ZF 0005 — 0008

CIRCUIT DIAGRAM REF.	COMPONENT TYPE		STOCK REF.
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ZF 0006 Attenuator

C 220-223	Ceramic trim.	4.5—20pF/160 V	CV 0020
C 224,225	Ceramic	22 pF/400 V	CK 1220
C 226	-	47 pF/400 V	CK 1470
R 220	Metal	1/4 W 1/2% 684 kΩ	RF 6009
R 221	-	- 900 kΩ	RF 6014
R 222	-	- 968.4 kΩ	RF 6015
R 223	-	- 990 kΩ	RF 6016
	Printed Circuit Board		XC 0428

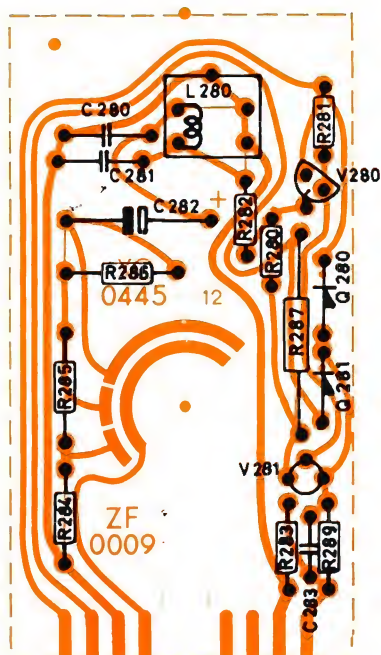
ZF 0007 Attenuator

C 240	Ceramic	3.9 pF/400 V	CK 0390
C 241	-	10 pF/400 V	CK 1100
C 242	-	47 pF/400 V	CK 1470
C 243	-	270 pF/400 V	CK 2270
C 244	-	800 pF/400 V	CK 2800
R 240	Metal	1/4 W 1/2% 316 Ω	RF 6000
R 241	-	- 684 Ω	RF 6002
R 242	-	- 2.162 kΩ	RF 6005
R 243	-	- 6.84 kΩ	RF 6007
R 244	-	- 316 kΩ	RF 6008
R 245	-	- 1MΩ	RF 6010
R 246	-	- 31.6 kΩ	RF 6012
R 247	-	- 100 kΩ	RF 6013
	Printed Circuit Board		XC 0429

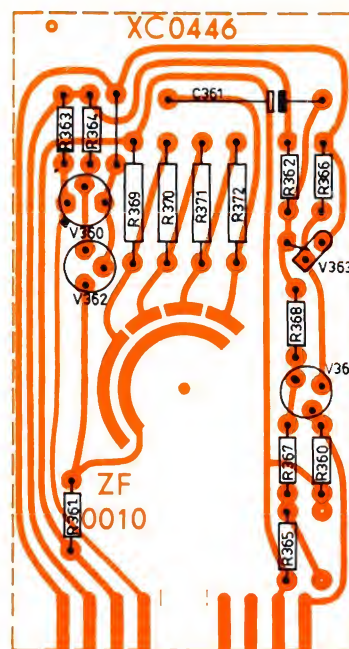
CIRCUIT DIAGRAM REF.	COMPONENT TYPE		STOCK REF.
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ZF 0008 Attenuator

C 260	Ceramic	39 pF/400 V	CK 1390
R 260	Metal	1/4 W 1/2% 462 Ω	RF 6001
R 261	-	- 1 kΩ	RF 6003
R 262	-	- 3.16 kΩ	RF 6006
R 263	-	- 10 kΩ	RF 6011
	Printed Circuit Board		XC 0433



ZF 0009 LP Filter



ZF 0010 20 dB Amplifier

CIRCUIT
DIAGRAM
REF.

COMPONENT TYPE

STOCK
REF.

ZF 0009

C 280	Polystyrene	1 nF/ 63 V	CT 1132
C 281	-	0.47 nF/125 V	CT 1111
C 282	Electrolytic	200 μ F/ 10 V	CE 0306
C 283	Polyester	10 nF/250 V	CS 0403
Q 280,281	Silicon	50 V/150 mA	BAX 13
			QV 0223
R 280	Carbon	1/4 W 5 % 47 Ω	RB 1470
R 281	-	- - 2.2 k Ω	RB 3220
R 282	Metal	- 1 % 715 Ω	RF 2715
R 283	-	- - 147 k Ω	RF 5147
R 284	-	- 1/2% 1.462 k Ω	RF 6004
R 285	-	- - 3.16 k Ω	RF 6006
R 286	-	- - 10 k Ω	RF 6011
R 287	Carbon	1/2 W 5% 1.25 k Ω	
R 289	Metal	1/4 W 1% 31.5 k Ω	RF 4316
L 280	300 kHz LP Filter	0.518 mH	LB 0666
V 280	Silicon	PNP 2 N 3702	VB 0038
V 281	FET	N 2 N 4302	VB 1025

Printed Circuit Board

XC 0445

CIRCUIT
DIAGRAM
REF.

COMPONENT TYPE

STOCK
REF.

ZF 0010

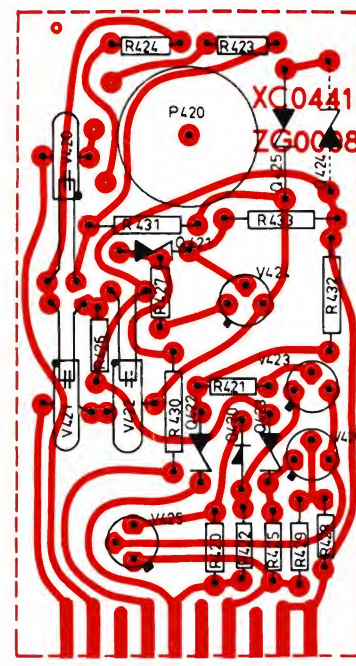
C 360	Polyester	10 nF/250 V	CS 0403
C 361	Electrolytic	200 μ F/ 10 V	CE 0306
R 360,361	Carbon	1/8 W 10% 10M Ω	RA 0025
R 362	-	1/4 W 5% 4.7 k Ω	RB 3470
R 363	-	- - 10 k Ω	RB 4100
R 364	-	- - 47 k Ω	RB 4470
R 365	Metal	- 1% 162 Ω	RF 2162
R 366	-	- - 2.21 k Ω	RF 3221
R 367	-	- - 3.01 k Ω	RF 3301
R 368	-	- - 31.6 k Ω	RF 4316
R 369	-	- 1/2% 462 Ω	RF 6001
R 370	-	- - 1 k Ω	RF 6003
R 371	-	- - 3.16 k Ω	RF 6006
R 372	-	- - 10 k Ω	RF 6011
V 360	Silicon	NPN BC 107	VB 0032
V 361	FET	N E 102	VB 1009
V 362	-	N 2 N 4302	VB 1025
V 363	Silicon	PNP 2 N 4289	VB 0049

Printed Circuit Board

XC 0446

ZF 0009—ZF 0010

2606 from serial no. 454879



pin 10 to Preamp. Input
pin 9 + 200 V
pin 7 from the diodes
pin 6 from the diodes
pin 4 + 140 V

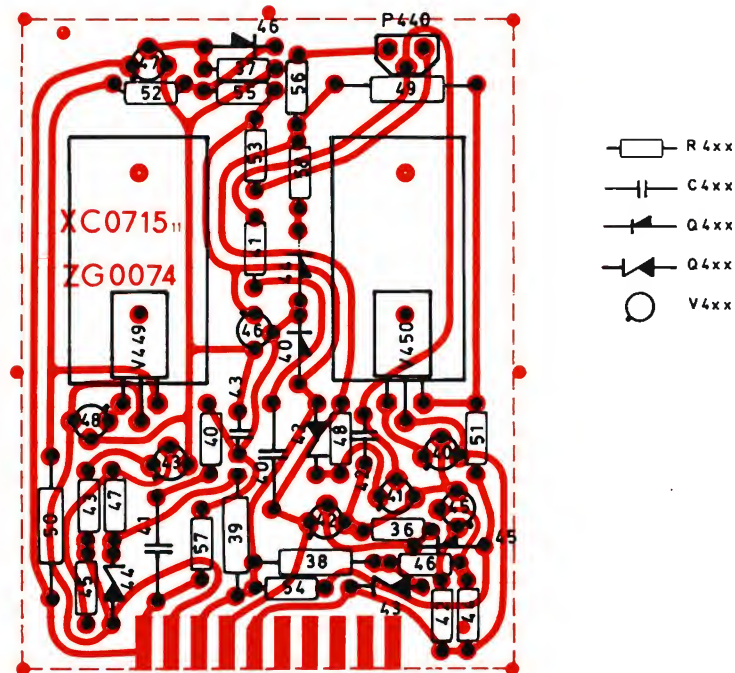
ZG 0008 + 140 V and Pol. req.

XC 0440

ZG 0008 + 140 V and Pol. reg.					
P 420	Pol. Volt adj.			25 kΩ	PH 3250
Q 420	Silicon	150 V/300 mA	BAX 16	QV 0217	
Q 421	Zener	6.6 – 7.0 V/ 40 mA	ZG 6.8	QV 1008	
Q 422	-	6.1 – 7.5 V/ 40 mA	ZG 6.8	QV 1106	
Q 423	-	27 – 30 V/ 9 mA	MZ 28	QV 1108	
Q 424,425	-	143 – 158 V/ 6.2 mA	1 N 3048 B	QV 1317	
R 420	Carbon	1/4 W 5%	270 Ω	RB 2270	
R 421	-	-	1.5 kΩ	RB 3150	
R 422	-	-	5.6 kΩ	RB 3560	
R 423,424	-	-	47 kΩ	RB 4470	
R 425	-	-	120 kΩ	RB 5120	
R 426	-	-	1MΩ	RB 6100	
R 427	Metal	- 1%	649 Ω	RF 2649	
R 428	-	-	30.9 kΩ	RF 4309	
R 429	-	-	121 kΩ	RF 5121	
R 430	Carbon	1/3 W 5%	1.8 kΩ		
R 431	-	-	22 kΩ		
R 432	-	-	200 kΩ		
R 433	-	-	330 kΩ		

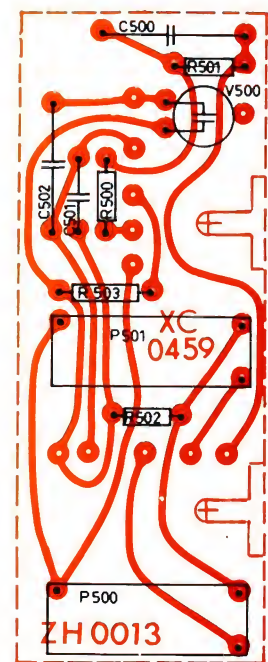
V 420,422	Neon stab 81 V/3.2 mA	ZZ 1000	VA 0088
V 423,424	Silicon PNP	MM 4003	VB 0068
V 425,426	NPN	2 N 3440	VB 0250
	Printed Circuit Board		XC 0441

1



ZG 0074
20 V Regulator

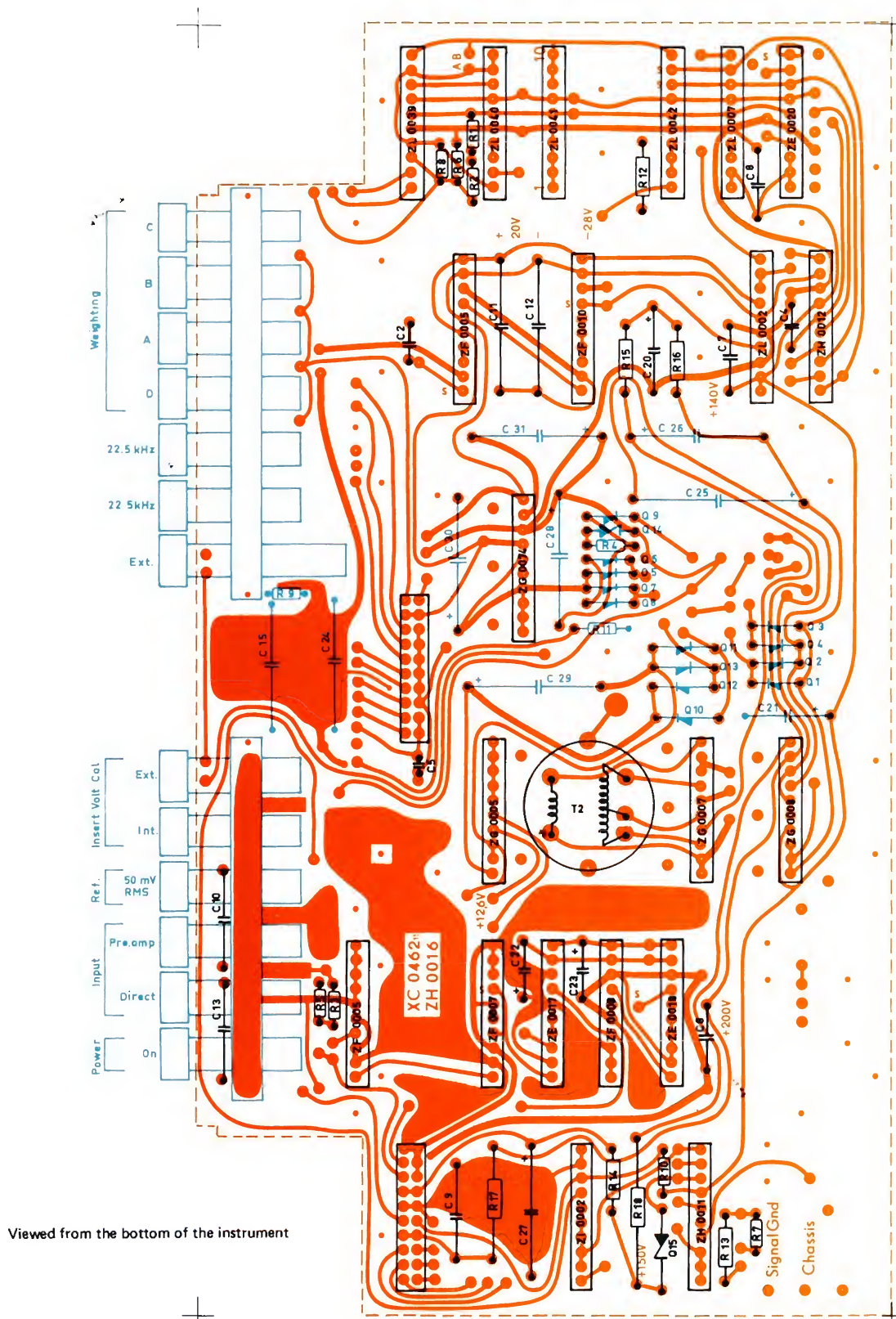
CIRCUIT DIAGRAM REF.	COMPONENT TYPE				STOCK REF.	CIRCUIT DIAGRAM REF.	COMPONENT TYPE				STOCK REF.
C 440,441	Polycarbonate	1 μ F/100 V			CS 0384	R 449,450	Wire	1 W	5%	2 Ω	RO 1106
C 442,443	Ceramic	4.7 nF/500 V			CK 3470	R 451,452	Metal	1/4 W	-	140 Ω	RF 2140
P 440	Cermet	0.5 W	lin.	1 k Ω	PG 2109	R 453	-	-	-	2.49 k Ω	RF 3249
Q 440,441	Si. diode	150 V/ 0.3 A		BAX 16	QV 0217	R 454,455	-	-	-	4.02 k Ω	RF 3402
Q 442	Ze. diode	6.8 V/0.25W		ZG 6.8	QV 1106	R 456	-	-	-	4.75 k Ω	RF 3475
Q 443,444	-	6.2 V/0.25W		ZG 6.2	QV 1322	R 457	-	-	-	11.5 k Ω	RF 4115
Q 445,446	Si. diode	150 V/ 0.3 A		BAX 16	QV 0217	R 458	-	-	-	12.1 k Ω	RF 4121
R 436,437	Carbon	1/4 W	5%	8.2 k Ω	RB 3820	V 440-443	Si. trans.	NPN		BC 107	VB 0032
R 438,439	-	1/3 W	-	3.9 k Ω		V 445-448	-	PNP		BC 177	VB 0071
R 440-443	-	1/4 W	-	470 Ω	RB 2470	V 449	-	PNP		2 N 4919	VB 0061
R 444,445	-	-	-	1.2 k Ω	RB 3120	V 450	-	NPN		2 N 4922	VB 0063
R 446,447	-	-	-	4.7 k Ω	RB 3470	Printed Circuit Board					XC 0715
R 448	-	-	-	3.3 k Ω	RB 3330						



Gain Circuit ZH 0013

Neon lamp 0.8 mA/220 V
Printed Circuit Board

Interconnecting Board

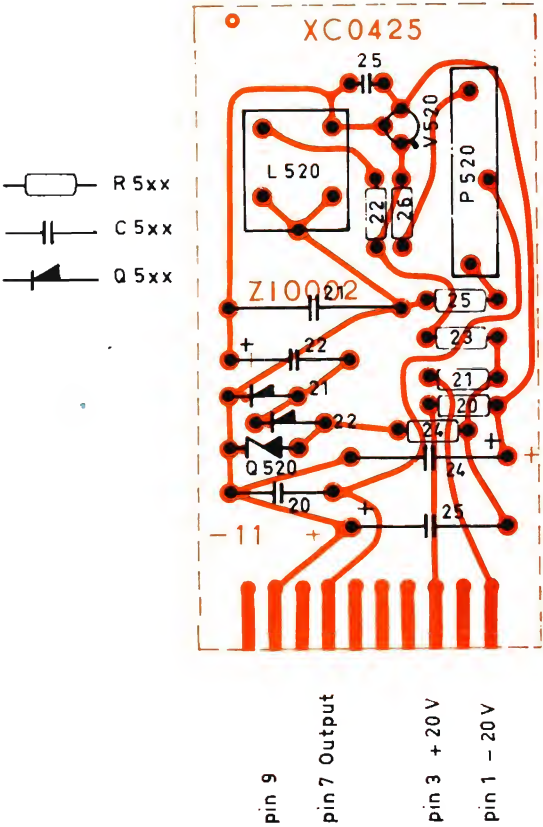


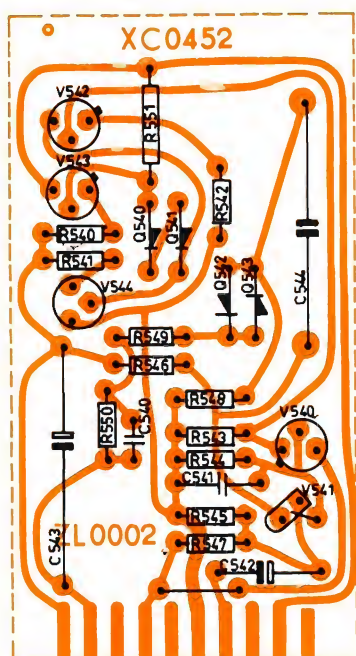
Black components are mounted on the top side.
Blue components are mounted on the bottom side.

ZH 0016 Interconnecting Board

CIRCUIT DIAGR. REF.	COMPONENT TYPE				STOCK REF.
C 2	Ceramic	33 pF/400 V			CK 1330
C 4	-	4.7 nF/500 V			CK 3470
C 5	-	4.7 nF/100 V			CK 0096
C 6-8	Polycarbonate	0.1 μ F/250 V			CS 0013
C 9	-	0.22 μ F/400 V			CS 0117
C 10	-	0.33 μ F/400 V			CS 0119
C 11,12	-	1 μ F/250 V			CS 0025
C 13	-	1.5 μ F/100 V			CS 0343
C 15	-	5.6 μ F/100 V			CS 0346
C 20,21	Electrolytic	4 μ F/250 V			CE 2034
C 22,23	-	8 μ F/ 40 V			CE 0414
C 24	-	22 μ F/ 25 V			CE 0428
C 25	-	16 μ F/550 V			CE 0915
C 26,27	-	32 μ F/250 V			CE 0711
C 28	-	220 μ F/ 63 V			CE 0617
N 1,2,3	Power Switch				NT 0021
O 3	Filters				OJ 0002
O 4	Input Calibration				OJ 0001
Q 1-4	Si. diode	1200 V/150 mA	BYX 10		QV 0025
Q 5-13	-	400 V/ 1 A	1 N 4004		QV 0237
Q 14	Ze. diode	27- 30 V/ 5 mA	MZ 28		QV 1108
Q 15	-	143-158 V/ 5 mA	ZD 150		QV 1317
R 1,2	Carbon	1/8 W	10%	6.8M Ω	RA 0023
R 3	-	-	-	10M Ω	RA 0025
R 4	-	1/4 W	5%	2.7 k Ω	RB 3270
R 5	-	-	-	10 k Ω	RB 4100
R 6	-	-	-	39 k Ω	RB 4390
R 7	-	-	-	47 k Ω	RB 4470
R 8	-	-	-	68 k Ω	RB 4680
R 9	-	-	-	100 k Ω	RB 5100
R 10,11	-	-	-	220 k Ω	RB 5220
R 12	-	1/3 W	-	300 Ω	
R 13	-	-	-	1 k Ω	
R 14	-	-	-	12 k Ω	
R 15	-	-	-	27 k Ω	
R 16	-	-	-	75 k Ω	
R 17	-	1/2 W	10%	20M Ω	
R 18	-	1 W	-	39 k Ω	
T 2	DC / AC Converter Coil				TO 0002
	10 pin socket				JJ 1002
	2 x 10 pin socket				JJ 2002

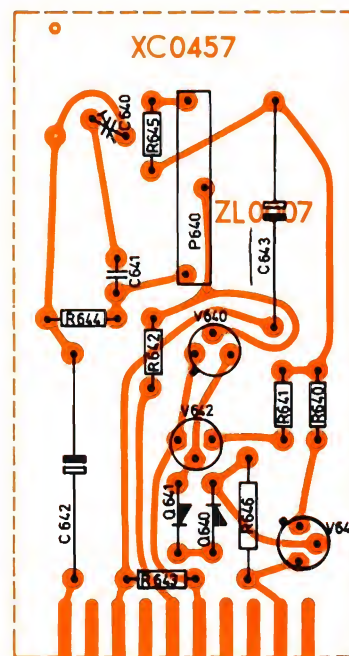
CIRCUIT DIAGRAM REF.	COMPONENT TYPE				STOCK REF.
C 520	Polycarbonate	47 nF/100 V			CS 0009
C 521	-	0.33 μ F/250 V			CS 0035
C 522	Electrolytic,	2 μ F/ 64 V			CE 0401
C 523,524	-	33 μ F/40 V			CE 0438
C 525	Ceramic	390 pF/400 V			CK 2391
L 520	Osc. Coil	75 mH			LB 0660
P 520	Ref. adj.	500 Ω			PG 1502
Q 520	Zener	8.5 - 9.6 V/ 5 mA	ZF 9.1		QV 1109
Q 521,522	Silicon	150 V/300 mA	BAX 16		QV 0217
R 520,521	Carbon	1/4 W	5%	470 Ω	RB 2470
R 522	-	-	-	1.8 k Ω	RB 3180
R 523,524	-	-	-	6.8 k Ω	RB 3680
R 525	Metal	-	1%	619 Ω	RF 2619
R 526	-	-	-	54.9 k Ω	RF 4549
V 520	Si. trans	NPN	BC 107 b		VB 0257
Printed Circuit Board					XC 0425





pin 10 to Phase Invert.
pin 9 to RMS circuit
pin 7 20V
pin 5
pin 4 Input
pin 2 140 V

ZL 0002 44 dB Amplifier



pin 10 Input
pin 8 Output
pin 6 -20V
pin 5
pin 2 140V

ZL 0007 Phase Inverter

ZL 0002 44 dB amplifier

C 540	Ceramic	1 pF/400 V	CK 0100
C 541	Polystyrene	100 pF/125 V	CT 1133
C 542	Electrolytic	12.5 μ F/ 25 V	CE 0416
C 543	-	22 μ F/100 V	CE 0616
C 544	-	400 μ F/ 10 V	CE 0305

Q 540,541	Si.	150 V/300 mA	BAX 16	QV 0217
Q 542,543	-	100 V/225 mA	BAY 72	QV 0219

R 540,541	Carbon	1/4 W	5%	100 Ω	RB 2100
R 542	-	-	-	120 Ω	RB 2120
R 543	-	-	-	1 k Ω	RB 3100
R 544	-	-	-	10 k Ω	RB 4100
R 545	-	-	-	100 k Ω	RB 5100
R 546	-	-	-	470 k Ω	RB 5470
R 547	-	-	-	820 k Ω	RB 5820
R 548	Metal	-	1%	464 Ω	RF 2464
R 549	-	-	-	4.64 k Ω	RF 3464
R 550	-	-	-	95.3 k Ω	RF 4953
R 551	Carbon	-	5%	31.6 k Ω	

V 540	Silicon	NPN	BC 107	VB 0032
V 541	-	PNP	2 N 4289	VB 0049
V 542,543	-	NPN	BF 178	VB 0052
V 544	-	PNP	2 N 4889	VB 0058
Printed Circuit Board				XC 0452

ZL 0007 Phase Inverter

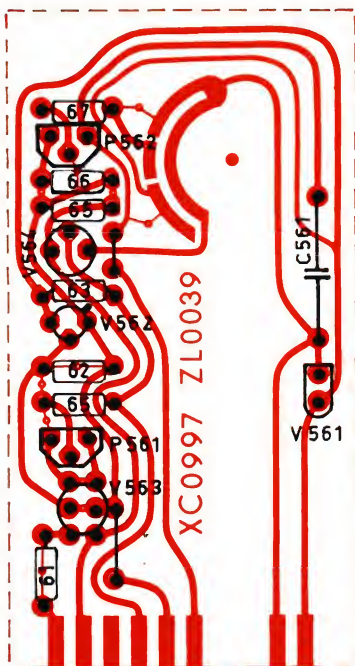
C 640	Ceramic	3.1 pF/160 V	CV 0030
C 641	-	22 pF/400 V	CK 1220
C 642,643	Electrolytic	20 μ F/100 V	CE 0616

P 640	Gain adj.	10 k Ω	PG 3107
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Q 640,641	Silicon	100 V/300 mA	BAX 16	QV 0217	
R 640,641	Carbon	1/4 W	5%	100 Ω	RB 2100
R 642	-	-	-	18 k Ω	RB 4180
R 643	-	-	-	100 k Ω	RB 5100
R 644,645	Metal	-	1%	47.5 k Ω	RF 4475
R 646	Carbon	1/3 W	5%	31.6 k Ω	

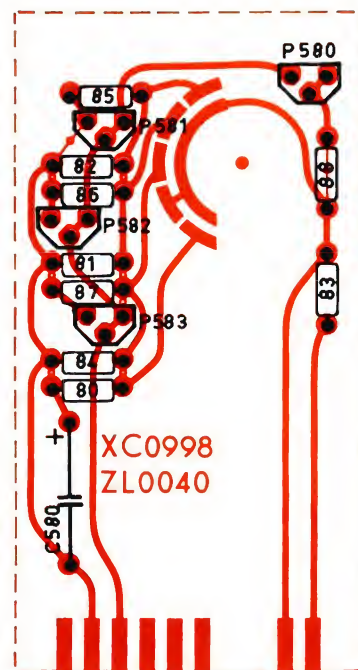
V 640,641	Silicon	NPN	BF 178	VB 0052
V 642	-	PNP	2 N 4889	VB 0058
Printed Circuit Board				XC 0457

Meter Circuit



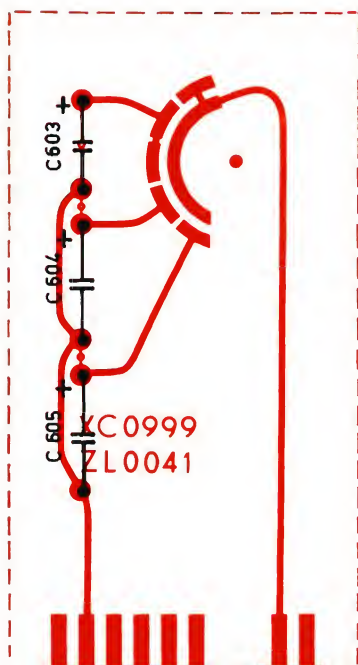
ZL 0039 Meter Ampl.

— R 5xx

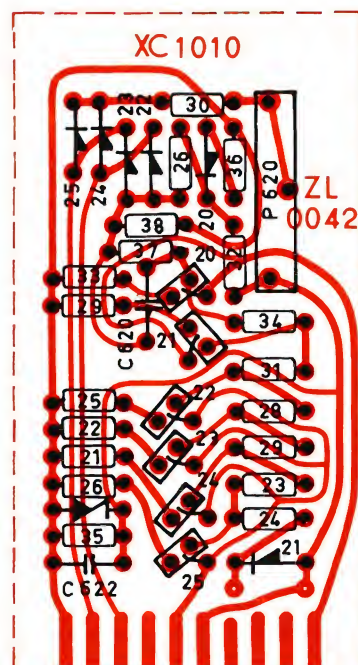


ZL 0040 Meter Damping

— R 5xx



ZL 0041 Average Time



ZL 0042 RMS Rectifier

— R 6xx — V 6xx

ZL 0039

C 561	Polycarbonate	0.33 μ F/100 V	CS 0340
P 561	Trimmer	lin. 220 Ω	PG 1220
P 562	-	- 10 k Ω	PG 3110
R 561	Carbon	1/4 W 5% 1 k Ω	RB 3100
R 562	-	- 6.8 k Ω	RB 3680
R 563	-	- 22 k Ω	RB 4220
R 564	-	- 39 k Ω	RB 4390
R 565	-	- 82 k Ω	RB 4820
R 566	-	- 100 k Ω	RB 5100
R 557	-	- 8.2M Ω	RB 6820
V 561	Silicon	NPN 2 N 4292	VB 0050
V 562	-	NPN BC 107	VB 0257
V 563	-	PNP TD 401	VB 5303
V 564	FET	N-channel E 102	VB 1028
Printed Circuit Board			XC 0997

ZL 0040

C 580	Electrolytic	50 μ F/ 6.4 V	CE 0204
P 580	Trimmer	lin. 4.7 k Ω	PG 2471
P 581,582	-	-	PG 4107
P 583	-	- 220 k Ω	PG 4203
R 580	Carbon	1/4 W 5% 2.7 k Ω	RB 3270
R 581	-	- 22 k Ω	RB 4220
R 582	-	- 27 k Ω	RB 4270
R 583	-	- 68 k Ω	RB 4680
R 584	-	- 82 k Ω	RB 4820
R 585,586	-	- 180 k Ω	RB 5180
R 587	-	- 680 k Ω	RB 5680
R 588	-	- 30.1 k Ω	RF 4301
Printed Circuit Board			XC 0998

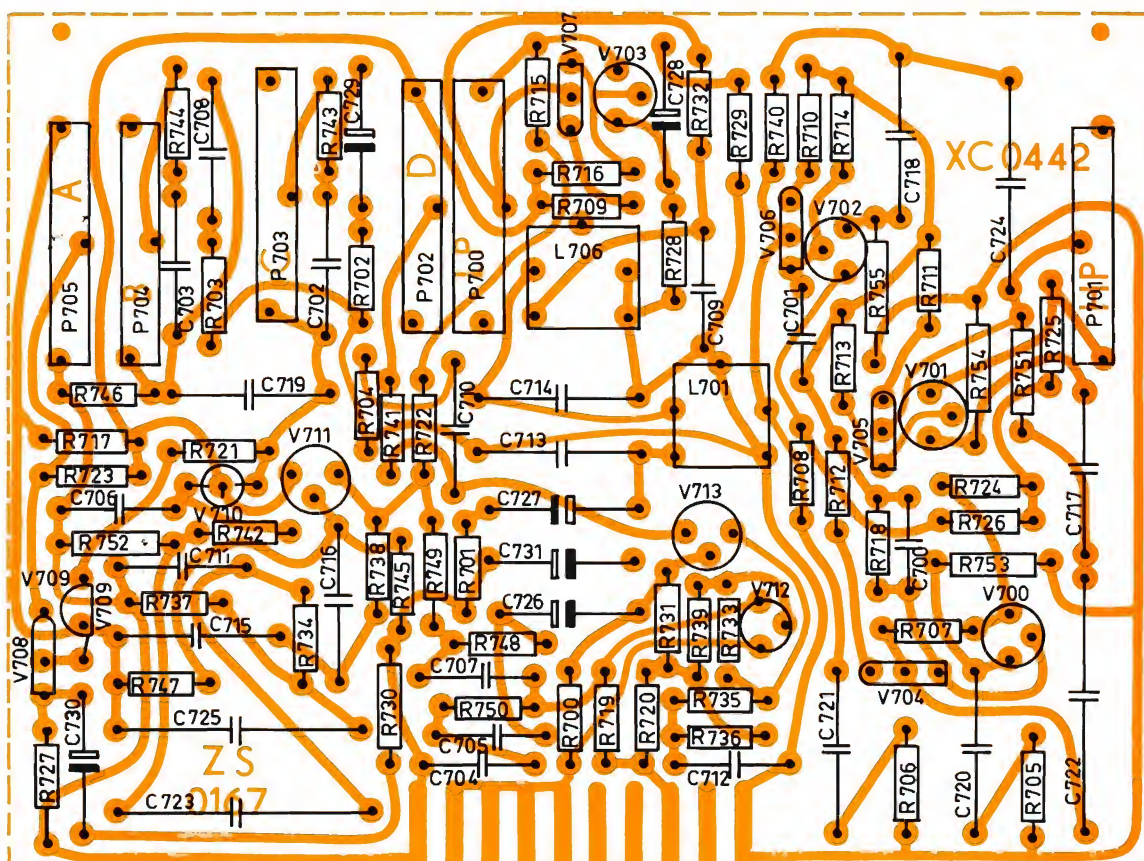
ZL 0041

C 603	Tantalum	3.3 μ F/ 15 V	CF 0025
C 604	-	6.8 μ F/ 35 V	CF 0002
C 605	-	56 μ F/ 6 V	CF 0001

Printed Circuit Board XC 0999

ZL 0042

C 620	Ceramic	15 pF/400 V	CK 1150
C 622	-	120 pF/400 V	CK 2121
P 620	Trimmer	lin. 2 k Ω	PG 2203
Q 620	Germanium	100 V/ 30 mA SFD 108	QV 0099
Q 621	Silicon	100 V/225 mA BAY 72	QV 0219
Q 622-625	-	150 V/300 mA BAX 16	QV 0217
Q 621	Zener	5.9-6.5 V ZP 6.2	QV 1334
R 620	Metal	1/4 W 1% 15.4 Ω	RF 1154
R 621	-	- 100 Ω	RF 2100
R 622	-	- 422 Ω	RF 2422
R 623,624	-	- 1.1 k Ω	RF 3110
R 625	-	- 1.27 k Ω	RF 3127
R 626	-	- 2.02 k Ω	RF 3200
R 627	-	- 2.21 k Ω	RF 3221
R 628	-	- 3.01 k Ω	RF 3301
R 629	-	- 3.16 k Ω	RF 3316
R 630,631	-	- 5.23 k Ω	RF 3523
R 632	-	- 8.06 k Ω	RF 3806
R 633	-	- 11.1 k Ω	RF 4110
R 634	-	- 11.8 k Ω	RF 4118
R 635	-	- 20.0 k Ω	RF 4200
R 636	-	- 21.5 k Ω	RF 4215
R 637	-	- 31.6 k Ω	RF 4316
R 638	-	- 68.1 k Ω	RF 4681
V 620-625	Silicon	PNP 2 N 4289	VB 0049
Printed Circuit Board			XC 1010



CIRCUIT
DIAGRAM
REF.

CIRCUIT DIAGRAM REF.	COMPONENT TYPE	STOCK REF.
C 700,701	Ceramic 47 pF/400 V	CK 1470
C 702,703	Polystyrene 220 pF/125 V	CT 0501
C 704,705	" 390 pF/ 63 V	CT 1531
C 706	" 510 pF/125 V	CT 1135
C 707	" 820 pF/ 63 V	CT 1532
C 708,709	" 1.6 nF/ 63 V	CT 1152
C 710,711	" 3 nF/ 63 V	CT 1157
C 712	" 3.3 nF/ 63 V	CT 1544
C 713	" 3.6 nF/ 30 V	CT 1506
C 714	" 4.3 nF/ 30 V	CT 1507
C 715,716	" 5.1 nF/ 63 V	CT 1124
C 717	" 16 nF/ 30 V	CT 1539
C 718	" 24 nF/ 30 V	CT 1540
C 719	" 30 nF/ 30 V	CT 1519
C 720,721	" 39 nF/ 30 V	CT 1541
C 722,723	" 51 nF/ 30 V	CT 1542
C 724	" 180 nF/ 63 V	CT 1527
C 725	Polycarbonate 0.68 μ F/ 63 V	CS 0342
C 726	Electrolytic 2 μ F/ 64 V	CE 0401
C 727-731	" 12 μ F/ 25 V	CE 0416

P 700	L.P. adj.	500 Ω	PG 1502
P 701	H.P. adj.	2 k Ω	PG 2203
P 702-704	D-A-C adj.	10 k Ω	PG 3107
P 705	D-A-B-C adj.	500 Ω	PG 1502
R 701,702	Carbon 1/4 W 5%	1M Ω	RB 6100
R 703-706	" 1/8 W 10%	10M Ω	RA 0025
R 707,708	" 1/4 W 5%	120 Ω	RB 2120
R 709	" - -	270 Ω	RB 2270
R 710-712	" - -	1 k Ω	RB 3100
R 713-720	" - -	4.7 k Ω	RB 3470
R 721	" - -	22 k Ω	RB 4220
R 722-726	" - -	39 k Ω	RB 4390

CIRCUIT
DIAGRAM
REF.

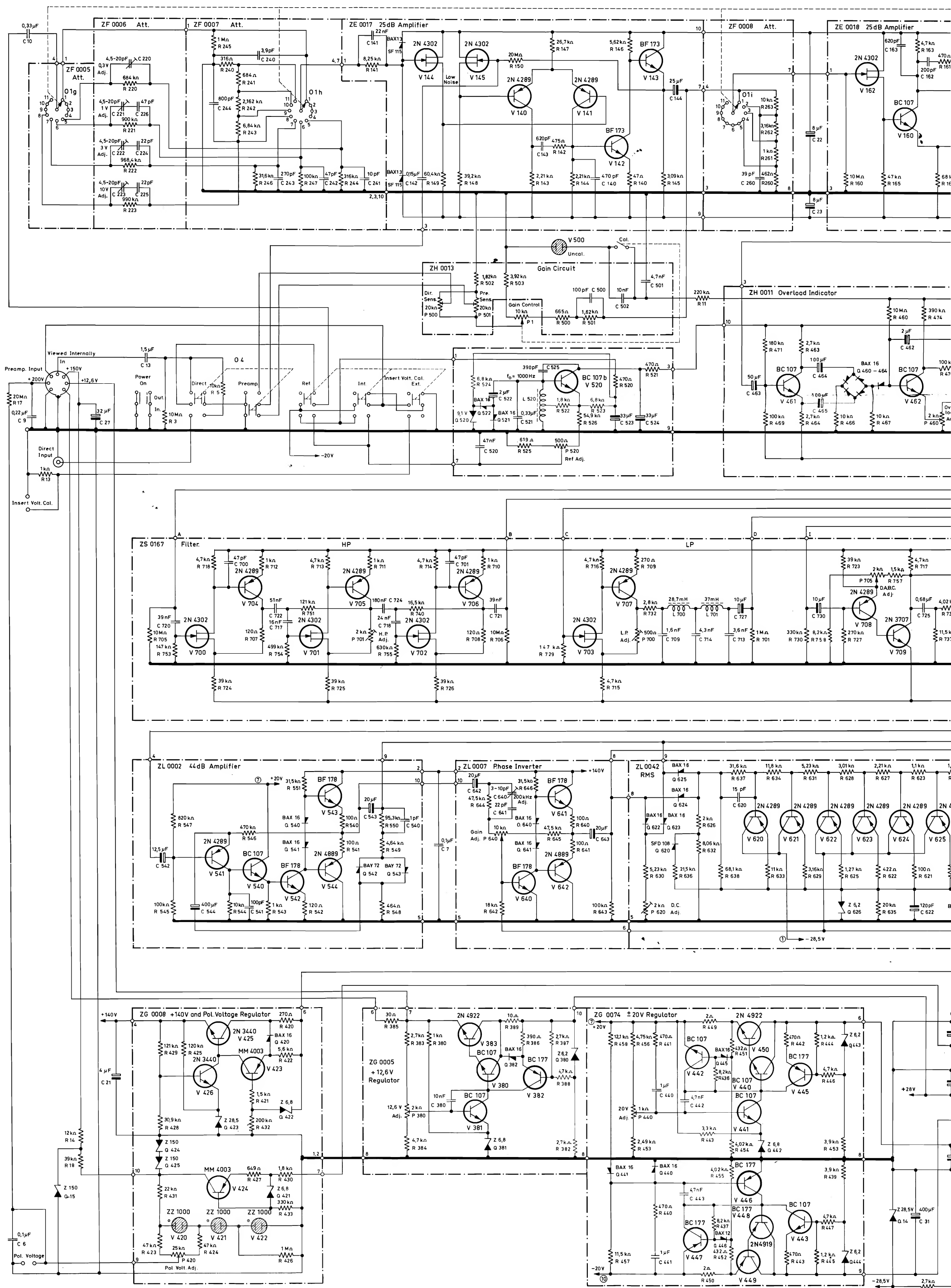
CIRCUIT DIAGRAM REF.	COMPONENT TYPE	STOCK REF.
R 727	Carbon 1/4 W 5%	270 k Ω RB 5270
R 729	Metal - 1%	147 k Ω RF 5147
R 730	Carbon - 5%	330 k Ω RB 5330
R 731	" - -	820 k Ω RB 5820
R 732	Metal - 1%	2.80 k Ω RF 3280
R 733	" - -	3.24 k Ω RF 3324
R 734	" - -	4.02 k Ω RF 3402
R 735,736	" - -	4.99 k Ω RF 3499
R 737	" - -	11.5 k Ω RF 4115
R 738	" - -	12.4 k Ω RF 4124
R 739	" - -	13 k Ω RF 4130
R 740	" - -	16.5 k Ω RF 4165
R 741	" - -	22.1 k Ω RF 4221
R 742	" - -	23.7 k Ω RF 4237
R 743,744	" - -	31.6 k Ω RF 4316
R 745	" - -	37.4 k Ω RF 4374
R 746	" - -	41.2 k Ω RF 4412
R 747,748	" - -	68.1 k Ω RF 4681
R 749,750	" - -	82.5 k Ω RF 4825
R 751	" - -	121 k Ω RF 5121
R 752,753	" - -	147 k Ω RF 5147
R 754	Carbon 1/3 W -	499 k Ω
R 755	" - -	630 k Ω
R 757	" 1/4 W 5%	1.5 k Ω RB 3150
R 758	" - -	8.2 k Ω RB 3820

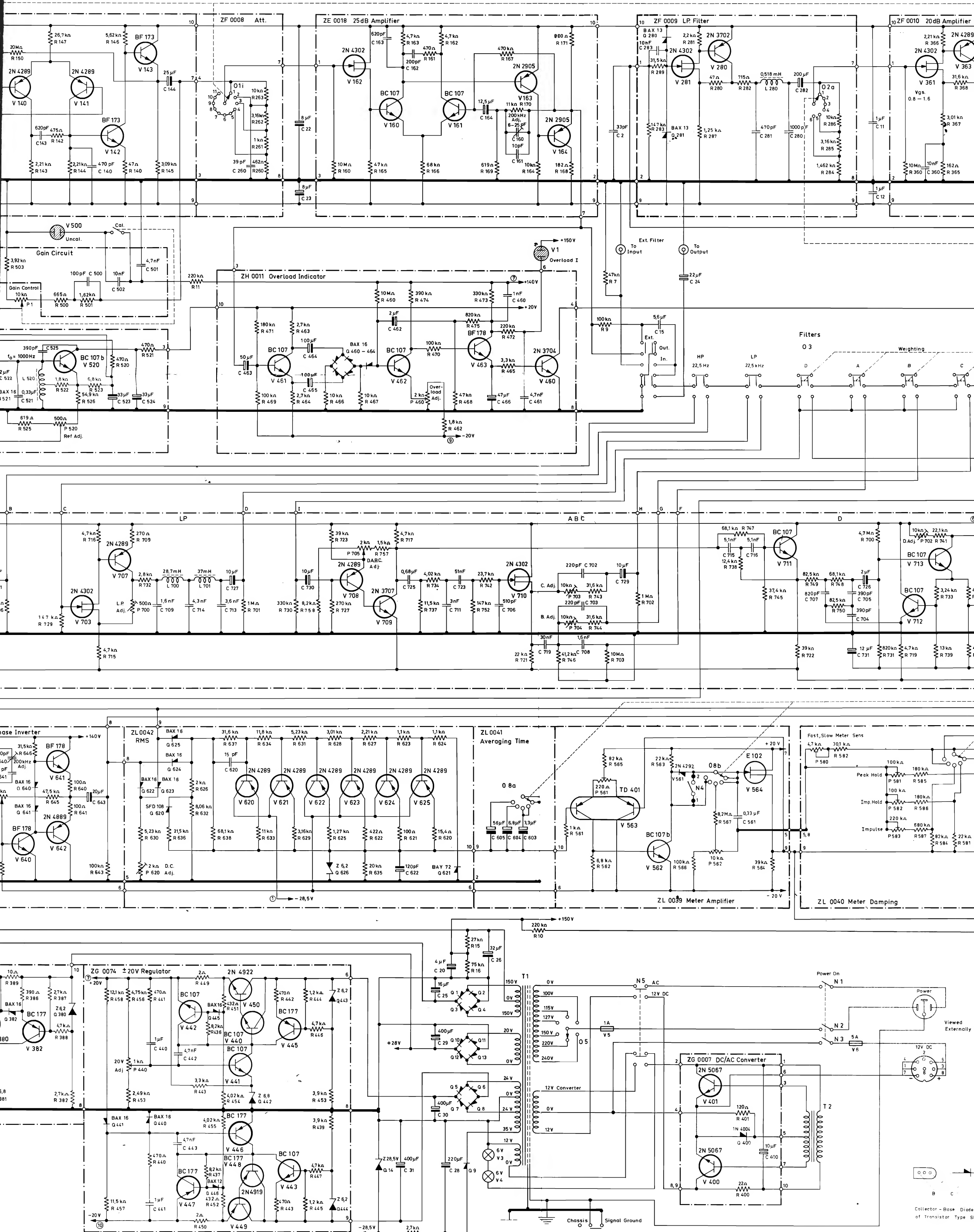
V 700-703	FET N	2 N 4302	VB 1025
V 704-708	Si. trans. PNP	2 N 4289	VB 0049
V 709	" NPN	2 N 3707	VB 0254
V 710	FET N	E 102 spec.	VB 1009
V 711-713	Si. trans. NPN	BC 107	VB 0257

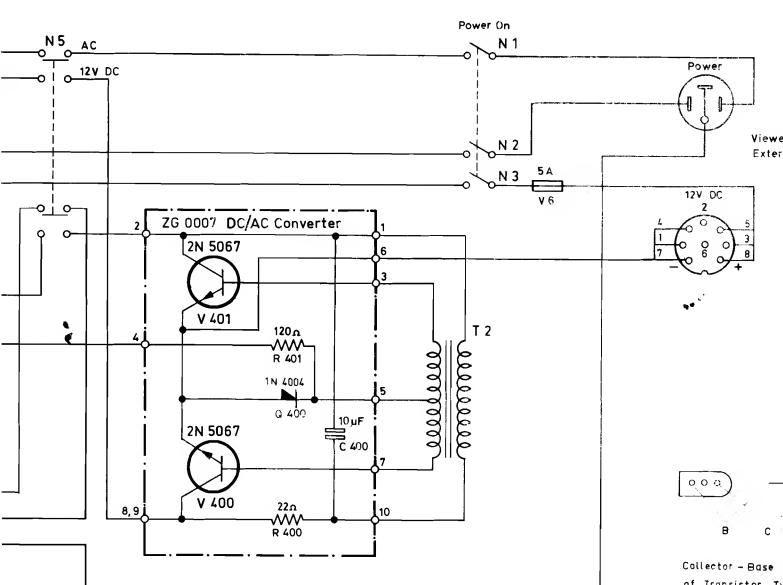
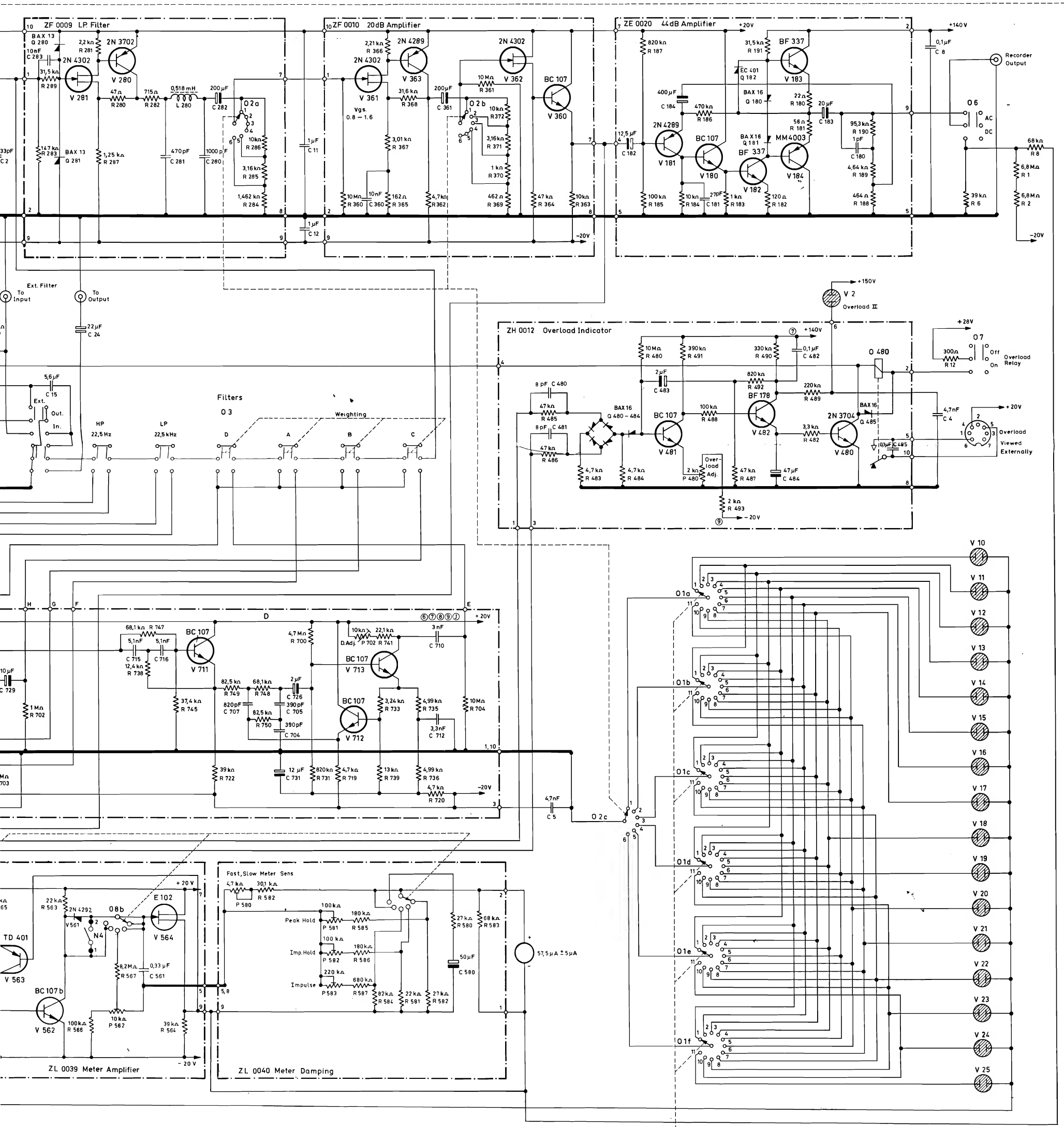
Printed Circuit Board

XC 0442

CIRCUIT DIAGRAM REF.	COMPONENT TYPE		STOCK REF.	CIRCUIT DIAGRAM REF.	COMPONENT TYPE	STOCK REF.
Lamps and Fuses						
V 1,2	Overload Lamps	220 V/ 0.8 mA	VS 1003		Metal Cabinet	KQ 0110
V 3,4	Dial Lamps	6.3 V/250 mA	VS 1273		Mahogany Cabinet	KA 0026
V 5	Fuse (Main Voltage)	1 A	VF 0008		Retaining Nut for Cabinet	YM 0425
V 6	Fuse (Battery Voltage)	5 A	VF 0015	T 1	Power Transformer	TN 0072
V 10-25	Range Lamps	65 V/ 0.3 mA	VS 0016	T 2	DC/AC Converter	TO 0002
V 500	Uncl. Lamp	220 V/ 0.8 mA	VS 0015		Dust Cover	KF 0025
Potentiometers			Printed Circuit Boards			
P 1	Gain Control	Carbon 10 kΩ	PQ 3103		25 dB Amplifier	without comp. XC 0430 ZE 0017
					44 dB Amplifier	XC 0436 ZE 0018
					25 dB Amplifier	XC 0458 ZE 0020
Switches					Attenuator input	XC 0427 ZF 0005
N 4	"Meter Reset"		NT 0023		Attenuator input	XC 0428 ZF 0006
N 5	"AC — DC" Mains		NN 0571		Attenuator input	XC 0429 ZF 0007
O 1	"Input Attenuator"		OE 0011		Attenuator output	XC 0433 ZF 0008
O 2	"Output Attenuator"		OT 0003		Low Pass Filter	XC 0445 ZF 0009
O 5	"Voltage Selector"		OA 0045		20 dB Amplifier	XC 0446 ZF 0010
O 6	"AC — DC" Output		NN 0031		12.6 V Regulator	XC 0438 ZG 0005
O 8	"Meter Function"		OK 0016		DC/AC Converter	XC 0440 ZG 0007
					140 V Pol. Volt. Reg.	XC 0441 ZG 0008
					20 V Regulator	XC 0715 ZG 0074
					Overload Indicator 1	XC 0426 ZH 0011
					Overload Indicator 2	XC 0451 ZH 0012
					Gain Control Circuit	XC 0459 ZH 0013
					Interconnecting Board	XC 0462 ZH 0016
Sockets and Relays					Ref. Oscillator	XC 0425 ZI 0002
	8 pin DIN plug		JP 0802		44 dB Amplifier	XC 0452 ZL 0002
	7 pin DIN plug		JP 0703		Phase Inverter	XC 0457 ZL 0007
	Screened socket (for B & K plug)		JJ 0108		Meter Amplifier	XC 0997 ZL 0039
	Socket 3-pin		JJ 4700		Meter Damping	XC 0998 ZL 0040
	Plug 3-pin		JP 4701		Average Time	XC 0999 ZL 0041
	Banana socket, isolated		JT 8344		RMS Rectifier	XC 1010 ZL 0042
	Banana socket		JT 6204		Filter Circuit	XC 0442 ZS 0167
	Fuse socket		JS 0019		Extended Circuit Board	XC 0711 AR 0010
	Neon Lamp retainers		JO 0016	Scales		
	Scale Lamp socket		JO 0023		dB scale	SA 0038
					1" Microphone scale	SA 0039
					1/2" Microphone scale	SA 0040
Miscellaneous					Acceleration scale	SA 0071
					Degree scale	SA 0086
	Power Cord EUR		AN 0010			
	Power Cord USA		AN 0006			
	Screened Cable		AO 0013			
	Rubber Feet, rear		DF 7015			
	Rubber Feet, front		DF 7018			
	Front Stand		DV 0050			
	Side Handles		DH 0052			
	Guides for P.C. Boards		DZ 9013			
	Locking Arm for P.C. Boards		DZ 9015			
	Retaining Pin for above		YN 0063			
	Moving Coil Instrument (0.5 mA)		IM 0018			
	Contact Slider for Rotary Switches		OD 0179			
	M3 Allen Screw for above		YQ 2003			
	1.5 mm Allen key for above		QA 0042			
	Knob, 20 mm		SN 2022			
	Knob, 31.5 mm		SN 3222			
	Retaining Ring for 31.5 mm knob		DB 0674			
	M4 Allen screw for above		YQ 2083			
	2 mm Allen key for above		QA 0043			







- | Input Section
Attenuator
O1 | Output Section
Attenuator
O2 | Meter Function
O8 |
|-----------------------------------|------------------------------------|----------------------|
| 1: 3 mV | 1: x 0.003 | 1: Imp. Hold |
| 2: 10 mV | 2: x 0.01 | 2: Impulse |
| 3: 30 mV | 3: x 0.03 | 3: RMS Fast |
| 4: 0.1 V | 4: x 0.1 | 4: RMS Slow |
| 5: 0.3 V | 5: x 0.3 | |
| 6: 1 V | 6: x 1 | |
| 7: 3 V | | |
| 8: 10 V | | |
| 9: 30 V | | |
| 10: 100 V | | |
| 11: 300 V | | |

