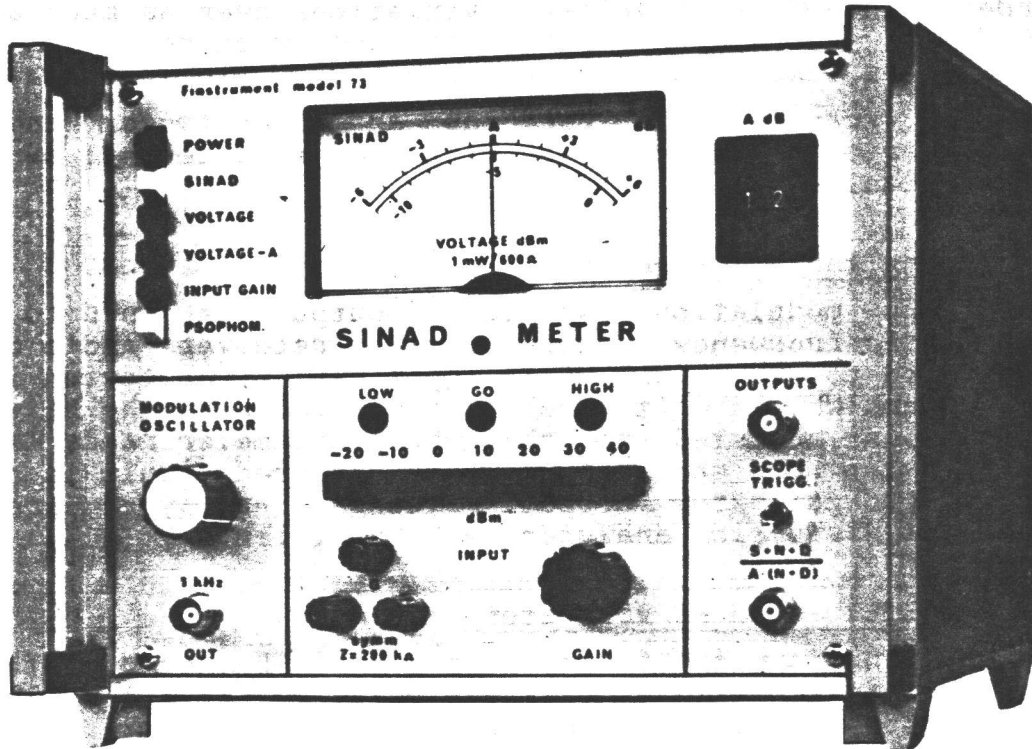


AEF 3873

FINSTRUMENT

Airboga Elektronikhs:istiska Fretning
www.aef.se 3873



SINAD METER

A NEW BREAKTHROUGH IN MODERN MEASURING TECHNOLOGY

With FINSTRUMENT model 73 you speed up and simplify testing of radiotelephone characteristics.

You also get the possibility to make measurements psophometrically weighed as the new radiotelephone measuring specifications require (CEPT T/R 17).

USE THIS SINAD METER IN LAB, PRODUCTION, QC, DELIVERY AND INCOMING INSPECTION AND ALSO IN SERVICE.

SIN 911-145

What it is:

FINSTRUMENT model 73 SINAD METER measures the SINAD ratio $S+N+D/N+D$ (S = signal, N = noise, D = distortion) continuously, independent of input voltage variations over as much as 40 dB. As well known, SINAD ratio is used when measuring receiver parameters like sensitivity, selectivity, intermodulation etc. Model 73 can also be used as an AC voltmeter and as an amplifier or attenuator with output adjustable in 1 dB steps or continuously.

Measuring the SINAD ratio:

The 1 kHz modulation oscillator output is used to modulate the radio frequency generator. The receiver audio output is connected to the SINAD METER input. SINAD criterion is set by the thumb wheels in the center scale (A). Now the RF generator output is adjusted so that the panel meter reads the wanted SINAD ratio at center scale. The measured result is available on the RF generator output settings. - Easy compared to the previous distortion analyzer technique, isn't it?

SINAD METER as an AC voltmeter:

By pressing down the function knob VOLTAGE the model 73 becomes an AC voltmeter with a dB-linear scale (0 dBm = 1 mW/600 Ω). If the input voltage is less than -30 dBm (≈ 2.5 mV) the function VOLTAGE-A increases the sensitivity by the A dB-setting on the thumb wheels.

HIGH - GO - LOW lights:

These lights show if the chosen sensitivity is suitable for the applied input voltage. The high limit is set by the decreasing of the crest factor, the low limit by inherent noise.

PSOPHOMETRIC filter option:

The Commission of European Post and Telegraph Administrations CEPT has come up with new recommendations for measuring the characteristics of mobile radiotelephones (T/R 17). According to these recommendations the psophometrically weighed SINAD ratio shall be used. A filter for this purpose can be inserted in the SINAD METER and it is activated by the front panel knob PSOPHOM.

Use of oscilloscope:

By connecting the $S+N+D/A \cdot (N+D)$ output to an oscilloscope Y input the total signal (switch in up position), or the noise and distortion (switch in down position) amplified by the A dB setting, can be watched. For closer examination of possible distortion, the scope can be triggered by the 1 kHz modulation signal from the SCOPE TRIG output.

S P E C I F I C A T I O N S

I Modulation oscillator

- Output voltage: adjustable, max 2,5 V/600 Ω or >20 V/hi-Z
- Distortion: <0.03 % at 2,5 V/600 Ω
- Frequency: 1000 Hz ±2 Hz

II AC voltmeter

- | | Voltage | Voltage-A |
|---|-----------|-----------|
| - Range/dBm | -31...+41 | -70...+41 |
| - Accuracy/dB | ±0,3 | ±0,5 |
| - Frequency response/-1 dB: <10 Hz...>25 kHz | | |
| - Input resistance: 100 kΩ grounded, 200 kΩ symmetrical | | |
| - Crest factor: ≈56 at low scale, ≈14 at full scale | | |
| - Calibration: 0 dBm = 1 mW/600 Ω = 775 mV sine wave | | |
| - Response: responds to average value of applied input | | |

III SINAD ratio

- Sinad range: 0...45 dB (A = 0...39 dB)
- Accuracy of A-dB setting: ±0.2 dB
- Crest factor:
 - GO lit, high limit = 4
 - HIGH lit, low limit = 14
 - GO lit, low limit = 300
- Low-frequency response/-1 dB: <10 Hz
- High-frequency response/-1 dB:
 - HIGH and GO lit: >25 kHz
 - GO lit, low limit +6 dB: >15 "
 - GO lit, low limit: >10 "
- Notch-filter response:

Attenuation	BW	Attenuation	BW
0.5 dB	≈370 Hz	20 dB	≈30 Hz
1 "	≈275 "	30 "	17 "
3 "	145 "	40 "	11 "
6 "	85 "	50 "	5 "
12 "	55 "	60 "	2.8 "

IV Psophometric filter option

The SINAD METER is readily equipped with a pushbutton on the front panel for a psophometric filter according to CCITT recommendation P53. It is used for measuring the psophometric SINAD ratio or AC voltage. If you find this option useful for your purpose, please contact your FINSTRUMENT representative.

V Outputs

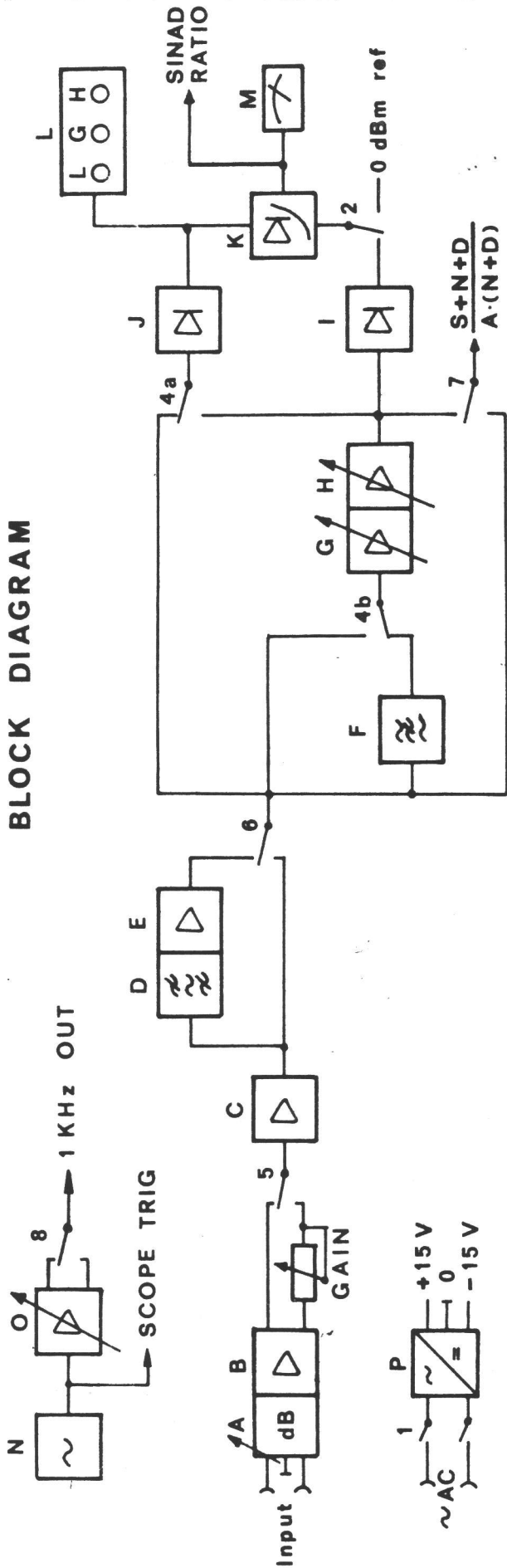
- SCOPE TRIG: 1000 Hz/1 V/2.4 k Ω
- S+N+D/A•(N+D): impedance 600 Ω
- dB-linear SINAD output at rear: 1 V DC/10 dB

VI General

- Dimensions: 235 wide, 190 high, 280 deep (mm)
- Weight: net without psophometric filter 3,5 kg
- Power: 220 V AC ± 10 %, 50 Hz, 4 VA

Manufacturer: T:mi Krook FINSTRUMENT
Rauduntie 4
02130 Tapiola 3
FINLAND

Your representative:



SWITCHES

- | | | |
|---|---------------|-------------------------|
| 1 | Power | on/off |
| 2 | Sinad | interacting, |
| 3 | Voltage | shown in SINAD-position |
| 4 | Voltage-A | variable/calibrated |
| 5 | Gain | psoph. weighted/flat |
| 6 | Psophometer | S+N+D/A.(N+D) |
| 7 | S+N+D/A.(N+D) | 2.5V 600ohm/>20V hi-Z |
| 8 | 1 KHz | |

- | | |
|---|-----------------------------|
| A | Input Attenuator |
| B | Input Amplifier |
| C | Amplifier |
| D | Psophometer Filter |
| E | Psophometer Amplifier |
| F | 1 KHz Notch-Filter |
| G | x 10 dB Amplifier |
| H | x 1 dB Amplifier |
| I | Noise-Channel Detector |
| J | Signal-Channel Detector |
| K | Logarithmic Ratio Detector |
| L | High-Go-Low Indicator |
| M | Panel Meter |
| N | 1 KHz Modulation Oscillator |
| O | Amplifier, Low-Pass Filter |
| P | Power Supply |

FINSTRUMENT model 73
SINAD METER

C A L I B R A T I O N

Instruments:

- AC voltmeter
- DC voltmeter
- Counter
- AF oscillator

Calibration Procedure

1. Adjust the 1 kHz modulation oscillator frequency with P1.
(When this is done, the notch filters must also be adjusted.)
2. Adjust the 1 kHz modulation oscillator amplitude with P2.
The amplitude can be increased to 8 V rms/600 ohm if required.
3. Null the signal- and noise-channel detectors with P4 and P14. This is done with no input signal, SINAD function, sensitivity at +20 dB and A at 0 dB. Use a DC mV-meter or a sensitive microammeter to get the DC output level of the detectors to the region of 1 mV.
4. Calibrate the notch filters by P9 (P11) and P10 (P12).
Adjust the interacting P9 (P11) and P10 (P12) to reject the 1 kHz in the noise channel. To be able to do this, overrun the second (first) filter by shorting C31 (C26).
 - SINAD function, modulation oscillator 1 kHz connected to input, and input level adjusted so that GO and HIGH are lit.
 - Adjust the trimmers one after the other until the SINAD reading is more than 55 dB. You can still continue the adjusting by connecting a sensitive AC voltmeter or a scope at front panel output A (N + D).
 - The second notch filter will then be adjusted in a similar way. Read now the information within the brackets.
5. Null the logarithmic ratio detector with P5.
 - SINAD function, A at 0 dB, a signal of about 2 kHz connected to input, GO lit.
 - The panel meter reads now A dB (middle of SINAD scale)
 - Decrease the input level until LOW lights and still 10 dB below that level.
 - Adjust P5 to get the reading back to A dB, if it has deviated.

6. Adjust the voltmeter reference with P7.

- Use the same external 2 kHz signal and set it to 0 dBm (= 0,775 V) with an external AC voltmeter.
- VOLTAGE-A function, input sensitivity at +10 dBm, GAIN and PSOPHOM OFF, set A at 5 dB.
- Adjust P7 to get the reading at -5 dB (middle of voltage scale)

7. Adjust panel meter scale with P6.

- Make this adjustment after voltmeter reference adjustment (point 6) with the same setup and levels.
- Press VOLTAGE function in; the meter should read -10 dB on voltage scale, if not, adjust P6.
- Change input sensitivity to 0 dBm, the meter reads now 0 dB.

8. Adjust the back panel SINAD RATIO output with P15.

- Connect the modulation oscillator 1 kHz signal and an external 2 kHz to the input connectors.
- Set sensitivity so that GO and HIGH are lit.
- Adjust the signal amplitudes until you get a SINAD-reading of 20 dB (A = 20 dB and reading in the middle of SINAD scale).
- Set A to 0 dB with the thumbwheels.
- Adjust P15 so that an accurate DC voltmeter connected to the SINAD RATIO output on the back panel reads 2.0 volts.

This completes the calibration.

LIST OF PARTS

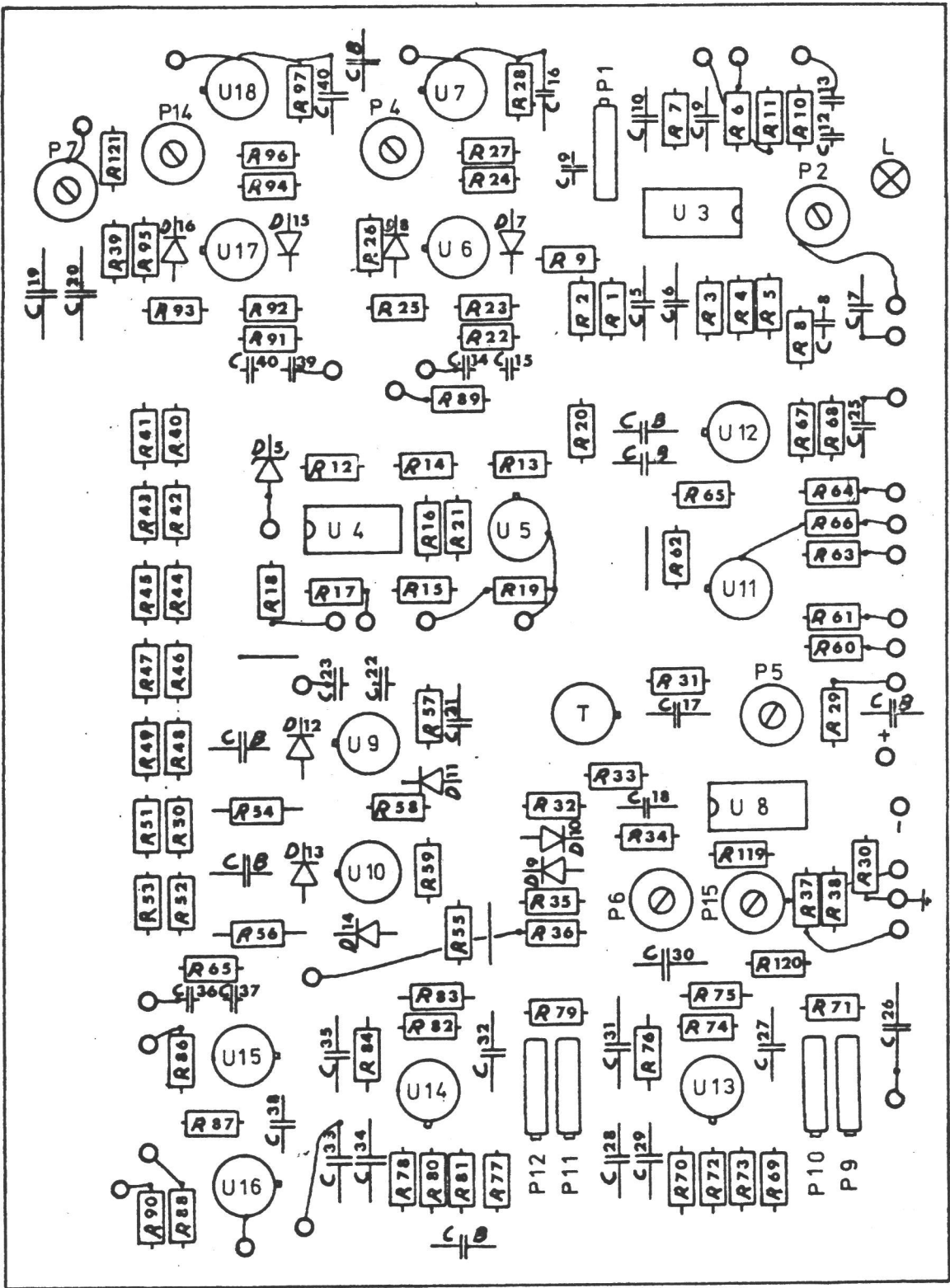
RESISTORS

CODE	VALUE	CODE	VALUE	CODE	VALUE	CODE	VALUE
R1	39k3	R31	10k0	R61	8k25	R91	10k0
2	x	32	511	62	6k81	92	6k81
3	40k2	33	26k1	63	26k1	93	10k0
4	10k0	34	1k00	64	9k09	94	20k0
5	3k16	35	287	65	6k81	95	10k0
6	20k0	36	2k15	66	0	96	6k81
7	"	37	15k4	67	10k0	97	23k7
8	100	38	"	68	x	98	4k64
9	"	39	26k1	69	39k3	99	287
10	590	40	68k1	70	x	100	825
11	10k0	41	"	71	18k7	101	140
12	12k7	42	21k5	72	x	102	187
13	1k00	43	"	73	40k2	103	100
14	2k15	44	6k81	74	82k5	104	82k5
15	38k3	45	"	75	910k	105	38k3
16	"	46	2k15	76	"	106	511
17	1k54	47	"	77	39k3	107	23k7
18	"	48	681	78	x	108	187
19	"	49	"	79	18k7	109	16k9
20	31.6	50	215	80	x	110	147
21	38k3	51	"	81	40k2	111	12k7
22	10k0	52	100	82	82k5	112	10k0
23	6k81	53	"	83	910k	113	187
24	20k0	54	10k0	84	"	114	7k87
25	10k0	55	6k81	85	10k0	115	162
26	"	56	10k0	86	"	116	6k49
27	6k81	57	6k81	87	"	117	140
28	23k7	58	3k16	88	"	118	5k36
29	15k4	59	"	89	590	119	2k15
30	"	60	6k81	90	"	120	4k64
						121	681

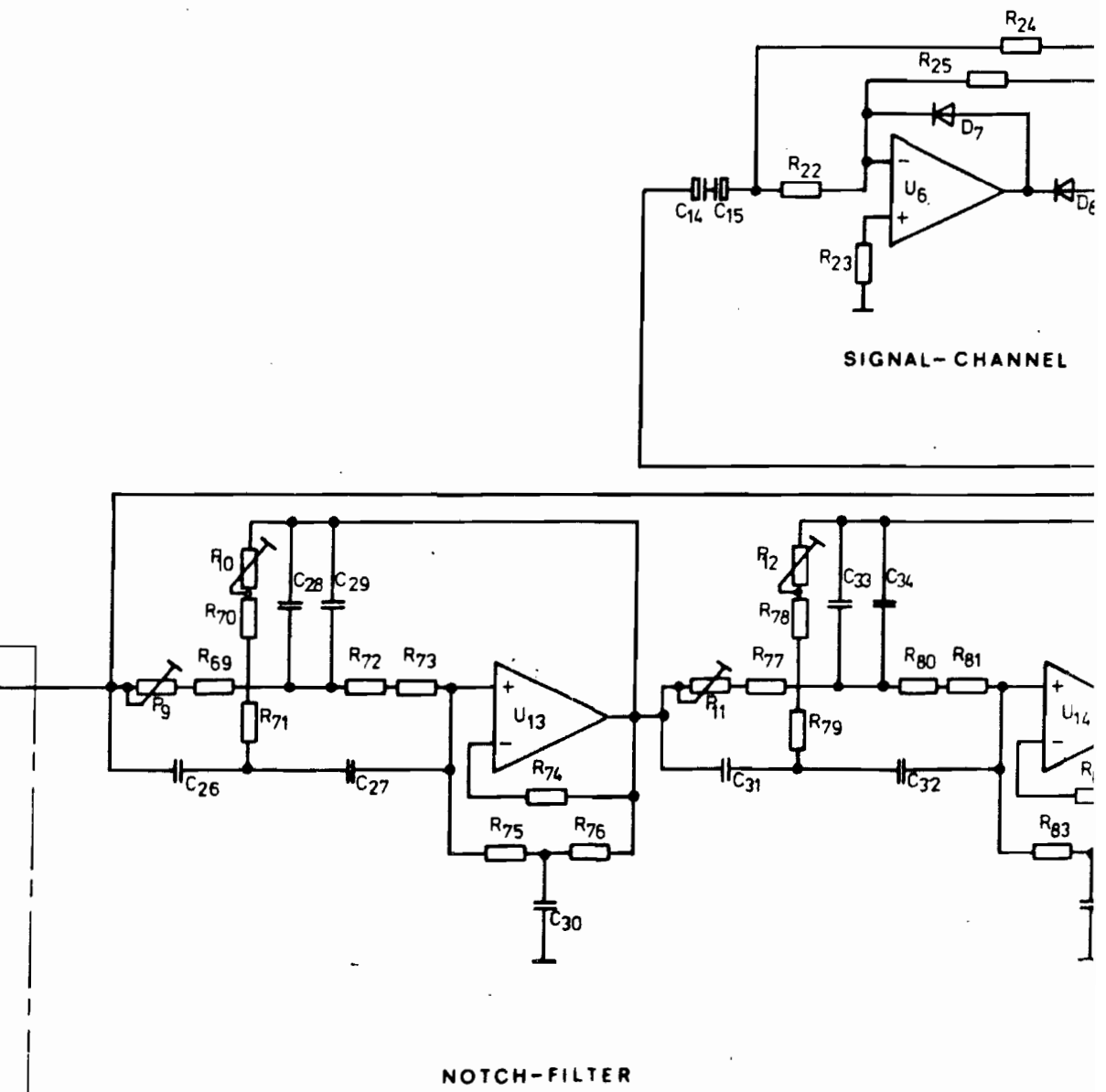
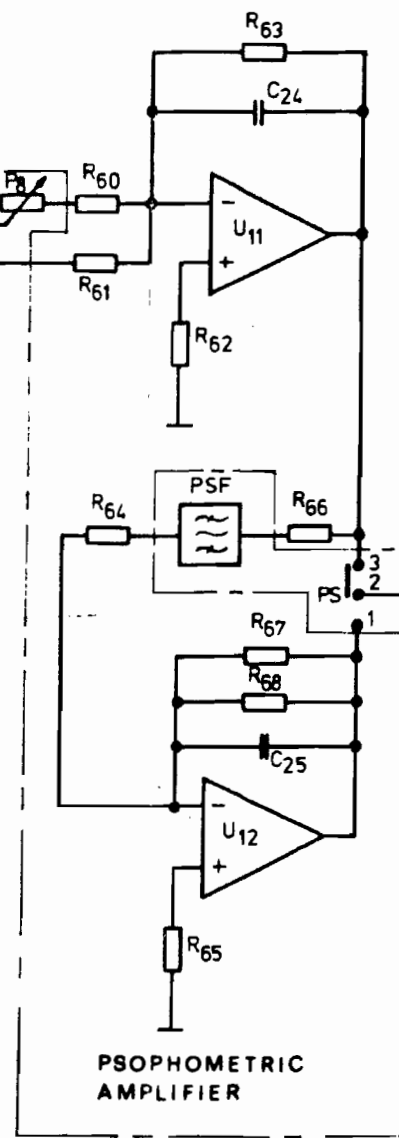
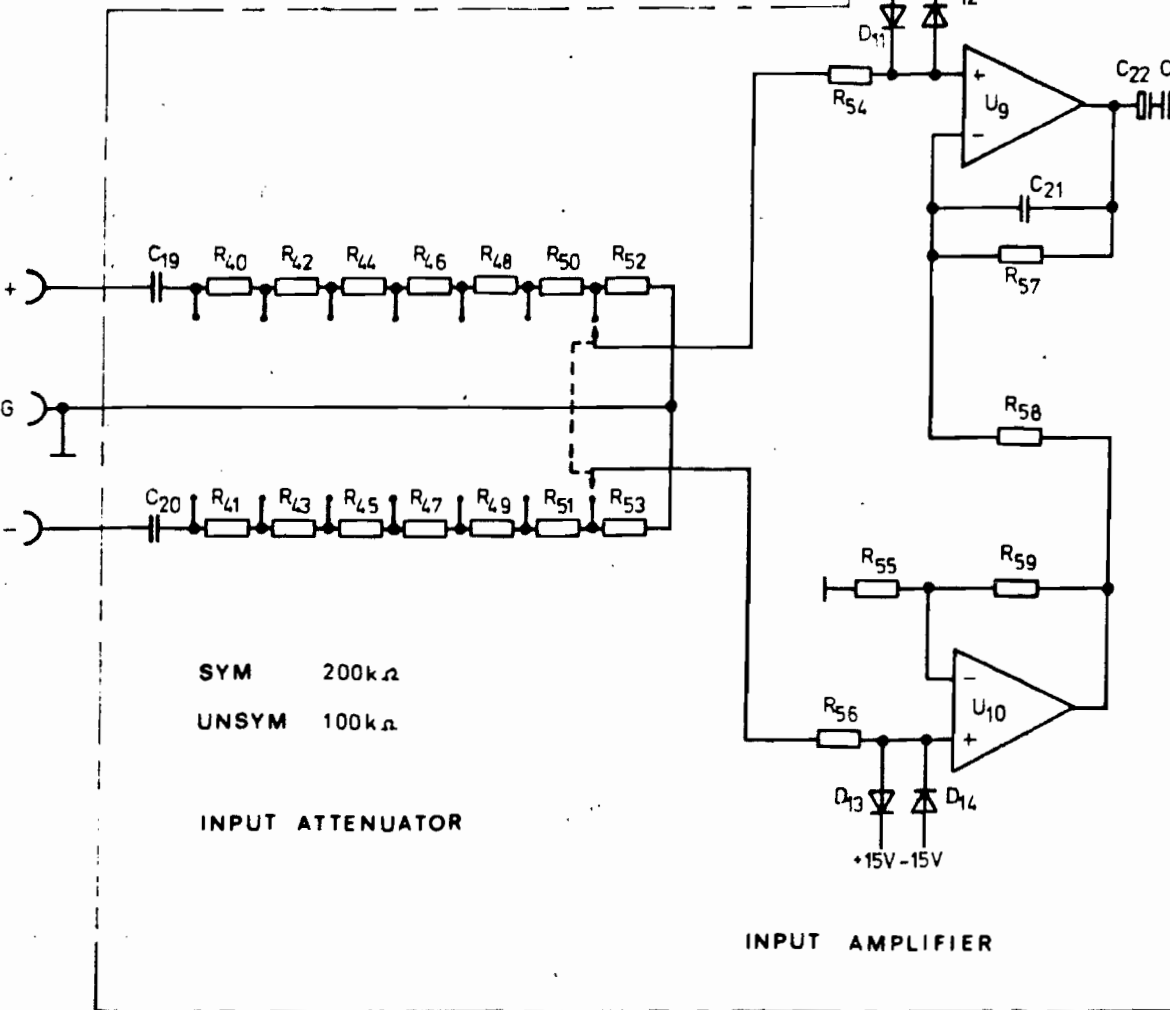
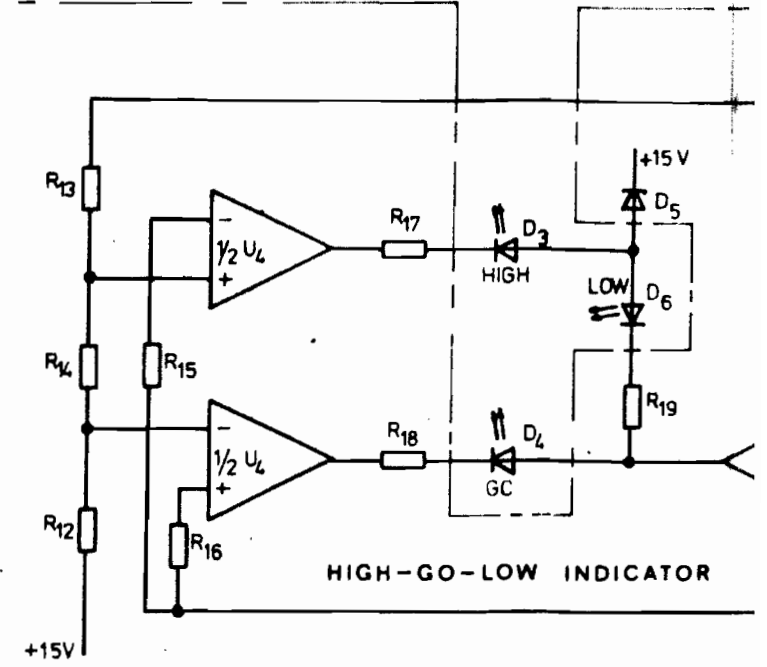
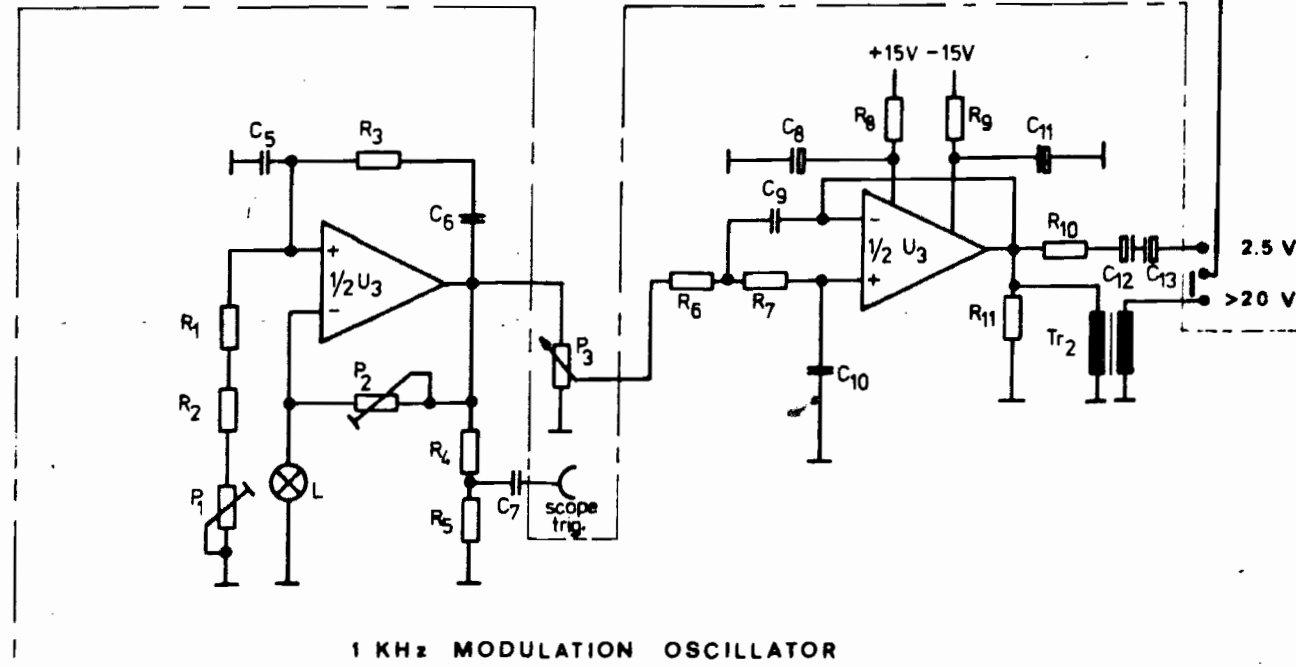
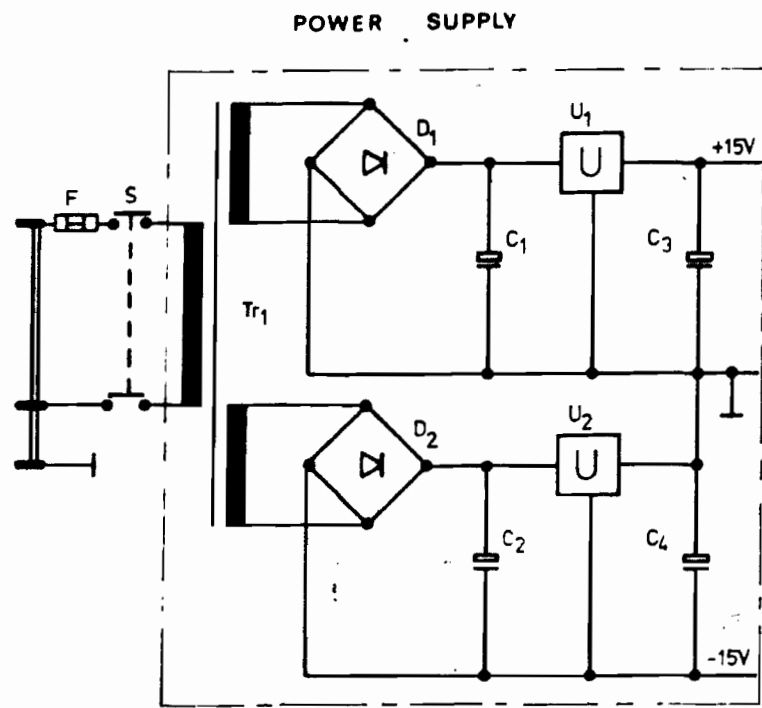
Resistors type Vitrohm 471-0
 " (x) " " 411-0
 " x Factory Selected

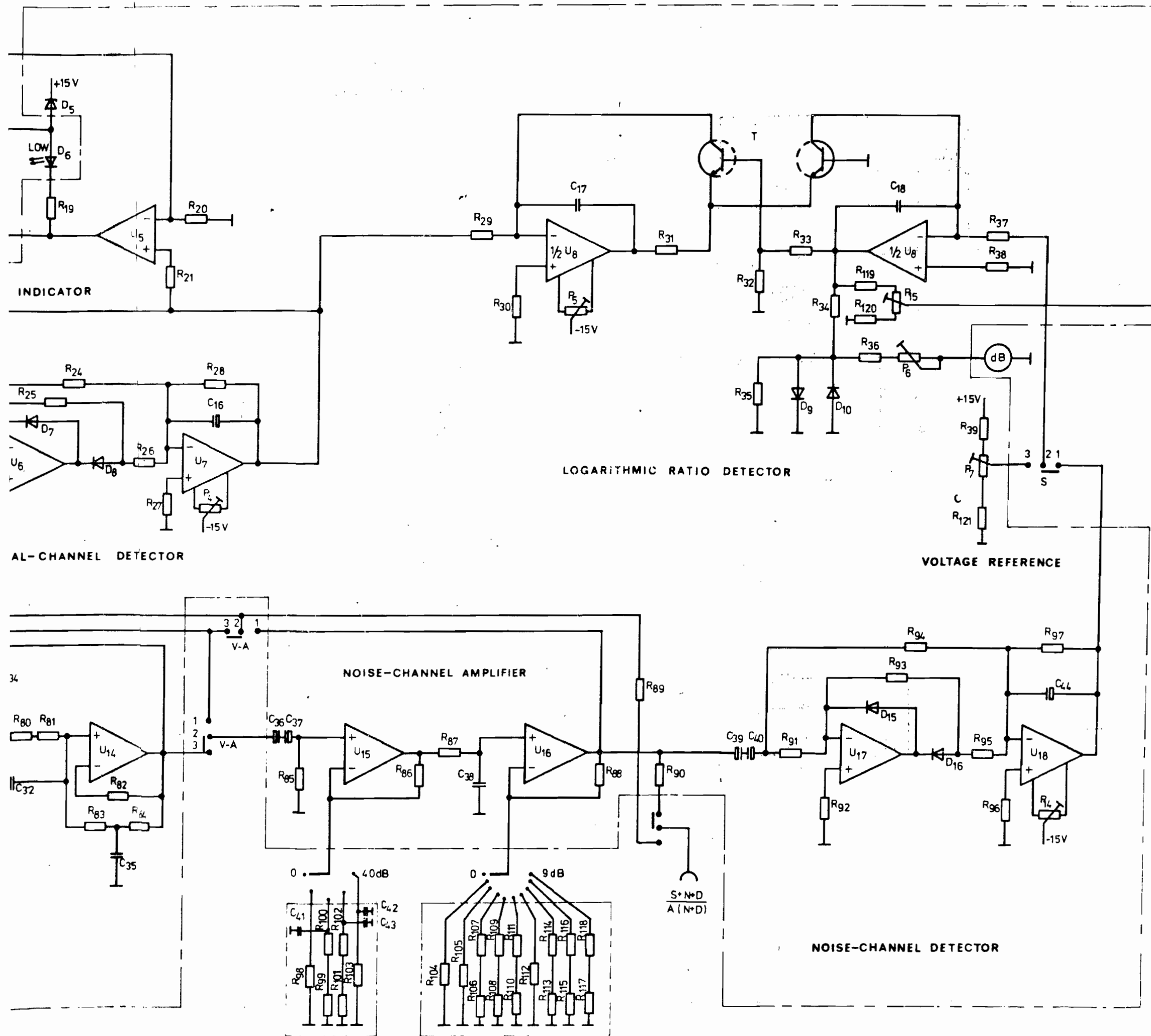
CODE	VALUE	FACTORY	TYPE
Capacitors C...			
1,2	2200 uF 35 V	Siemens	609 41100
3,4	15 uF 22 V	Ero Tantal	ETP 15/20
5,6,26,27,28, 29,31,32,33,34	3900 pF 63 V	Philips	424 33902
7 + 7 bypass	"	"	"
8,11	100 nF 250 V	"	342 44104
9,17,18	68 uF 16 V	Ero Tantal	ETP 68/16
10	22 nF 250 V	Philips	342 44223
12,13,14,15,22, 23,36,37,39,40	3300 pF 63 V	"	424 33302
16,44	22 uF 6,3 V	Ero Tantal	ETP 22/63
19,20	"	"	"
21,25	4,7 uF 16 V	Philips	015 15478
30,35	680 nF 100 V	"	344 21684
38	150 pF 500 V	"	427 31501
41	350 pF 250 V	"	426 33601
42	68 pF 63 V	"	632 10689
43	680 pF 250 V	"	426 36801
	68 nF 250 V	"	342 44683
	6,8 nF 63 V	"	424 36802
Potentiometers			
Trimmers P...			
1,9,10,11,12	2 kohm	Bourns	3007P-1-202
2,6	1 kohm	Piher	PT-10 V
3	2 k5	CTS	AW 2k5
4,5,14	10 kohm	Piher	PT-10 V
7,15	500 ohm	"	"
8	25 kohm	CTS	AW 25k
Transformers			
Tr1	220/2x17,5 W	Muuntosähkö Oy	19789
Tr2		"	19489
Lamp L	12 V 20 mA	Taunuslight	4622-00-012-020
Psophometric Filter		Finstrument	88A

CODE	TYPE	FACTORY	No.
D1, D2	BS1	IR	2
D3, D6	MV 5023	Monsanto	2
D4	MV 5222	"	1
D5	1N 746	Motorola	1
D7...D16	1N 4146	Teledyne	10
IC: U1, U2	TBA 625C	SGS	2
U3, U4, U8	MC 1458CP2	Motorola	3
U5, U12	MC 1741CG	"	2
U6, U7, U9...U18	MC 1456CG	"	11
Transistor: T	MD8002	Motorola	1
Mechanical Parts:			
Input Attenuator Switch	V 12.5 7D2S	Isostat	1
Button	4179 SN 10607	"	7
Function Switch	V-10R-7 D-2xD2W	"	1
	3xD2S 3510/21		
Button	4748 SN 10101	"	1
"	SN 10604	"	2
"	SN 10607	"	3
Thumbwheel Switch	SMI 10ND Black	Birch-Stolec Ltd.	2
Thumbwheel End Plates	SMEP/Black	"	1p
Panel Meter	KM 106 \pm 50 uA	Kyoritsu	1
BNC Female Connector	31-221	Amphenol	3
Knob	021-4420	Elma	2
Accessories for Knobs	040-4010	"	1
"	040-4020	"	1
Terminal, Front	024-2020	"	1
"	024-2030	"	2
"	RC11 Black	SFM	1
"	RC11 Blue	"	1
Fuseholder	1911/1971	ELU	1
Fuse	5x20, .1 A Fast	"	1
Switch	CTS 3	Arrow	2
Case	1441-72	Elma	1
Foot	1924-02	"	1
Heat Sink	207 AB	Wakefield	2



PARTS' LOCATION



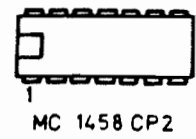


CONNECTION DIAGRAMS

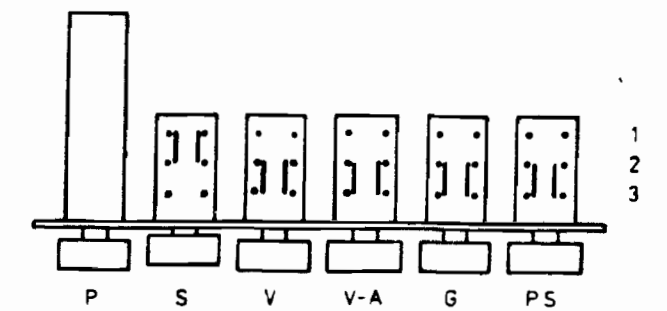
BOTTOM VIEW



TOP VIEW



SINAD RATIO
1 V/10 dB



- P POWER
- S SINAD
- V VOLTAGE
- V-A VOLTAGE-A
- G GAIN
- PS PSOPHOM

SINAD METER
model 73

FINSTRUMENT