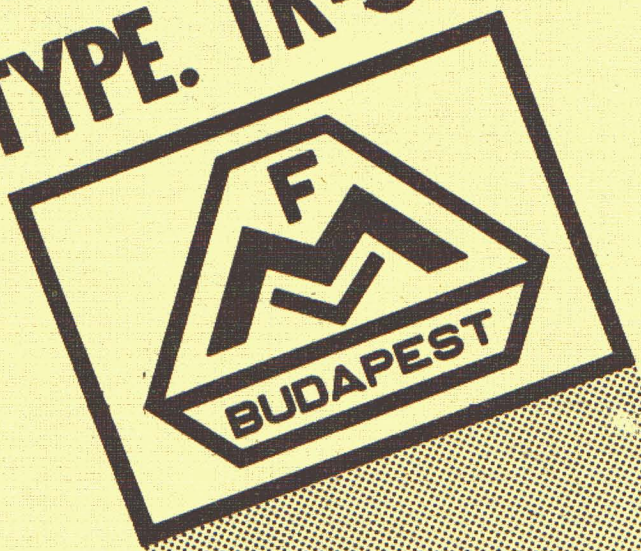
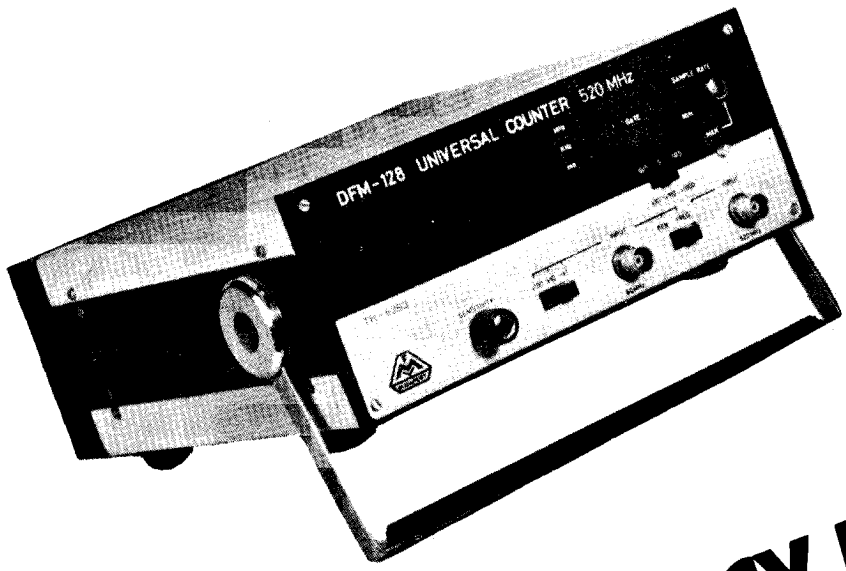
DIGITAL FREQVENCY METER
TYPE. TR-5283(DFM-128)



DIGITAL FREQUENCY METER TYPE **TR-5283** (DFM-128)



DIGITAL FREQVENCY METER TYPE. TR-5283(DFM-128)

BUDAPEST

HG5TN

CONTENTS

DIGITAL FREQUENCY METER TYPE **TR-5283** (DFM-128)

1. APPLICATION

The small-size universal Frequency Meter of type DFM-128 assures fast, accurate and reliable frequency, frequency ratio and averaged time period measurement in wide range. It is designed for general application purposes and favourably applicable for development, working calibration and service of telecommunication facilities.

The continuously variable sensitivity of the direct input assures correct frequency measurement even at multiple turnover wave-forms. The high sensitivity of the instrument makes the measurement of local oscillators and RF carriers without galvanic connection (with inductive loop) possible.

The prescaler input of the instrument, using external attenuator, has min. 50 dB working dynamic range, that provides possibility for measuring different magnitude signals. The measurement can be started by external electric signal and the result appears at the output of the instrument, or on the parallel connected printer.

2. TECHNICAL DATA

Frequency measurement:	2 Hz to 60 MHz (direct input) 50 MHz to 520 MHz (prescaler input)
Gate time:	0.1 s; 1 s; 10 s
Resolution:	0.1 Hz; 1 Hz; 10 Hz (direct input) 1 Hz, 10 Hz, 100 Hz (prescaler input)
Accuracy:	$\pm$ 1 digit + clock error
Read-out:	in kHz or MHz with automatic decimal point shift

Averaged time period measurement:

Measuring range:	100 ns to 0.5 s
Resolution:	10 ns, 100 ns, 1 μs
Accuracy:	$\pm$ 1 digit $\pm$ clock error $\pm$ trigger error/number of averaging
Averaging:	to 10, 100, 1000 periods
Read-out:	in ms with automatic decimal point shift

Frequency measurement:

Measurement result: $\frac{f\ (\text{direct input})}{f\ (\text{ext. clock input})} \times Nfr$

Nfr: 10^5; 10^6; 10^7

$\frac{f\ (\text{prescaler input})}{f\ (\text{ext. clock input})} \times Nfr$

Nfr: 10^4; 10^5; 10^6

$\frac{f\ (\text{ext. clock input})}{f\ (\text{direct input})} \times Nper$

Nper: 10^0; 10^1; 10^2

Positions of gate time switch: x10, x100, x1000

Frequency range: (from ext. clock input): 1 kHz to 10 MHz

Signal input:

Sensitivity

Direct input: 30 mVrms up to 20 MHz, 40 mVrms to 60 MHz (sinusoidal input signals)

Prescaler input: 10 mVrms

Divisions: x1, x10, x100 steps
continuously variable within the individual ranges (direct input)

Input impedance: 1 MOhm less than 30 pF (direct input)
50 Ohm (prescaler input)

Overloadability: 50 Vrms, x1 (up to 10 kHz)
250 Vrms, x10, x100 (up to 10 kHz)
10 mVrms, x1, x10, x100 (up to 10 MHz) (direct input)

5 Vrms (prescaler input)
5 Vrms (ext. attenuator input)

Clock:

Internal: TCXOA31

Frequency: 10 MHz

Stability:	better than $\pm$ 5x10^{-7} 0°C to 40°C
Ageing:	less than $\pm$ 5x10^{-7}/month; $\pm$ 5x10^{-8}/day (at constant temperature)
Output:	1 MHz TTL level (with switch on back-panel in INT position)

External clock input:

Input impedance:	1 kOhm
Frequency:	1 MHz
Sensitivity:	min. 100 mVrms (with switch on back-panel in EXT position)
Max. input signal:	2 Vrms

General data:

Display time:	appr. 0.2 s to 4 s, continuously variable
HOLD mode:	new measurement is started by pushbutton MAN or by external electric signal
Display:	8 digit LED display
Outputs:	Parallel measurement data output with decimal point, printer control output, new measurement start blocking input.
Coding:	BCD 8421
Printing command signal:	appr. 1.4 ms wide, 0 → 1 → 0 TTL signal
Power consumption:	220 V $\pm$ 10 % appr. 40 VA

Permissible ambient data:

Working temperature:	0 to 40°C
Sensitivity:	at 0°C between 50 MHz - 200 MHz = 25 mVrms at 40°C between 50 MHz - 200 MHz = 15 mVrms
Relative humidity:	max. 80 %
Storage temperature:	-25 to +50°C

Dimensions:

Depth:	254 mm
Width:	220 mm
Height:	90 mm
Weight:	appr. 35 N

Accessories (price included):

1 pc	Mains connector
1 pc	Manual
1 pc	BNC-BNC measuring cable
1 pc	31-31 pin service card
1 pc	15-15 pin service card
1 pc	external attenuator of 20 dB
1 pc	Fuse link
2 pcs	Needle-contact plug

Rights for alterations reserved!

3. DESCRIPTION OF OPERATION

3.1. The schematic diagram of the instrument is shown in Fig.1. on page 23. The instrument is constructed from the following units:

1. Input stage (direct)
2. Input stage (prescaler)
3. Selector circuit
4. Thermo-compensated crystal oscillator (TCXO)
5. Clock selector circuit
6. Clock scaler circuit
7. Control circuit
8. Signal gate
9. Counters, storages, decoders, LED displays
10. Printer output
11. Decimal point and unit display automatics
12. Supply unit

3.2. Input stage (direct, Drw. No.: DFM-128-131)

The input signal to be counted gets thru a 3-way compensated divider to a source or an emitter follower, that assures high input impedance. By means of circuit elements R5, D1, D2 overcurrent protection is provided. The signal gets thru the solid-state amplifier TR3 to the Schmitt circuit constructed from inverter elements IC1, at the output of which (5) unified TTL level compatible output signals occur. The continuous sensitivity change of the direct input can be performed by potmeter P1.

3.3. Input stage (prescaler, Drw. No.: DFM-128-132)

The HF input signal to be measured gets thru the wide band amplifier IC2 to the input No. 10 of ECL construction prescaler IC3. The diodes D3, D4 assure overcurrent protection. The divided in frequency by 10:1 signal appears at output No. 4 on ECL logic level from where it is transformed to TTL compatible output signal by the Schmitt circuit IC4 constructed from NAND elements. The digital prescaler IC3 oscillates without input signal. In order to prevent this from being visible on the counter display a further gating is applicated at TTL level.

In case of sufficient magnitude input signal the peak rectifier constructed from diodes D5, D6 and trimmed source follower TR4, TR5 drives the output of the level comparator IC5 into logic "1". The level comparator passes the divided output signal thru point 3 of IC4 to the output. The comparison level (and simultaneously the sensitivity, too) can be adjusted by potmeter P2.

3.4. Supply unit of -5.2 V (Drw. No.: DFM-128-133)

The unit assures supply voltage for the digital prescaler IC3. The circuit is a series transistor (TR6) regulator equipped with error signal amplifier (TR7). The output voltage can be changed by means of potmeter P3.

Changing the output voltage the optimum state(sensitivity, working dynamic range) of the digital prescaler IC3 can be adjusted.

3.5. Control circuit I. (Drw. No.: DFM-128-15B)

Operation in frequency meter mode:

With switch K7 on the back-panel in INT position, the gate signal is produced from the 1 MHz signal (arriving at point CS8/3) of the thermo-compensated internal crystal oscillator, while with switch K7 in EXT position it is produced by attenuation from the external 1 MHz clock signal connected to the BNC CS3. The electronic selection of the internal or external clock is assured by gate network constructed from case IC15, while the attenuation of the clock signals is assured by number chain decades IC5, IC6, IC7, IC13, IC14, IC21. The output signal determining the magnitude of the gating signal appears at the point 8. of IC20. It can be of 0.01 s, 0.1 s, and 1 s period.The gate driver synthesizes the control signal necessary for opening the gate (IC10, output 8.) from the time quantums (of 0.01 s, 0.1 s, 1 s). The flip-flops IC2, IC3, IC4 form an 11 state number chain. The 11th state of the counter is decoded by the output 11. of NAND element IC12.

From states 1 to 10 gating level (logic "1") is present at the output 11 of IC12, while a gate closing level (logic "0") in the 11th state. The duration of the 11th state can be extended by the output signal arriving at point CS8 of the monostable multivibrator (DFM--128-16B) described later.This provides possibility for changing the sampling rate. The auxiliary signals necessary for evaluating the measurement are generated by the monoflops IC11 (zeroing signal) and IC19 (overfeed signal), while the printing command necessary for recording the result by the monostable circuit IC16. The zeroing signal appears at the junction point CS7b/23, the overfeed signal at CS7b/1, CS7b/2, and CS7b/4, while the printing command signal at CS7b/28. The visual display of the gate signal is assured by the LED titled GATE (DFM-128-14B) connected to point CS7b/3. One input of the signal gate (terminal 10 of IC10) is supplied with properly unified by the input stages signal to be measured, while its other input (terminal 9 of IC10) with the decimal gating signal derived from the clock. In frequency meter mode the switch K2 should be set

either to 60 MHz or to 520 MHz position, accordingly either the output signal of the 60 MHz (direct) input stage connected to point CS7b/10, or that of the 520 MHz (prescaler) input stage connected to point CS6b/15 appears at the output 6 of IC10. The first counter decade (IC9) of the counted pulses comming from signal gate is located near the signal gate due to velocity reasons. The display store of the first lowest digit is the IC17 at the output (CS7b/17, CS7b/18, CS7b/20, CS7b/21) of which the result appears in BCD code.

The space ratio of periods to be measured necessary for display counters is formed in case of maximum operating frequency approximately to value 1:1 by the monostable multivibrator IC1 assuring proper operation for the 2nd counter decade (DFM-128-14B, LD 12).

Operation in average time period mode:

In this mode the signals arriving at the signal gate inputs interchange. The periods to be measured get to input 9 of IC10, while the signal of the clock to its input 10. The measured periods unified by the 60 MHz input stage get thru connection CS7b/10 to input 13 of IC24, from where passing thru an electronic switching circuit arrive at point 6 of IC24.

The magnitudes of period averaging are specified by switch K3 and these can be of times 10,times 100 and times 1000. The necessary for quantization 10 kHz signal originating from the clock is connected to output 4 of IC18. With switch K2 in PER position this signal appears at the output 8 of IC18 from where thru output 11 of IC18 and output 6 of IC10 gets inverted to the input 10 of signal gate IC10. The operation of the further circuit units is identical to that described under frequency meter mode.

Operation in frequency ratio measurement mode:

In this mode 3 cases are possible:

1./ The higher frequency is connected to the 60 MHz (direct) input, while the lower one to input (CS3) titled EXT. INP. on the back-panel. In this case the switch K7 should be in EXT position. The operation is identical to that described under frequency meter mode, except function of the clock is undertaken by the input signal led to connection titled EXT. INP. The result will be as described in "Technical data".

2./ The higher frequency is connected to the 520 MHz(prescaler) input CS2, while the lower frequency to the input (CS3) titled EXT. INP. on the back-panel. The switch K7 should be in EXT position. The operation is identical to that

described under frequency meter mode, but the function of the clock is undertaken by the input signal led to connection EXT.INP. The result will be as described in "Technical data".

3./ The higher frequency is connected to the external clock input titled EXT. INP., while the lower one to the 60 MHz (direct)input CS1.

The switch K1 should be set to PER. position. The operation is identical to that described under period measuring mode, but the function of the clock is undertaken by the input signal led to connection EXT. INP. The result will be as described in"Technical data".

3.6. Control circuit II. (Drw. No.: DFM-128-16B)

This card contains the internal clock consisting of the thermo--compensated crystal oscillator Q1, the inverter element construction Schmitt circuit IC2, and the decade attenuator IC1.

For internal clock functions a 1 MHz TTL level signal appears at the junction point CS10b/13 for the control circuit I. The light intensity modulation change of the numeric display is assured by changing the quasi-stable state of the monostable multivibrator IC9. The change of the quasi-stable is performed by means of potmeter P1.

The modulating signals for the display panel appear with 1 MHz repetition rate at the junction points CS10b/8 and CS10b/4. Performing continually repeating measurements by the instrument, the sampling rate is determined by the length of quasi-stable state of the monostable circuit consisting of IC14 and IC5. The output pulse Q of the monostable multivibrator (at point 6 of IC14) passing thru the gate circuit IC13 appears at the junction point CS9b/29 and determines the length of 11th state of the numeric chain located on the control circuit I. PCB (DFM-128-15B). The quasi-stable state is changed by means of potmeter P2 titled "SAMPLE RATE". With turn-knob in "HOLD" position the J-K marked IC4 serves a flip-flop.

After turnover it supplies such a level thru its output Q (point 11 of IC4) that getting to the junction point CS9b/29 holds the above mentioned number chain in the 11th state. Thus no new measurement can start until the flip-flop IC4 is tilted back either by the push--button "HAND" or by connecting the signal transition 1-0 arriving at the "PRINT.INPUT" (CS10b/6) to its point 8. The R-S flip-flop constructed from NAND elements IC12 prevents the push-button K4 from bounce.

The monostable pulse (resetting IC4) arriving from two places is generated by circuits IC3, IC10, and IC12. The monostable multivibrator IC11 play role in printing mode. After printing is performed, 1-0 signal transition occurs at the junction point CS10b/6 providing delay according to the quasi-stable state of monostable circuit IC11.

Periodicity of printing is determined by positions of switch K6. In position III the printing is repeated most frequently, in position II the printing is less frequency, while in position I no new printing is started. In this latter case the printing can be started by depressing push-button K4 titled "HAND" on the front panel

The decimal point and the unit display circuit - the operation of which is determined by the positions of switch K2 and K3, respectively - is constructed from IC6, IC7, IC8, IC15, IC16. The decimal point informations necessary for driving the display panel (DFM-128-14B) appear at the junction points CS9b/9, CS9b/10, CS9b/11 and CS9b/12, while those necessary for displaying the unit at the junction points CS9b/7, CS9b/5.

3.7. Power supply circuit I. (Drw. No.: DF?-128-122)

The ac voltage arriving from coil 7-8 of the mains transformer is rectified by D1 and stabilized by the series stabilizer consisting of IC1 and T1. The C2 performs buffering while the other capacitors prevent the singing. The stabilized 5 V appears at the junction point CS14b/9 and 10.

3.8. Power supply circuit II. (Drw. No.: DFM-128-123)

The ac voltage arriving from coil 3-4 and 5-6 of the mains transformer is rectified by D2 and D3 and buffered by C6 and C11, respectively.

The regulation is performed by stabilizer IC2 and IC3, respectively.As a result of different grounding of the output of ICs +15 V and -15 V occurs at the junction point CS15b/7 and CS15b/10, respectively.

3.9. Display circuit (Drw. No.: DFM-128-14B)

The function of this panel is to decode and display by LD12 the BCD coded signals arriving from the outputs of storage IC17 of the control circuit I (DFM-128-15B), further to count, store, decode and display the gated pulses arriving at its input 43. These functions are performed by (7 pcs. TIL 306 type) ICs LD5-LD11.

The control of storages is performed by overfeed pulses arriving the point 42, while the counters are zeroed by means of zeroing pulses arriving at the point 41. The output of each storage as well as the decimal points (from 10^0 to 10^7) are tapped out for numeric printer connectible to the instrument. The intensity modulation of displays is performed by pulses arriving at the points 44 and 45.

The control for displaying decimal point is performed thru junction point 33, 34, 35, and 36.

The LEDs indicating the unit and the gate time, as well as the switches K8, K4 and potmeter P2 are located also on this panel.

4. INSTRUCTIONS FOR OPERATIONS

4.1. Putting the instrument into operation

Use only mains connection (of 220 V, 50 Hz) equipped with protective grounding.

The mains voltage is switched on by setting the switch on the back-panel to "ON" position.

The instrument should be connected to the mains by means of the (3-core) mains cord supplied as accessory.The occassional replacement of the primary fuse (of nominal value 0.5 A) can easily be performed on the back-panel.

The back-panel mains cord first should be connected to the instrument, first pull the mains cord out of the mains connector. When the instrument is switched on allow 10-minute warm-up.

4.2. Description of controls of the instrument (Drw. No.: DFM-128 B)

With switch K2 in FREQ positions the required input (of 60 MHz or 520 MHz) can be selected for frequency measurement purposes.

In position PER the instrument measures the average time period of the signal led to the 60 MHz input.

The signal to be measured is led to the BNCs (CS1, CS2) titled INPUT.

By means of switch K1 the measurement ranges (x1, x10, x100) are adjusted according to magnitude of input signal led to input CS1. The stepless change of the sensitivity at this input can be performed

by means of potmeter P1 "SENSITIVITY". The required gate time in frequency meter mode, and the rate of averaging (x10, x100, x1000) in average time period measuring mode is set by means of switch K3. In frequency ratio measurement modes by means of this switch the decimal factors occuring in the results can be adjusted as specified by Technical data.

Visual display of the signal gate opening time is assured by LED (LD4) titled GATE.

The required sampling rate can be adjusted by means of potmeter P2 titled SAMPLE RATE.With potmeter is HOLD position,the periodicity of sampling terminates and the new measurement can be started either by depressing push-button MAN or by external electric signal (1-0 signal transition) led to printer connection.

The unit (MHz, kHz, ms) of the measured result is displayed by LEDs.

Controls located on the back-panel of instrument:

When switching the instrument on the switch on the back-panel should be set to ON position. Using internal base-pulse (clock) the switch K7 should be set to INT position.

In this case 1 MHz TTL level base pulse (clock signal) can be obtained from the BNC (CS3) titled IN/OUT on the back-panel. Using external clock or frequency ratio measurement mode the signal should be connected to the BNC jack (CS3) IN/OUT with switch K7 in EXT position. If printer is used the measurement result to be recorded (in BCD code) appears at the 20-pin needle contact connection marked 1, 2.

The rate of printing is set by means of sliding switch PRINT SPEED.

5. INSTRUCTION FOR USE

By means of the multi-purpose meter DFM-128 frequency, frequency ratio, and average time period can be measured as specified in "Technical data". The measurement result appears in BCD code at the two 20-pin connections on the back-panel making record by numeric printer possible.

5.1. Frequency measurement at the (direct) input titled 60 MHz

Switch on the instrument by means of switch on the back-panel. In case of using internal clock (base-pulse generator) the two-way sliding switch on the back-panel should be set to "INT" position.

In this case a 1 MHz TTL level output signal can be obtained from the BNC titled IN/OUT.

Using external clock the two-way switch is set to EXT position and the signal of the 1 MHz external clock should be led to connection IN/OUT.

The signal to be measured should be connected to the intput "60 MHz"and the input attenuator should be set according to the magnitude of the signal.

When the rms value of the signal is between 30 mV and 300 mV, the input attenuator should be set to position "x1", with signal between 0.3 V and 3 Vrms - to position "x10", and above 3 Vrms - to "x100".The continuous attenuation of the signal within the individual ranges is performed by means of the potmeter "SENSITIVITY". The instrument is most sensitive with attenuator in "x1" position and potmeter turned to "MAX". If the magnitude of the signal to be measured is unknown, it is practicable to set the input attenuator to "x100" position. The 3-way sliding switch titled "PER FREQ" should be set to neutral position and the required gate time - determining the measurement result resolution - adjusted by means of 3-way sliding switch titled "0.1 s", "1 s", "10 s". (For example in "1 s" position the lowest digit corresponds to Hz.)

The decimal point appearing on the display should be understood as MHz or kHz depending upon the illuminating LED.

The measurement rate is continuously variable by means of the potmeter "SAMPLE RATE" and with potmeter in "HOLD" position single measurement can be performed by depressing the pushbutton "MAN".

During open time of the gate the LED "GATE" illuminates.

5.2. Averaged period time measurement at the (direct) input 60 MHz

The signal to be measured should be connected to input "60 MHz". The 3-way sliding switch "PER FREQ" should be set to "PER" position. Depending upon the magnitude of signal to be measured the input attenuator "x1, x10, x100" and the potmeter "SENSITIVITY" should be adjusted.

The magnitude of averaging can be selected by sliding switch "0.1 s, 1 s, 10 s" for times 10, 100 or 1000 values.

An advantage of the average period measurement is that the trigger error reduces according to the rate of averaging.The decimal point appearing on the display should always be understood as ms.

The increase of the number of averaging increases the resolution (the result appears with more digits) and the measurement time.

The change of the measurement speed is the same as described at frequency measurement. During the open-time of periods to be measured the LED "GATE" illuminates.

5.3. Frequency measurement at the "520 MHz" (prescaler) input

The signal to be measured should be connected to the input titled "520 MHz". Make sure the input signal does not exceed the 5 Vrms voltage level. If necessary use the external 20 dB attenuator - supplied as accessory - assuring min. 50 dB working dynamic range for the prescaler input.

The 3-way sliding switch "PER FREQ" should be set to right"FREQ" position. The required gate time - determining the measurement result resolution - is adjusted by means of the 3-way sliding switch "0.1 s, 1 s, 10 s". Due to the times 10 prescale the resolution eg. in "1 s" position is 10 Hz.

The decimal point appearing on display should be understood as kHz or MHz according to the illuminating LED.

5.4. Frequency measurement in "FREQ" mode

By means of the instrument ratio of two frequencies can be measured with the following adjustment.

The sliding switch on the back-panel should be set to "EXT" position, while the switch "PER FREQ" on the front panel to "FREQ" position. (With switch on back-panel in center position the 60 MHz input, while in right position the 520 MHz one is used.)

The measurement range is: f_1/f_2

where: f_1 is 2 Hz to 60 MHz using direct input, or 50 MHz to 520 MHz using prescaler input. f_2 is the 1 kHz to 10 MHz signal connected to external clock input "IN/OUT".

The measurement result will be as specified in "Technical data". The measurement speed is changed as described earlier.

5.5. Frequency measurement in "PERIOD" mode

The switch on the back-panel should be set to "EXT" position and the switch "PER FREQ" on the front panel to "PER" position.

The measurement range is: f_1/f_2

where: f_1 is the 1 kHz to 10 MHz signal connected to external clock input "IN/OUT".

f_2 is the 2 Hz to 60 MHz signal connected to direct input. The measurement result will be as specified in "Technical data". The measurement speed is changed as described earlier.

5.6. Recording the measurement result by printer (eg. of EMG-14892 type)

The measurement result appears at the connection "1" and "2" on the back-panel in form of parallel BCD coded TTL logic level signals.

Connect the connections "1" and "2" to the input points of the printer conforming the proper digits.

The decimal point and the necessary unit display should be wired on the printer by the user. Before printing the measurement result - that can be frequency, average time period or frequency ratio - the turn knob "SAMPLE RATE" should be set to "HOLD" position. The printing command signal (eg. signal B2 of EMG-14892 printer) appears at terminal A5 of connection "2" on the back-panel. The new measurement can be started by 1-0 signal transition arriving at point C5 of connection "2" (it is the signal M1 of EMG-14892 printer). This 1-0 signal transition is delayed in different degree depending upon the position of switch "PRINT SPEED" on the back--panel.

With switch in position "III" the printing repetition rate is the highest appr. 2 s , in position "II" is lower (appr. 10 s) while in position "I" the restart of printing is performed by means of push-button "MAN" on the front panel. In this latter way the printing is controled manually and performed optionally from the front panel.

The result appearing on the display is tapped in parallel BCD code also to the connections CS4 and CS5 titled 2 and 1, resp. . Weighting of the BCD code corresponds to the usual A-2^0, B-2^1, C-2^2 and D-2^3. The wiring of the connections is shown in the below Table:

Digit	Weighting	Connection	Junction point
MSB	A	2	A4
10^7	B	2	B3
	C	2	C4
	D	2	B4
10^6	A	2	A3
	B	2	B2
	C	2	C2
	D	2	C3
10^5	A	2	A1
	B	2	B1
	C	2	C1
	D	2	A2
10^4	A	1	A6
	B	1	B6
	C	1	C7
	D	1	A7
10^3	A	1	A5
	B	1	B5
	C	1	C5
	D	1	C6
10^2	A	1	A4
	B	1	B3
	C	1	C4
	D	1	B4

Digit	Weighting	Connection	Junction point
10^1	A	1	A3
	B	1	B2
	C	1	C2
	D	1	C3
LSB 10^0	A	1	A1
	B	1	B1
	C	1	C1
	D	1	A2
Printing command signal /B2/		2	A5
Start of new measurement /M1/		2	C5
Decimal point belonging to 5th digit /DP 1./		2	B6
Decimal point belonging to 4th digit /DP 2./		2	B5
Decimal point belonging to 3th digit /DP 3./		2	A7
Decimal point belonging to 2th digit /DP 4./		2	A6

6. MAINTENANCE AND REPAIR

The instrument requires no special maintenance, however, after a few months of operation it should be dust cleaned by blown air.

It is practicable to tune of frequency of the thermo-compensated crystal oscillator approx. every 3 months to a calibrated higher stability and accuracy standard. The control of the oscillator is screw-driver adjustable.

6.1. Repair

The cover plate of the instrument can be removed by backing off the 4 capscrews on each side.

By means of the service cards supplied as accessories both the supply unit PCBs and the control circuit PCBs are accessible at both sides. The repair of the damaged instrument should be started by checking the supply unit.

If the output voltages of the supply unit are proper, go on with trouble-shooting.

After this it is practicable to check the decade—attenuated signals at the outputs IC12, IC15, IC21, IC14, IC6, IC7 of the clock decade attenuators (DFM-128-15B) for present.

The test point of the signal gate is the output 3 and 8 of IC10.

The test points of the output of input stage (DFM-128-13B) are: outputs 4 and 5 of resistors R36 and R19.

Supplying input signal of value corresponding to the sensitivity to the input, unified TTL level signals should occur at the above mentioned points.

Perform the test by means of oscillator.

In case of insufficient sensitivity locate the damaged part by means of voltage measurement.

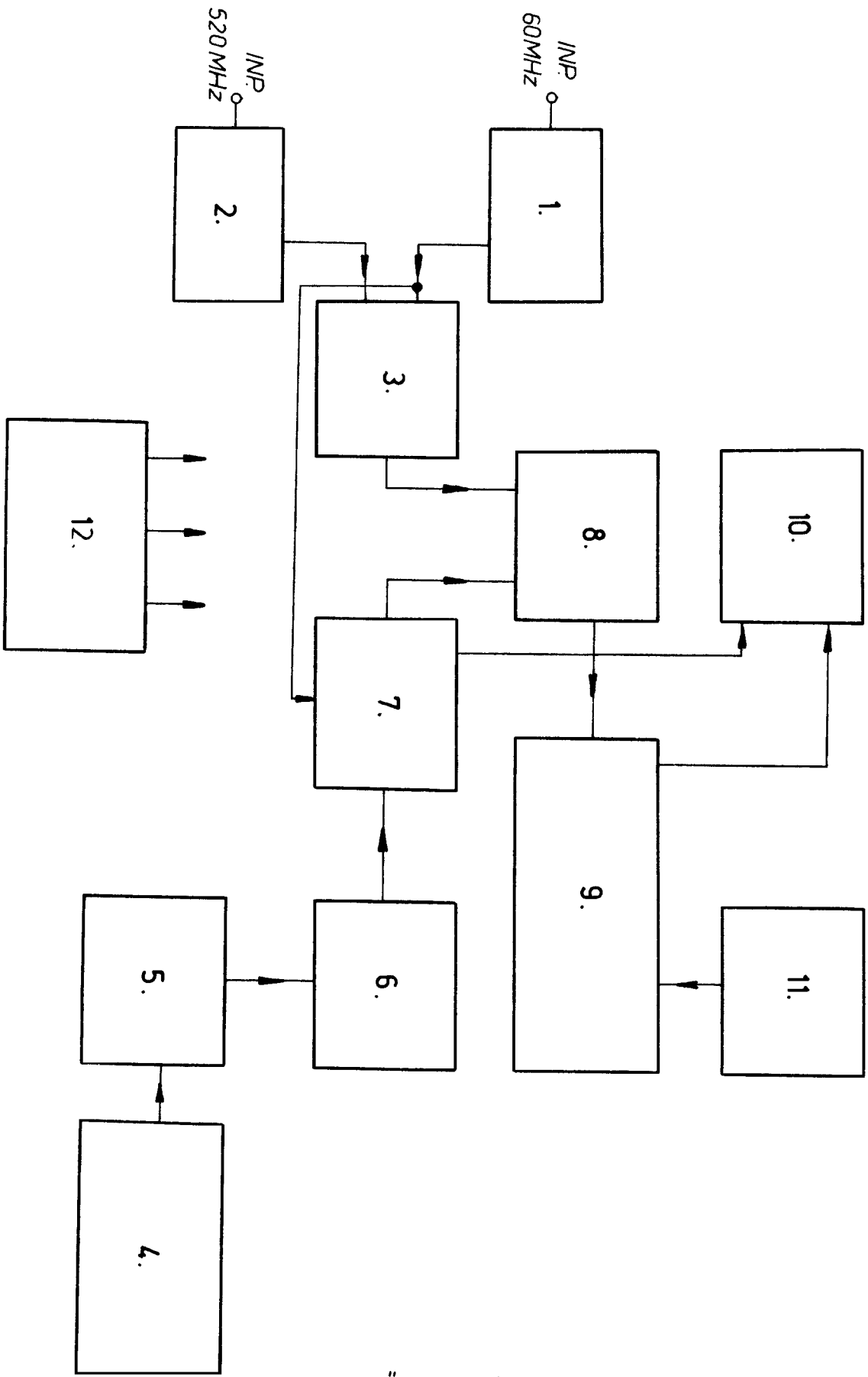
Testing the display, the complete display (counter, storage, decoder and LED) unit, as well as the decimal point and unit display circuit (DFM-128-14B) should be checked for proper operation.

The damaged parts should be replaced.

6.2. Instruments necessary for repair

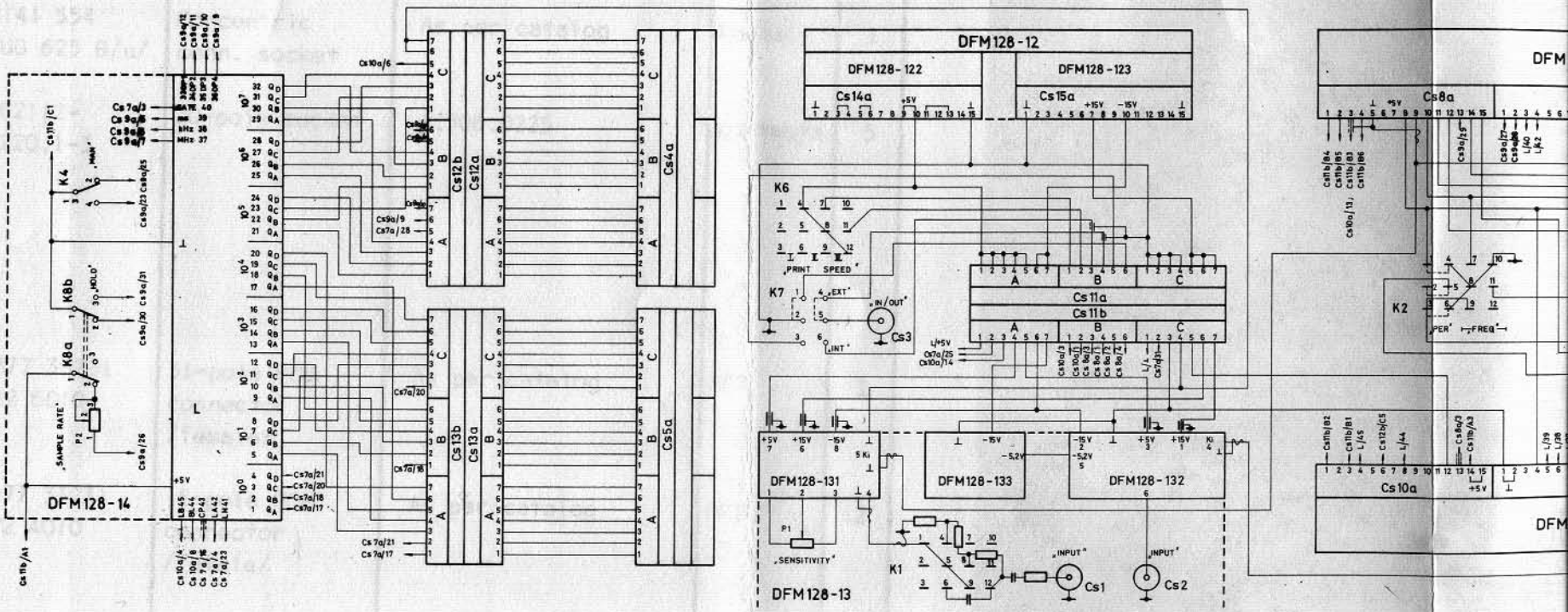
1. Signal generator:	Frequency range:	2 Hz to 520 MHz
	Output level:	10 mVrms to 10 mVrms adjustable
2. Oscilloscope:	Frequency range:	DC, min. 60 MHz
	Sensitivity:	min. 10 mVrms
3. Digital frequency meter:	Frequency range:	2 Hz to 520 MHz
	Accuracy:	min. 1×10^{-8}

4. Digital DC voltmeter:	Measuring range:	1 mV to min. 20 V
	Accuracy:	min. 0.2 %


INP.
520 MHz
INP.
60MHz
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.

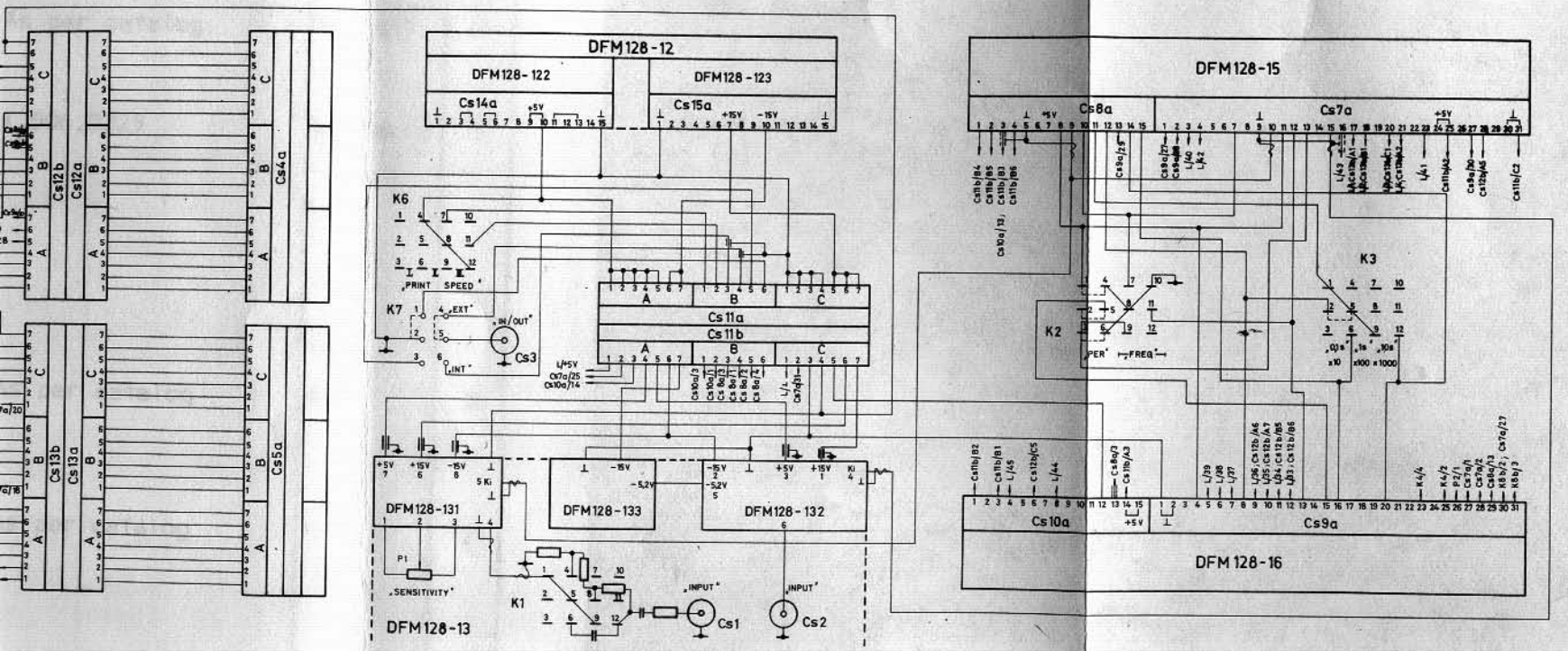
DIGITAL FREQUENCY METER TYPE **TR-5283** (DFM-128)

DFM 128 B



25

26



DFM128-12 Tápegység
Power supply
Netzgerät
Блок питания

DFM128-13 Bemenő fokozat
Input stage
Eingangsstufe
Входной контур

DFM128-14 Kijelző áramkör
Indiocting circuit
Anzeigestromkreis
Индикаторный контур

DFM128-15 Vezérlő áramkör I
Control circuit I
Regelkreis I
Цепь управления I

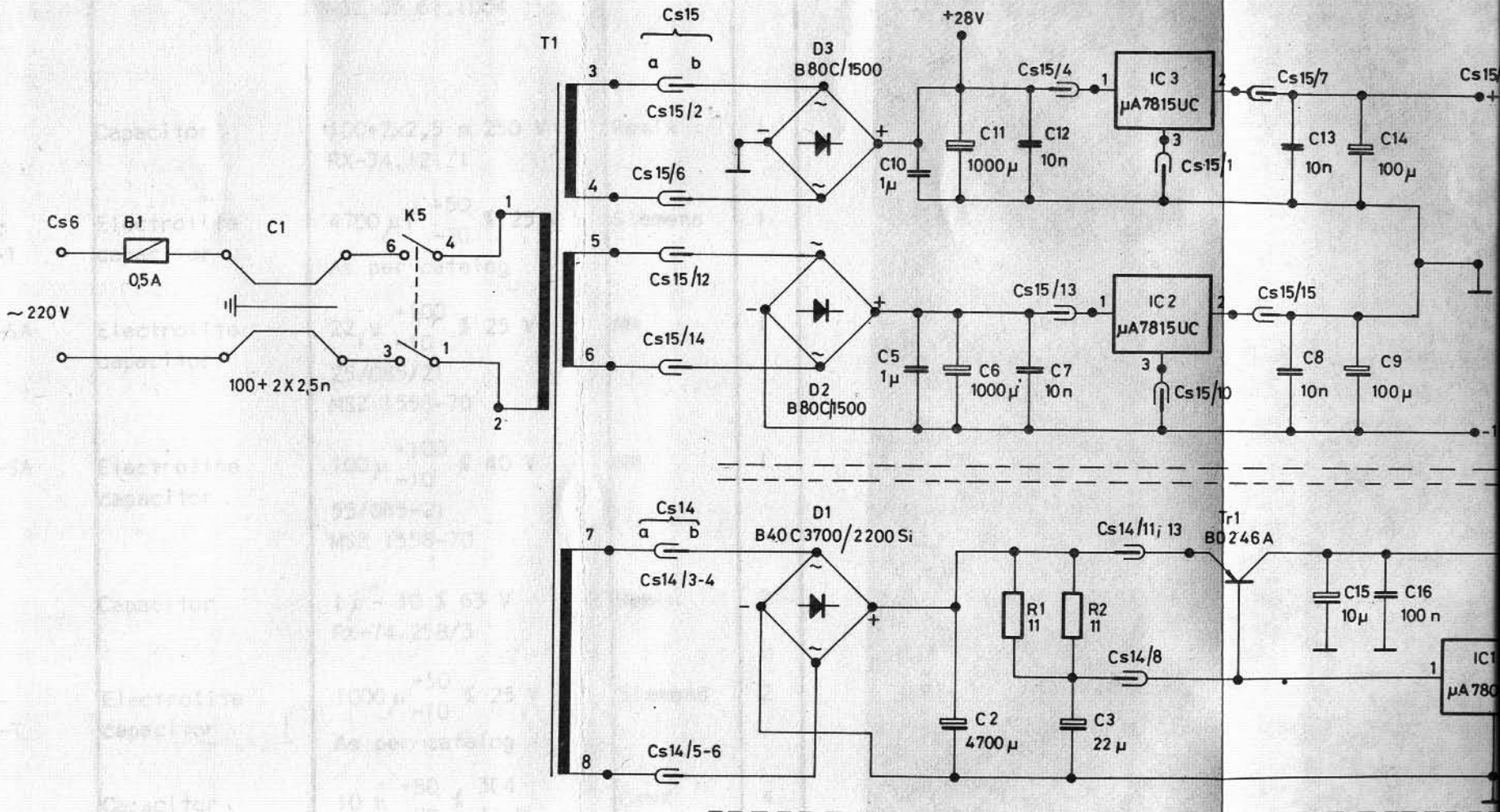
DFM128-16 Vezérlő áramkör II
Control circuit II
Regelkreis II
Цепь управления II

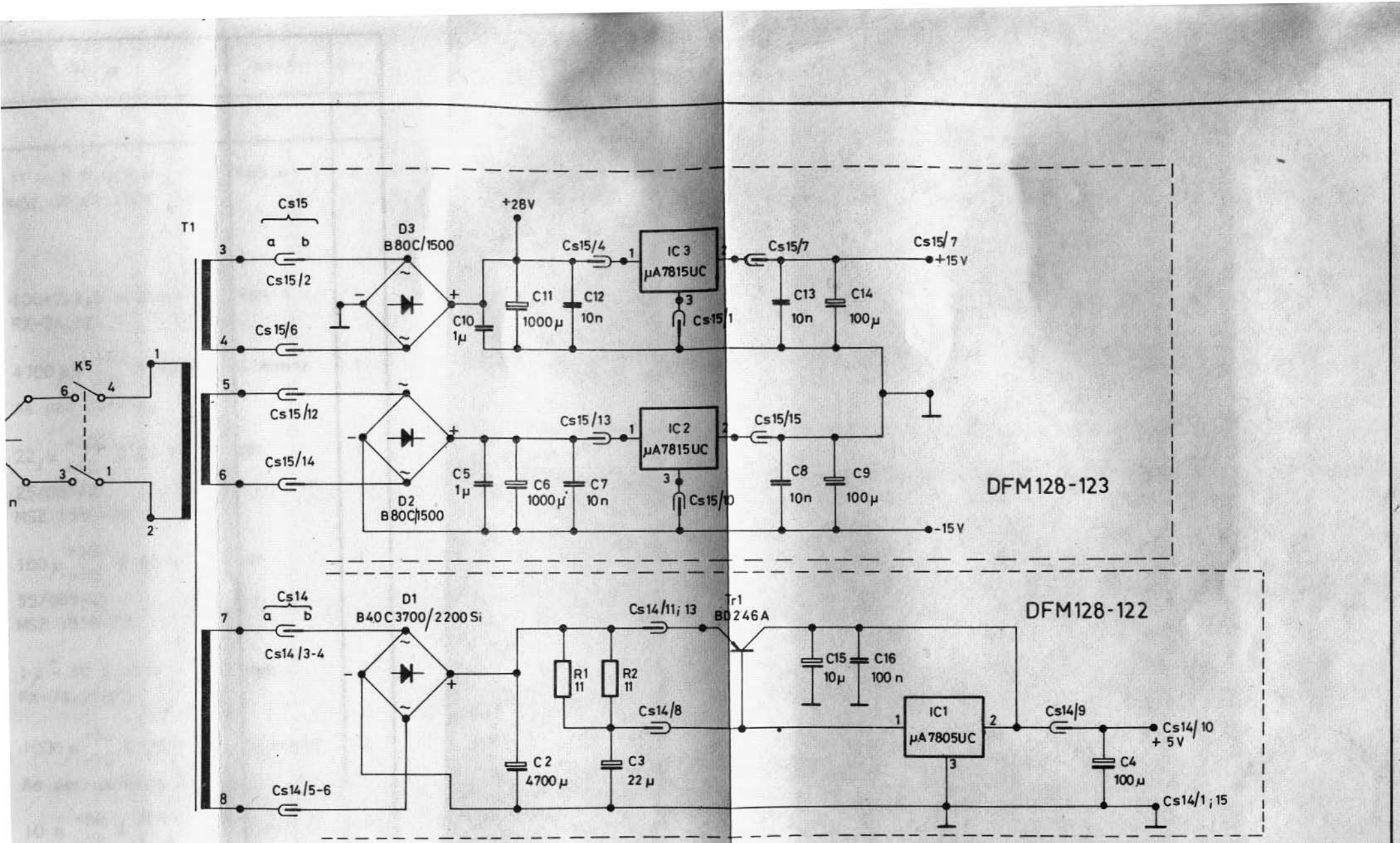
Multi-purpose frequency meter

Position	Circuit symbol	Drawing No. or Type No.	Description	Value	Maker	Qty
1.	2.	3.	4.	5.	6.	7.
1.	K2, K3, K6	S6T 11033/004	Sliding switch	3-way As per catalog	EMI--SOUND	3
2.	K7	KC121.121	Sliding switch	1.151.0038	Kontakta	1
3.						
4.						
5.	Cs3	R141 554 /UG 625 B/u/	Concentric conn. socket	As per catalog	Radiall	1
6.	Cs4/a Cs5/a Cs11/a Cs12/a Cs13/a	DS2112--220.1-3	20-pole socket	1.506.0225	Kontakta	5
7.						
8.	Cs7/a Cs9/a	1377 33231 222 6010	31-pole PCB connector /female/	As per catalog	RFT	2
9.	Cs8/a Cs10/a	1377 33231 222 4010	15-pole PCB connector /female/	As per catalog	RFT	2
10.						
11.						
12.	Cs11/b Cs12/b Cs13/b	DS2112--220.2-3	20-pole jack	1.506.0237	Kontakta	3
13.						
14.						
15.		DFM-128-12	Supply unit	Furnished with separate		1

1.	2.	3.	4.	5.	6.	7.
16.		DFM-128-13	Input stage	Furnished with separate		1
17.		DFM-128-14	Display circuit	Furnished with separate		1
18.		DFM-128-15	Control circuit I.	Furnished with separate		1
19.		DFM-128-16	Control circuit II.	Furnished with separate		1

DFM 128 - 12 B


T1
Cs15
a b
3
Cs15/2
4
Cs15/6
D3
B80C/1500
+28V
Cs15/4
IC 3
µA7815UC
Cs15/7
C11
1000µ
C12
10n
C10
1µ
Cs15/1
C13
10n
C14
100µ
Cs6
B1
0,5A
C1
K5
~220V
100+2X2,5n
5
Cs15/12
6
Cs15/14
D2
B80C1500
Cs15/13
IC 2
µA7815UC
Cs15/15
C5
1µ
C6
1000µ
C7
10n
Cs15/10
C8
10n
C9
100µ
Cs14
7
Cs14/3-4
8
Cs14/5-6
D1
B40C3700/2200Si
Cs14/11;13
Tr1
BD246A
R1
11
R2
11
Cs14/8
C15
10µ
C16
100n
C2
4700µ
C3
22µ
IC1
µA780
Jele
Elöf.
Kell.
Tervező
Rajzoló
Ellenőr



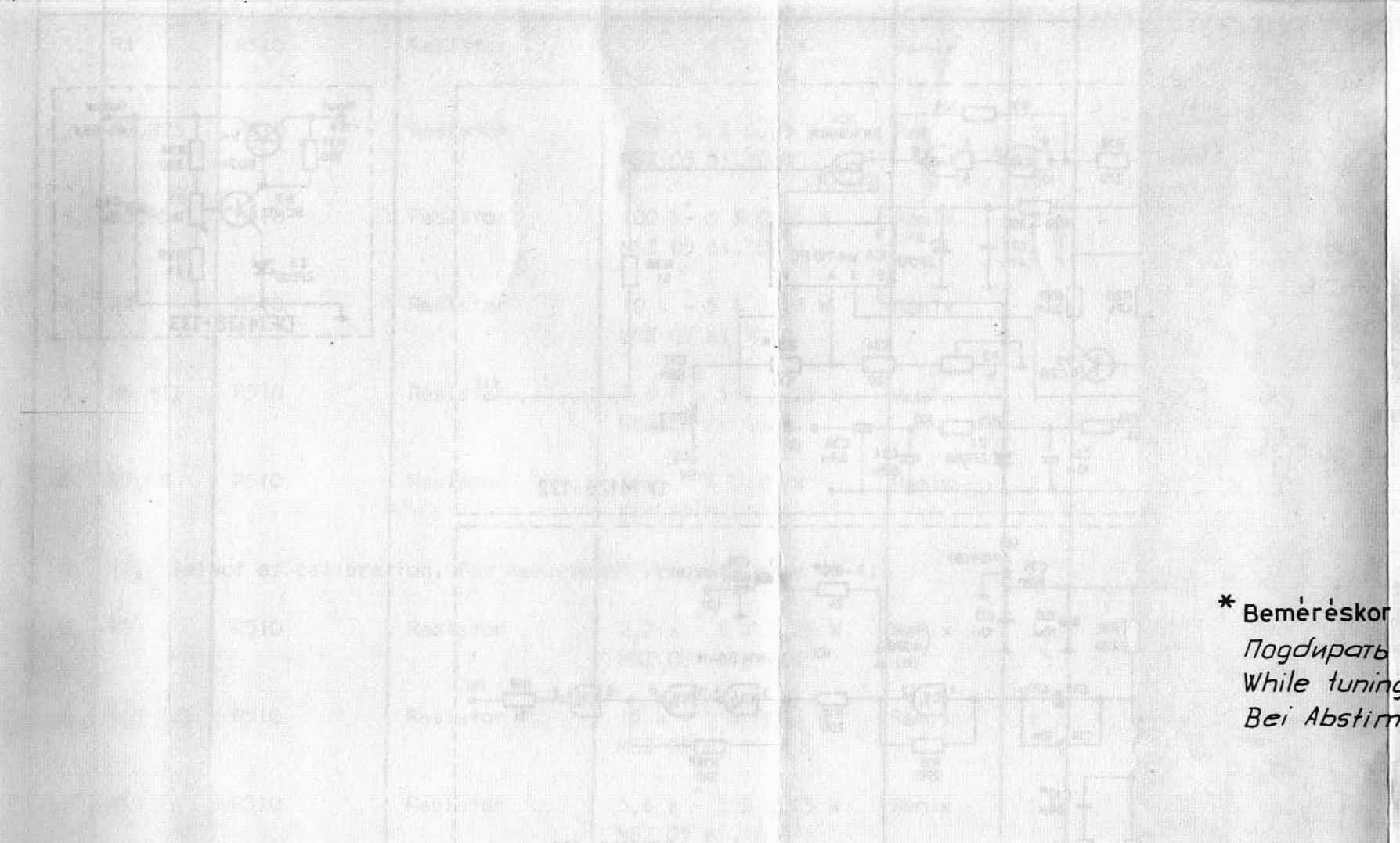
Változás	Jele	Előf.	Kelt	Jegyzőkönyvisz.	Aláírás	Változás	Jele	Előf.	Kelt	Jegyzőkönyvisz.	Aláírás

Tervező	Megnevezés	Lapszám	Rajzszám
Rajzoló	Tápegység Power Supply Netzgerät Блок питания	1/6	DFM128 - 12 B
Ellenőr			

Supply unit

Position	Circuit symbol	Drw. No. or. Type No.	Description	Value	Maker	Qty
1.	2.	3.	4.	5.	6.	7.
1.	R1, R2	R510	Resistor	11 $\pm$ 5 % 0,5 W MSZ 05 61.1004	Remix	2
2.						
3.	C1	C216	Capacitor	100+2x2,5 n 250 V RX-74.121/1	Remix	1
4.	C2	B41010- -C5478-T	Electrolite capacitor	4700 μF $^{+50}_{-20}$ % 25 V As per catalog	Siemens	1
5.	C3	CE2089-SA	Electrolite capacitor	22 μ $^{+100}_{-10}$ % 25 V 25/085/21 MSZ 1558-70	MM	1
6.	C4	CE5863-SA	Electrolite capacitor	100 μ $^{+100}_{-10}$ % 40 V 55/085-21 MSZ 1558-70	MM	1
7.	C5,C10	C219	Capacitor	1 μ $\pm$ 10 % 63 V RX-74.258/3	Remix	2
8.	C6,C11	B41010- -C5108-T	Electrolite capacitor	1000 μ $^{+50}_{-10}$ % 25 V As per catalog	Siemens	2
9.	C7, C8, C12,C13	TK783	Capacitor	10 n $^{+80}_{-20}$ % 3E4 32 V As per catalog	CsNK	4
10.	C9, C14	CE2118-SA	Electrolite capacitor	100 μ $^{+100}_{-10}$ % 16 V 25/085/21 MSZ 1558-70	MM	2
11.	C15	CE2059-SA	Electrolite capacitor	10 μ $^{+100}_{-10}$ % 25 V 25/085/21 MSZ 1558-70	MM	1

1.	2.	3.	4.	5.	6.	7.
12.	C16	FSIM N47	Capacitor	100 n $^{+}_{-}$ 10 % 63 V 6x9x2,5 As per catalog	Köporc	1
13.						
14.	Tr1	BD246A	Transistor	As per catalog	Texas	1
15.	D1	B40 C3700/ 2200 Si	Diode	As per catalog	AEG	1
16.	D2, D3	B80 C1500	Diode	As per catalog	ITT	2
17.						
18.	IC1	µA 7805UC	Integrated circuit	As per catalog	FAIR	1
19.	IC2, IC3	µA 7815UC	Integrated circuit	As per catalog	FAIR	2
20.						
21.	B1	VPI-1 0,5 A	Fuse link	As per catalog	USSR	1
22.	K5	KB 140.102	Switch	1.612.0002	Kontakta	1
23.	Cs6	Mkcf2-62k	Conn. socket	1.254.0010	Kontakta	1
24.	Cs14/a Cs15/a	1377 33231 222 4010	15-pole PCB connector /female/	As per catalog	RFT	2
25.						
26.	Cs14/b Cs15/b	1377 33231 104 4110	15-pole PCB connector /male part/	As per catalog	RFT	2
27.						
28.	T1	NT 3008	Transformer		FMV	1
		Equivalent type				
	IC1	µA 7805CKC LM340 T-0.5	Integrated circuit	As per catalog	Texas /National/	
	IC2, IC3	µA 7815CKC LM 340 T-1.5	Integrated circuit	As per catalog	Texas /National/	



33

* Bemérèskor válogatni.
Подбирать при регулировке.
While tuning must be selected.
Bei Abstimmung auswählen.

34

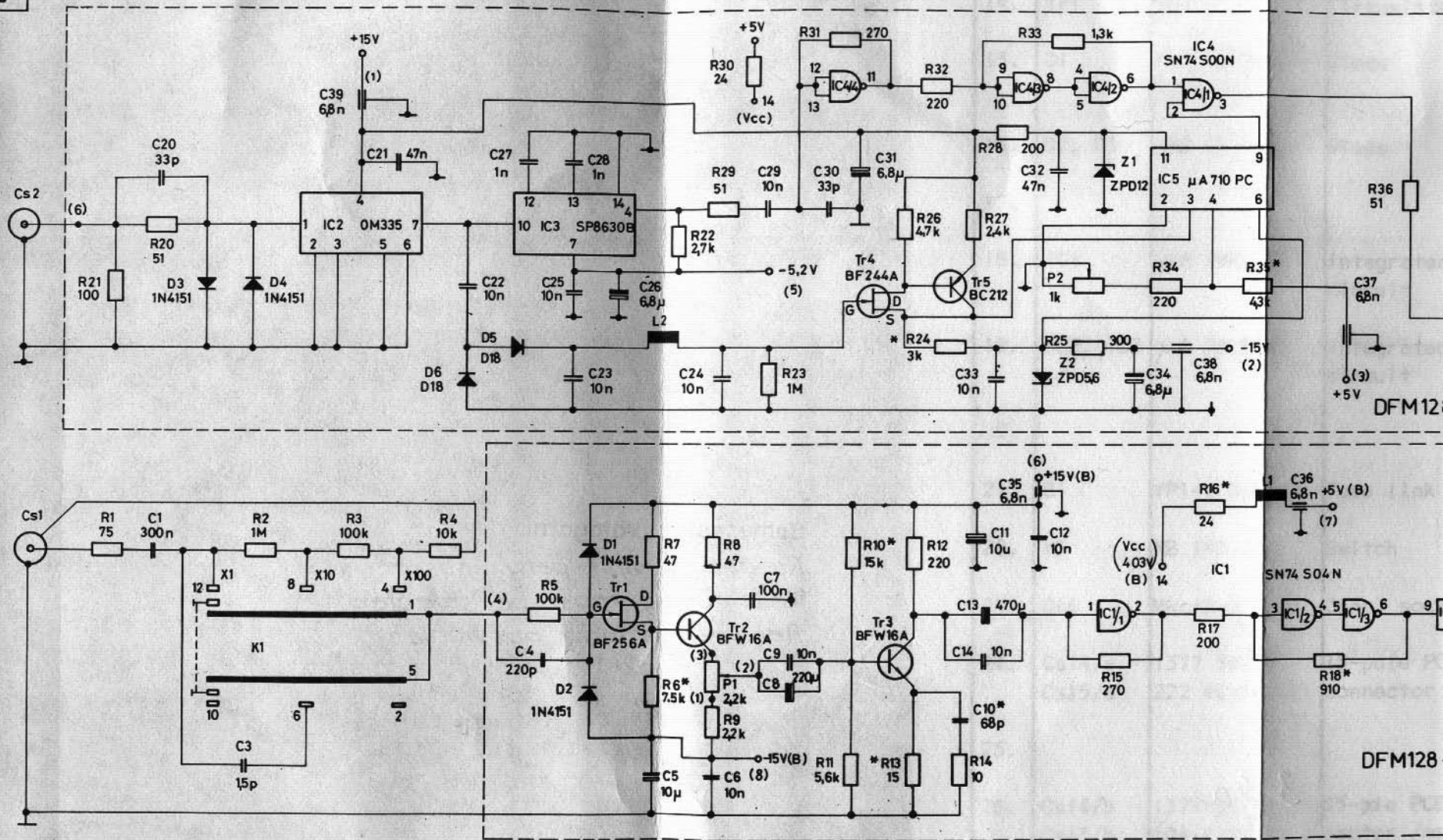
Megnevezés
Bemenő
Input stá
Eingangss
Входной

* Beméréskor válogatni.
Подбирать при регулировке.
While tuning must be selected.
Bei Abstimmung auswählen.

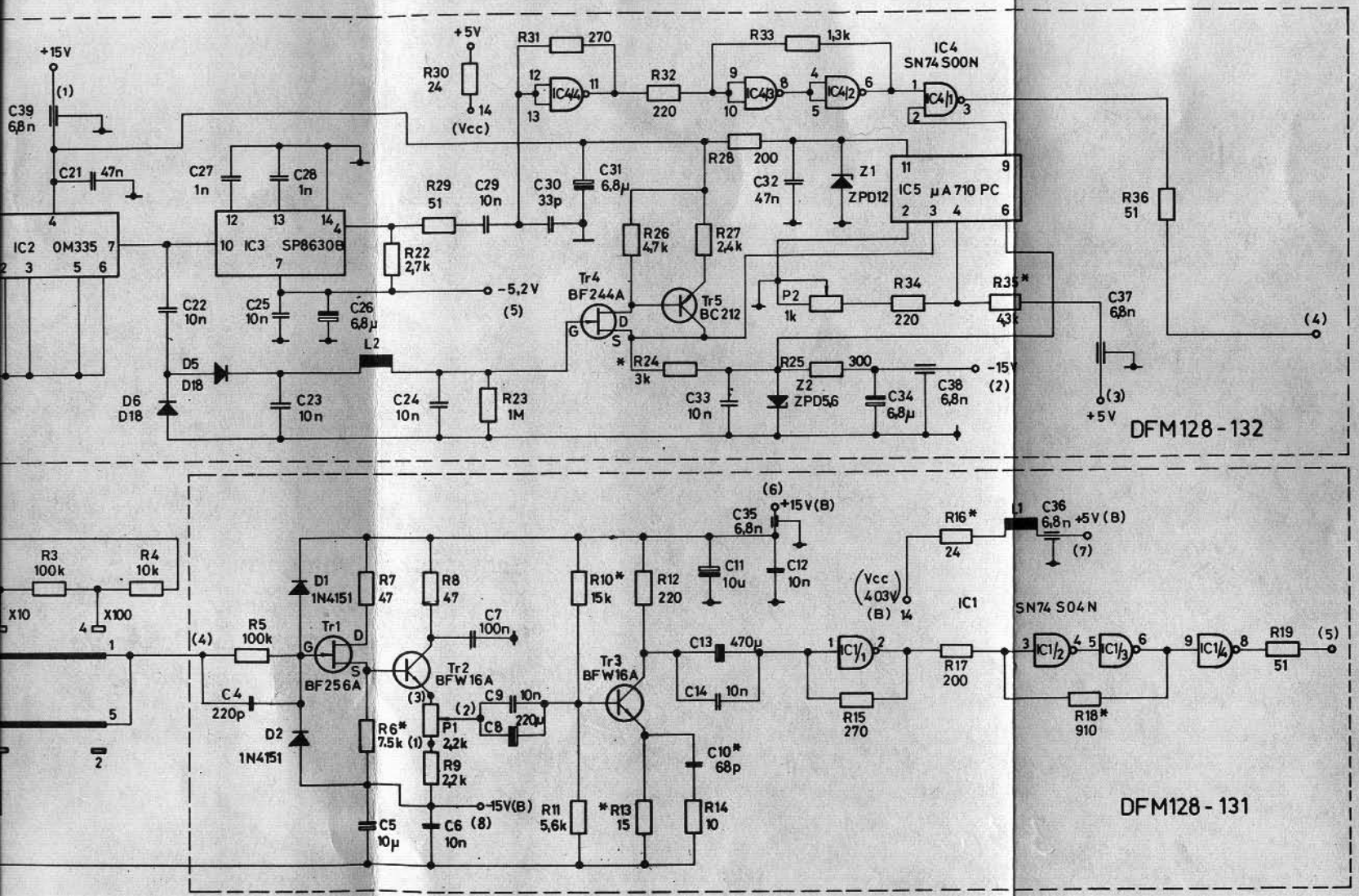
Megnevezés
Bemenő fokozat
Input stage
Eingangsstufe
Входной контур

Rajzszám
DFM128-13B

DFM 128 - 13 B


+15V
(1)
C39 6,8n
C20 33p
C21 47n
R20 51
R21 100
D3 1N4151
D4 1N4151
Cs2
(6)
IC2 OM335
IC3 SP8630B
C27 1n
C28 1n
C22 10n
C25 10n
C26 6,8µ
D5 D18
D6 D18
C23 10n
L2
R22 2,7k
-5,2V (5)
R29 51
C29 10n
C30 33p
C31 6,8µ
+5V
R30 24
(Vcc)
R31 270
R32 220
R33 1,3k
IC4 SN74S00N
IC4/1
IC4/2
IC4/3
IC4/4
R28 200
C32 47n
Z1 ZPD12
IC5 µA 710 PC
R26 4,7k
R27 2,4k
Tr4 BF244A
Tr5 BC212
P2 1k
R34 220
R35* 43
R36 51
C37 6,8n
(3) +5V
R24 3k
R25 300
Z2 ZPD5,6
C33 10n
C34 6,8µ
C38 6,8n
-15V (2)
C24 10n
R23 1M

Cs1
R1 75
C1 300n
R2 1M
R3 100k
R4 10k
X1
X10
X100
K1
C3 1,5p
R5 100k
(4)
C4 220p
D1 1N4151
D2 1N4151
Tr1 BF256A
Tr2 BFW16A
Tr3 BFW16A
R7 47
R8 47
C7 100n
R6* 7,5k
P1 2,2k
R9 2,2k
C8 220µ
C9 10n
C5 10µ
C6 10n
-15V(B) (8)
R10* 15k
R12 220
C35 6,8n
(6) +15V(B)
C11 10u
C12 10n
C13 470µ
C14 10n
R11 5,6k
R13 15
R14 10
C10* 68p
R15 270
R16* 24
R17 200
R18* 910
C36 6,8n +5V(B)
(7)
(Vcc) 4,03V (B) 14
IC1
SN74 S04 N
IC1/1
IC1/2
IC1/3


+15V
(1)
C39 6,8n
C21 47n
IC2 OM335
IC3 SP8630B
C27 1n
C28 1n
C22 10n
C25 10n
C26 6,8µ
D5
D18
D6
D18
L2
C23 10n
C24 10n
R23 1M
R22 2,7k
R29 51
C29 10n
C30 33p
C31 6,8µ
+5V
R30 24
(Vcc)
R31 270
R32 220
R33 1,3k
IC4 SN74 S00N
IC4/1
IC4/2
IC4/3
IC4/4
R28 200
C32 47n
Z1 ZPD12
IC5 µA 710 PC
R36 51
-5,2V
(5)
Tr4 BF244A
Tr5 BC212
R26 4,7k
R27 2,4k
P2 1k
R34 220
R35* 43k
C37 6,8n
(4)
R24 3k
R25 300
Z2 ZPD5,6
C33 10n
C34 6,8µ
C38 6,8n
-15V
(2)
(3)
+5V
DFM128-132
Input
-15V
R37 390
Tr6 BD240
R38 390
Output
-4,5 -6,5V
Tr7 BC 212
P3 1k
C40 10u
Z3 ZPD27
R39 2k
DFM128-133
R3 100k
R4 10k
X10
X100
(4)
R5 100k
Tr1 BF256A
D1 1N4151
D2 1N4151
R7 47
R8 47
C7 100n
Tr2 BFW16A
C4 220p
R6* 7,5k
P1 2,2k
R9 2,2k
C5 10µ
C6 10n
(8)
-15V(B)
(6)
+15V(B)
C35 6,8n
C11 10u
C12 10n
R10* 15k
R12 220
Tr3 BFW16A
C9 10n
C8 220µ
C10* 68p
R11 5,6k
*R13 15
R14 10
C13 470µ
C14 10n
R16* 24
L1
C36 6,8n
+5V(B)
(7)
Vcc 4,03V
(B) 14
IC1
SN74 S04N
IC1/1
IC1/2
IC1/3
IC1/4
R17 200
R15 270
R18* 910
R19 51
(5)
DFM128-131

Input stage

Position	Circuit symbol	Drw. No. or Type No.	Description	Value	Maker	Qty
1.	2.	3.	4.	5.	6.	7.
1.	R1	R510	Resistor	75 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
2.	R2,R23	R510	Resistor	1 M ± 5 % 0,25 W MSZ 05 61.1004	Remix	2
3.	R3,R5	R510	Resistor	100 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	2
4.	R4	R510	Resistor	10 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
5.	R6 (1)	R510	Resistor	7,5 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
6.	R7,R8	R510	Resistor	47 ± 5 % 0,25 W MSZ 05 61.1004	Remix	2
7.	(1) Select at calibration. For assortment refer to page 40-41					
8.	R9	R510	Resistor	2,2 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
9.	R10 (2)	R510	Resistor	15 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
10.	R11	R510	Resistor	5,6 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
11.	R12,R32, R34	R510	Resistor	220 ± 5 % 0,25 W MSZ 05 61.1004	Remix	3
12.	R13 (3)	R510	Resistor	15 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
13.	R14	R510	Resistor	10 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
14.	(2) Select at calibration. For assortment refer to page 41-42					
	(3) Select at calibration. For assortment refer to page 42.					

1.	2.	3.	4.	5.	6.	7.
15.	R15,R31	R510	Resistor	270 ± 5 % 0,25 W MSZ 05 61.1004	Remix	2
16.	R16 (1)	R510	Resistor	24 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
17.	R17,R28	R510	Resistor	200 ± 5 % 0,25 W MSZ 05 61.1004	Remix	2
18.	R18 (2)	R510	Resistor	910 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
19.	R19,R20, R29,R36	R510	Resistor	51 ± 5 % 0,25 W MSZ 05 61.1004	Remix	4
20.	R21	R510	Resistor	100 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
21.	(1) Select at calibration. For assortment refer to page 42.					
	(2) Select at calibration. For assortment refer to page 42.					
22.	R22	R510	Resistor	2,7 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
23.	R24 (3)	R510	Resistor	3 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
24.	R25	R510	Resistor	300 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
25.	R26	R510	Resistor	4,7 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
26.	R27	R510	Resistor	2,4 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
27.	R30	R510	Resistor	24 ± 5 % 0,25 W	Remix	1
28.	(3) Select at calibration. For assortment refer to page 40-41					
29.	R33	R510	Resistor	1,3 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1

1.	2.	3.	4.	5.	6.	7.
30.	R35 (1)	R510	Resistor	4,3 k $\pm$ 5 % 0,25 W MSZ 05 61.1004	Remix	1
31.	R37, R38	R510	Resistor	390 $\pm$ 5 % 0,25 W MSZ 05 61.1004	Remix	2
32.	R39	R510	Resistor	2 k $\pm$ 5 % 0,25 W MSZ 05 61.1004	Remix	1
33.						
34.						
35.	(1) Select at calibration. For assortment refer to page 40-41					
36.	P1	SzP0-05 0SZ3	Potentiometer	2,2 k $\pm$ 20 % L = 13 0ZS0.468.047 TU	USSR	1
37.	P2,P3	P7272	Potentiometer	1 k $\pm$ 30 % 0,5 W RX-74.297/2	Remix	2
38.						
39.	C1	MKFM T4000	Capacitor	300 n $^{+50}_{-20}$ % 100 V 10x10x3,5 As per catalog	Kőporc	1
40.	C3	KD-1 M47	Capacitor	1,5 p $\pm$ 0,4 p 250 V GOSZT 7159-69	Kőporc	1
41.	C4	C2262	Capacitor	220 p $\pm$ 5 % 63 V RX-74.330	Remix	1
42.	C5,C11, C40	CE2059-SA	Electrolite capacitor	10 μ $^{+100}_{-10}$ % 25 V 25/085/21 MSZ 1558-70	MM	3
43.	C6,C9, C12,C14, C22,C23, C24,C25, C29,C33	TK783	Capacitor	10 n $^{+80}_{-20}$ % 3E4 32 V As per catalog	CsNK	10

1.	2.	3.	4.	5.	6.	7.
44.	C7	FSIM N47	Capacitor	100 n $\pm$ 10 % 63 V 6x9x2,5 As per catalog	Köporc	1
45.	C8	CE2162-SA	Electrolite capacitor	220 μ $^{+100}_{-10}$ % 25 V 25/085/21 MSZ 1558-70	MM	1
46.	C10 (1)	C2262	Capacitor	68 p $\pm$ 5 % 63 V RX-74.330	Remix	1
47.	C13	CE578-SA	Electrolite capacitor	470 μ $^{+100}_{-10}$ % 10 V 25/085/21 MSZ 1558-70	MM	1
48.	(1) Select at calibration. For assortment refer to page 43.					
49.	C20, C30	TRIM Ø 5 N750/1B	Capacitor	33 p $\pm$ 10 % 160 V As per catalog	Köporc	2
50.	C21, C32	TK783	Capacitor	47 n $^{+80}_{-20}$ % 3E4 32 V As per catalog	CsNK	2
51.	C26, C31, C34	TAG 43212 16168	Electrolite capacitor	6,8 μ $^{+50}_{-20}$ % 25 V As per catalog	ITT	3
52.	C27, C28	TK724	Capacitor	1 n $\pm$ 20 % E2000 40 V As per catalog	CsNK	2
53.	C35, C36, C37, C38, C39	KTP 2AA N-70	Transfer capacitor	6800 p $^{+80}_{-20}$ % 400 V 0ZS0.460.021 TU	USSR	5
54.						
55.						
56.						
57.	D1,D2, D3,D4	1N4151	Diode	As per catalog	EIVRT	4

1.	2.	3.	4.	5.	6.	7.
58.	D5, D6	D18	Diode	As per catalog	USSR	2
59.						
60.	Z1	ZPD 12	Zener diode	As per catalog	EIVRT	1
61.	Z2	ZPD 5,6	Zener diode	As per catalog	EIVRT	1
62.	Z3	ZPD 2,7	Zener diode	As per catalog	EIVRT	1
63.						
64.	Tr1	BF256A	Transistor	As per catalog	Texas	1
65.	Tr2, Tr3	BFW16A	Transistor	As per catalog	Valvo	2
66.	Tr4	BF244A	Transistor	As per catalog	Texas	1
67.	Tr5,Tr7	BC212	Transistor	As per catalog	EIVRT	2
68.	Tr6	BD240	Transistor	As per catalog	Texas	1
69.						
70.						
71.	IC1	SN74S04N	Integrated circuit	As per catalog	Texas	1
72.	IC2	OM335	Integrated circuit	As per catalog	Philips	1
73.	IC3	SP8630B	Integrated circuit	As per catalog	Plessey	1
74.	IC4	SN74S00N	Integrated circuit	As per catalog	Texas	1
75.	IC5	μA710PC	Integrated circuit	As per catalog	EIVRT	1
76.						
77.						
78.	L1, L2	DM 0,4 100	Choke coil	100 μH GI0.477.005 TU	USSR	2

1.	2.	3.	4.	5.	6.	7.
79.						
80.	K1	S6T 11033/004	Sliding switch	3-way As per catalog	EMI- -SOUND	1
81.	Cs1, Cs2	R141 554 /UG 625 B/u/	HF socket	As per catalog	Radial1	2
82.						
83.						
84.						
		Selection	set			
85.	R6	R510	Resistor	1,5 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
86.	R24	R510	Resistor	1,8 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
87.	R6	R510	Resistor	2 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
88.	R24	R510	Resistor	2,2 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
89.	R6,R24, R35	R510	Resistor	2,7 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,3
90.	R35	R510	Resistor	3 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
91.	R35	R510	Resistor	3,3 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
92.	R6,R24, R35	R510	Resistor	3,6 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,3
93.	R35	R510	Resistor	3,9 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
94.	R6,R24, R35	R510	Resistor	4,7 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,3

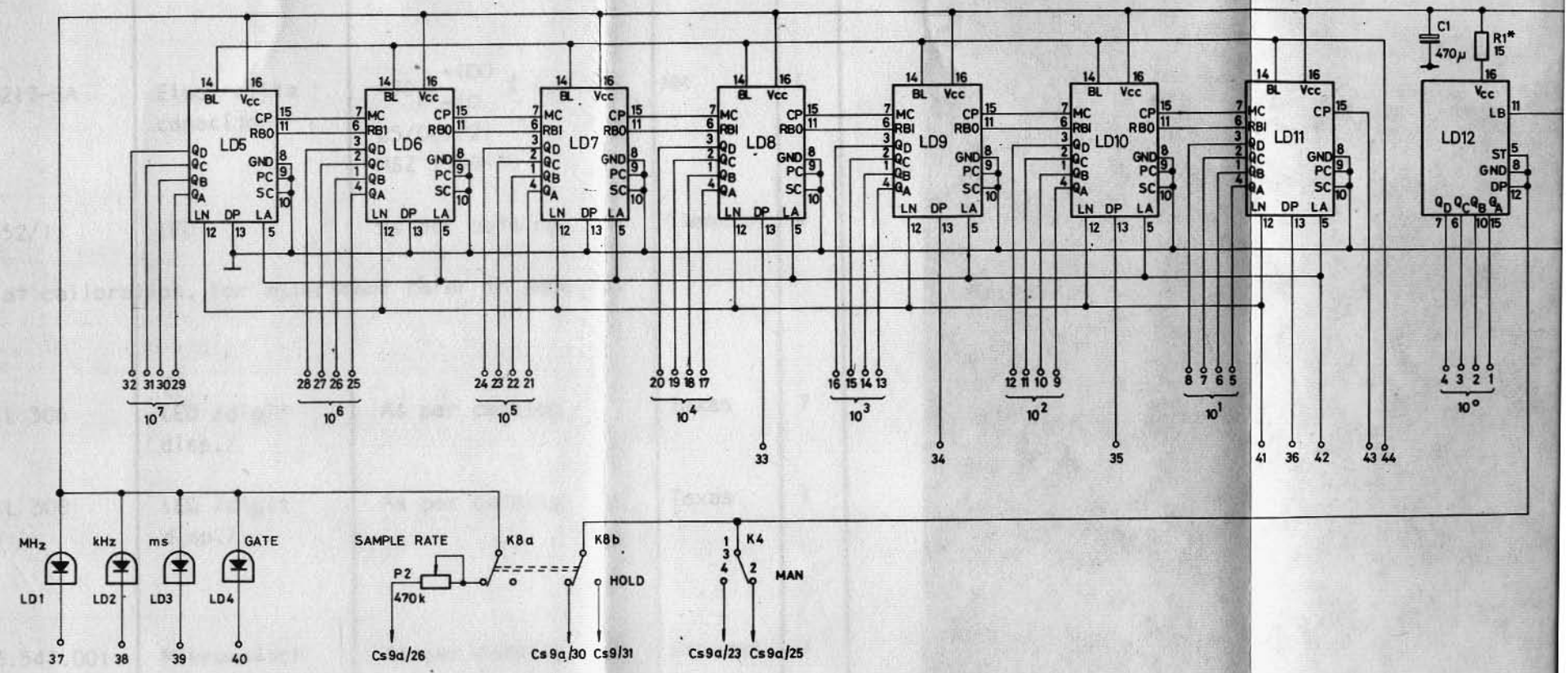
1.	2.	3.	4.	5.	6.	7.
		Selection	set			
95.	R24,R35	R510	Resistor	5,6 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
96.	R35	R510	Resistor	6,2 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
97.	R6,R24, R35	R510	Resistor	6,8 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,3
98.	R35	R510	Resistor	8,2 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
99.	R6	R510	Resistor	10 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
100.	R6	R510	Resistor	12 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
101.	R6	R510	Resistor	15 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
102.	R10	R510	Resistor	7,5 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
103.	R10	R510	Resistor	12 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
104.	R10	R510	Resistor	18 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
105.	R10	R510	Resistor	22 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
106.	R10	R510	Resistor	33 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
107.	R10	R510	Resistor	43 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
108.	R10	R510	Resistor	47 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1

1.	2.	3.	4.	5.	6.	7.
		Selection	set			
109.	R10	R510	Resistor	56 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,1
110.	R10	R510	Resistor	12 ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
111.	R13	R510	Resistor	13 ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
112.	R13, R16	R510	Resistor	18 ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,4
113.	R13, R16	R510	Resistor	20 ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,4
114.	R13, R16	R510	Resistor	22 ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,4
115.	R13	R510	Resistor	24 ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
116.	R16	R510	Resistor	27 ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
117.						
118.	R18	R510	Resistor	820 ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
119.	R18	R510	Resistor	1 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
120.	R18	R510	Resistor	1,1 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
121.	R18	R510	Resistor	1,2 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
122.	R18	R510	Resistor	1,3 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
123.						

1.	2.	3.	4.	5.	6.	7.
		Selection	set			
124.						
125.						
126.	C10	C2262	Capacitor	33 p ± 5 % 63 V RX-74.330	Remix	0,1
127.	C10	C2262	Capacitor	47 p ± 5 % 63 V RX-74.330	Remix	0,1
128.	C10	C2262	Capacitor	56 p ± 5 % 63 V RX-74.330	Remix	0,1
129.	C10	C2262	Capacitor	82 p ± 5 % 63 V RX-74.330	Remix	0,1
130.	C10	C2262	Capacitor	100 p ± 5 % 63 V RX-74.330	Remix	0,1
131.	C10	C2262	Capacitor	120 p ± 5 % 63 V RX-74.330	Remix	0,1
132.	C10	C2262	Capacitor	150 p ± 5 % 63 V RX-74.330	Remix	0,1
133.						

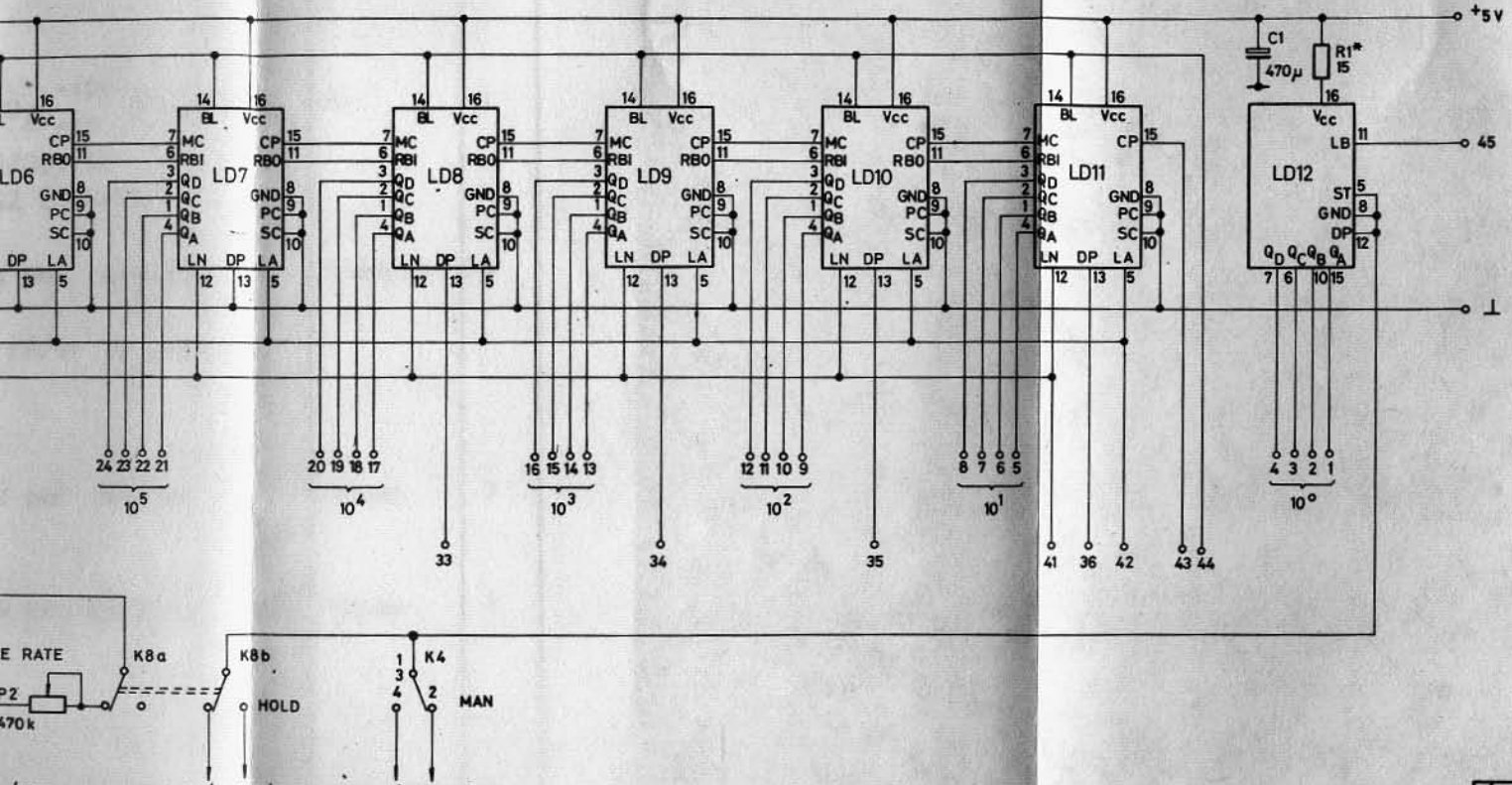
1.	2.	3.	4.	5.	6.	7.
		Equivalent	type			
134.	IC1	MH74S04	Integrated circuit	As per catalog	Tesla	
135.	IC4	MH74S00	Integrated circuit	As per catalog	Tesla	
136.						
137.	P1	SzP3-9a	Potentiometer	2,2 k ± 20 % 0Sz3-20 0ZS0.468.012 TU	USSR	

DFM128-14B



45

46



* Beméréskor válogatni!
While tuning must be selected.
Bei Abstimmung auswählen.
Подбирается по настройке.

45

46

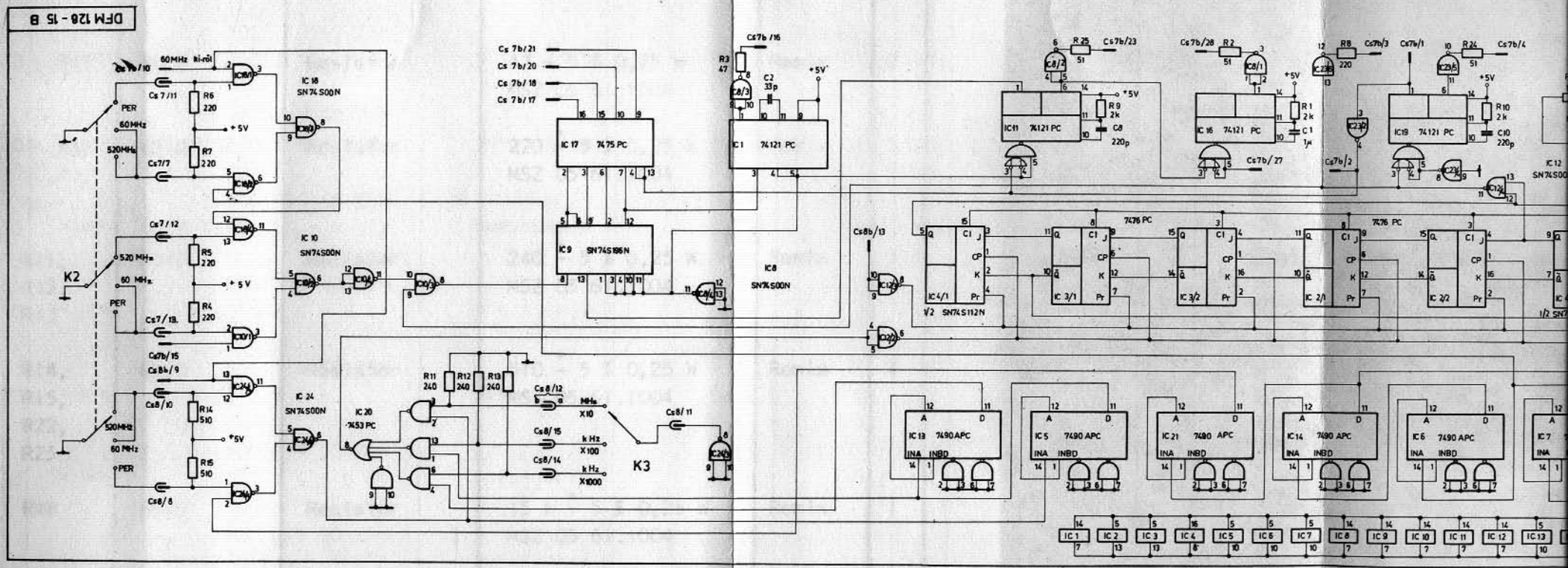
Változat	Jele	Első	Kelt	Jegyzőkönyv sz.	Aláírás	Változás	Jele	Első	Kelt	Jegyzőkönyv sz.	Aláírás
Tervező											
Rajzoló											
Ellenőr											

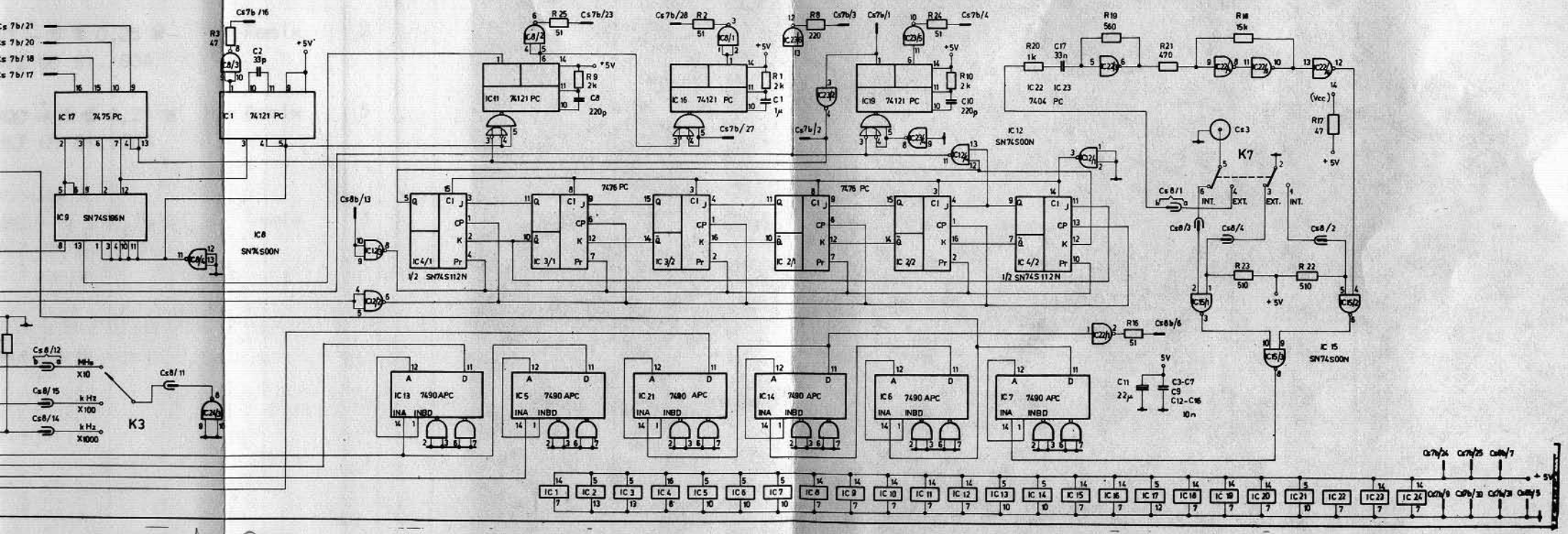
Megnevezés	Lapszám	Rajzszám
Kijelző áramkör Indicating circuit Anzeigestromkreis Индикаторный контур	1/5	DFM 128 - 14 B

Display circuit

Position	Circuit symbol	Drw. No. or Type No.	Description	Value	Maker	Qty
1.	2.	3.	4.	5.	6.	7.
1.	RI (I)	R510	Resistor	15 $\overset{+}{-}$ 5 % 0,25 W MSZ 05 61.1004	Remix	I
2.	P2	SzP0-05 0Sz3	Potentiometer	470 k $\overset{+}{-}$ 20 % L= 19 0ZS0.468.047 TU	USSR	I
3.						
4.	CI	CE217-SA	Electrolite capacitor	470μ $^{+100}_{-10}$ % 6;3 V 25/085/21 MSZ 1558-70	MM	I
5.	LDI-LD4	LD52/II	LED	As per catalog	Siemens	4
6.	(I) Select at calibration. For assortment refer to page 48.					
7.						
8.	LD5-LDII	TIL 306	LED /digit disp./	As per catalog	Texas	7
9.	LDI2	TIL 308	LED /digit disp./	As per catalog	Texas	I
10.						
11.	K4	83.547.001 83.132	Mikroswitch with push-button	As per catalog	Crouzet	I
12.						
13.	K8/a, K8/b	Pm2-III 1.203.0018	Mikroswtich	As per catalog	Kontakta	2
14.						

1.	2.	3.	4.	5.	6.	7.
		Selection set				
15.	R1	R510	Resistor	10 ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
16.	R1	R510	Resistor	12 ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
17.	R1	R510	Resistor	13 ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
18.	R1	R510	Resistor	18 ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
19.	R1	R510	Resistor	20 ± 5 % 0,25 W MSZ 05 61.1004	Remix	0,2
20.						
		Equivalent type				
21.	P2	SzP3-9a	Potentiometer	470 k ± 20 % OSz3-25 OZS0.468.012 TU	USSR	
22.						
23.						
24.						
25.						
26.						
27.						
28.						
29.						
30.						


DFM 128 - 15 B
60MHz Ni-cd
PER
60MHz
520MHz
+5V
IC 18 SN74S00N
IC 10 SN74S00N
IC 24 SN74S00N
K2
520 MHz
60 MHz
IC 20 7453 PC
R11 240
R12 240
R13 240
MHz X10
k Hz X100
k Hz X1000
K3
IC 17 7475 PC
IC 9 SN74S196N
IC 1 74121 PC
IC8 SN74S00N
IC11 74121 PC
IC 16 74121 PC
IC19 74121 PC
7476 PC
IC 4/1
IC 3/1
IC 3/2
IC 2/1
IC 2/2
√2 SN74S112N
IC 13 7490 APC
IC 5 7490 APC
IC 21 7490 APC
IC 14 7490 APC
IC 6 7490 APC
IC 7
INA INBD
IC 1
IC 2
IC 3
IC 4
IC 5
IC 6
IC 7
IC 8
IC 9
IC 10
IC 11
IC 12
IC 13


IC 17 7475 PC
IC 1 74121 PC
IC 9 SN74S196N
IC 8 SN74S00N
IC41 74121 PC
IC 16 74121 PC
IC 19 74121 PC
IC 22 IC 23 7404 PC
IC 12 SN74S00N
7476 PC
IC 4/1 1/2 SN74S112N
IC 3/1
IC 3/2
IC 2/1
IC 4/2 1/2 SN74S112N
IC 15 SN74S00N
IC 13 7490 APC
IC 5 7490 APC
IC 21 7490 APC
IC 14 7490 APC
IC 6 7490 APC
IC 7 7490 APC
K3
K7
MHz X10
k Hz X100
k Hz X1000
INT.
EXT.
+5V
(Vcc)

Control circuit I.

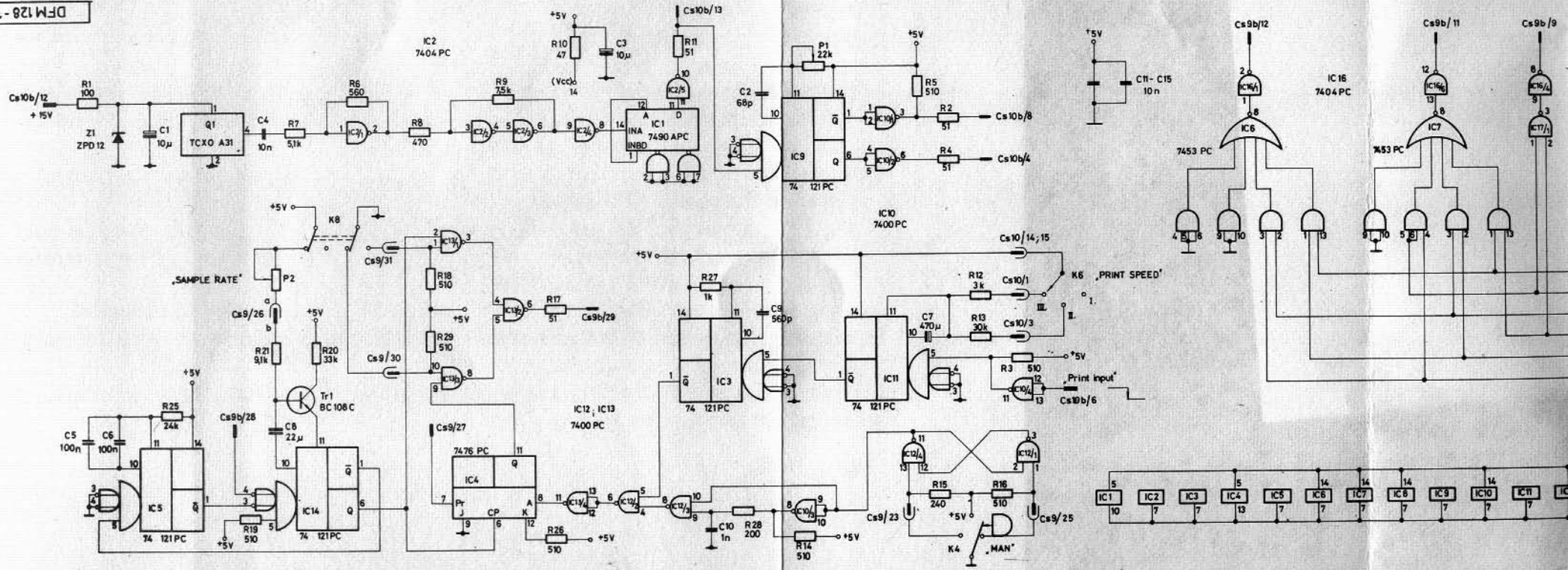
Position	Circuit symbol	Drw. No. or Type No.	Description	Value	Maker	Qty
1.	2.	3.	4.	5.	6.	7.
1.	R1, R9, R10	R510	Resistor	2 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	3
2.	R2,R16, R24, R25	R510	Resistor	51 ± 5 % 0,25 W MSZ 05 61.1004	Remix	4
3.	R3,R17	R510	Resistor	47 ± 5 % 0,25 W MSZ 05 61.1004	Remix	2
4.	R4,R5, R6,R7, R8	R510	Resistor	220 ± 5 % 0,25 W MSZ 05 61.1004	Remix	5
5.	R11, R12, R13	R510	Resistor	240 ± 5 % 0,25 W MSZ 05 61.1004	Remix	3
6.	R14, R15, R22, R23	R510	Resistor	510 ± 5 % 0,25 W MSZ 05 61.1004	Remix	4
7.	R18	R510	Resistor	15 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
8.	R19	R510	Resistor	560 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
9.	R20	R510	Resistor	1 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
10.	R21	R510	Resistor	470 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
11.						
12.						

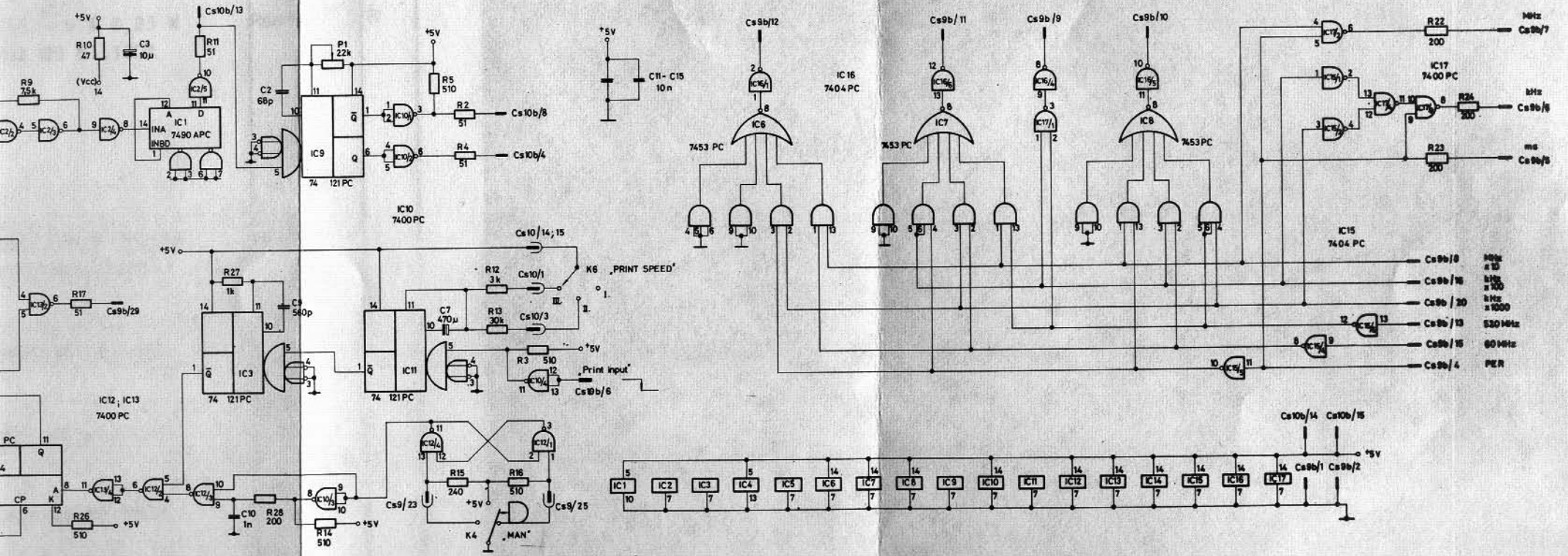
1.	2.	3.	4.	5.	6.	7.
13.	C1	CE2004-SA	Electrolite capacitor	$1\mu^{+100}_{-10}$ % 63 V 25/085/21 MSZ 1558-70	MM	1
14.	C2	MKFM N47	Capacitor	33 p $\pm$ 5 % 50 V 5x5x2,5 As per catalog	Köporc	1
15.	C3-C7, C9, C12-C16	TK783	Capacitor	10 n $^{+80}_{-20}$ % 3E4 32 V As per catalog	CsNK	11
16.	C8,C10	MKFM N47	Capacitor	220 p $\pm$ 5 % 50 V 5x5x2,5 As per catalog	Köporc	2
17.	C11	CE2082-SA	Electrolite capacitor	$22\mu^{+100}_{-10}$ % 10 V 25/085/21 MSZ 1558-70	MM	1
18.	C17	MKFM T1000	Capacitor	33 n $\pm$ 20 % 100V 7,5x7,5x2,5 As per catalog	Köporc	1
19.						
20.						
21.						
22.	IC1, IC11, IC16, IC19	74121 PC	Integrated circuit	As per catalog	EIVRT	4
23.	IC2, IC3	7476 PC	Integrated circuit	As per catalog	EIVRT	2
24.	IC4	SN74S112N	Integrated circuit	As per catalog	Texas	1

1.	2.	3.	4.	5.	6.	7.
25.	IC5, IC6, IC7, IC13, IC14, IC21	7490 APC	Integrated circuit	As per catalog	EIVRT	6
26.	IC8, IC10, IC12, IC15, IC18, IC24	SN74S00N	Integrated circuit	As per catalog	Texas	6
27.	IC9	SN74S196N	Integrated circuit	As per catalog	Texas	1
28.						
29.	IC17	7475 PC	Integrated circuit	As per catalog	EIVRT	1
30.	IC20	7453 PC	Integrated circuit	As per catalog	EIVRT	1
31.	IC22, IC23	7404 PC	Integrated circuit	As per catalog	EIVRT	2
32.						
33.	Cs7b	1377 33231 104 6110	31-pole PCB connector /male part/	As per catalog	RFT	1
34.	Cs8b	1377 33231 104 4110	15-pole PCB connector /male part/	As per catalog	RFT	1
35.						
36.						
		Equivalent type				
	IC4	MH74S112	Integrated circuit	As per catalog	Tesla	

1.	2.	3.	4.	5.	6.	7.
	IC8, IC10, IC12, IC15, IC18 IC24	MH74S00	Integrated circuit	As per catalog	Tesla	

DFM 128-16 B


IC2
7404 PC
IC1
7490 APC
IC9
74 121 PC
IC3
74 121 PC
IC11
74 121 PC
IC5
74 121 PC
IC14
74 121 PC
IC4
7476 PC
IC12 ; IC13
7400 PC
IC10
7400 PC
IC6
7453 PC
IC7
7453 PC
IC16
7404 PC
Q1
TCXO A31
Z1
ZPD 12
Tr1
BC 108 C
K8
„SAMPLE RATE"
K6 „PRINT SPEED"
K4 „MAN"
„Print input"
+5V
(Vcc)
Cs10b/12
Cs10b/13
Cs10b/8
Cs10b/4
Cs9/31
Cs9/30
Cs9/26
Cs9b/28
Cs9/27
Cs9b/29
Cs10/14;15
Cs10/1
Cs10/3
Cs10b/6
Cs9/23
Cs9/25
Cs9b/12
Cs9b/11
Cs9b/9
C11 - C15
10 n


+5V
R10 47
(Vcc)
14
C3 10µ
Cs10b/13
R11 51
R9 7,5k
IC2/5
IC2/2
IC2/3
IC2/4
IC1 7490 APC
A
INA
INBD
D
12
11
14
1
2 3 6 7
C2 68p
P1 22k
IC9
74 121 PC
R5 510
R2 51
R4 51
Cs10b/8
Cs10b/4
IC10/1
IC10/2
IC10/3
IC10/4
IC10 7400 PC
C11 - C15 10n
IC16 7404 PC
Cs9b/12
Cs9b/11
Cs9b/9
Cs9b/10
IC6
IC7
IC8
7453 PC
IC16/1
IC16/2
IC16/3
IC16/4
IC16/5
IC17/1
IC17/2
IC17/3
IC17/4
IC17 7400 PC
R22 200
R24 200
R23 200
MHz
kHz
ms
Cs9b/7
Cs9b/9
Cs9b/8
IC15 7404 PC
Cs9b/8
Cs9b/16
Cs9b/20
Cs9b/13
Cs9b/15
Cs9b/4
x 10
x 100
x 1000
530 kHz
60 kHz
PER
Cs10/14; 15
R27 1k
R12 3k
Cs10/1
K6 „PRINT SPEED"
III.
II.
I.
R13 30k
Cs10/3
C7 470µ
C9 560p
IC3
IC11
74 121 PC
R3 510
„Print input"
Cs10b/6
IC12; IC13 7400 PC
IC12/1
IC12/2
IC12/3
IC12/4
R15 240
R16 510
R14 510
C10 1n
R28 200
R26 510
K4 „MAN"
Cs9/23
Cs9/25
R17 51
Cs9b/29
Cs10b/14
Cs10b/15
Cs9b/1
Cs9b/2
IC1
IC2
IC3
IC4
IC5
IC6
IC7
IC8
IC9
IC10
IC11
IC12
IC13
IC14
IC15
IC16
IC17

55

56

Control circuit II.

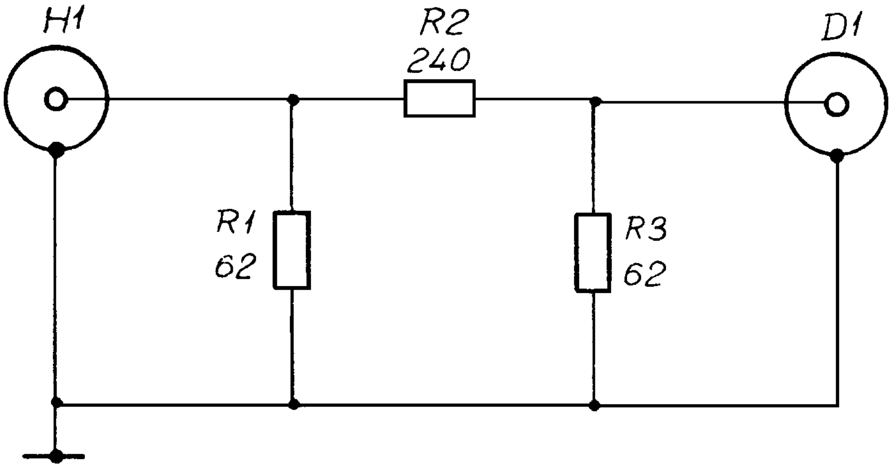
Position	Circuit symbol	Drw. No. or Type No.	Description	Value	Maker	Qty
1.	2.	3.	4.	5.	6.	7.
1.	R1	R510	Resistor	100 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
2.	R2,R4, R11, R17	R510	Resistor	51 ± 5 % 0,25 W MSZ05 61.1004	Remix	4
3.	R3,R5, R14, R16, R18, R19, R26, R29	R510	Resistor	510 ± 5 % 0,25 W MSZ 05 61.1004	Remix	8
4.	R6	R510	Resistor	560 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
5.	R7	R510	Resistor	5,1 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
6.	R8	R510	Resistor	470 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
7.	R9	R510	Resistor	7,5 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
8.	R10	R510	Resistor	47 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
9.	R12	R510	Resistor	3 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
10.	R13	R510	Resistor	30 k ± 5 % 0,25 W MSZ 05 61.1004	Remix	1
11.	R15	R510	Resistor	240 ± 5 % 0,25 W MSZ 05 61.1004	Remix	1

1.	2.	3.	4.	5.	6.	7.
12.	R20	R510	Resistor	33 k $\pm$ 5 % 0,25 W MSZ 05 61.1004	Remix	1
13.	R21	R510	Resistor	9,1 k $\pm$ 5 % 0,25 W MSZ 05 61.1004	Remix	1
14.	R22, R23, R24, R28	R510	Resistor	200 $\pm$ 5 % 0,25 W MSZ 05 61.1004	Remix	4
15.	R25	R510	Resistor	24 k $\pm$ 5 % 0,25 W MSZ 05 61.1004	Remix	1
16.	R27	R510	Resistor	1 k $\pm$ 5 % 0,25 W MSZ 05 61.1004	Remix	1
17.						
18.	P1	P7272	Potentiometer	22 k $\pm$ 30 % 0,5 W RX-74.297/2	Remix	1
19.						
20.	C1, C3	CE2059-SA	Electrolite capacitor	10 μ $^{+100}_{-10}$ % 25 V 25/085/21 MSZ 1558-70	MM	2
21.	C2	MKFM N47	Capacitor	68 p $\pm$ 5 % 50 V 5x5x2,5 As per catalog	Köporc	1
22.	C4, C11-C15	TK783	Capacitor	10 n $^{+80}_{-20}$ % 3E4 32 V As per catalog	CsNK	6
23.	C5, C6	TK783	Capacitor	100 n $^{+80}_{-20}$ % 3E4 32 V As per catalog	CsNK	2
24.	C7	CE217-SA	Electrolite capacitor	470 μ $^{+100}_{-10}$ % 6,3 V 25/085/21 MSZ 1558-70	MM	1

1.	2.	3.	4.	5.	6.	7.
25.	C8	CE2082-SA	Electrolite capacitor	$22\mu^{+100}_{-10}$ % 10 V 25/085/21 MSZ 1558-70	MM	1
26.	C9	MKFM N47	Capacitor	560 p $\pm$ 5 % 50 V 5x5x2,5	Köporc	1
27.	C10	TK724	Capacitor	1 n $\pm$ 20 % 40 V E2000 As per catalog	CsNK	1
28.						
29.						
30.	Z1	ZPD 12	Zener diode	As per catalog	EIVRT	1
31.	Tr1	BC108C	Transistor	As per catalog	EIVRT	1
32.						
33.	IC1	7490 APC	Integrated circuit	As per catalog	EIVRT	1
34.	IC2, IC15, IC16	7404 PC	Integrated circuit	As per catalog	EIVRT	3
35.	IC3, IC5, IC9, IC11, IC14	74121 PC	Integrated circuit	As per catalog	EIVRT	5
36.	IC4	7476 PC	Integrated circuit	As per catalog	EIVRT	1
37.	IC6, IC7, IC8	7453 PC	Integrated circuit	As per catalog	EIVRT	3
38.	IC10, IC12, IC13, IC17	7400 PC	Integrated circuit	As per catalog	EIVRT	4

1.	2.	3.	4.	5.	6.	7.
39.	Q1	TCXO A31	Quartz crystal /crystal oscillator/	10 MHz As per catalog	Kristall	1
40.						
41.	Cs9b	1377 33231 104 6110	31-pole PCB connector /male part/	As per catalog	RFT	1
42.	Cs10b	1377 33231 104 4110	15-pole PCB connector /male part/	As per catalog	RFT	1

DFM126-14 B



20dB-es osztó

DFM126-14 B

20 dB attenuator

Position	Circuit symbol	Drw. No. or Type No.	Description	Value	Maker	Qty
1.	R1, R3	R510 1.	Resistor	62 ± 5 % 1 W	Remix	2
2.	R2	R510 1.	Resistor	240 ± 5 % 1 W	Remix	1
3.						
4.	H1	R141 554 /UG 625 B/u/	HF socket		Radiall	1
5.	D1	R141 008 /UG 88 C/u/	HF plug		Radiall	1
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						

DIGITAL FREQUENCY METER TYPE **TR-5283** (DFM-128)