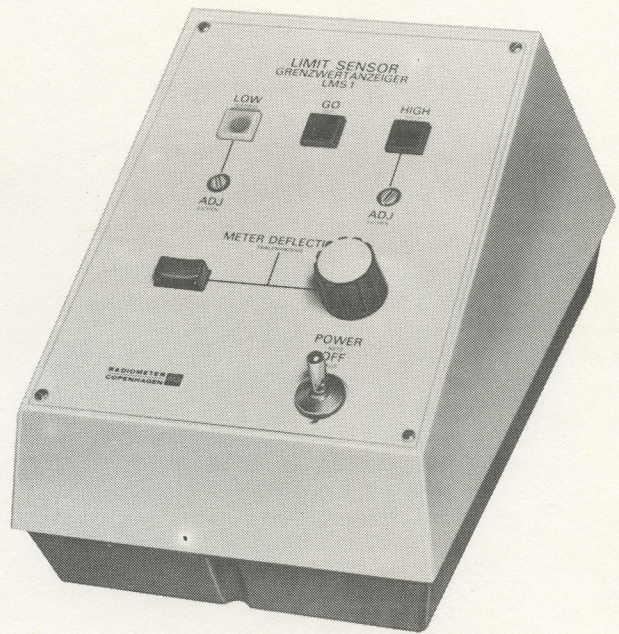


LMS1
LIMIT SENSOR

OPERATING INSTRUCTIONS

LMS1
LIMIT SENSOR



OPERATING INSTRUCTIONS

NOTE: The KPH1 Component Jig mentioned several places in this manual is no longer manufactured.

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Table of Contents

| | page |
|--|------|
| SECTION A - INTRODUCTION | A1 |
| SECTION B - SPECIFICATIONS | B1 |
| SECTION D - GENERAL DESCRIPTION | D1 |
| 1. General | D1 |
| 2. Controls and Terminals | D2 |
| SECTION E - OPERATING INSTRUCTIONS | E1 |
| 1. Connecting the Limit Sensor, type LMS1, to the Component Jig, type KPH1, and to a Component Tester | E1 |
| 2. Step-By-Step Operation | E1 |
| SECTION F - PARTS LIST | F1 |

Limit Sensor Type LMS1

Section A. Introduction

It is often advantageous at the end of production lines or in acceptance control to provide tolerance bridges or component comparators with a device giving a visual signal when the tolerance of the component parameters is exceeded. It renders manual checking easier and is a necessity in the many instances where a measuring speed of 8 to 10 components per second is required.

The Limit Sensor, type LMS1, is part of a component testing system which comprises a component tester (viz., the R,L,C Impedance Comparator, type TRB11, or the 1 MHz Capacitance Comparator, type CMB12), a Component

Jig, type KPH1, and the Limit Sensor, type LMS1.

The Limit Sensor, type LMS1, is a line-operated, solid-state instrument designed for accurate electronic indication of the transgression of two preselected limits. This transgression is indicated by means of two lamps. A yellow lamp is lit when the lower tolerance is exceeded, a red one when the higher tolerance is exceeded. Furthermore, a green lamp is lit if the component is within the tolerances. A relay output is activated at the same time as the lamps. This output can, for example, be used for connecting an automatic sorting device to the Limit Sensor.

Section B. Specifications

| | |
|----------------------------------|--|
| SENSITIVITY | 0 to ± 125 mV |
| STABILITY | $\pm 2\%$ |
| INPUT | |
| <u>Impedance:</u> | > 1 M Ω |
| <u>Max. Input Voltage:</u> | 15 V |
| MEASURING SPEED | Up to 10 measurements per second |
| TEMPERATURE RANGE | 0 to 40°C |
| CONTACT LOAD FOR RELAY OUTPUT | 100 V max./1 A |
| POWER SUPPLY | 110 and 220 V $\pm 10\%$ |
| DIMENSIONS | |
| <u>Height:</u> | 150 mm (6") |
| <u>Width:</u> | 120 mm (4 3/4") |
| <u>Depth:</u> | 230 mm (9 1/4") |
| WEIGHT | 2.4 kg (5 lbs) |
| ACCESSORIES SUPPLIED | 5-conductor cable with Tuchel plugs, code 617-715 |

Section D. General Description

GENERAL

The Limit Sensor, type LMS1, consists of two identical Relay Driver channels feeding a Relay Matrix. The Relay Drivers are fed from an amplifier common to both channels. This amplifier receives its input from the appropriate component tester. The threshold values of either Relay Driver can be individually adjusted by means of the screwdriver potentiometers ADJ. on the front plate. Via the 5-pin socket OUTPUT, two unloaded, all-purpose change-over contacts are available, e.g., to control sorting machines or the like.

The input voltage from the component tester is fed, via the five-pin socket INPUT, to the common amplifier QA101. The input of the amplifier is protected against overloading by R107 and the antiparalleled diodes CR109 and CR110. The amplified voltage is fed from the output of QA101 to the parallel inputs of the Relay Drivers via R112 and R113. By means of resistor R112 and potentiometer R3 (alternatively R113 and R2), it is possible to adjust the threshold value of either channel separately by shunting their input.

When the amplified voltage rises above a predetermined value, enough base current runs into transistor Q105 (alternatively Q103), and the transistors are

then in a more conducting state. This causes transistor Q108 (alternatively Q107) to start conducting, as the base goes more negative and supplies base current to transistor Q110 (alternatively Q109). As the collector of transistor Q110 (alternatively Q109) goes low, the base current, and in turn the collector-emitter current, of Q106 (alternatively Q104) decreases, thus forming a positive feedback to Q105 (alternatively Q103) to ensure stable switching conditions.

When transistor Q110 (alternatively Q109) conducts, the relay K102 (alternatively K101) operates. If no relay operates, the LOW lamp is lit. When K102 is activated, the GO lamp is lit, and if both relays are energized, only the HIGH lamp indicates.

In order to facilitate the setting of the Limit Sensor, it has been provided with a pushbutton and a METER DEFLECTION knob. When setting the desired range the button is pushed in and the meter deflection of the component tester is adjusted by means of the knob to (e.g.) the lowest acceptable limit of the parameter under observation, with the Limit Sensor acting as a dummy component. By means of a screwdriver, the ADJ potentiometer is adjusted until the LOW indicator is just switched off, and similarly for HIGH.

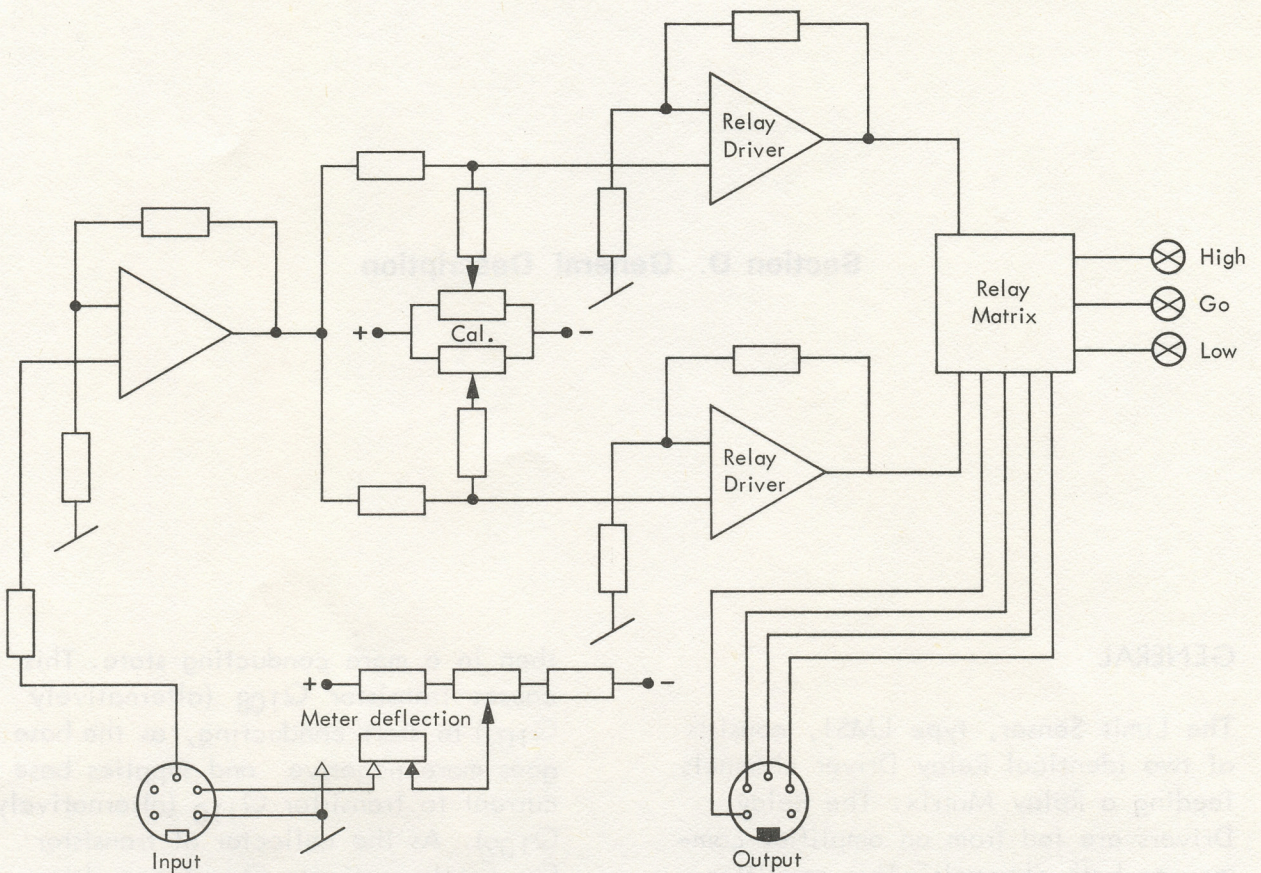


Fig.D1. Block diagram of the Limit Sensor, type LMS1

CONTROLS AND TERMINALS

General

The Limit Sensor, type LMS1, is provided with the following controls and terminals, as shown in Figs.D2 and D3.

Controls (see Fig.D2)

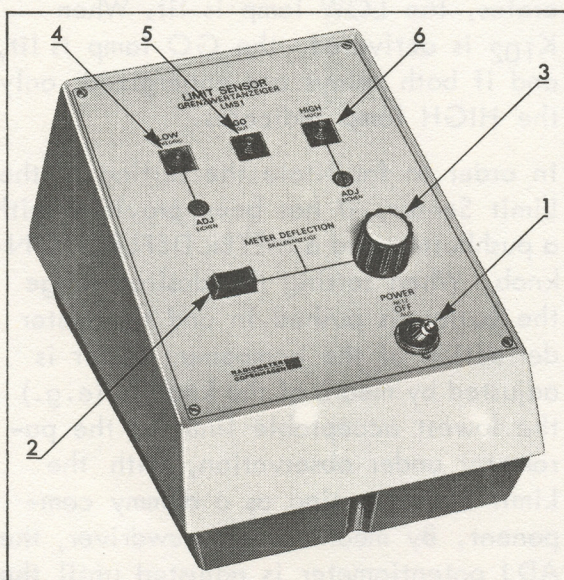


Fig.D2. Front plate of the Limit Sensor, type LMS1.

POWER-OFF Switch (1)

The switch POWER-OFF is a toggle switch used to turn the instrument on.

METER DEFLECTION Pushbutton (2) and Potentiometer (3)

The pushbutton METER DEFLECTION is used when setting the limits in conjunction with the potentiometer METER DEFLECTION.

LOW Lamp and ADJ control (4)

The yellow lamp LOW indicates, when lit, that the component under test has a deviation that is beyond the lowest limit. The control ADJ, under the LOW lamp, is used to adjust the turning-on point of this lamp.

GO Lamp (5)

The green lamp GO indicates, when lit, that the component under test is within the limits.

HIGH Lamp and ADJ control (6)

The red lamp HIGH indicates, when lit, that the component under test has a deviation that is beyond the highest limit. The control ADJ., under the HIGH lamp, is used to adjust the turning-on point of this lamp.

Terminals (see Fig.D3)

INPUT Terminal (1)

The terminal INPUT is a five-pole plug which provides for connection to the component tester to be used or to the Component Jig, type KPH1.

OUTPUT Terminal (2)

The terminal OUTPUT is a five-pole

socket which provides for connection to sorting machines or the like.

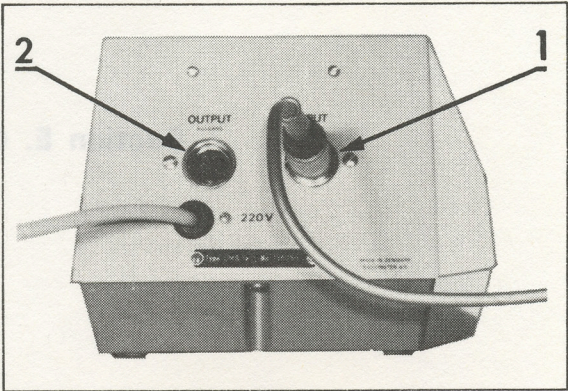


Fig.D3. Rear plate of the Limit Sensor, type LMS1.

Section E. Operating Instructions

CONNECTING THE LIMIT SENSOR TYPE LMS1, TO THE COMPONENT JIG, TYPE KPH1, AND TO A COMPONENT TESTER

1) The use of a Component Jig, type KPH1, is recommended, as the meter and the input of the Limit Sensor are automatically short-circuited while components are being exchanged on the Component Jig. In this manner, parasitic deflection on the meter of the component tester, as well as activation of any sorting devices via the recorder output of the component tester, is avoided.

2) Two component testers are compatible with the Limit Sensor, type LMS1, viz:

R,L,C Impedance Comparator, type TRB11

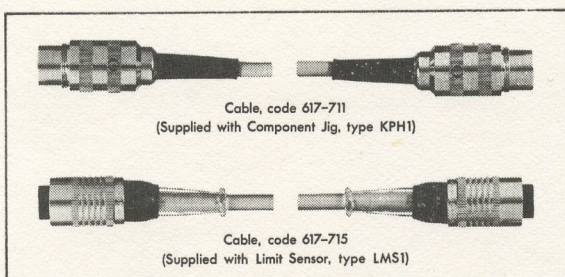


Fig.E1. Cables required for connection of a Limit Sensor, type LMS1, to a Component Jig, type KPH1, and to a component tester.

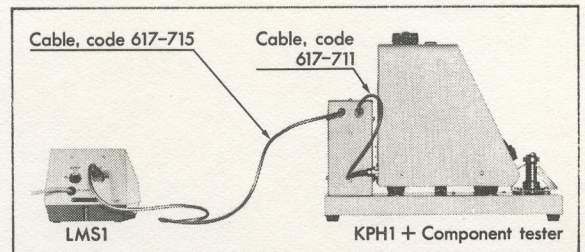


Fig.E2. How to connect the Limit Sensor, type LMS1, to a Component Jig, type KPH1, and to a component tester.

1 MHz Capacitance Comparator, type CMB12

(for further details, see the respective instruction manuals).

STEP-BY-STEP OPERATION

1) Connect the Limit Sensor, type LMS1, to the Component Jig, type KPH1, by means of the Cable, code 617-715, supplied with LMS1 (see Fig.E1). To do so, refer to Fig.E2.

2) Connect the component tester to the Component Jig, type KPH1, by means of the Cable, code 617-711, supplied with KPH1 (see Fig.E1). To do so, refer to Fig.E2.

3) Turn the screwdriver control ADJ under the LOW lamp of the Limit Sensor clockwise, and that under the HIGH lamp fully counterclockwise, so that the GO lamp lights up.

- 4) Prepare the component tester for measuring (see separate instruction manual).
- 5) Push in the pushbutton METER DEFLECTION of the Limit Sensor, and, at the same time, set the desired lower limit by turning the potentiometer METER DEFLECTION of the Limit Sensor until the pointer of the component tester settles at this limit.
- 6) With the pushbutton METER DEFLECTION still pressed in, turn the screwdriver control ADJ under the lamp LOW counterclockwise until the lamp lights up.
- 7) Push in the pushbutton METER DEFLECTION and set the desired higher limit by turning the potentiometer METER DEFLECTION of the Limit Sensor until the pointer of the component tester settles at this limit.
- 8) With the pushbutton METER DEFLECTION still pressed in, turn the screwdriver control ADJ under the lamp HIGH clockwise until the lamp lights up.
- 9) The Limit Sensor is now ready to indicate whether the component to be tested is within the preset limits or not.

Section F. Parts List

In the following parts list a group code prefix number is used. To facilitate the use of this code, the different types of parts and their corresponding group code prefixes are listed below:

| | |
|---------------------------------------|--------------|
| Standard resistors | 100- to 139- |
| Precision resistors | 140- to 152- |
| Non-linear resistors | 160- |
| UHF resistors | 170- to 172- |
| Carbon potentiometers | 180- to 185- |
| Wire-wound potentiometers | 190- to 195- |
| Mica capacitors | 200- to 208- |
| Ceramic capacitors | 210- to 214- |
| Paper capacitors | 220- to 222- |
| Metal-paper capacitors | 224- to 229- |
| Plastic capacitors | 240- to 245- |
| Electrolytic capacitors | 260- to 267- |
| Variable capacitors | 280- to 286- |
| Special tubes | 310- |
| Rectifiers | 340- to 341- |
| Diodes | 350- |
| Transistors | 360- |
| Integrated circuits | 364- |
| Lamps, batteries, fuses | 400- to 486- |
| Switches | 500- to 580- |
| Coils, coil material and transformers | 700- to 785- |

As we are continually improving our instruments, it is important, when ordering spare parts, that you include the following information:

The code number and description of the part

The circuit reference from the wiring diagram

The complete type designation of your instrument

The serial number of your instrument

Please note that the position of any part can easily be found by referring to the last column of the parts list. This indicates on which figure the part can be located.

^x indicates special parts manufactured by Radiometer.

CAPACITORS

| Designation | Type | Value | Code No. | Shown Fig. |
|-------------|--------------|---------------------------|----------|------------|
| C101 | electrolytic | 100 μ F 35/40 V | 260-013 | F1 |
| C102 | electrolytic | 250 μ F 25 V | 260-042 | F1 |
| C103 | ceramic | 150 pF 5% | 211-315 | F1 |
| C104 | ceramic | 47 nF -20/+80% 30 V | 213-016 | F1 |
| C105 | ceramic | 47 nF -20/+80% 30 V | 213-016 | F1 |
| C106 | ceramic | 0.1 μ F -20/+80% 12 V | 213-017 | F1 |
| C107 | ceramic | 0.1 μ F -20/+80% 12 V | 213-017 | F1 |

DIODES

| Designation | Type | Code No. | Shown Fig. |
|-------------|-----------------------|----------|------------|
| CR101 | diode BAX16 | 350-023 | F1 |
| CR102 | diode BAX16 | 350-023 | F1 |
| CR103 | diode BAX16 | 350-023 | F1 |
| CR104 | diode BAX16 | 350-023 | F1 |
| CR105 | zener diode BZY94C12 | 350-605 | F1 |
| CR106 | zener diode BZY94C12 | 350-605 | F1 |
| CR107 | zener diode BZY88C5V6 | 350-629 | F1 |
| CR108 | zener diode BZY88C5V6 | 350-629 | F1 |
| CR109 | diode BAX16 | 350-023 | F1 |
| CR110 | diode BAX16 | 350-023 | F1 |
| CR111 | diode BAX16 | 350-023 | F1 |
| CR112 | diode BAX16 | 350-023 | F1 |
| CR113 | diode BAX16 | 350-023 | F1 |
| CR114 | diode BAX16 | 350-023 | F1 |
| CR115 | diode BAX16 | 350-023 | F1 |
| CR116 | diode BAX16 | 350-023 | F1 |
| CR117 | zener diode BZY88C7V5 | 350-621 | F1 |
| CR118 | diode BAX16 | 350-023 | F1 |
| CR119 | diode BAX16 | 350-023 | F1 |

LAMPS

| Designation | Type | Code No. |
|-------------|--------------|----------|
| I1 | lamp, yellow | 400-806 |
| I2 | lamp, green | 400-807 |
| I3 | lamp, red | 400-805 |

TERMINALS

| Designation | Type | Code No. |
|-------------|----------------|----------|
| J1 | multiplug | 805-202 |
| J2 | multiplug | 805-203 |
| P100 | terminal strip | 805-623 |

RELAYS

| Designation | Type | Code No. | Shown Fig. |
|-------------|----------------------------|----------|------------|
| K101 | relay, 24 V, 1700 Ω | 570-026 | F1 |
| K102 | relay, 24 V, 1700 Ω | 570-026 | F1 |

TRANSISTORS

| Designation | Type | Code No. | Shown Fig. |
|-------------|--------------------|----------|------------|
| Q101 | transistor 2N1711 | 360-047 | F1 |
| Q102 | transistor 2N2905A | 360-073 | F1 |
| Q103 | transistor BC149C | 360-072 | F1 |
| Q104 | transistor BC149C | 360-072 | F1 |
| Q105 | transistor BC149C | 360-072 | F1 |
| Q106 | transistor BC149C | 360-072 | F1 |
| Q107 | transistor 2N3906 | 360-062 | F1 |
| Q108 | transistor 2N3906 | 360-062 | F1 |
| Q109 | transistor 2N1711 | 360-047 | F1 |
| Q110 | transistor 2N1711 | 360-047 | F1 |

INTEGRATED CIRCUITS

| Designation | Type | Code No. |
|-------------|----------------|----------|
| QA101 | amplifier 809C | 364-004 |

RESISTORS

| Designation | Type | Value | Code No. | Shown Fig. |
|-------------|-------------|-------------------------|----------|------------|
| R1 | carbon pot. | 10 k Ω lin. | 180-007 | |
| R2 | carbon pot. | 5 k Ω lin. | 180-006 | |
| R3 | carbon pot. | 5 k Ω lin. | 180-006 | |
| R101 | carbon film | 6.8 k Ω 5% 0.3 W | 106-468 | F1 |
| R102 | carbon film | 6.8 k Ω 5% 0.3 W | 106-468 | F1 |
| R103 | carbon film | 680 Ω 5% 0.3 W | 106-368 | F1 |
| R104 | carbon film | 5.6 k Ω 5% 0.3 W | 106-456 | F1 |
| R105 | carbon film | 5.6 k Ω 5% 0.3 W | 106-456 | F1 |
| R106 | carbon film | 680 Ω 5% 0.3 W | 106-368 | F1 |
| R107 | carbon film | 1 k Ω 5% 0.3 W | 106-410 | F1 |
| R108 | carbon film | 1 k Ω 5% 0.3 W | 106-410 | F1 |
| R109 | carbon film | 33 k Ω 5% 0.3 W | 106-533 | F1 |
| R110 | carbon film | 15 k Ω 5% 0.3 W | 106-515 | F1 |
| R111 | carbon film | 15 k Ω 5% 0.3 W | 106-515 | F1 |
| R112 | carbon film | 15 k Ω 5% 0.3 W | 106-515 | F1 |
| R113 | carbon film | 15 k Ω 5% 0.3 W | 106-515 | F1 |
| R114 | carbon film | 22 k Ω 5% 0.3 W | 106-522 | F1 |
| R115 | carbon film | 22 k Ω 5% 0.3 W | 106-522 | F1 |
| R116 | carbon film | 22 k Ω 5% 0.3 W | 106-522 | F1 |
| R117 | carbon film | 22 k Ω 5% 0.3 W | 106-522 | F1 |
| R118 | carbon film | 2.7 k Ω 5% 0.3 W | 106-427 | F1 |
| R119 | carbon film | 4.7 k Ω 5% 0.3 W | 106-447 | F1 |
| R120 | carbon film | 2.7 k Ω 5% 0.3 W | 106-427 | F1 |
| R121 | carbon film | 4.7 k Ω 5% 0.3 W | 106-447 | F1 |
| R122 | carbon film | 3.9 k Ω 5% 0.3 W | 106-439 | F1 |
| R123 | carbon film | 3.9 k Ω 5% 0.3 W | 106-439 | F1 |
| R124 | carbon film | 1.8 k Ω 5% 0.3 W | 106-418 | F1 |
| R125 | carbon film | 1 M Ω 5% 0.3 W | 106-710 | F1 |
| R126 | carbon film | 1 M Ω 5% 0.3 W | 106-710 | F1 |

SWITCHES

| Designation | Type | Code No. |
|-------------|-------------|----------|
| S1 | main switch | 500-102 |
| x S2 | switch | 550-991 |

TRANSFORMER

| Designation | Type | Code No. | Shown Fig. |
|-------------|-------------------|----------|---------------|
| x T101 | power transformer | 770-600 | F1 |

CABLES

| Designation | Type | Code No. |
|-------------|------------------------------|----------|
| W1 | power lead with plug | 615-005 |
| W2 | coaxial cable RG174M, 0.07 m | 600-008 |

MISCELLANEOUS

| Type | Code No. |
|-------------------------|----------|
| knob, 21 ϕ , black | 852-601 |
| cover for knob | 852-602 |

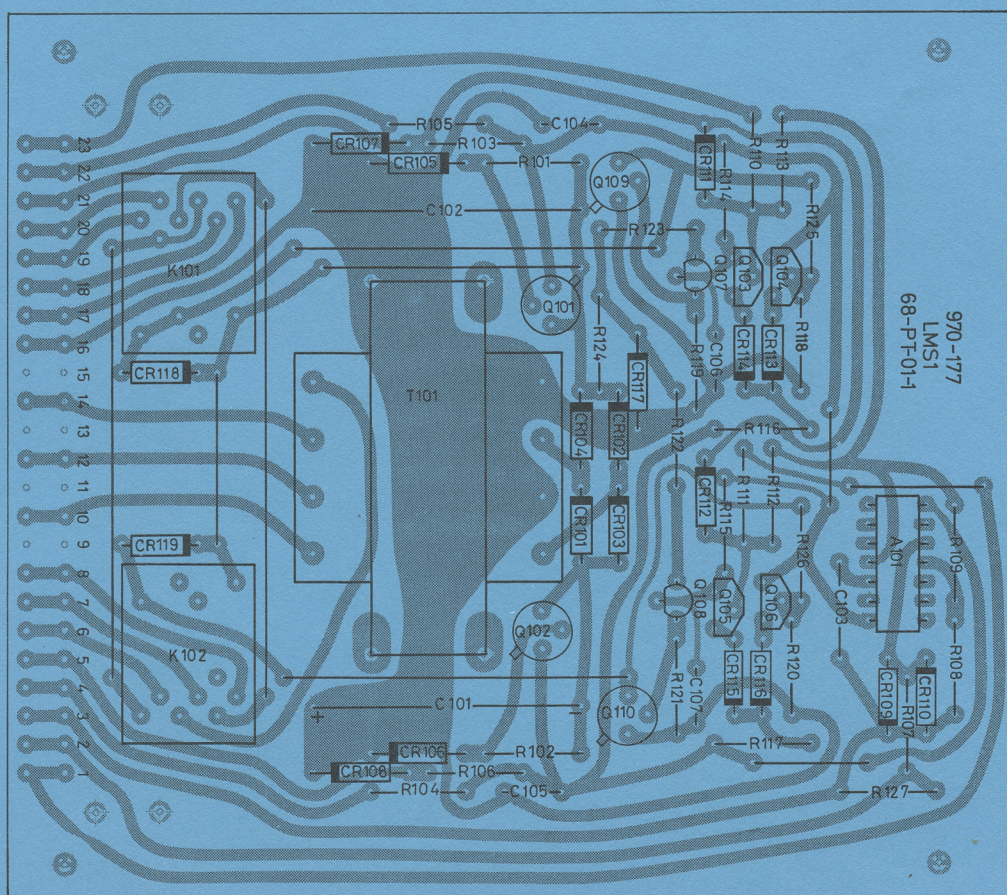


Fig.F1.

