

## OPERATING INSTRUCTIONS

# IRM 11

Impulse reflectometer



**SAT-Kabel®**

Satelliten- und Kabelfernsehanlagen/Industriervertretung GmbH

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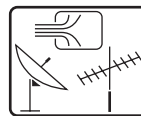
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Errors, technical amendmends and developments are subject to change without notice!

IRM11/e1/2005



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**Attention! Read essentially!**

At defects caused by nonobservance of the operating instructions, the guarantee claims expire.

**Contents**

1. Introduction
2. Security informations
3. Operating elements
4. Measuring instruction, starting
5. Battery change
6. Technical data

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Updated operating instructions in PDF form can be also downloaded from our internet homepage. ([www.sat-kabel.de](http://www.sat-kabel.de))

**Guarantee**

*State July 2006*

For this instrument will be granted a service life (in following called guarantee) to following conditions:

- This guarantee is valid for new instruments purchased in Germany.
- New instruments and their components, which are defective because of production faults and/or material faults, are repaired or are replaced from SAT-Kabel® against a corresponding instrument.
- For wear parts, like accumulators, keyboards, housings, bags, connecting cables this guarantee is valid for 6 month from the purchasing date.
- The guarantee claim expires at matings by the purchaser or third persons.
- At defects, caused by improper handling or operating, by wrong installation or store, by improper connection or mounting, no guarantee is granted .
- For not justified demand of our service we charge for our service the usual payment for material, working hours and forwarding costs.
- Repairs are only made with filled service covering.

(Forms for service coverings and further information are found in the standard form contracts under:  
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## 6. Technical data

**Display:** 3½ digit LCD-display  
**Power supply:** 9-V-block battery (IEC 6F 22)  
Power consumption 6 mA  
**Dimensions:** 6.9 × 12.5 × 2.7 [cm] (W × H × D)  
**Weight:** 250g incl. battery

### Measuring ranges:DC Voltage

2-,20-,200- and 1000 V ±0.5 % ±2 digits  
Input impedance = 1MΩ

### AC Voltage

200 and 750 V ±1.5% ±10 digits  
Input impedance = 450 kΩ

### Resistance

200 Ω, 2-, 20-, 200-, 2000 kΩ  
±1% ±2 digits

### Diode test

test current = ca. 1mA  
test voltage = ca. 2.8 V

### Cable length measurement

5 m to ca. 300 m, attenuation less (thick)  
cable up to 1000 m  
cable end open ±1% ±2 m  
cable end shorted ±1% ±5 m  
measuring exceeding results in a wrong  
display (most too less values)  
measuring frequency 32 kHz, 4 Vpp  
overload protection max. 25 V

The specified measuring errors apply for a temperature range of 18 to 28°C at a relative humidity below 75%.

## 1. Introduction

The IRM 11 is a handy impulse reflectometer. With this instrument can be made length measurements of coaxial cables in three ranges, as well as also fault location of disconnections, short-circuits on coaxial and mains cable.

It can also be used as digitalmultimeter in four ranges for DC, in two ranges for AC and in four ranges for resistance. Besides it has a diode and transistor tester tester.

## 2. Security information

**2.1.** Never do not exceed the maximum allowed input voltages in the corresponding measuring ranges and do not measure voltages over 600 V.

**2.2.** Do not operate the instrument in rooms or surroundings with bad conditions, such as inflammable gases, vapours or dust.

**2.3.** Avoid to get moist or wet of the instrument resp. the measuring lines.

**2.4.** Use for measurement of voltages only the measuring lines, which are on the instrument.

**2.5.** Never do not operate the instrument with opened housing!

**2.6.** Before changing of the measuring range remove the measuring tips from the object to be measured.

**2.7.** To avoid electric shock, do not touch te measuring tips or the connexions to be measured during the measurement!

**2.8.** Adjustment, maintenance or repair of the instrument with opened housing may be done only from authorized people, which knows the danger of this activity.

**2.9.** If it is supposed, that a not dangerous operation is not more possible, the instrument is put out of action and have to secure against unintentional operation.

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#### 4.2.4 Diode test

- Connect the black measuring cable with the COM-socket and the red measuring cable (+pole) with the V/Ohm-socket.

- Set the range selecting switch on  $\rightarrow \text{+} \leftarrow$  and put the measuring tips on the diode to be measured.

**Information:**

1. If the diode blocks, appear the overflow display "1".
2. During the measurement flows a current of 1 mA through the diode to be measured.
3. The forward voltage is displayed in millivolt.

#### 5. Battery change

Before opening of the housing, remove the measuring instrument from all measuring objects and switch it off.

Turn out the both Phillips screws on the back side with a cross screwdriver .

Remove carefully the lower part of the housing. Consider, that the lower part of the housing on is engaged on the display side.

Replace the battery (9-V-block) and close the instrument again.

Do not throw away the exhausted batteries, but deposit these at a according collecting point.

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To measure cable length less than 5m, a forerun cable (e.g.. 10m) must be inserted between measuring instrument and measuring object, as the impulse reflectometer displays otherwise no analysable measuring value. At cables, which are terminated with their characteristic impedance, no measurements are possible.

#### 4.2.2 DC and AC measurements

Connect the black measuring cable with the COM-socket and the red measuring cable (+pole) with the V/Ohm-socket. Set the range switch on the desired voltage measuring range and connect the measuring lines with the measuring object under observance of the security rules .

##### **Attention!**

Switch the range switch always to the highest value, if the value to be measured is unknown. Switch than step by step to a lower range, up to the right measuring range is reached. Before you switch to a lower range, remove absolutely the measuring lines from the measuring object.

If at the leading digit of the display a "1" is displayed, then the measuring range is set too low.

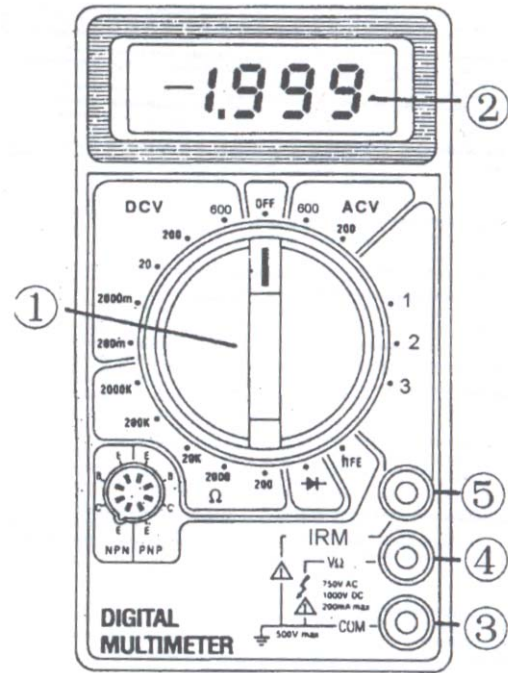
#### 4.2.3 Resistance measurement

##### **Attention!**

Before every resistance measurement be carefully, that the measuring object is dead and all capacitors of the circuit are discharged. So you can avoid damages of the instrument. The maximal allowable input voltage amount here to 250 Vrms for a time less than 10 s.

Connect the black measuring cable with the COM-socket and the red measuring cable (+pole) with the V/Ohm-socket. Set the range switch on the desired resistance measuring range and connect the measuring lines with the measuring object under observance of the security rules .

### 3. Operating controls



1. Range selection switch
2. 3½ digit LCD display
3. Common socket for the black (negative) test tip
4. V/Ohm socket for the red (positive) test tip
5. IRM socket for the red (positive) test tip at Cable length measurement

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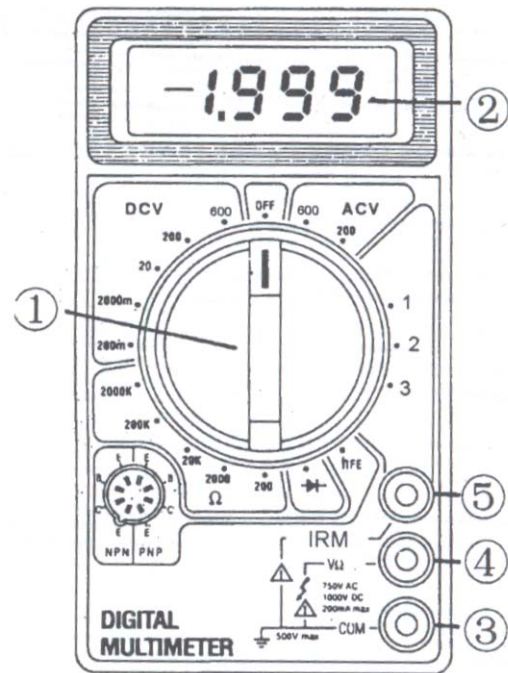
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## 4. Measuring instructions, starting

### 4.1 Starting

In order to check the built-in battery at its capacity, set the instrument to any measuring range. If a symbol of a battery appears, the battery must be replaced according point 5 of this operating instruction.

**The IRM11 switch off automatically 10 min. after starting. To switch on once again set the range selection switch to "off".**

### 4.2 Measuring procedure

Connect the black measuring cable with the COM-socket and the red measuring cable (+pole) with the IRM-socket.

#### 4.2.1 Length measurement of electrical cables, fault location of disconnexions and short-circuits

Measuring principle:

The fed measuring pulses into the cable are reflected on the cable end, on a short-circuit or a disconnexion. The delay time of the measuring pulse is proportional to the cable length.

The propagation speed of the measuring pulse depends of the structure of the cable.

The propagation factor (relative propagation speed) indicates, how fast the signals propagate in the cable compared to the velocity of light.

Measuring of cable length:

#### **Attention!!!**

Do not measure on live cables !  
(overload protection max. 25 V)

- select the measuring range according to the cable type
- Connect the measuring tips with the cable to be measured
- Read the cable length on the display

At multi-conductor cables are to use adjacent wires for the measurement. At a short-circuit appears a "-" before the measuring value. The measuring error is at short-circuit cable ends larger and the maximally measurable cable length smaller.

The three measuring ranges are preset as follows:

- Range 1 for a propagation factor of 0.53 (electro cable)
- Range 2 for a propagation factor of 0.66 (coaxial cable/PE-solid)
- Range 3 for a propagation factor of 0.83 (coaxial cable/PE-foam, cell-PE)

Propagation factors:

PVC-isolation: p/f 0.49 to 0.57

PE-solid: p/f ca. 0.66

PE-foam: p/f 0.77 to 0.85

Air isolation: p/f 0.88 to 0.92

For the individual calibration of the impulse reflectometer is the knowledge of the propagation factor necessary.

Calibration:

- Connect a cable with known length (100–500m) on the instrument and calibrate the measuring range with corresponding control (back side of the instrument). If shorter cable lengths are used for the calibration, the measuring error increases.

Fault location:

If a cable has a disconnexion or a short-circuit, the fault location can be easily determined by the IRM 11:

- The measuring range is set according the cable type and the measuring tips are to connect to the faulty cable.
- The displayed measuring value indicates the distance of the disconnexion or short-circuit.
- A fault location from both ends of the cable result in a more accurate determination of the defective place.

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