UNITEST® INSTRUCTION MANUAL

Cat-No.:
Set (Transmitter and Receiver) 2032

UNITEST® Cable Locator

- Localisation of cable interruptions
- Localisation of cables in walls
- Localisation of short circuits in lines
- Localisation of fuses
- Tracing of water and heating pipes in walls and floors
- Sorting of shielded lines, voltage free

Safety Instructions

The Cable Locator should only be used after careful study of the operating instructions. When using the cable locator, the valid safty regulations according to VDE are to be considered. The transmitter should be connected between phase an neutral.

Otherwise, first verify the functional safety of 0the grounde wire in compliance wih the VDE 100 for, when connectiong the transmitter from phase to ground, all parts being connected to ground could be live during failure occurenses (in cases where the earth resistance does not comply with the regulations). The Cable Locator must only be used in systems using the nominal voltages as indicated in the spezifications section of this operating manual.

The instruments and its accesoires must not be disassembled by unauthorized persons. When changing the batteries, the instrument must be disconnected from live circuits.

Only use the Cabvle Locator in a clean and dry enviroment. The Cable Locator must only be used in conjunction with the accessoires supplied. After using the instruments, they should be disconnected from live circuits and switched off.

Theoretical functional principle

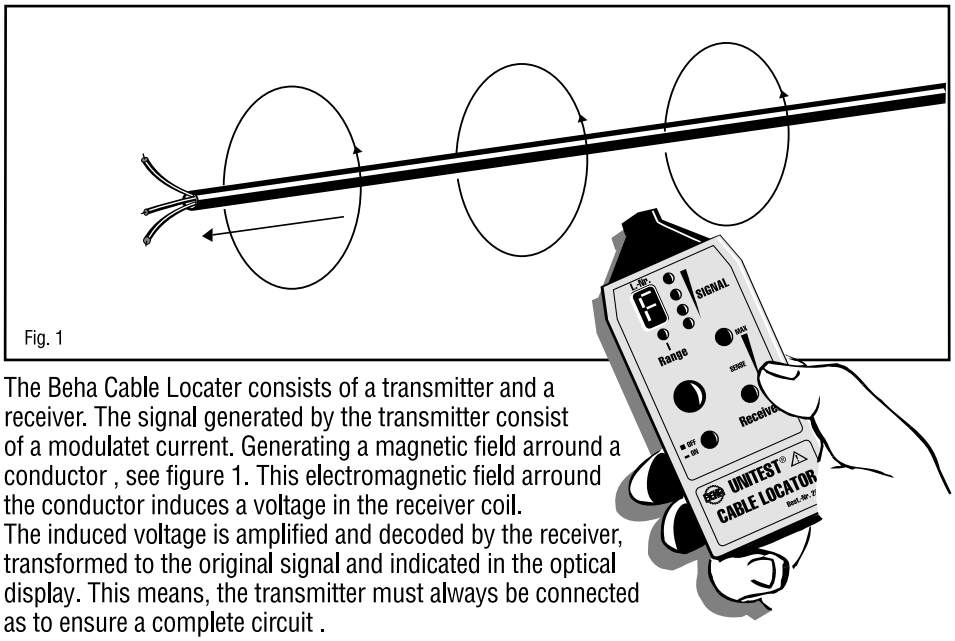


Fig. 1

The Beha Cable Locater consists of a transmitter and a receiver. The signal generated by the transmitter consist of a modulatet current. Generating a magnetic field arround a conductor , see figure 1. This electromagnetic field arround the conductor induces a voltage in the receiver coil.
The induced voltage is amplified and decoded by the receiver, transformed to the original signal and indicated in the optical display. This means, the transmitter must always be connected as to ensure a complete circuit .

There are several possibilities for a Cable Locator in complete circuits:

1st Possibility (one pole application)
Connect the transmitter to only one conductor. In this operational mode, the transmitter is supplied by the bulild-in battery. Due to the high-frequenzy signal generated by the transmitter, only one single conductor can be located and traced. The second conductor is the ground.
This arrangement causes a high-frquenzy current to flow through the conductor and to be transmitted to ground, similar to a radio and receiver. As from now on, we will call the above described operation **one-pole application**.

2nd Possibility (double-pole application)
Connect the transmitter to the mains. The transmitte is supplied by the mains. In this example, the modualted current flows through the phase into the transformer and back through neutral. There is a furhter possibility for voltage free systems by connecting the transmitter to two line terminals while short-circuiting the other line ends. Thus a complete circuit is created. Then, the transmitter is supplied by the build-in battery. From now on , we will call this operation **double pole application**.

The tracing depth is between approx. 0 . . . 40 cm.

Please consider:

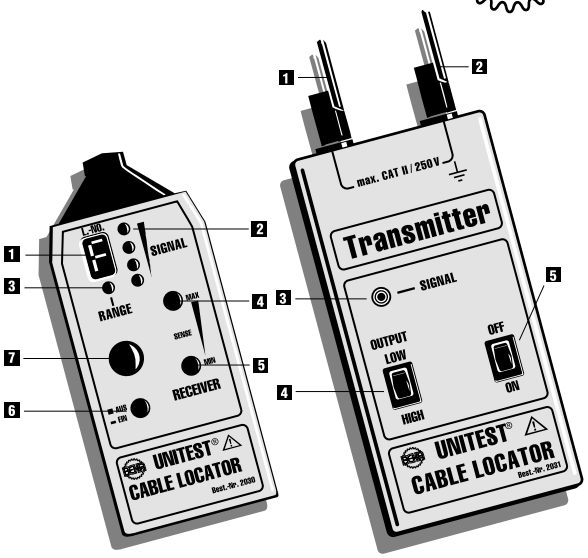
The BEHA Cable Locator can only detect or locate lines, etc. which are connected correctly in accordance with the physical principle described.

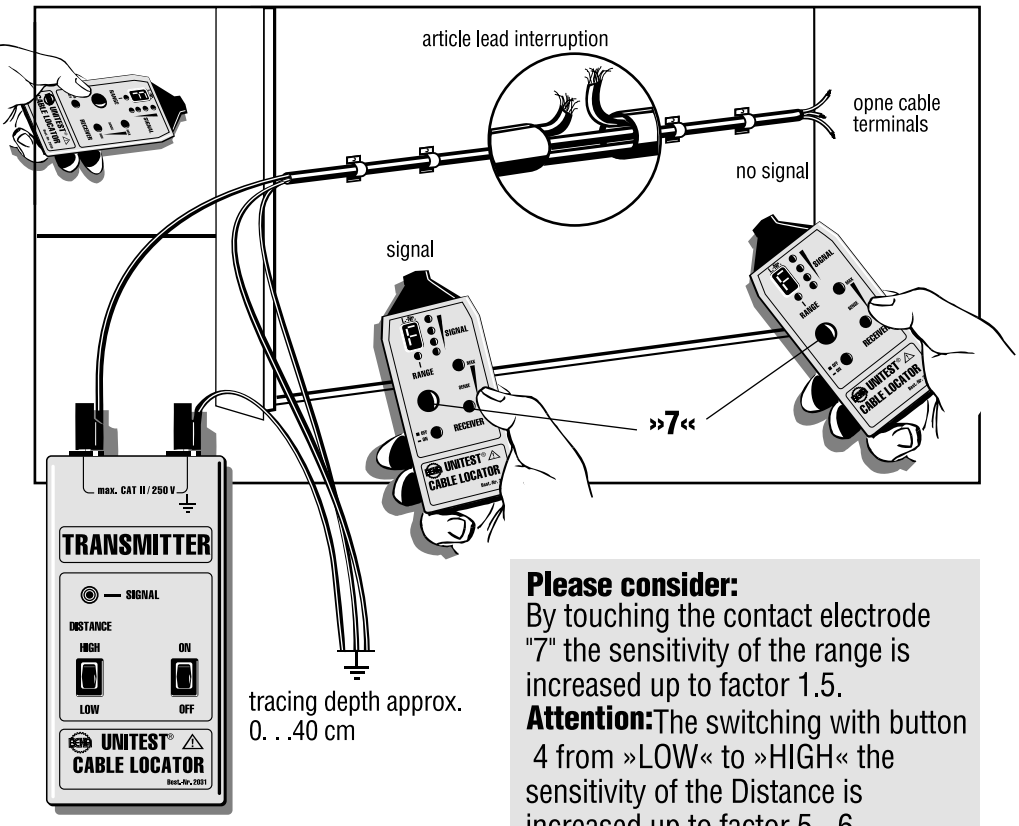
Important Application Example:

In order to sucessufull work with this instrument, you have to try the varios tracing possibilities at an approproate location within your surrondings. For example , try with detecting line interruptions. Before using the instrument , insert the supplied batteries

For our example, we advise you to take a piece of a plastic-sheathed cable NYM 3 x 1,5 mm_2, for example. Provisionally install 5m of this cable along the wall with nail clips at eye level as surface mounting. Make sure that the wall is accessible from both sides. Create an arifived interruption at a distance of 1,5m before the line terminal. The line terminals must be open. Strip the interrrupted lead at the lead at the start of the light plastic-sheathed cable and connect it via the measuring leads (supplied with the instrument) with terminal (1) of the transmitter. Connect terminal (2) of the transmitter to a suitable ground. All other cable leads must also be connected to the transmitter and the same ground.

Switch in the transmitter via pushbutton (5). Set the transmitter to "LOW" via button (4). The transmitter function is indicated via the flashing of the signal lamp (3). During the manufacture process, the transmitter has been programmed to display the letter "F". Switch on the receiver via pushbutton (6). An "0" is indicated on the display for a short period of time, then the decimal point is visible. This indicates that the receiver is functional and that the batteries are full. When switching on the receiver, the instrument is automaticaly set to the medium sensitivity level 5. The sensitivety range comprises 9 levels. The respective sensitivity level, betweeen 1 and 9 , is changed and briefly displayed (1) by pressing buttons (4) or (5). Button (4) advances in the direction of the maximum sensitivity "SENSE MAX", while button(5) advances in the direction of minimum sensitivity " SENSE MIN". When pressing buttons (4) or (5), the sensitifity level digit 1 to 9 is indicated in the display (1), whereby 1 represent the lowest and 9 the highest sensitifety level. Now approate the light-plastic sheathed cable with your receiver just before the location of the interruption. With button (5) "SENSE MIN" set the sensitivity level so as to just receive the "F" signal. The signal strenght is indicated via the row of lights LED´s (2). The display (3) indicates the signal sent. Togehter with this optical indication, an acoustic signal is also emitted from the receiver. As soon as the receiver receives an acceptable signal, this display flashes at the same rythm as the signal sent. If the signal, the strenght increases , letter "F" apperars in the display (1). If the signal strenght increases further, the lamps in luminous row (2) are illuminated one after the other in accordance with the signal stenght. Now, using the lowest possible sensitivity level of the receiver, move along the cable and past the interruption. The signal "F" is not displayed any longer and the acoustic signal is not audible any more. Pepeat the same experiment on the other side of the wall. It would be advantagerous for the test, if you marked the artifical interruption also on the other side of the wall. Set the sensitivety via button (4) "SENSE MAX" and button (5) "SENE MIN" as to still receive signal "F". Trace the signal allong the wall with the receiver, until it si not displayed any more. Systematically circle round the interruption by changing the sensitivity.





tracing depth approx. 0. . .40 cm

Please consider:
By touching the contact electrode "7" the sensitivity of the range is increased up to factor 1.5.
Attention: The switching with button 4 from »LOW« to »HIGH« the sensitivity of the Distance is increased up to factor 5 - 6.

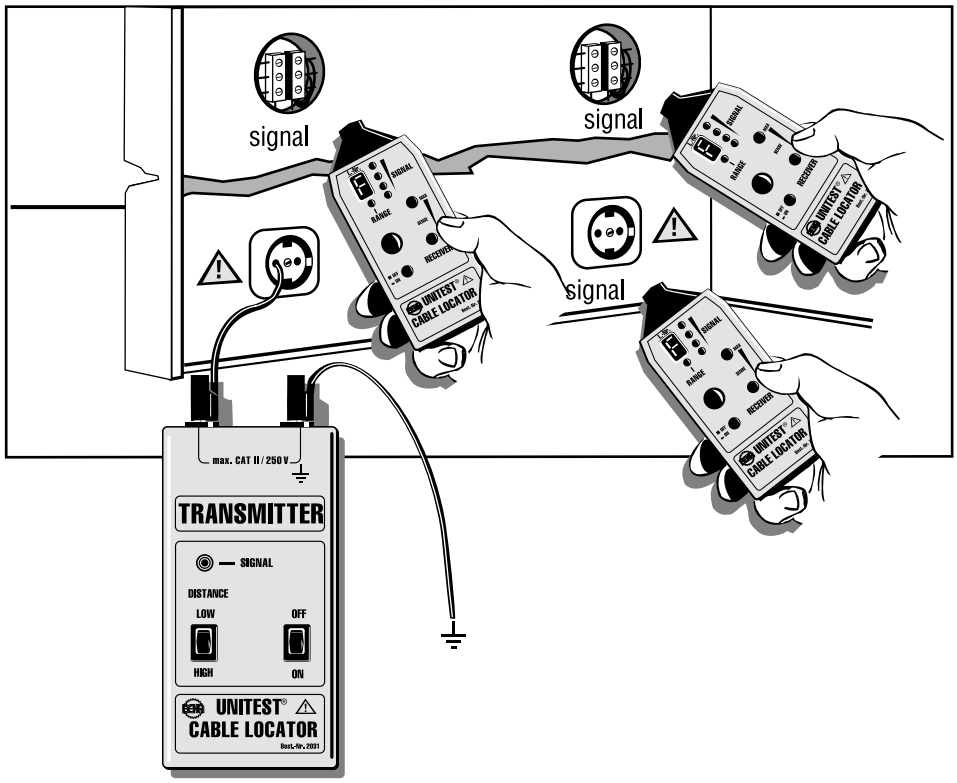
This cable Locator has been developed to detect metal conductors (cables and contacts) in buildings. The Cable Locator is suitable for open and complete circuits. It trace lines:

1. In open circuits:
(one pole application)

Line interruptions in walls and floors. Finding and tracing of lines, sockets, junction box, switches, etc. for house installations. Finding of bottlenecks, kinking and bucklings and obstructions in installation pipes by means of a metal coil.

Finding of sockets, switches etc. in voltage - free systems. The ground connector must be connected to a suitable earth. A typical example would be the earth of an earthed socket.

The tracing depth amounts to 0...40 cm.

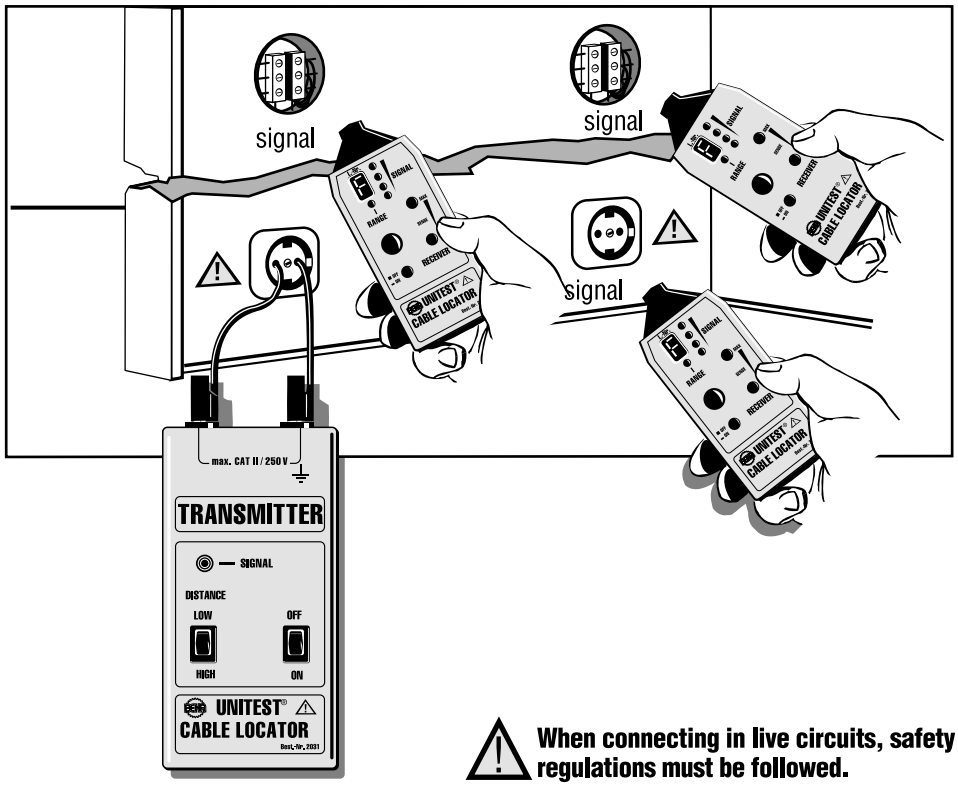


2. In complete circuits:
(double pole application)

When detecting short-circuits or during wire sortin, i.e circuits with or wihout voltage. Voltgage-free circuits are directly supplied by the instrument battery. In live circuits , the transmitter is supplied directly by the circuit connected. Switching from battery voltage to circuit voltage is carried out automatically. The transmitter is voltage-proof up to 250 V AC/DC.

Example for a complete circuit:

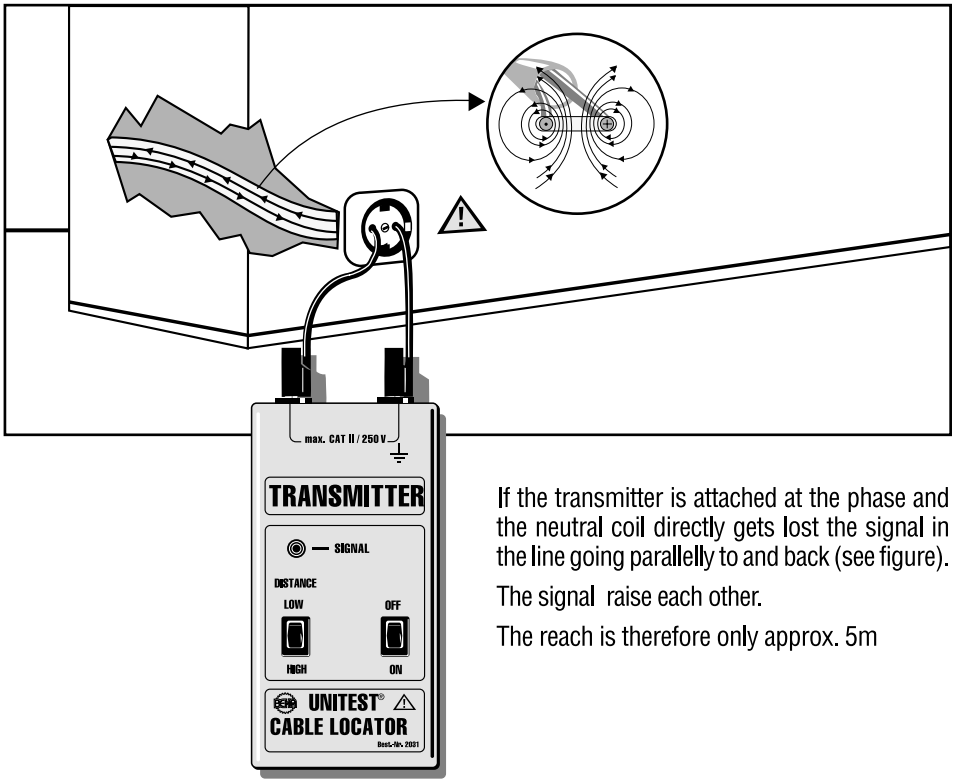
Complete circuits are apppropriate for: i.e. detecting sockets, switches, etc in live installations.



When connecting in live circuits, safety regulations must be followed.

Example 1
(dual-pole application)

The reach will be improved when seeking the tension:



If the transmitter is attached at the phase and the neutral coil directly gets lost the signal in the line going parallelly to and back (see figure).

The signal raise each other.

The reach is therefore only approx. 5m

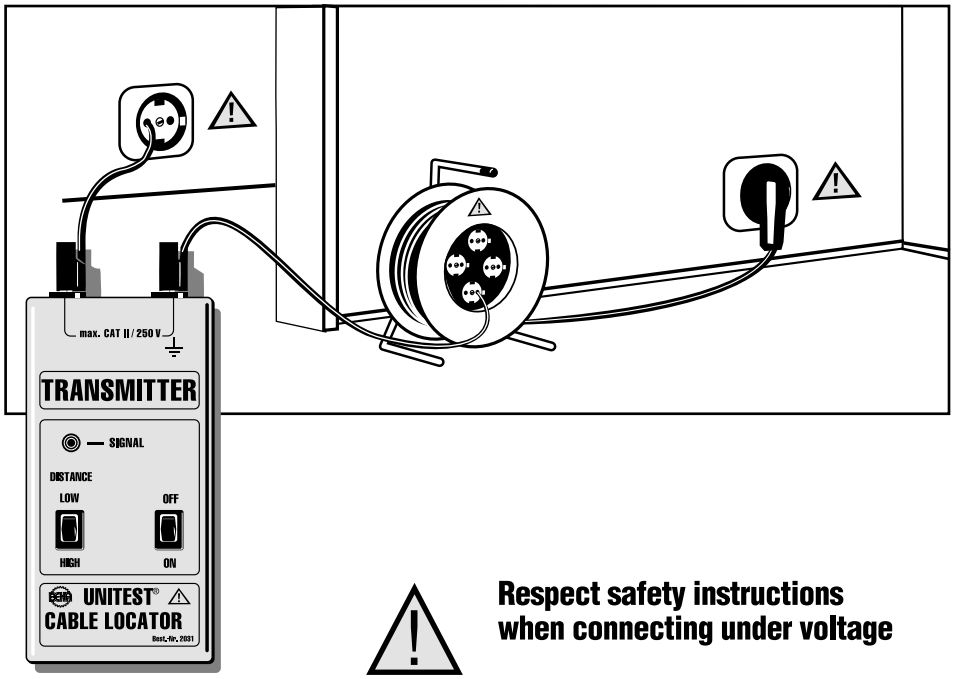
To turn the effect pointed in the upper figure off, the connection schould be carried out like the lower figure

The backline is produced about a seperate cable.

The distance in in voltage-circuits will be up to 40 cm.

Back coils at higher distance i.e. Cabletrace (see figure).

(see text in example).



Respect safety instructions when connecting under voltage

Example 2
(one-pole application)

Locating and tracing of lines, sockets, switches and junctions in house installations circuits.

Requirements:

1) The circuit must be dead.
2) Neutral line and ground must be connected and fully operational.
3) Connect transmitter to phase and neutral according to figure 2.
4) Carry out this example as described in the application example.

The fuse must be removed during this example.

With the one-pole indication, also lateral circuit branches can be traced.

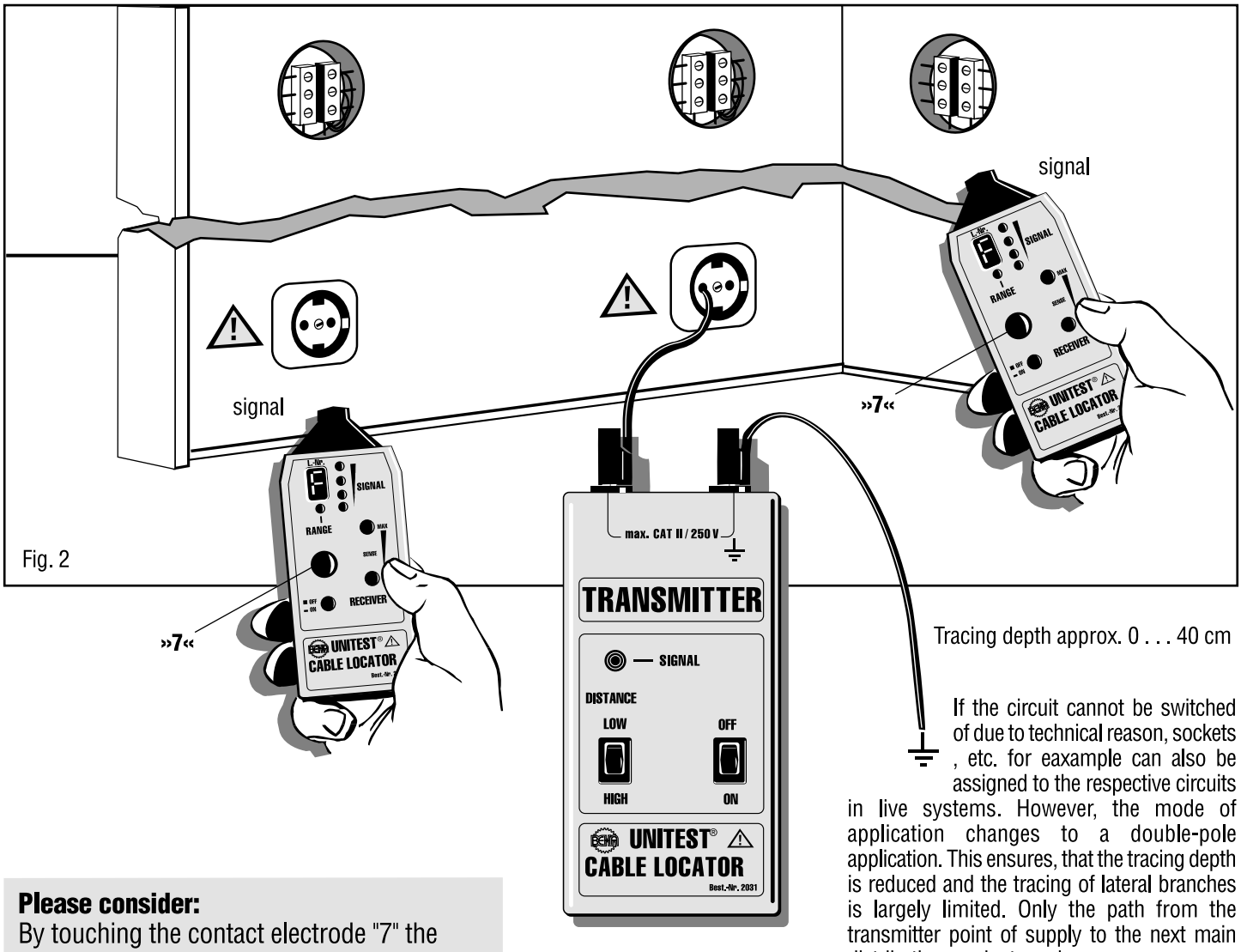


Fig. 2

Tracing depth approx. 0 . . . 40 cm

If the circuit cannot be switched of due to technical reason, sockets , etc. for eaxample can also be assigned to the respective circuits in live systems. However, the mode of application changes to a double-pole application. This ensures, that the tracing depth is reduced and the tracing of lateral branches is largely limited. Only the path from the transmitter point of supply to the next main distribution can be traced.

Please consider:
By touching the contact electrode "7" the sensitivity of the range is increased up to factor 1.5.

Example 3
(one-pole application)

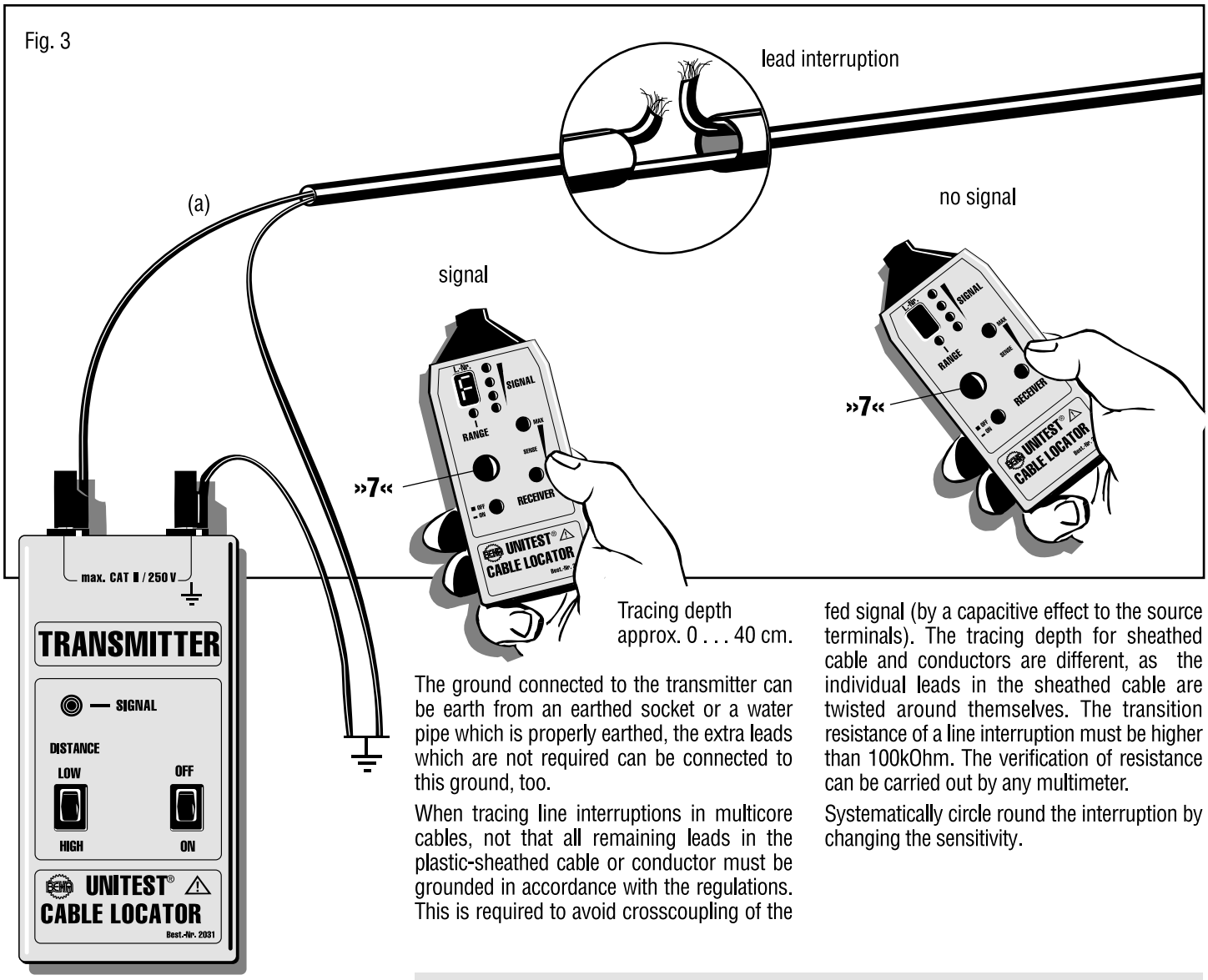
Locating of line interruptions

Requirements:

1) The circuit must be dead.
2) All lines which are not required must be conneted to the auxiliary ground in accordance with figure 3.
3) Connect transmitter to one lead and to an neutral according to figure 3.
4) Carry out this example as described in the application example.

Line interruption in the plastic-sheathed cable.

Fig. 3



Tracing depth approx. 0 . . . 40 cm.

The ground connected to the transmitter can be earth from an earthed socket or a water pipe which is properly earthed, the extra leads which are not required can be connected to this ground, too.

When tracing line interruptions in multicore cables, not that all remaining leads in the plastic-sheathed cable or conductor must be grounded in accordance with the regulations. This is required to avoid crosscoupling of the fed signal (by a capacitive effect to the source terminals). The tracing depth for sheathed cable and conductors are different, as the individual leads in the sheathed cable are twisted around themselves. The transition resistance of a line interruption must be higher than 100kOhm. The verification of resistance can be carried out by any multimeter.

Systematically circle round the interruption by changing the sensitivity.

Please consider: By touching the contact electrode "7" the sensitivity of the range is increased up to factor 1.5.

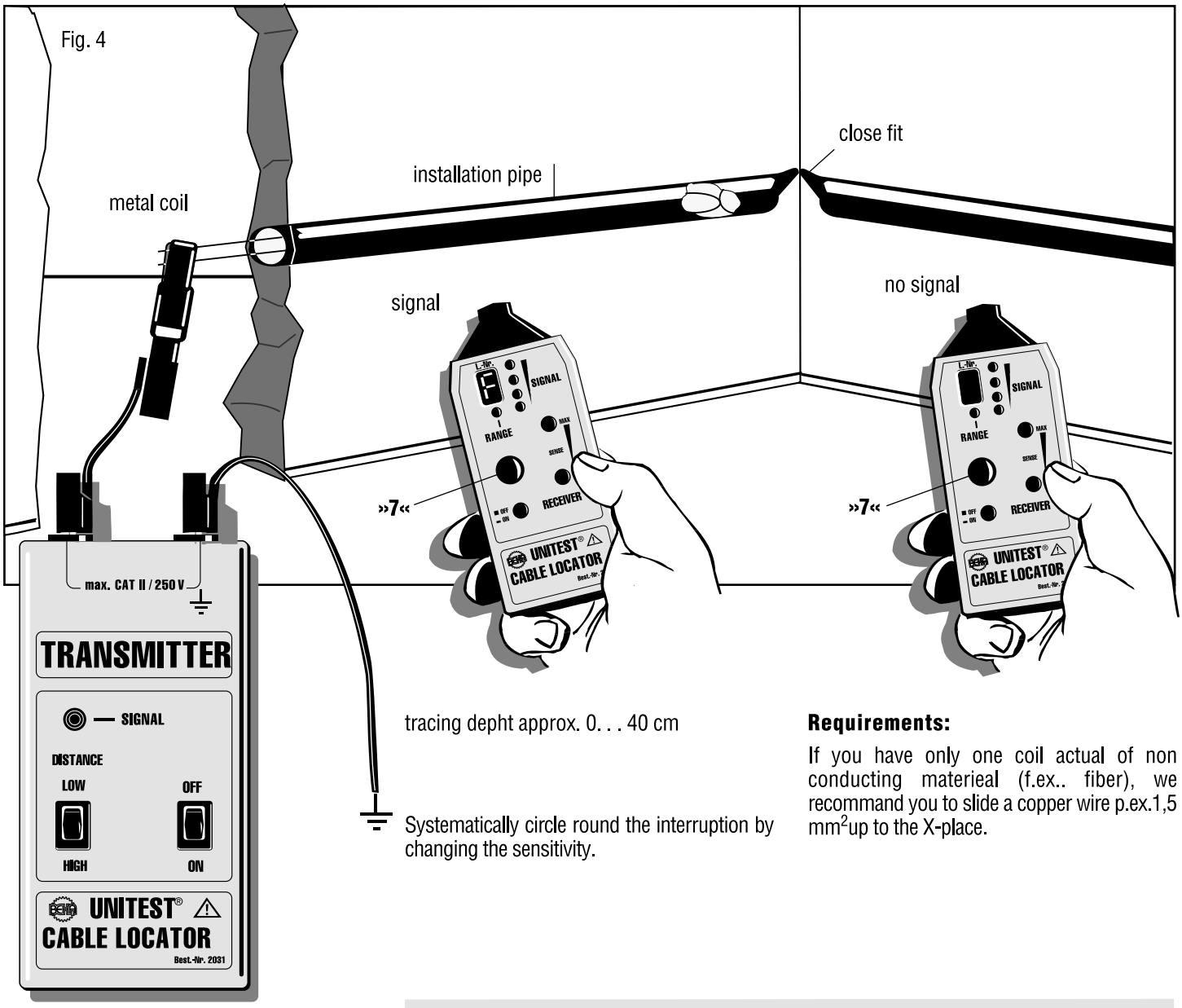
Example 4
(single-pole application)

Locating of bottlenecks (obstructions) in installation pipes.

Requirements:

1) Any circuits in the pipe must be dead and grounded.
2) Connect transmitter to the metal coil and auxiliary ground according to figure 4.
3) Carry out this example as described in the application example.

Fig. 4



tracing depht approx. 0. . . 40 cm

Systematically circle round the interruption by changing the sensitivity.

Requirements:

If you have only one coil actual of non conducting materieal (f.ex.. fiber), we recommand you to slide a copper wire p.ex.1,5 mm^2up to the X-place.

Please consider: By touching the contact electrode "7" the sensitivity of the range is increased up to factor 1.5.

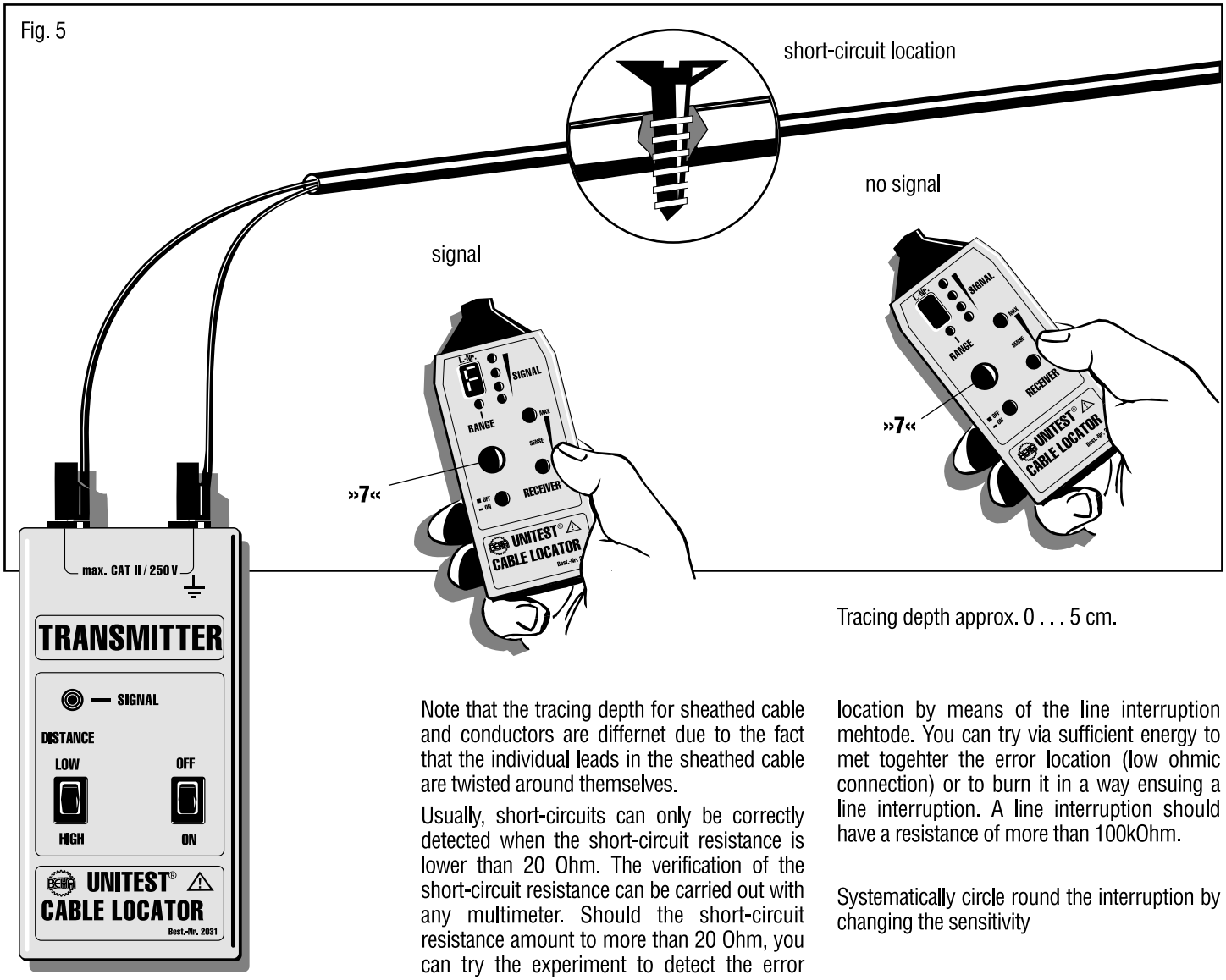
Example 5
(doubel-pole applicaion)

Locating of short-circuits in conductors

Requirements:

1) Any existing circuits within the cable must be voltage-free.
2) Connect transmitter in accordance with Figure 5.
3) Carry out this example as described in the application example.

Fig. 5



Tracing depth approx. 0 . . . 5 cm.

Note that the tracing depth for sheathed cable and conductors are differnet due to the fact that the individual leads in the sheathed cable are twisted around themselves.

Usually, short-circuits can only be correctly detected when the short-circuit resistance is lower than 20 Ohm. The verification of the short-circuit resistance can be carried out with any multimeter. Should the short-circuit resistance amount to more than 20 Ohm, you can try the experiment to detect the error location by means of the line interruption mehtode. You can try via sufficient energy to met togehter the error location (low ohmic connection) or to burn it in a way ensuing a line interruption. A line interruption should have a resistance of more than 100kOhm.

Systematically circle round the interruption by changing the sensitivity

Please consider: By touching the contact electrode "7" the sensitivity of the range is increased up to factor 1.5.

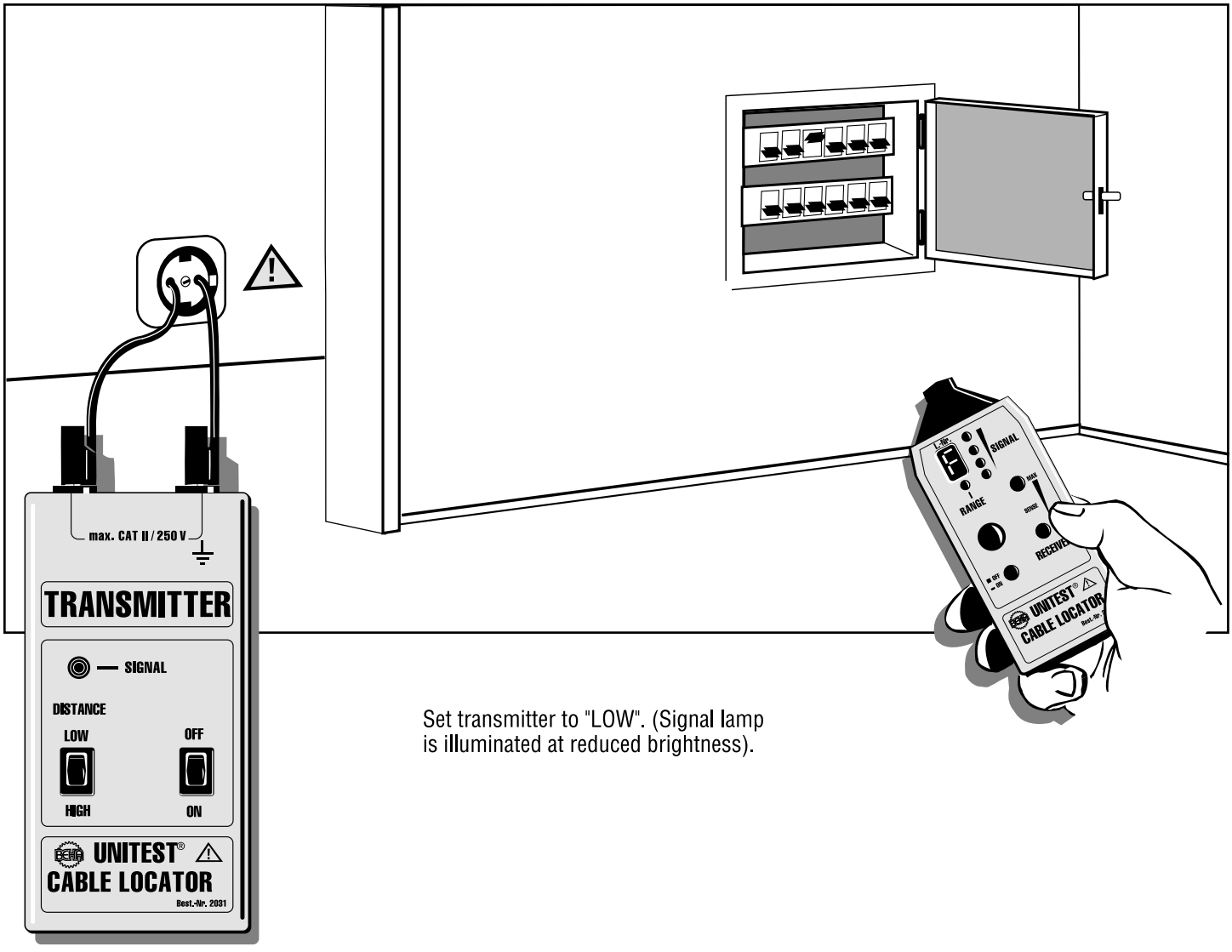
Example 6
(dual-pole application)

Locating Fuses

When connecting in live circuits, the safety prescriptions must absolutely be respected.

Insert into the current circuit of a multifamily residential structure flat within a socket between L1 and N and switch the transmitter to "LOW". You may assign the signal in the secondary distribution and main distribution by transmitter pre-setting "LOW". **Thus, fuses and automatic devices can be definitely assigned to a certain current circuit**.

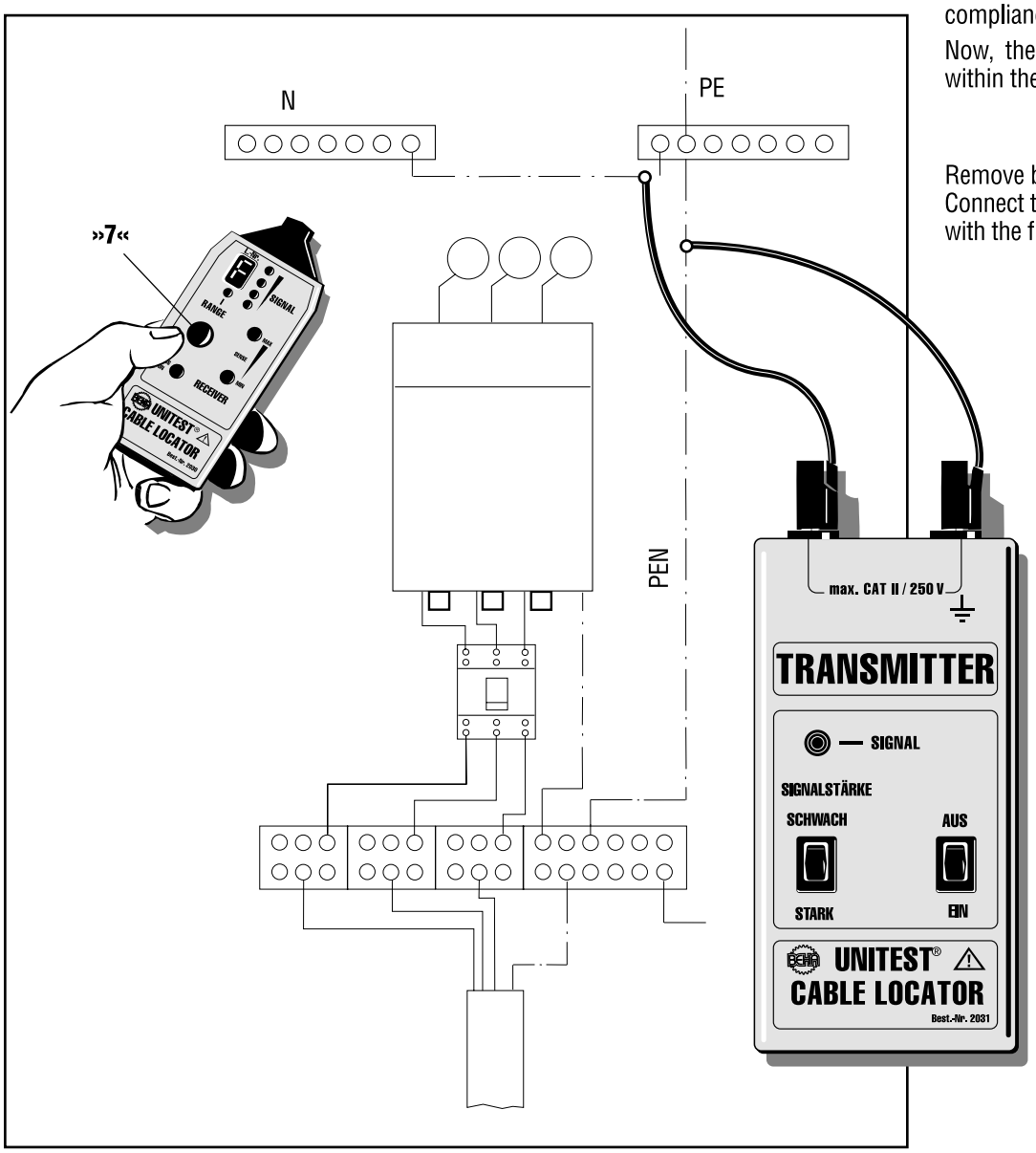
This is of particular importance for current circuits operating electronic data processing equipment. Proceed as in the example shown.



Set transmitter to "LOW". (Signal lamp is illuminated at reduced brightness).

Example 7
(one-pole application)

Locating a complete house wiring



Practical application example

In order to determine all electrical lines of a house within one working process, proceed as follows:

Remove the bridge in the main distribution between "PE" and "N".

ATTENTION: For security reasons, the system must not be live !

Connect transmitter to the system compliance with the left wiring diagram.

Now, the neutral conductor, being present within the total system, may be followed.

Remove bridge between PE and N.
Connect transmitter in compliance with the figure.

Please consider: By touching the contact electrode "7" the sensitivity of the range is increased up to factor 1.5.

Example 8 (one-pole application)

Precise locating of line interruptions using two transmitters

When locating a line interruption using one transmitter to feed from one conductor end, the location of interruptions may not be precisely located in case of bad conditions due to a field disturbance. Furthermore, when feeding with only one transmitter, special case has to be taken that the transition resistance of the interruption is higher than 100kOhm.

The drawbacks described above can easily be avoided when using two transmitters (one from each end) for line interruption detection. In this instance, each of the transmitters are set to a different line code (e.g. transmitter one to code "F", the other transmitter to code "C"). A second transmitter with a different line code is not included within the scope of supply and, therefore, has to be ordered separately. (Order number 2031 D with line code "C").

The transition resistance of the line interruption has to be higher than 10 kOhm for this application.

If the transmitters are connected in accordance with the figure shown below, the receiver indicates "E" at the left side of the line interruption. If you continue further than the interruption, towards the right, the receiver displays "F". If you are directly above the interruption, no line code is displayed, due to the overlapping of both transmitter signals. The line interruption is located exactly in the middle between the displayed line codes "E" and "F".

Conditions:

1. The current circuit must not be live.
2. All lines not being used must be connected to the auxiliary ground as shown in the figure.
3. Connect both transmitters as shown in the figure.
4. Proceed as described in the application example.

The ground connected to the transmitter and to the wires not being used can be as follows: an auxiliary ground, an orderly connected ground contact of a home office socket, or an orderly grounded water pipe.

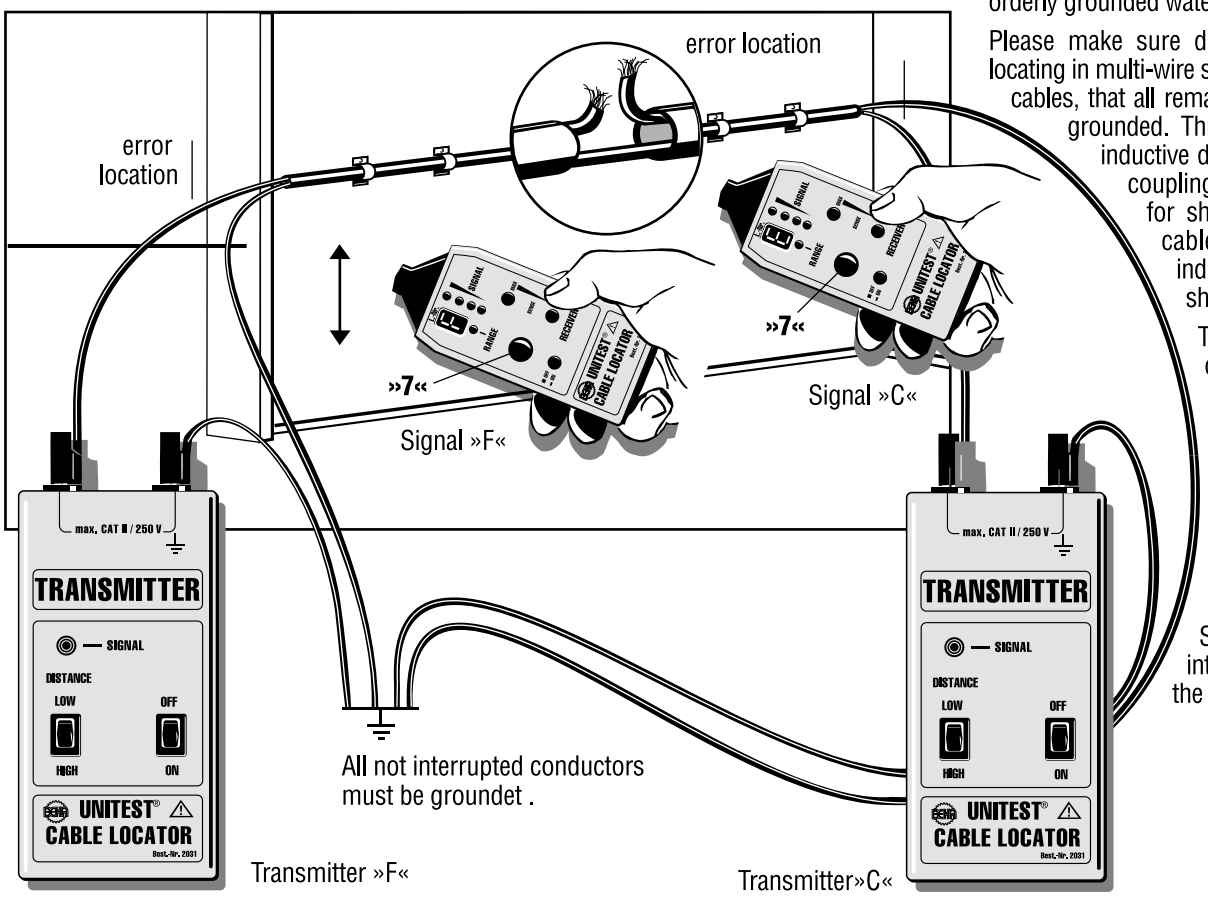
Please make sure during line interruption locating in multi-wire shielded conductors and cables, that all remaining wires are orderly grounded. This is required to avoid inductive disturbance (by capacity coupling). The locating depth for shielded conductors and cables varies, as the individual wires within the shield are twisted.

The transition resistance of a line interruptions must exceed 10kOhm.

The determination of the transition resistance can be carried out using a multimeter.

Systematically circle the interruption by changing the sensitivity.

Please consider:
By touching the contact electrode "7" the sensitivity of the range is increased up to factor 1.5.



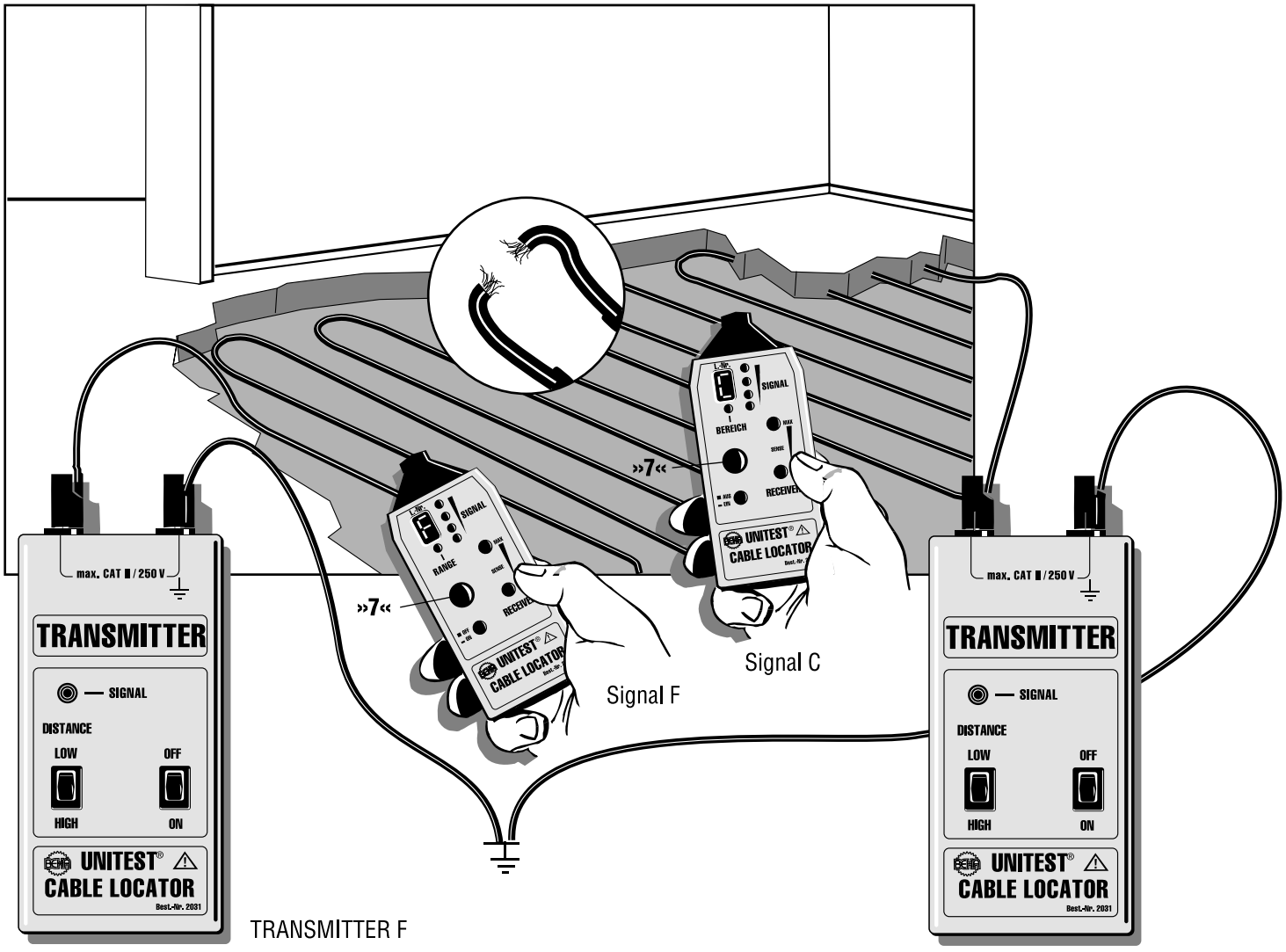
Example 9
(one-pole application)

Error detection for a electrical floor heating.

Note: If a shield mat or shield wiring is located above the heating wires, no ground connection (⏚) may exist.

If required, separate the shield from the ground connection.

Please also note the connection conditions as mentioned in example 8.



TRANSMITTER F

TRANSMITTER C

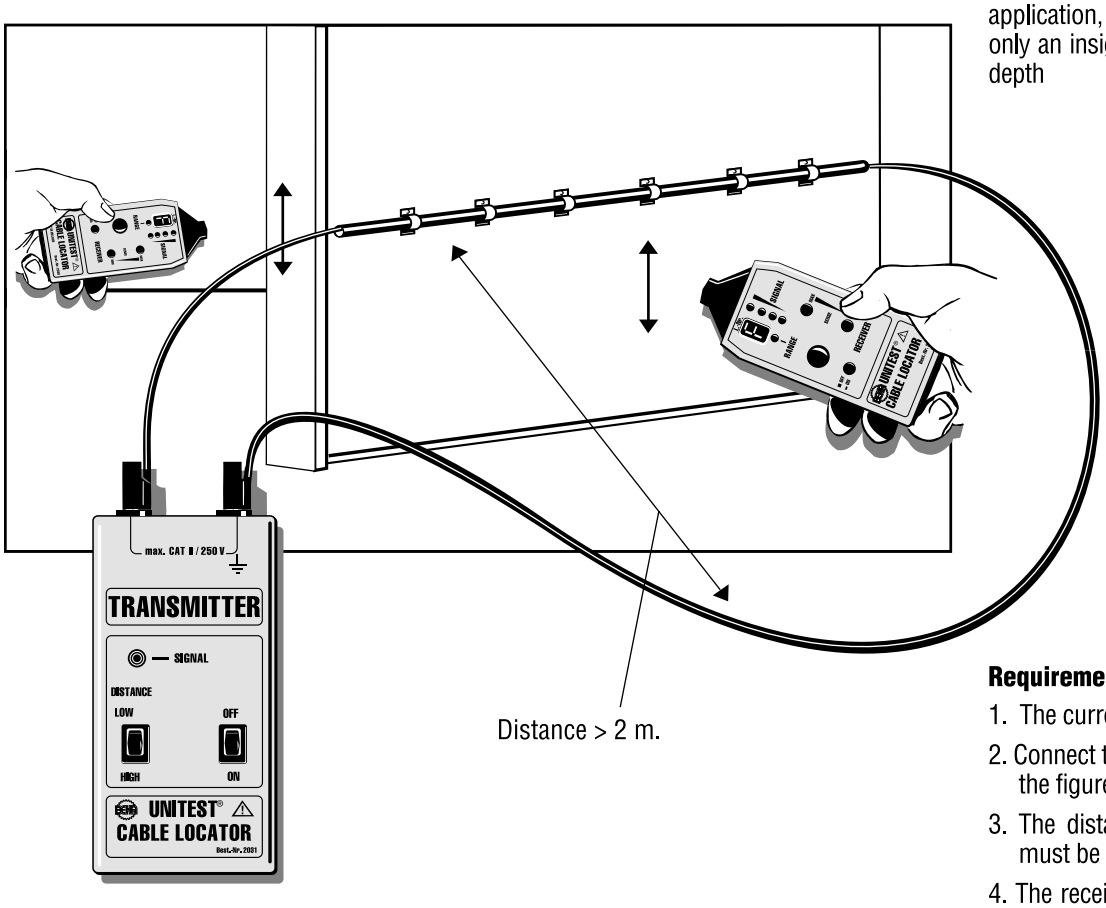
Please consider: By touching the contact electrode "7" the sensitivity of the range is increased up to factor 1.5..

Example 10
(dual-pole application)

Following lines with higher location depth.

If the dual-pole application is carried out on multi-wire cables (e.g. NYM 3x1.5mm2), the location depth is widely limited. The reason herefore is that the go-and-return lines are installed very closely. Thus, a strong distortion of the generated magnetic field occurs. The electro-magnetic field may not develop at the bottleneck.

This limitation **can easily be eliminated** when using a separate conductor to simulate the return line. This separate conductor allows a larger spreading of the electro-magnetic field. Any conductor or cable reel can be used as separate return conductor. When tracing the conductors, special care has to be taken that the distance between go-and-return-line is larger than the location depth. In practical applications, this amounts to approx. 2.0 m. Furthermore, the receiver has to be held at a right angle to be cable to be traced. For this application, humid walls, plaster, etc. have only an insignificant influence on the location depth



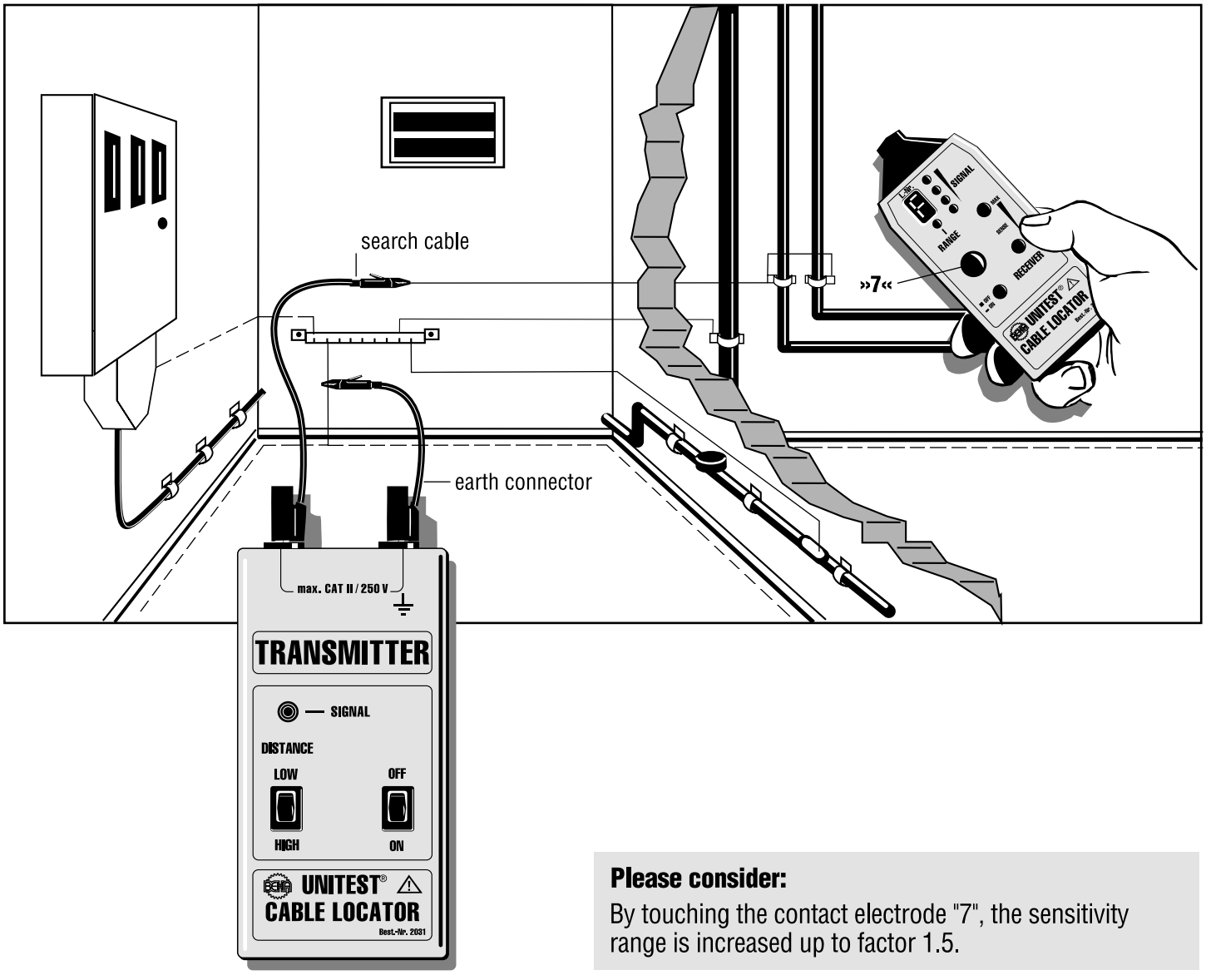
Requirement:

1. The current circuit must not be live.
2. Connect the transmitter in compliance with the figure.
3. The distance between go-and-return line must be minimum 2.0m to 2.5m or more.
4. The receiver must be held at a right angle to the cable.
5. Proceed as described in the application example.

Example 11
(one-pole application)

Tracing installed water and heating pipes.

The following has to be respected:
The line to be located must be separated from the equipotential bonding.
ATTENTION !
For safety reasons the electrical system must not be live !
Connect transmitter at foundation ground to the ground socket. The second transmitter socket has to be connected to the conductor to be located.
Now the feed line can be traced.



Please consider:
By touching the contact electrode "7", the sensitivity range is increased up to factor 1.5.

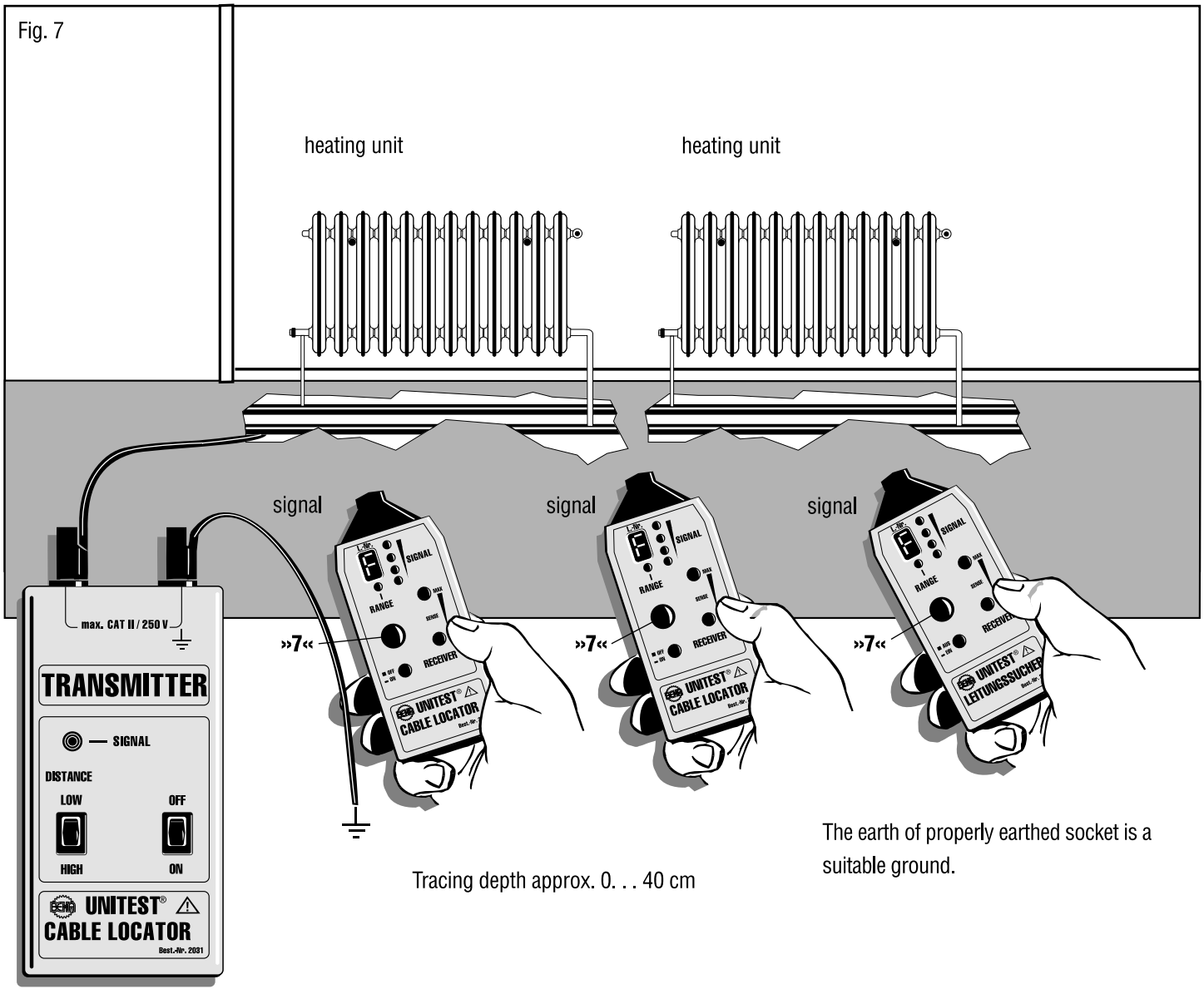
Example 12
(one-pole application)

Detecting the direction of water and heating pipes already installed

Requirements:

1) The respective water and heating pipes must be suuitable grounded.
2) Connect transmitter according to figure 7.
3) Carry out this example as described in the application example.

Fig. 7



Tracing depth approx. 0. . . 40 cm

The earth of properly earthed socket is a suitable ground.

Please consider: By touching the contact electrode "7" the sensitivity of the range is increased up to factor 1.5.

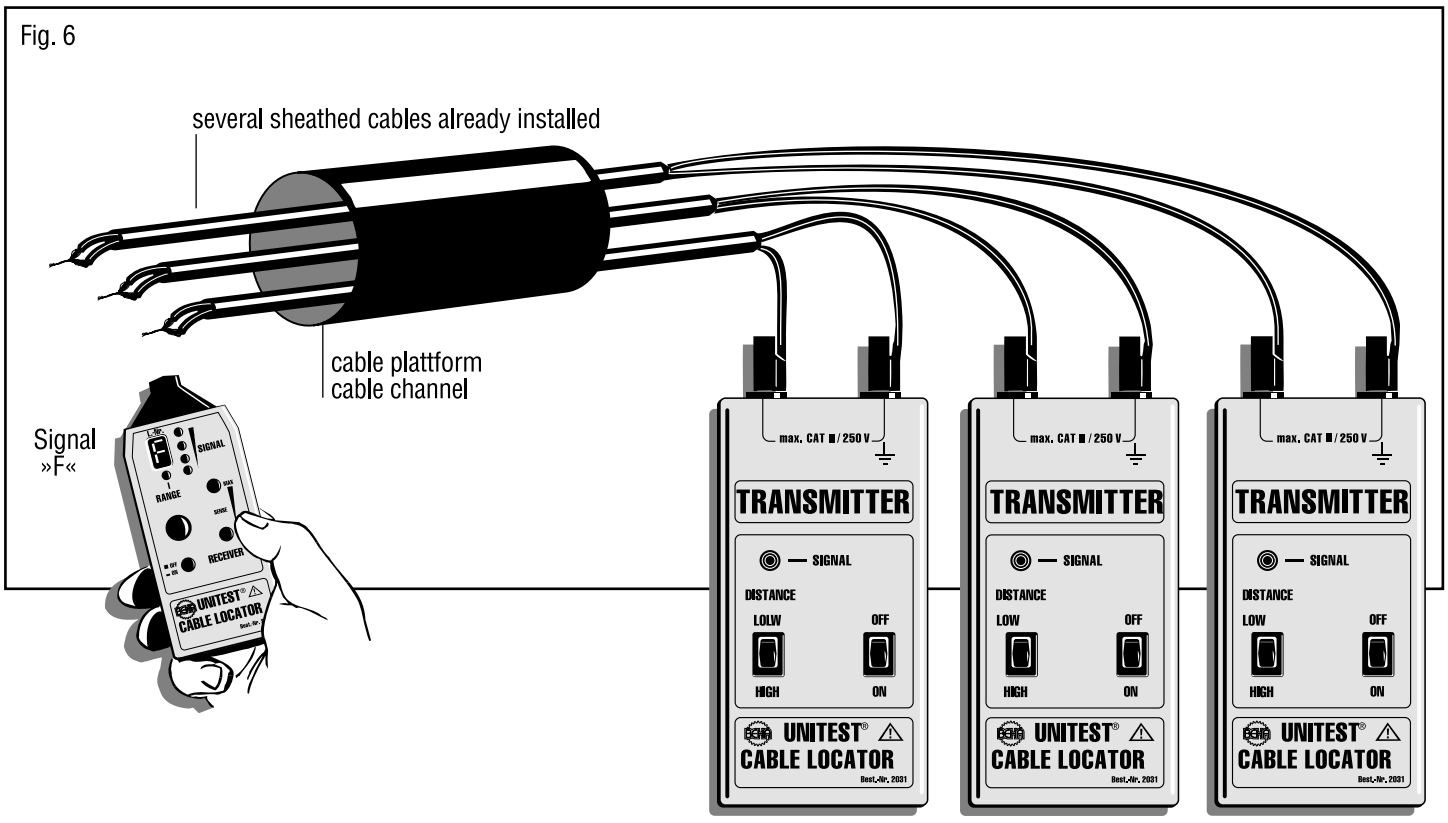
Example 13
(double-pole application)

Sorting or determination of conductors already installed

Requirements:

1) Any exisiting circuits within the cable must be voltage-free.
2) The lead terminals must be twisted and electrically connected between each other.
3) You need several transmitters, with different transmitter signals (A to F or 0 to 9).
4) Connect the transmitter according to figure 6.
5) Carry out this example as described in the application example.

Fig. 6



Tracing depth approx. 40 cm

Transmitter signal »F« Transmitter signal »E« Transmitter signal »D«

For this application example, please pay attention that the stripped lead terminals are twisted which each orther. The electrical connection between the stripped lead terminals must be good.

In case only one transmitter is available, the sorting of the sheathed cables can be carried out by sequentially reconnection the transmitter.

Garantie

12 Month Warrenty

UNITEST instruments are subject to strict quality control. However, should the instrument function improperly during daily use, your are protected by our 12 months warranty (valid only with invoice).We will repair free of charge any defects in workmanship or material, provided the instrument is returned unopened and untampered with, i.e. with undamaged warranty label.

Any damage due to dropping or incorrect handling are not covered by the warranty.

If the instrument shows failure following expiration of warranty, our service department can offer you a quick and economical repair.

Technical Data

Transmitter

Voltage range	:	0 – 250 V AC/DC
Switching	:	distance »LOW« / »HIGH«
Transmitting frequnezy	:	quarz stable 125 kHz
Transmission principle	:	bit serial with test bit
Temperature range	:	– 10°C up to + 40°C
Humidity	:	max. 95 % relativ
Hight above MSL	:	up to 2000 m
Display	:	LED for sending signal
Battery	:	2 x 9 V alkaline 6 LR 61
Dimensions	:	H 150 x B 79 x T 45 mm
Weight		350 g with battery

Receiver

Temperature range	:	– 10°C up to + 40°C
Humidity	:	max. 95 % relativ
Hight above MSL	:	up to 2000 m
Display	:	7-Segment-LED for Line number and battery Condition, ! LED for receiving range, 4 LEDs for receiving signal
Battery	:	1 x 9 V alkaline 6 LR 61
Auto Power off	:	-
Dimension	:	H 150 x B 65 x T 30 mm
Weight	:	170 g with battery

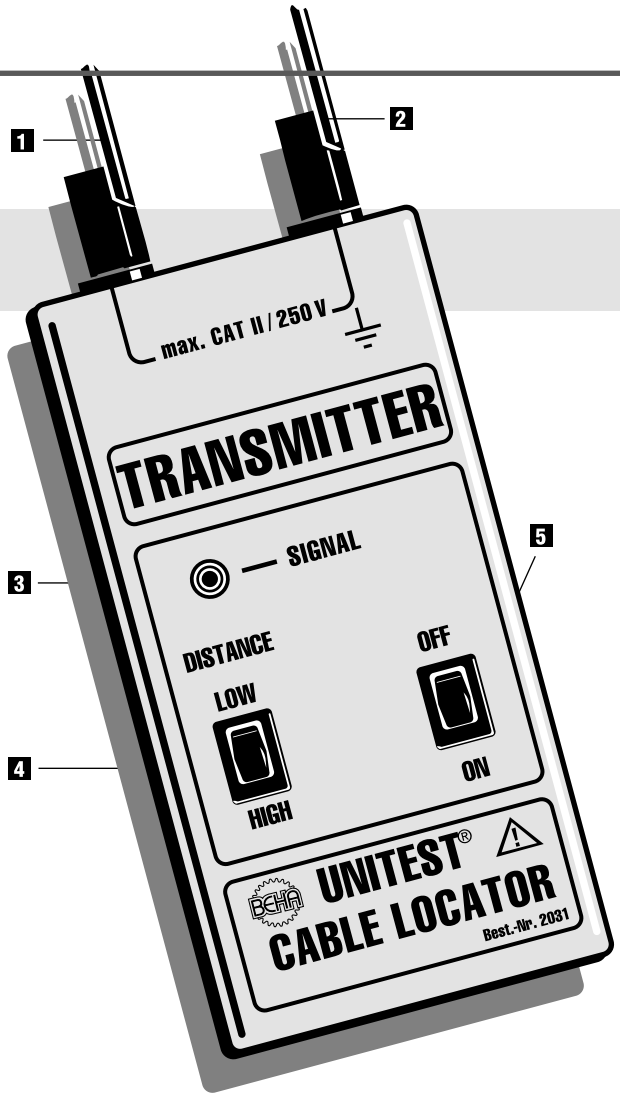
Working field

tracing depth	:	approx. 0 . . . 40 cm
depending on media and type application		

Catalogue number

Set (Transmitter and Receiver) in Case	:	**2032 E**
Transmitter	:	**2031 E**
Receiver	:	**2030 E**

Operating elements Transmitter:



1 Terminal

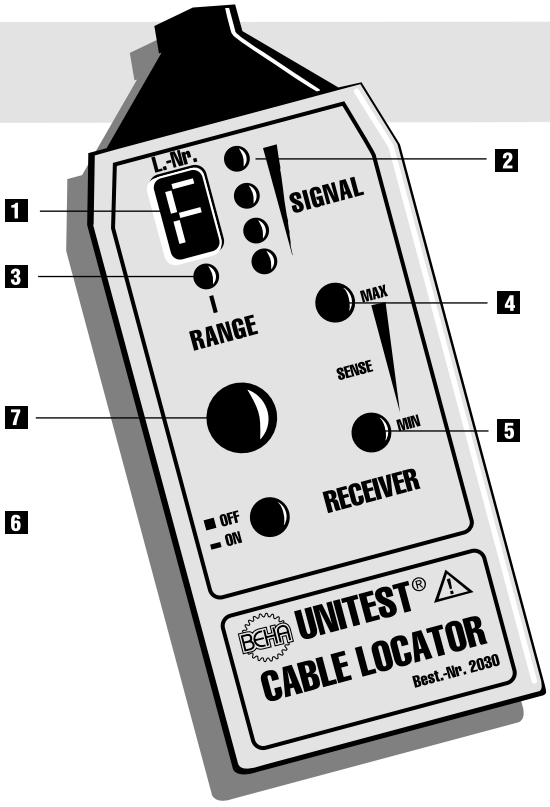
2 Terminal

3 Display transmitter

4 Signal intensity setting for "LOW" and "HIGH"

5 Power switch on/off

Operation elements Receiver:



1 7-segment display for indication of line number, receiver battery condition, battery condition transmitter (display "L" for low battery)

2 LED row for display of signal intensity received (luminous row)

3 Range display indicates that the signal from transmitter is present

4 Sensitivity setting »SENSE MAX«

5 Sensitivity setting »SENSE MIN«

6 Power Switch on/off

7 contact-electrode intensifies the sensitivity by factor 1.5

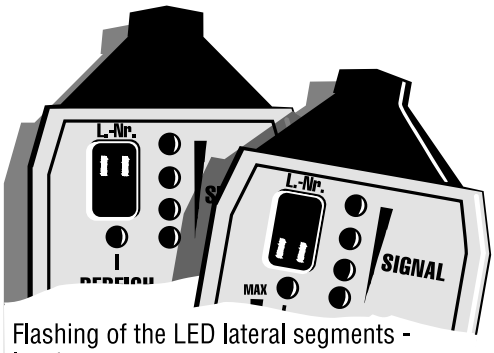
Batterychange

The battery of the receiver needs to be changed, when both lateral segments of the display (1) start flashing in turns.

The necessity of a transmitter battery change is indicated via signal (3). The signal lamp (3) blinks. Additionally, the transmitter does not send the signal "F" but the signal "L" for low battery, which is indicated receiver display (1).

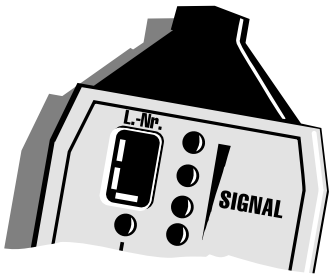
In order to avoid wrong test results, the battery should be replaced. Discharged batTeries must not remainin the instrument. In order to save batteries, switch off the instruments when not in use. When not used over a long period of time, remove the batteries. Disconnct the test instruments from the mains an switch them off. Open the battery case at the bottom of the instrument case, take out the old battery and insert a new battery. Close the battery case.

Display (1) for low battery:



Flashing of the LED lateral segments - low battery

Display (1) of the receiver for low transmitter battery:



Transmitter - low battery.

Please consider your environment when you dispose of your one-way batteries or accumulators. They belong in a rubbish dump for hazardous waste. In most cases, the batteries can be returned to their point of sale.

Please, comply with the respective valid regulation regarding the return, recycling and disposal of used batteries and accumulators.

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