Basic principles Trace and Locate Cables

Application Note

The majority of electrical professionals have the need to trace cabling or wiring systems. This can often be a tiresome and time consuming practice. In addition, there is often the requirement to identify which safety devices are connected to certain circuits or the need to identify and trace metallic conduit, heating pipes or underground cabling. The new Fluke 2042 cable locator has been specifically designed as a multi-purpose tool to assist the user in all of these applications.

Image 1 *– The FLUKE 2042 cable locator is supplied in a practical carry case complete with accessories.*

Operating Mode

The FLUKE-2042 cable locator consists of a transmitter and a receiver. The transmitter supplies a modulated alternating voltage to the cable concerned which generates an electrical field around the cable. The receiver is fitted with a coil and is placed in close proximity to the electrical conductor, the lines of flux will run through the coil and into the receiver.
A small amount of voltage is produced in the coil, which is measured by the electronics of the receiver and is shown on the display.
The special feature of the Fluke-2042 is the digital coded transmitter signal. This ensures that the signal is clearly received by the transmitter. Incorrect displays caused by any interfering fields e.g. from electronic fluorescent lamp ballasts or frequency converters are avoided (see image 2).

In general, there are two different application principles, with and without voltage.

Application without voltage

A typical application is locating switch and distribution boxes that have been inadvertently covered over with plaster or accidentally concealed within the building fabric.

Almost everyone is familiar with the scenario:
The switch and distribution boxes are set and the cables are laid out for a new installation. After the walls have been covered, not all of the sockets can be located. In this case, it is sufficient to supply the signal to any wire of the cable which needs to be traced. The second pole of the signal transmitter is attached to the earth potential by a ground wire.

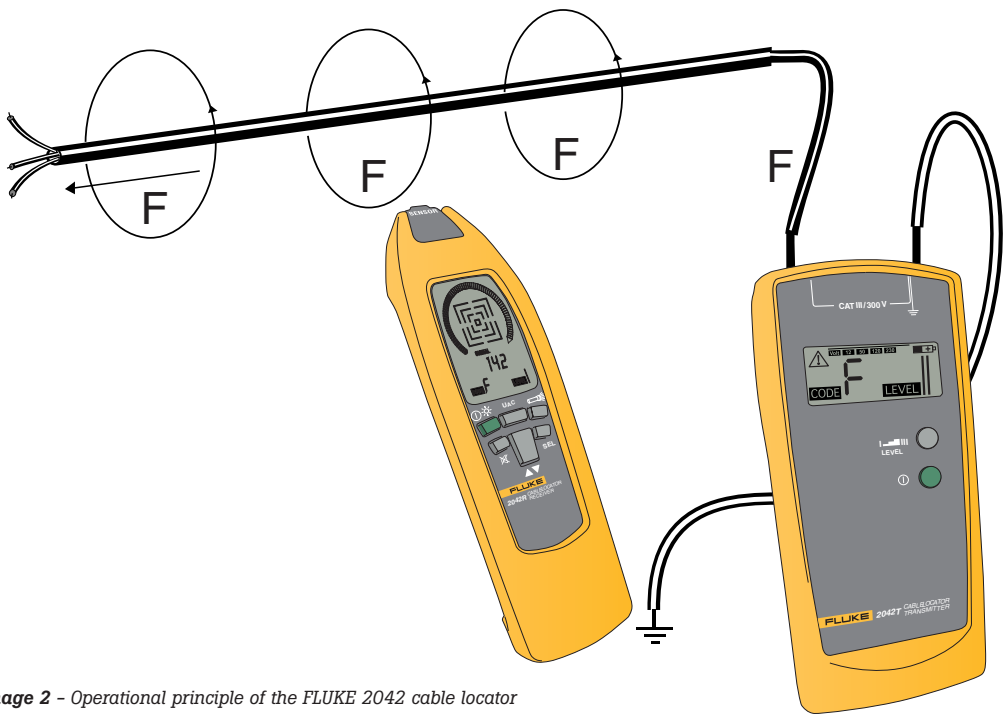

Image 2 *– Operational principle of the FLUKE 2042 cable locator*

Application with live voltage

It is a frequent occurrence that electric circuits in old systems are not labeled. To avoid interrupting an incorrect supply, the correct safety device must be assigned to the correct electric circuit.
The 2042 Cable locator can also be used for this application. Connect the signal transmitter directly to the phase and neutral wire (see image 3). The signal detection strength is generally reduced with this application. The electric flux of the alternating voltage and the signal transmitter mutually affect one another. However, the reduced tracing depth is not of significant importance in this case, as the cables are directly accessible in the opened distribution cabinet.

Procedure for locating cables

In order to be able to proceed successfully with this type of application, it is necessary to have a theoretical understanding of the operating mode. The approach is illustrated using the example of a covered socket. In this case the electrical outlets are often the only places that are accessible to the cable. Here the transmitter's signal is fed onto this cable.
The transmitter is connected as described under the application without voltage. The earthing contact of a nearby plug socket or an extension lead is used as a grounding connection. Now the run of the concealed cable is traced until the signal is no longer received. The operator can manually adjust the level of sensitivity on the receiver, then depending on the depth of installation in the wall, the sensitivity must be increased or decreased on the receiver. As soon as the signal is received, the receiver displays the letter "F" and the strength of the signal that is being received.

Furthermore, 3 different transmission levels can be set on the signal transmitter. The run of the cable is traced in this way until it ends and the concealed distribution box or switch box is located. A good earthing of the transmitter's output signal is important for the application without voltage. No signal should be received on the cable that is connected to the earth.

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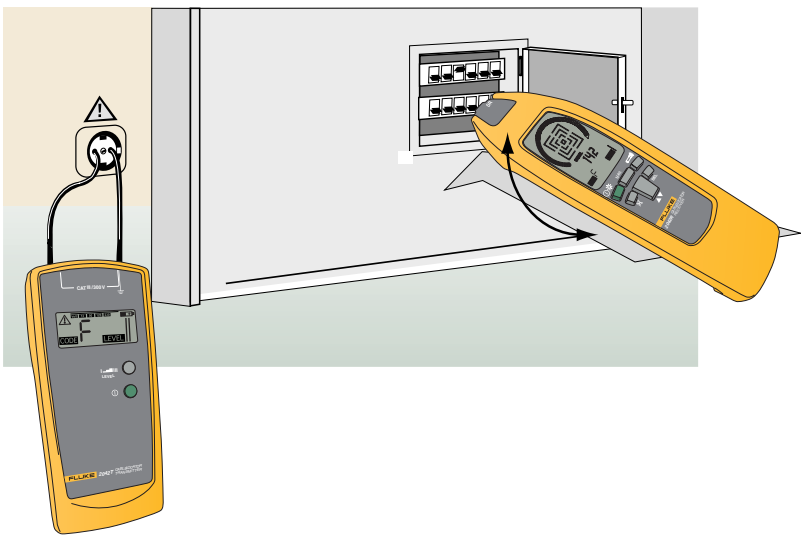
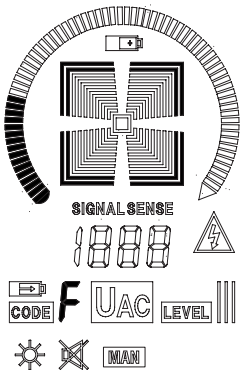
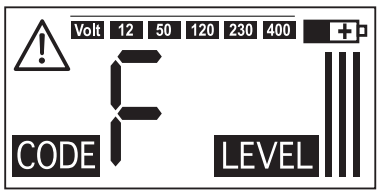




Display FLUKE 2042 Receiver



Display FLUKE 2042 Transmitter

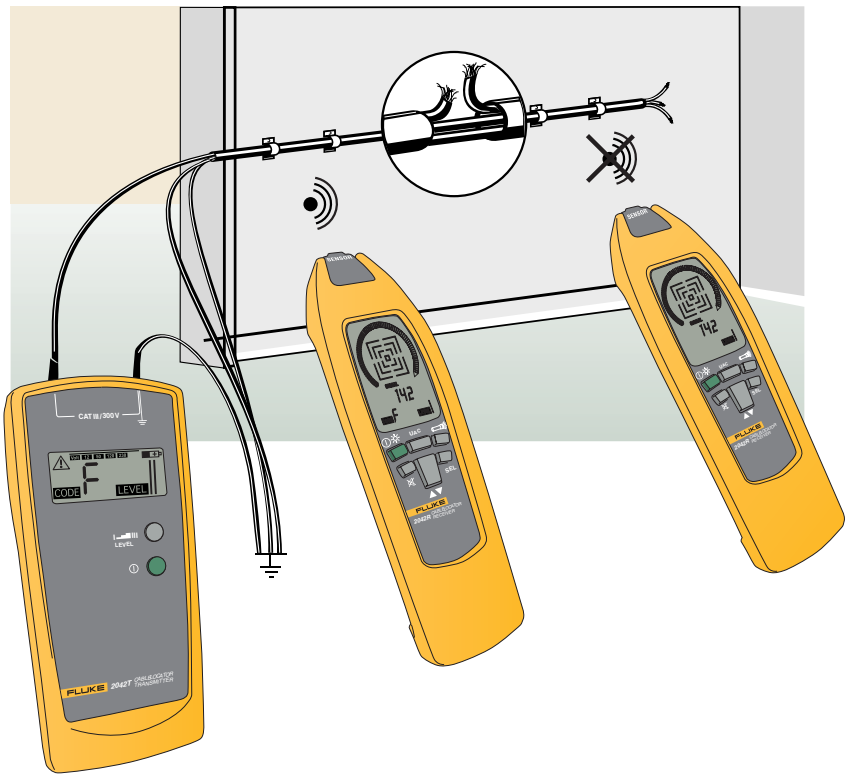
***Image 3** – Example of application, allocation from electric circuits to safety devices without switching off the system*

Example for locating a break in a cable

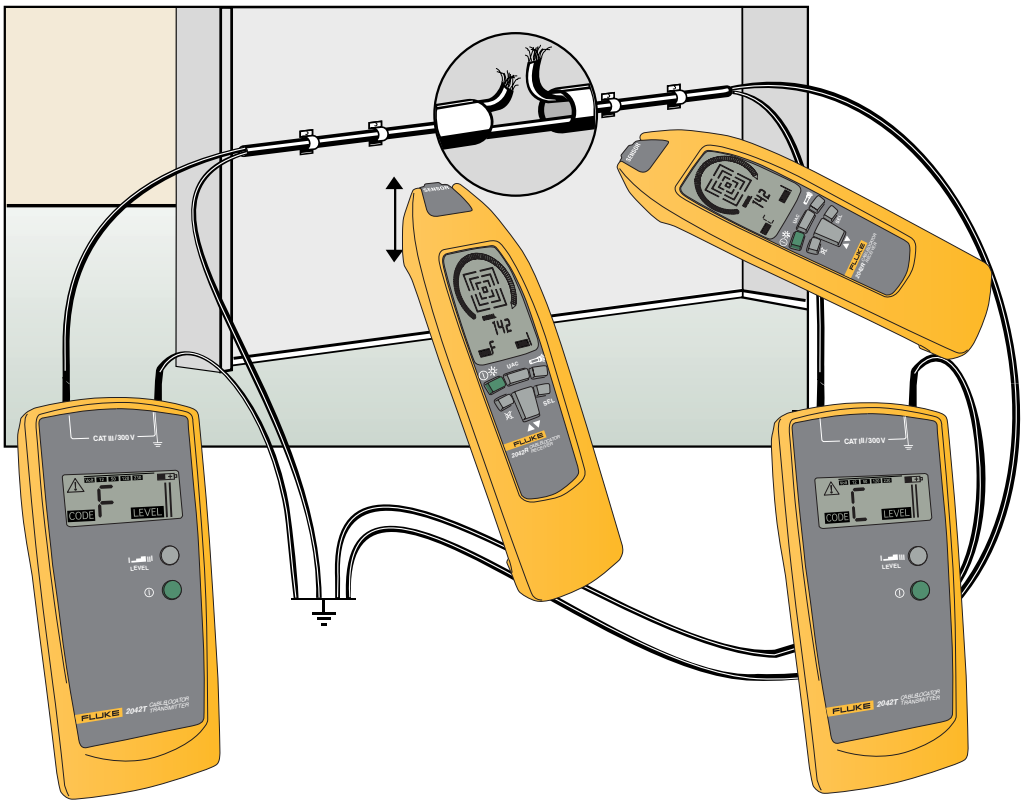
If a transmitter is attached to one end of the cable to locate an interruption, the location of the break can sometimes only be roughly isolated due to field interference. An additional signal transmitter with another signal code can help in this case.

For shielded cables, e.g. aerial cables, the signal is displayed on the screen. Knowing the structural conditions in advance also facilitates the procedure.
The reinforcing iron in solid concrete can have a negative influence on tracing the signal.
It is quite possible that concrete reinforcement acts like a grounded shield, which will not receive the signal.

It is advisable to conduct some practice testing on a well-known system before implementing the first field operation.
This is the best way to make the user familiar with the operation of the instrument. Locating cables with a purpose-made cable locator offers several advantages on site. Trial and error methods for locating cables eg. making penetrations in the wall, causes damage to the structure of the building and can also damage the electrical cabling itself. The new Fluke cable locator can also be used for floor heating and cable/pipe tracing applications.



Locating cable interruptions



Precise location of interruptions with an additional signal transmitter

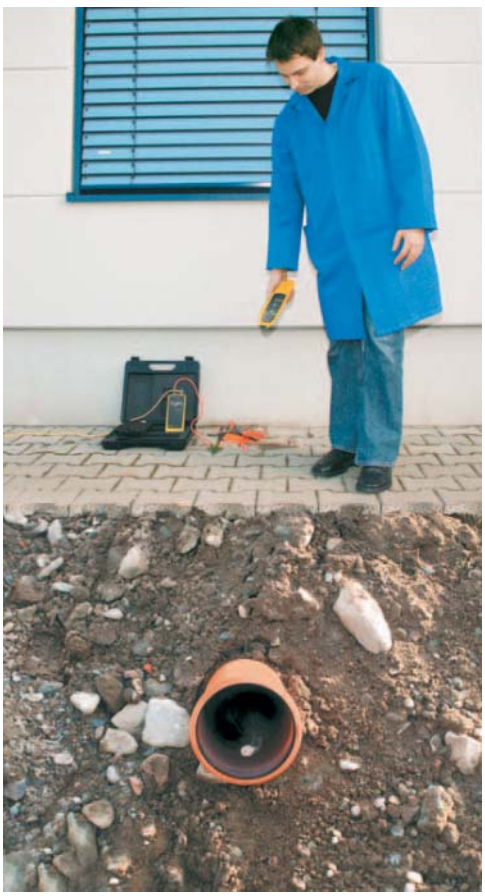
Locating faults in electrical under-floor heating

A particularly interesting application is the location of faults in electrical floor heating systems. For example, the heating has recently been laid but it does not function correctly. A common cause of such a fault is when the flooring is being laid the heating wire is inadvertently cut or damaged. Sometimes the floor heating wires are inadvertently cut or damaged during installation. The 2042 can easily help you determine where the fault is located, so the electrical contractor can minimize the damage to any floors.

Locating faults in electrical under-floor heating

Cable and pipe tracing in the ground

The Fluke-2042 cable locator also traces cables that are laid in the ground. This is very helpful when working on exterior lighting for example.
The maximum detection depth for this type of application is 2.5 m.



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