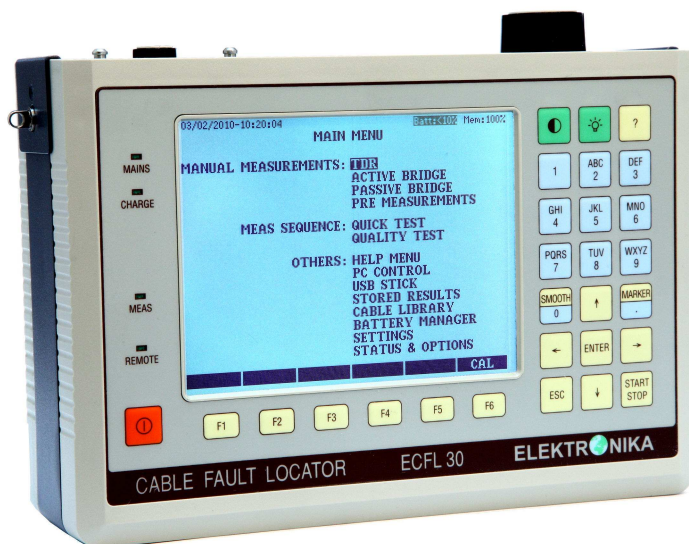


WHERE IS THE FAULT ? ECFL30 GIVES THE ANSWER !



Four instruments in one

- **Active Bridge** for accurate location of faults where the level of disturbing voltages are low
- **Passive Wheatstone Bridge** for location of faults where the level of disturbing voltages are high
- **Graaf Fault Locator** for accurate fault location on totally water-soaked cable where the disturbing voltages are usually high and intermittent
- **TDR** to find low impedance faults and splits causing cross talk between the pairs

APPLICATIONS

The **CABLE FAULT LOCATOR ECFL 30** hand-held instrument is intended to test the quality of telecom cables and to locate cable faults. That combined instrument provides several tools for the accurate location of DC/AC faults on the line:

Resistance Measurements

- Loop resistance
- Resistance difference
- Insulation resistance

Capacitance Measurements

- Cable capacitance
- Capacitive balance

DC Fault Location Methods

- Murray
- 3 Point
- K upfm uller
- Repeated K upfm uller

AC Fault Location Methods

- Interruption
- Repeated K upfm uller

Graaf Fault Location Method

- End to end Master-Slave measurement
- Fault location on totally water-soaked cable

TDR Measurements

- Single pair
- Double Pair Measurements
- XTALK
- Comparison to Memory

AC-DC Voltage measurements

Cable temperature measurement

FEATURES

Extremely Simple Operation

- Easy to use menu system
- Many-sided topic oriented help system
- Large Graphic Display with Backlight

Operation is made extremely comfortable by means of pre-defined automatic test sequences:

Automatic Test Sequences

- Cable State Survey to find the best test method
- Quick Test of main parameters
- Quality Test Sequence

USB Ports for Result Transfer

- USB B device-port for direct PC connection
- USB A host-port for USB stick (Indirect transfer)

The indirect transfer is advantageous for the user who does not have administrative right to install a special driver to his PC.

ECFL 30 is suitable for the remote control of loop closing devices on the far end. Utilizing that feature just one person can perform measurements during which the far endings of the tested pair should be opened or closed (e.g K upfm uller method).

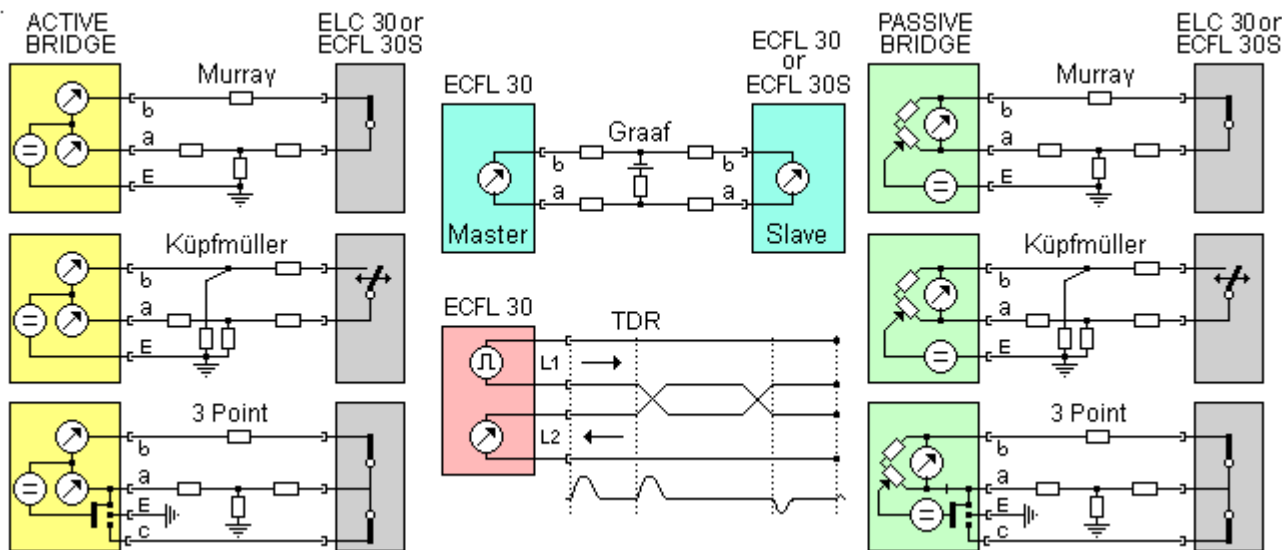
Remote Controllable Far end Devices

- ELC 30 loop closing device to open or close the far end of the tested cable
- ECFL 30S slave unit to perform synchronic end to end Graaf measurement and open or close the far end of the tested cable.

Large Memory

The obtained test results can be stored in the internal memory of the instrument and transferred to PC.

FAULT LOCATOR MODES



SPECIFICATIONS

TDR

Measuring Modes

Single Pair..... L1, L2, L1 long time, L2 long time
 Double Pair L1& L2, L1-L2, XTALK
 Memory Modes L1& Memory, L1- Memory

Measuring Ranges

For non loaded cable (at V/2=100) up to 32 km
 For loaded cable (at V/2=10) 6.4 to 32 km
 The maximum range depends on cable type and condition

Evaluation of Results

With Cursor and Marker In meters
 Refreshing of waveform ~4/sec
 Zoom Maximum 16

Accuracy

Fault location0.2% of range
 Resolution.....0.01 m

Propagation Velocity

For non loaded cables

V/2.....45 to 149 m/μs
 VOP30 to 99 %

For loaded cables

V/2.....1.2 to 30 m/μs
 VOP0.8 to 20 %

Pulse Characteristics

Widths for non loaded cable 4 ns to 6 μs
 Widths for loaded cable 330 μs
 Amplitude:.....1.3 to 12 Vpp into 120 Ω
 Automatically changed with gain and width.

Line Connection

Impedance120 Ω balanced
 Balance control 50 to 270 Ω

Gain Control

Range0 to 90 dB
 Steps.....6 dB/Step

Distance Dependent Amplitude Correction

Number of steps 10

ACTIVE BRIDGE

Voltage

DC voltage. up to 400 V
 AC voltage..... up to 250 V eff
 Accuracy±3% ±1 V
 Frequency range 15 to 300 Hz
 Input resistance2 M Ω

Loop Resistance

Measuring range 1 Ω to 10 kΩ
 Accuracy ±0.3% ±0.1 Ω

Resistance Difference

Loop resistance range..... 10 Ω to 5000 Ω
 Accuracy..... ±0.2% of RI ±0.2 Ω

Insulation Resistance

Measuring range 10 kΩ to 300 MΩ
 Measuring voltage..... 100 V
 Accuracy.....2 to 5% ±1 kΩ

Capacitance

Measuring range 1 nF to 2 (10) μF
 Measuring voltage.....11 Hz, 100 V
 Accuracy ±2% ±0.2 nF

Capacitive Balance

Measuring range 1 nF to 2000 nF
 Measuring voltage.....11 Hz, 100 V
 Accuracy of Lx/L value ±0.2 %

DC Fault Location

Test Methods.....Murray, Küpfmüller, 3 Point
 Loop resistance range 1 Ω to 10 kΩ
 Fault resistance range.....up to 100 MΩ
 Measuring voltage..... 100 V
 Accuracy (RI=2 kΩ, Lx/L=0,1 to 1)
 Fault resistance < 1MΩ ± 0.2 %
 Fault resistance 1 MΩ to 5 MΩ ± 0.3 %
 Fault resistance 5 MΩ to 25 MΩ ± 0.5 %
 Fault resistance 25 MΩ to 100 MΩ ± 2 %

AC Fault Location Interruption

Range up to 20 km (Depends on cable typ)
 Accuracy..... ±2% ±0.2 nF

PASSIVE BRIDGE**Loop Resistance**

Measuring range 1 Ω to 10 k Ω
 Accuracy $\pm 0.3\%$ $\pm 0.3 \Omega$

Insulation Resistance

Measuring modes Quick measurement,
 Quality measurement

Measuring ranges

Quick measurement 10 k Ω to 300 M Ω
 Quality measurement up to 10 G Ω
 Measuring voltage 100 V

Accuracy

10 k Ω to 50 M Ω $5\% \pm 1 \text{ k}\Omega$
 50 M Ω to 100 M Ω 10 %
 100 M Ω to 5 000 M Ω 20 %
 5 000 M Ω to 10 000 M Ω 30 %

Resistance Difference

Loop resistance range 1 Ω to 5000 Ω
 Accuracy $\pm 0.2\%$ of RI $\pm 0.2 \Omega$
 Resolution of Lx/L (Mk)-value
 In range $\Delta R < 10\%$ 1/10000
 In range $\Delta R > 10\%$ 1/1000

DC Fault Location

Test methods Murray, K pfm ller, 3 Point
 Loop resistance range 1 Ω to 10 k Ω
 Fault resistance range up to 100 M Ω
 Measuring voltage 100 V
 Accuracy (RI=2 k Ω , Lx/L=0,1 to 1)
 Fault resistance < 1 M Ω 0.2 %
 Fault resistance 1 M Ω to 5 M Ω 0.3 %
 Fault resistance 5 M Ω to 25 M Ω 0.5 %
 Fault resistance 25 M Ω to 100 M Ω 2 %
 Resolution of Lx/L (Mk) value 1/1000

AC Fault Location K pfm ller Method

Loop resistance range 1 Ω to 10 k Ω
 Fault resistance range up to 25 M Ω
 Measuring voltage 11 Hz, 100 V
 Accuracy (RI=2 k Ω , Lx/L=0,1 to 1)
 Fault resistance < 1 M Ω $\pm 0.3\%$
 Fault resistance 1 M Ω to 5 M Ω $\pm 0.5\%$
 Fault resistance 5 M Ω to 25 M Ω $\pm 1.0\%$
 Resolution of M value 1/1000

AC Capacitive Balance

Measuring range 10 nF to 2000 nF
 Accuracy of Lx/L value $\pm 0.2\%$
 Measuring voltage 11 Hz, 100 V
 Resolution of Lx/L value
 In range Lx/L=0.9 to 1.1 1/10000
 In range Lx/L<0.9 or Lx/L>1.1 1/1000

Fault Location Graaf Method

Loop resistance range 10 Ω to 10 k Ω
 DC current range 5 μA to 1 A
 Accuracy ($I > 10 \mu\text{A}$) $\pm 0.3\%$

PRE MEASUREMENTS**Disturbing Voltage**

Measuring mode Repeated measurement
 Measuring range
 DC voltage up to 400 V
 AC voltage up to 250 V eff
 Accuracy $\pm 3\%$ $\pm 1 \text{ V}$
 Frequency range 15 to 300 Hz
 Input resistance 2 M Ω

Loop Resistance

Measuring mode Repeated measurement
 Measuring range 1 Ω to 10 k Ω
 Accuracy $\pm 0.5\%$ $\pm 0.2 \Omega$

Insulation Resistance

Measuring mode Repeated measurement
 Measuring range 10 k Ω to 300 M Ω
 Measuring time ~ 3 sec
 Measuring voltage 100 V
 Accuracy (without disturbing voltages)
 in % of test result 20 %

DC Current

Measuring range 5 μA to 1 A
 Accuracy $\pm 0.5\%$ 0.1 μA

Temperature (with Pt 1000 temperature probe)

Temperature range -20 to +60 $^{\circ}\text{C}$
 Resolution 0.1 $^{\circ}\text{C}$
 Accuracy $\pm 0.4^{\circ}\text{C}$

AUTOMATIC QUICK TEST**Disturbing Voltage**

Measuring range up to 400 V DC, 250 V AC
 Test results Vab, VaE and VbE

Insulation

Measuring range 10 k Ω to 300 M Ω
 Measuring time ~3 x 20 sec

Capacitance

Measuring range 10 to 2000 nF

Capacitive Balance

Test result Unbalance %
 Measuring voltage 11 Hz, 100 V

AUTOMATIC QUALITY TEST**Insulation**

Measuring range 10 k Ω to 10 000 M Ω
 Measuring time ~3 x 35 sec

Capacitance

Measuring range 10 to 2000 nF

Capacitive Balance

Test result Unbalance %
 Resolution 1/1000

Loop Resistance

Measuring range 1 Ω to 10 k Ω
 Accuracy $\pm 0.3\%$ $\pm 0.1 \Omega$

Resistance Difference

Loop resistance range 10 Ω to 5 k Ω
 Resolution 1/1000

GENERAL SPECIFICATIONS**Power Supply**

Internal rechargeable NiMH battery pack
 Operation timeapprox. 8 hours
 (Without backlight)
 Charging (without taking the battery pack out)
 From 100 to 240 V mains with mains adapter
 From 12 V car battery with car adapter
 Charging time less than 3 hours
 (Fast charging mode)
 Display320 x 240 dot graphic LCD
 with backlight

Connectors

Connector for mains adapter2.1/5.5mm coax
 L1 and L2 line
 connectors 4 mm banana sockets
 Ground connector 4 mm banana socket
 USB A USB 1.1 host port for USB-Stick
 (FAT 16 file system supported)
 USB BUSB 1.1 device port to connect PC
 (Device driver provided)

Over Voltage Protection

Between a and b
 or ground500 V DC, 350 V AC
 Longitudinal voltage..... 60 V AC

Ambient temperature ranges

Reference23±5°C
 Rel. humidity 45% to 75%*
 Normal operation 0 to +40°C
 Rel. humidity 30% to 75% *(<25g/m³)
 Limits of operation..... -5 to +45°C
 Rel. humidity 5% to 95% *(< 29 g/m³)
 Storage and transport -40 to +70°C
 Rel. humidity 95% at +45°C *(<35g/m³)

Memory Locations

For test results50
 For cable parameter.....50

Mechanical Data

Dimensions224 x 160 x 75 mm
 Weight (Including battery pack) ca. 1.8 kg

* Without condensation

ORDERING INFORMATION**CABLE FAULT LOCATOR**

ECFL 30..... 419-000-000

Including:

Operating manual
 Short form operation instruction
 Calibration Certificate
 CD
 Ground cable
 2-wire test lead (red/black)
 2- wire test lead (blue/yellow)
 Mains adapter 100 to 264 VAC
 USB cable
 USB stick
 Battery pack (built-in)
 Carrying case

Options

Loop closing device ELC 30..... 421-000-000
 Intelligent Slave ECFL 30S 425-000-000
 Coaxial adapter ECA 10..... 378-000-000
 Result transfer PC SW SW 419-510-000
 Car battery adapter EAA 10 Y 367-000
 Temperature probe PT 1000 Y-146-014
 Calibration Report CR419-000-000E