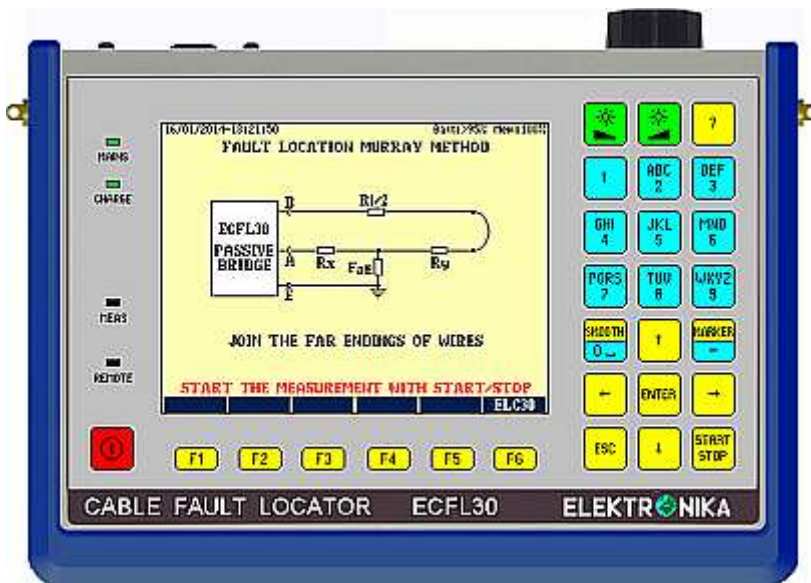


## WHERE IS THE FAULT ? ECFL30 GIVES THE ANSWER !



### 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. Manual and Automatic configuration provided

### APPLICATIONS AND FEATURES

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

#### 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).

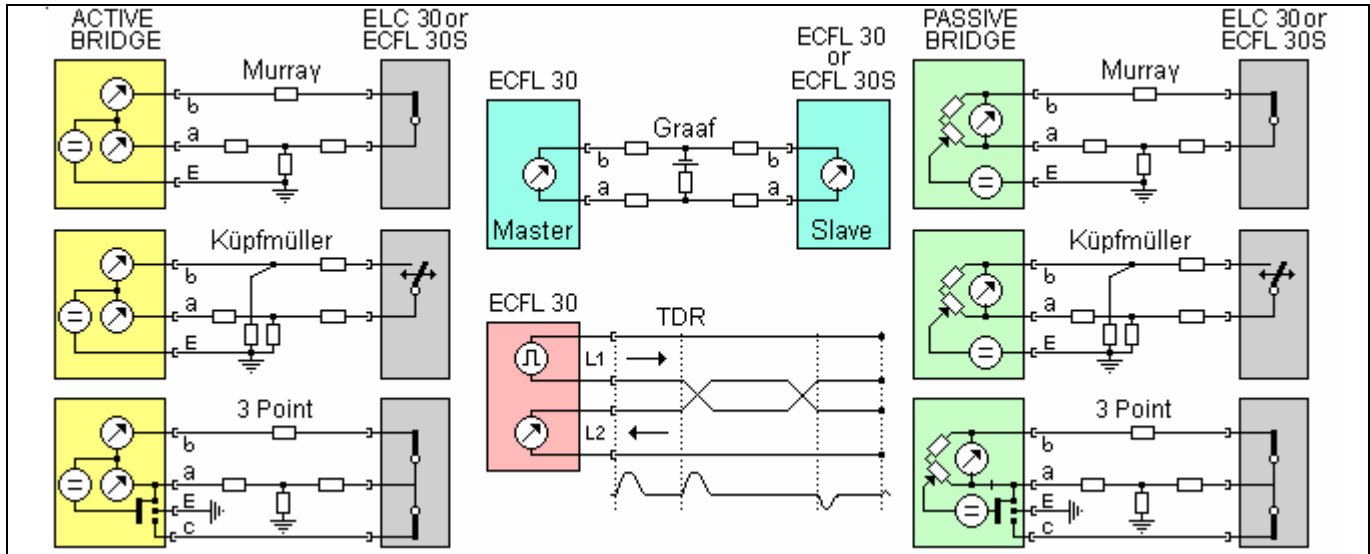
#### Remote Controllable Far end Devices

- 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.

#### Single End Line Test (SW option)

- Loss and data transfer speed estimation

FAULT LOCATOR MODES



SPECIFICATIONS

TDR

Measuring Modes

- Single Pair..... L1, L2, L1 long time, L2 long time  
L1 with automatic configuration
- Double Pair ..... L1& L2, L1-L2, XTALK  
XTALK with automatic configuration
- 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 location .....0.2% of range
- Resolution.....0.01 m

Propagation Velocity

For non loaded cables

- V/2.....45 to 149 m/μs
- VOP .....30 to 99 %

For loaded cables

- V/2.....1.2 to 30 m/μs
- VOP .....0.8 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

- Impedance ..... 120 Ω balanced
- Balance control ..... 50 to 270 Ω

Gain Control

- Range .....0 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 resistance .....2 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 kΩ  
Accuracy.....±0.3% ±0.3 Ω

**Insulation Resistance**

Measuring modes .....Quick measurement,  
Quality measurement

Measuring ranges

Quick measurement ..... 10 kΩ to 300 MΩ

Quality measurement ..... up to 10 GΩ

Measuring voltage ..... 100 V

Accuracy

10 kΩ to 50 MΩ ..... 5 % ± 1 kΩ

50 MΩ to 100 MΩ ..... 10 %

100 MΩ to 5 000 MΩ ..... 20 %

5 000 MΩ to 10 000 MΩ ..... 30 %

**Resistance Difference**

Loop resistance range .....1 Ω to 5000 Ω

Accuracy .....±0.2% of RI ±0.2 Ω

Resolution of Lx/L (Mk)-value

In range ΔR <10%..... 1/10000

In range ΔR >10%..... 1/1000

**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 < 1 MΩ ..... 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 %

Resolution of Lx/L (Mk) value ..... 1/1000

**AC Fault Location Küpfmüller Method**

Loop resistance range ..... 1 Ω to 10 kΩ

Fault resistance range ..... up to 25 MΩ

Measuring voltage ..... 11 Hz, 100 V

Accuracy (RI=2 kΩ, Lx/L=0,1 to 1)

Fault resistance < 1 MΩ .....±0.3%

Fault resistance 1 MΩ to 5 MΩ .....±0.5%

Fault resistance 5 MΩ to 25 MΩ .....±1.0%

Resolution of M value ..... 1/1000

**AC Capacitive Balance**

Measuring range..... 10 nF to 2000 nF

Accuracy of Lx/L value .....±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 kΩ

DC current range ..... 10μA to 1A

Accuracy of current measurement.....±0.3% ±2μA

Accuracy of Lx/L value (current >0.1mA) .....±3%

Accuracy of Lx/L value (current >1mA) ±0.3%

**PRE MEASUREMENTS**

**Repeated Disturbing Voltage Measurement**

Measuring range

DC voltage ..... up to 400 V

AC voltage ..... up to 250 V eff

Frequency range ..... 15 to 300 Hz

**Repeated Loop Resistance Measurement**

Measuring range ..... 1 Ω to 10 kΩ

Accuracy ..... ±0.5 % ±0.2 Ω

**Repeated Insulation Resistance Measurements**

Measuring mode ..... Repeated measurement

Measuring range ..... 10 kΩ to 300 MΩ

Measuring time ..... ~ 3 sec

Measuring voltage ..... 100 V

**Repeated DC Current Measurement**

Measuring range ..... 5μA to 0.1A

Accuracy ..... ±0.5 % 0.1 μA

**Temperature (with Pt 1000 temperature probe)**

Temperature range ..... -20 to +60°C

Resolution ..... 0.1°C

Accuracy ..... ±0.4°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 kΩ to 300 MΩ

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 kΩ to 10 000 MΩ

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 10kΩ

Accuracy ..... ±0.3% ±0.1 Ω

**Resistance Difference**

Loop resistance range ..... 10 Ω to 5 kΩ

Resolution ..... 1/1000

**SURVAY OF PAIR CONDITION**

The purpose of this measurement is to find the optimal fault location method. Measured parameters:

- Disturbing voltage
- Capacitance
- Loop and wire resistances
- Insulation resistances

**GENERAL SPECIFICATIONS**

**Power Supply**

Internal rechargeable NiMH battery pack  
 Operation time .....approx. 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)  
 Display ..... 320 x 240 color LCD TFT  
 with backlight

**Connectors**

Connector for mains adapter .....2.1/5.5mm 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  
 (FAT16, FAT32 file system supported)  
 USB B .....USB 1.1 device port to connect PC  
 (Device driver provided)

**Over Voltage Protection**

Between a and b  
 or ground .....500 V DC, 350 V AC  
 Longitudinal voltage..... 60 V AC

**Ambient temperature ranges**

Reference .....23±5°C  
 Rel. humidity 45% to 75%\*  
 Normal operation ..... 0 to +40°C  
 Rel. humidity 30% to 75% \*( $<25\text{g/m}^3$ )  
 Limits of operation..... -5 to +45°C  
 Rel. humidity 5% to 95% \*( $<29\text{g/m}^3$ )  
 Storage and transport ..... -40 to +70°C  
 Rel. humidity 95% at +45°C \*( $<35\text{g/m}^3$ )  
 Protection ..... IP 54

**Memory Locations**

For test results .....50  
 For cable parameter.....50

**Mechanical Data**

Dimensions .....224 x 160 x 75 mm  
 Weight (Including battery pack) ..... ca. 1.8 kg

\* Without condensation

**ORDERING INFORMATIONS**

**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

**HW Options**

Loop closing device ELC 30..... 421-000-000  
 Intelligent Slave ECFL 30S ..... 425-000-000  
 Coaxial adapter ECA 10..... 378-000-000  
 Car battery adapter EAA 10 ..... Y 367-000  
 Temperature probe PT 1000.....Y-146-014

**SW Options**

Result transfer PC SW ..... SW 419-510-000  
 Multi section Cable SW ..... SW 419-520-000  
 Loaded Cable SW ..... SW 419-530-000  
 Single End Line Test SW ..... SW 419-540-000

**Others**

Calibration Report ..... CR419-000-000E