LOOPaLINE Application Note #3

Resistance Bridge Fault Location using the Kupfmuller Method

This application note shows how the **TX915 LOOPaLINE** enables a telephone line technician with a Resistance Bridge Fault Locator, such as the Aegis CZ3000, to quickly locate and repair a line fault, and to test and re-commission the pair, without assistance from a second technician at the Exchange end of the cable, and without having to travel from one end of the cable to the other several times during the process.

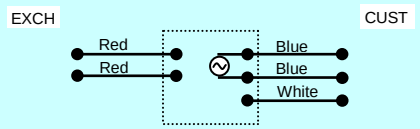
An indispensable instrument in telephone line technician's kit, is the Pair Identifier which consists of an Oscillator, or tone generator, and a Probe. The Oscillator puts a distinctive tone on the pair at one end of a cable, and the Probe is used to quickly find or identify that pair at the other end.

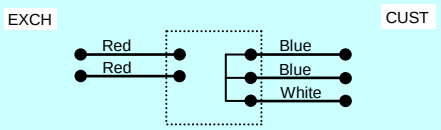
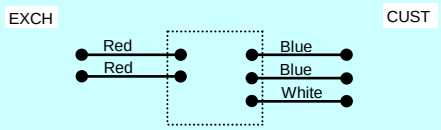
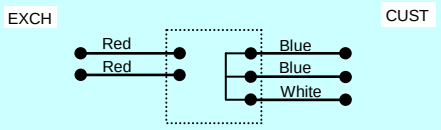
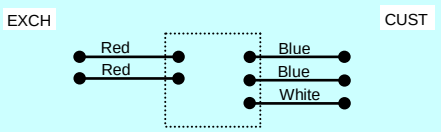
LOOPaLINE is a pair identifier with the added ability to remotely control the termination at the far end of the pair after, it has been identified by the Probe.

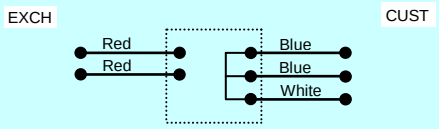
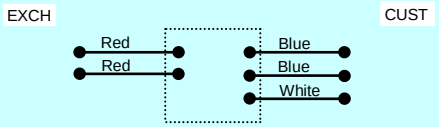
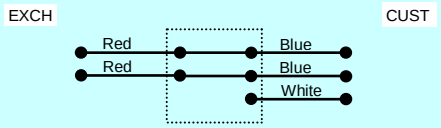
In the application below, **LOOPaLINE** eliminates the need for a second technician at the Exchange end of the cable and reduces from thirteen to two (plus Customer end to Fault and return), the number of times the unassisted technician needs to traverse the cable from end to end.

In Australia, **LOOPaLINE**, used as below to assist in fault finding, repair and testing of a telephone line, in the metropolitan area, pays for itself typically, in about five jobs, or just a few days. In rural areas where cables are much longer, the pay back period will be even shorter.

The Kupfmuller fault location technique is used when there are no good wires available for use in a standard two or three wire fault location method.

Step	Using a Pair Identifier	Using LOOPaLINE
1	At the Exchange end of the cable, identify the faulty pair and isolate it from the Exchange.	
2	Connect the Oscillator to the pair.	Connect the blue Oscillator leads to the Customer side of the pair and the red leads to the Exchange side of the pair. 
3	Travel to the Customer end of the cable (Trip 1).	
4	Identify the pair using the Probe.	
5	Place a short circuit across the pair. Travel back to the Exchange end of the cable (Trip 2). Remove the Oscillator.	Connect the Probe leads to the pair and press the SHORT button. This places a short circuit, or strap, across the Exchange end of the pair. Disconnect the Probe from the pair.

		
6	Connect the Bridge instrument and press the LOCATE button.	
7	Travel to the Customer end of the pair (Trip 3). Remove the strap. Travel back to the Exchange end of the pair (Trip 4).	Disconnect the Bridge. Re-connect the Probe to the pair and press the OPEN button. This removes the strap from the Exchange end of the pair. Disconnect the Probe from the pair.  Re-connect the Bridge.
8	Press the LOCATE button again.	
9	Travel to the Customer end of the pair (Trip 5). Replace the strap. Travel back to the Exchange end of the pair (Trip 6).	Disconnect the Bridge. Re-connect the Probe leads to the pair and press the SHORT button. This again straps the pair at the Exchange end. Disconnect the Probe from the pair.  Re-connect the Bridge.
10	Press the LOCATE button again.	
11	Travel to the Customer end of the pair (Trip 7). Remove the strap. Travel back to the Exchange end of the pair (Trip 8).	Disconnect the Bridge. Re-connect the Probe to the pair and press the OPEN button. This again removes the strap from the Exchange end of the pair. Disconnect the Probe from the pair.  Re-connect the Bridge.
12	Press the LOCATE button again. The Bridge will now calculate the location of the fault.	

13	Travel to the fault and repair the damage (Trip 9).	Travel to the fault and repair the damage (Trip 2).
14	Travel on to the Customer end of the line (Trip 10).	Travel back to the Customer end of the line (Trip 3).
15	Place a short circuit across the pair. Travel back to the Exchange end of the line (Trip 11).	Connect the Probe leads to the pair and press the SHORT button. This again straps the pair at the Exchange end. Disconnect the Probe from the pair. 
16	Use an ohmmeter to measure the loop resistance of the pair. See **Note 1**.	
17	Remove the ohmmeter, leaving the pair open, and travel back to the Customer end of the cable (Trip 12).	Remove the ohmmeter. Re-connect the Probe to the pair and press the OPEN button. This removes the short circuit at the Exchange end of the pair. Disconnect the Probe from the pair. 
18	Use a high voltage megohmmeter to measure the insulation resistances of the pair. See **Note 1**.	
19	Travel back to the Exchange end of the cable (Trip 13). Re-connect the pair to the Exchange. Travel back to the Customer end of the cable (Trip 14).	Re-connect the Probe to the pair and press the EXCH button. This connects the pair to the Exchange. Disconnect the Probe from the pair. 
20	Test and commission the customer telephone service.	
21		Travel back to the Exchange end of the cable (Trip 4). Disconnect the Oscillator and re-connect the pair to the Exchange. This does not have to be done immediately after commissioning the service because the Oscillator will provide the Exchange

		connection until it is removed.

Note 1: The tests included here are loop and insulation resistance measurements. If additional tests are desired, perhaps because the pair is to be used for a high frequency service such as pair gain or ADSL, the Teletech TX120A and TX125 Digital Line Test Sets are recommended. Both instruments incorporate the LOOPaLINE functionality.