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बाहरी दूरसंचार प्रयोगशाला  
प्रयोग नं: एल पी - 9

IRISET  
OUTDOOR TELECOMMUNICATION  
LABORATORY  
EXPERIMENT NO.: LP - 9

नाम

Name : \_\_\_\_\_

अनुक्रमांक

Roll No : \_\_\_\_\_

पाठ्यक्रम

Course : \_\_\_\_\_

दिनांक

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प्राप्त अंक

Marks Awarded : \_\_\_\_\_

अनुदेशक का अधाक्षर

Instructor Initial : \_\_\_\_\_

**Objective:** Identifying the Cable route by using Cable Tracer, Model CRT8.

### Introduction

The audio frequency signals generated in a Audio Frequency Generator are fed to the cable under test. Because of capacitance and resistance between the cable conductors, some energy is radiated. This energy is picked up using a sensor and then amplified using a receiver. The receiver output can be actually heard on headphone or seen on display. Audio signal heard is maximum or minimum (depending on the probe orientation) over the cable. This principle is used for route tracing.

Over a healthy cable, audio frequency signal will attenuate gradually. However, if there is a fault (impedance change), attenuation of audio signal level will vary, depending on nature of fault. This method is used for fault finding. More than one audio frequencies are used in practice, hence the receiver is having a switching circuit to select a particular frequency.

This way it is possible to locate a fault and trace the exact path of cable.

**The functions of different controls on the front panel of AFG-8 are as given under:**

1. **Impedance selector switch:** For selecting output impedance to match that of cable
2. **Frequency selection switch:** For selecting output frequency
3. **Power selector switch:** For selecting the required output power
4. **Analog meter:** It is used to indicate the output power and battery status
5. **Output terminal (Red):** To be connected to the core
6. **Hazardous Voltage indicator:** Indicates harmful voltages.
7. **Output terminal(Black):** To be connected to the earth spike
8. **Rocker switch:** To turn ON / OFF the output modulation
9. **Rocker switch:** To turn ON / OFF the output modulation
10. **3 way switch:** For making AFG-8 ON / OFF and the battery check (spring loaded)

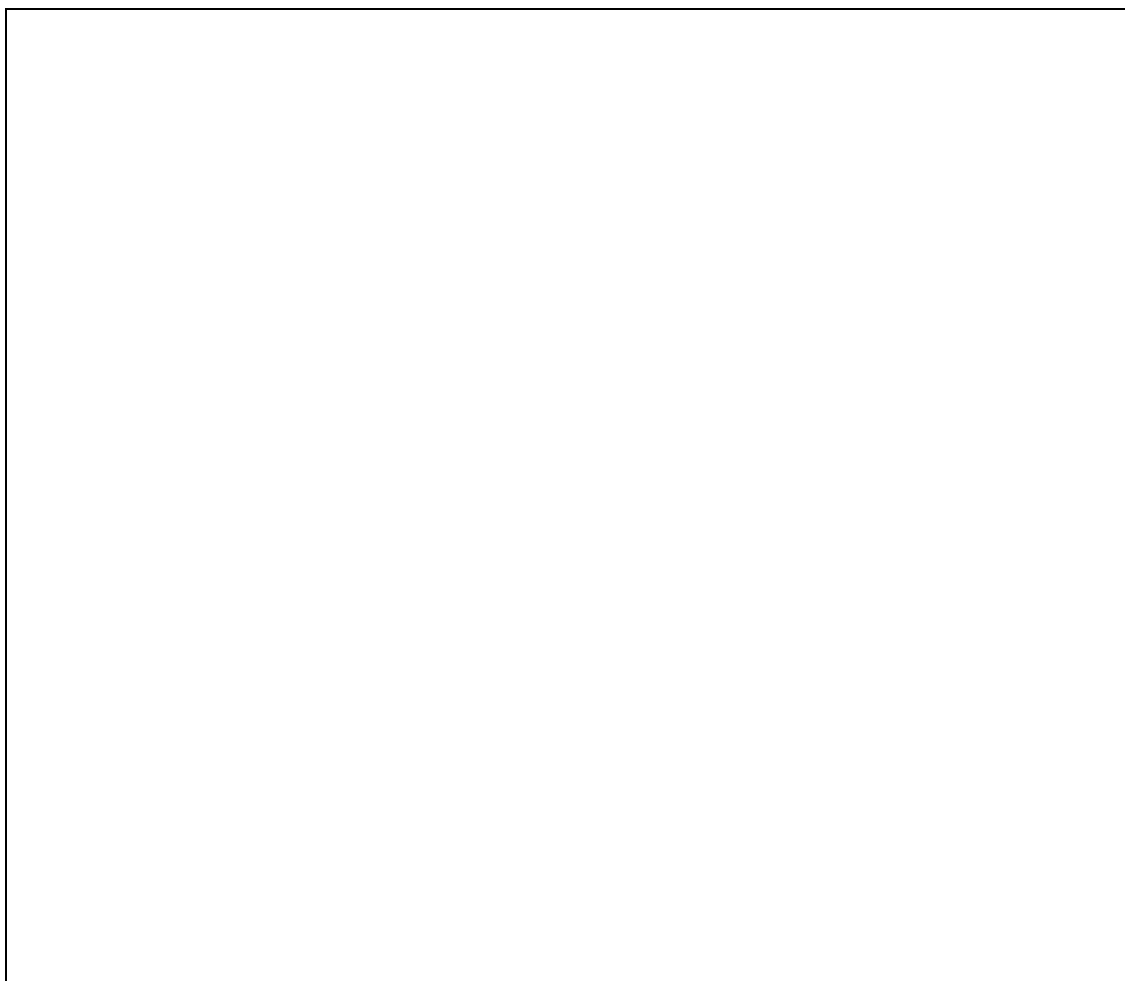
11. **Earth terminal:** To be connected to protective earth
12. **ON/OFF indicator:** Indicates whether the meter is in ON condition or OFF condition.
13. **Battery charging indicator:** Blinks when battery is charging, remains steady when fully charged.

**The functions of different controls on the front panel of AFR-4 are as follows:**

1. **Output socket:** For connecting the headphones to the unit.
2. **LCD bar graph:** For indication of output.
3. **Input socket:** For connecting the sensors or microphones to the unit.
4. **On/Off Switch:** To ON / OFF the power.
5. **Battery check/ display illumination switch:** This switch can be used to check battery status or to illuminate the LCD bar-graph display.
6. **Frequency selector switch:** To select the required receiving frequency.
7. **Sensitivity control:** To increase the sensitivity of the display.
8. **Volume control:** To increase the output of the receiver and receive sensitivity.

#### **Procedure**

1. Draw the different controls on the front panel of AFG-8 in the given block.



2. Draw the different controls on the front panel of AFR-4 in the given block.



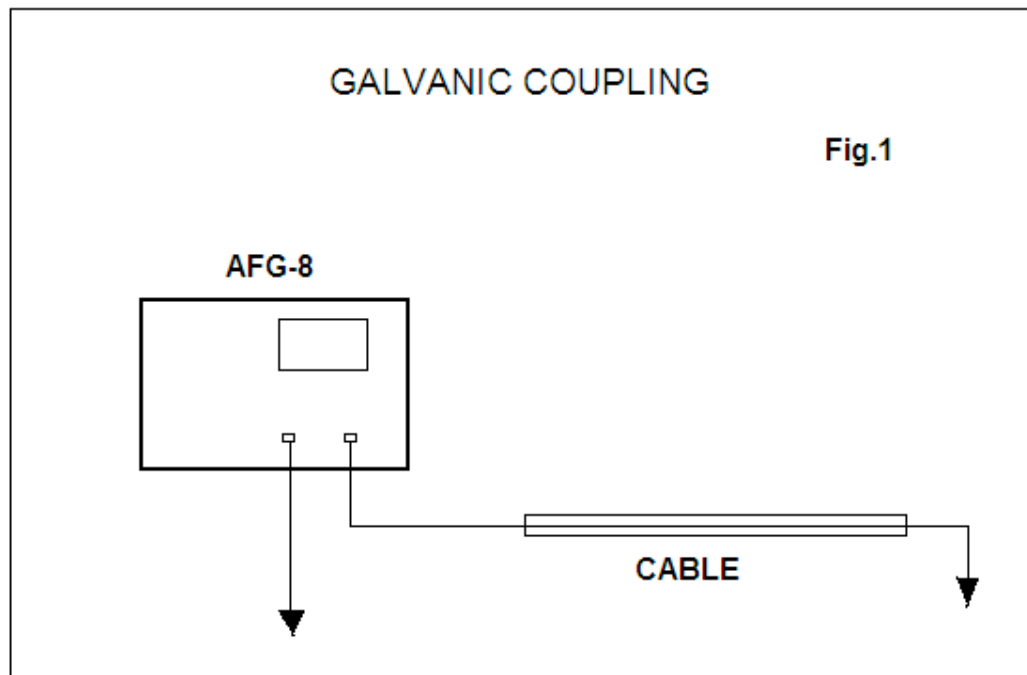
3. Trace out the cable route of 100 pair PIJF cable from ODT Lab DP to Hostel 4 DP.

The testing procedure can be done by three methods of couplings. They are,

**(i) Galvanic coupling method ( With earth as return conductor) (Refer the Fig.1):**

1. Connect the RED output terminal of Audio Frequency Generator to one pair of PIJF cable.
2. Connect other output terminal BLACK to the earth using earth spike.
3. Connect the far end of the same pair/pairs of cable to the earth using earth spike.
4. Connect the shields of cables to exchange frame/earth.
5. Check the battery status. Recharge if necessary.
6. Keep the frequency knob on 480Hz or 1450 Hz.
7. Connect the cable pair to the unit using connectors provided.
8. Switch on the unit.
9. Adjust the power selection knob to 1 W position.
10. Change the impedance and find out the value for which maximum power is transferred.
11. Increase the power if needed.
12. Proceed with the route tracing procedure.
13. Operate the Audio Frequency Receiver 4(AFR4) as per the given procedure
14. Connect the head phones to the receiver.
15. Check the battery status and confirm that they have enough power, If required replace them.
16. Connect the search coil to the input socket.
17. Switch ON the unit.
18. Select proper frequency.
19. Adjust the sensitivity and volume control as needed.
20. Trace the cable length.

21. Keep sensitivity control at mid way position. Adjust volume control to register 10-12 bar graphs on LCD display.
22. Check the readings and signal in the headphone at a distance point. Make adjustment of volume and sensitivity if required.
23. Check the maximum signal on the cable by keeping search coil in perpendicular position.
24. Check the minimum signal on the cable by keeping search coil in vertical position.
25. The frequency selected on AFG-8, AFG-4 & Search coil SC-4 must be same.



**Procedure of tracing cable route by Galvanic coupling method:**

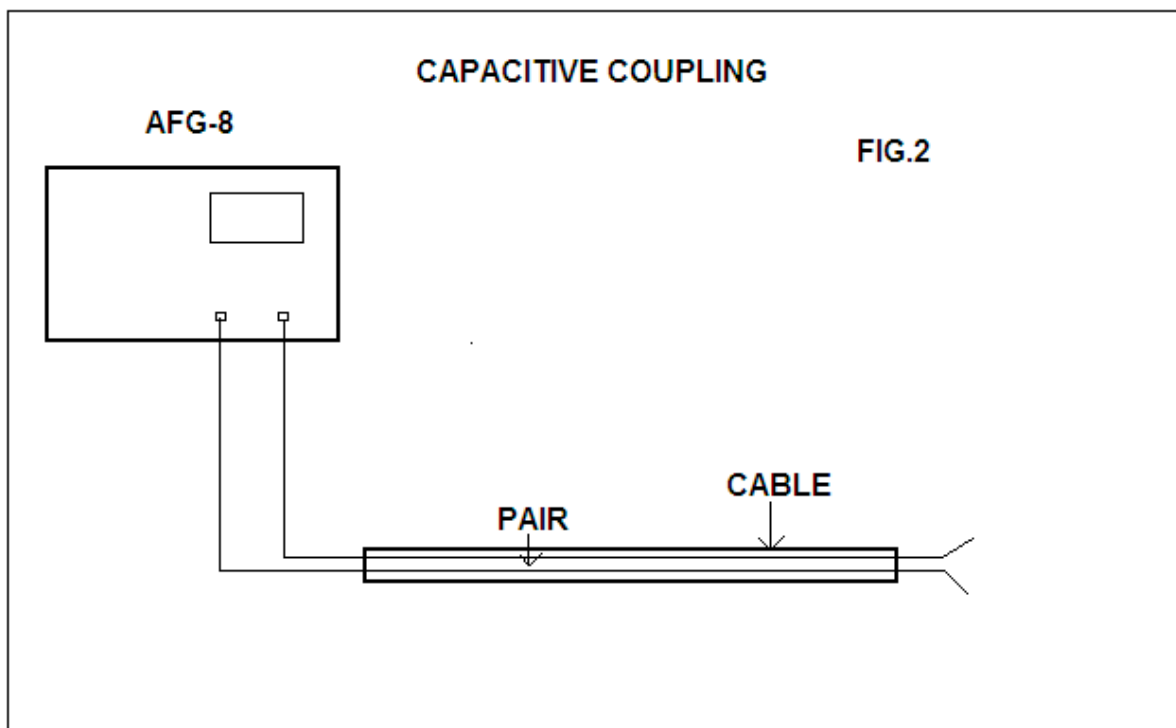
1. Once the settings of generator and connections are over, start checking for Maximum signal starting from the near end of the feed point.
2. Follow the route of the cable, adjusting the volume control from minimum and increase slowly to hear a comfortable available level in the headphones.
3. Put the axis of the search coil perpendicular to the cable to get maximum Signal. A search can be done quickly to know the route.
4. To get pinpoint location of cable, turn the axis of the cable through 90° (Make it vertical).
5. The signal will be minimum exactly on the cable, this method is known as Minima method and it is necessary to use this method of tracing cable away from the feed point.
6. When cable route is bent, the operator has to watch the signal carefully. And when the signal intensity suddenly starts dropping faster, the operator has to turn the axis in other directions for the search of maxima of the signal. Whenever the operator again gets reading as earlier, that route should be followed. The operator may have to walk a circle to search the signal. The bend in the shape of 'U' turn can be traced with 'Minimum method'.

**Draw the cable route diagram**



**(ii) Capacitive coupling method** This method is mainly used when near end of the cable is available and the far end is not accessible.


This method of coupling gives measurable radiated signal from cable for a limited distance.



### **Procedure of cable route tracing using 'Capacitive coupling':**

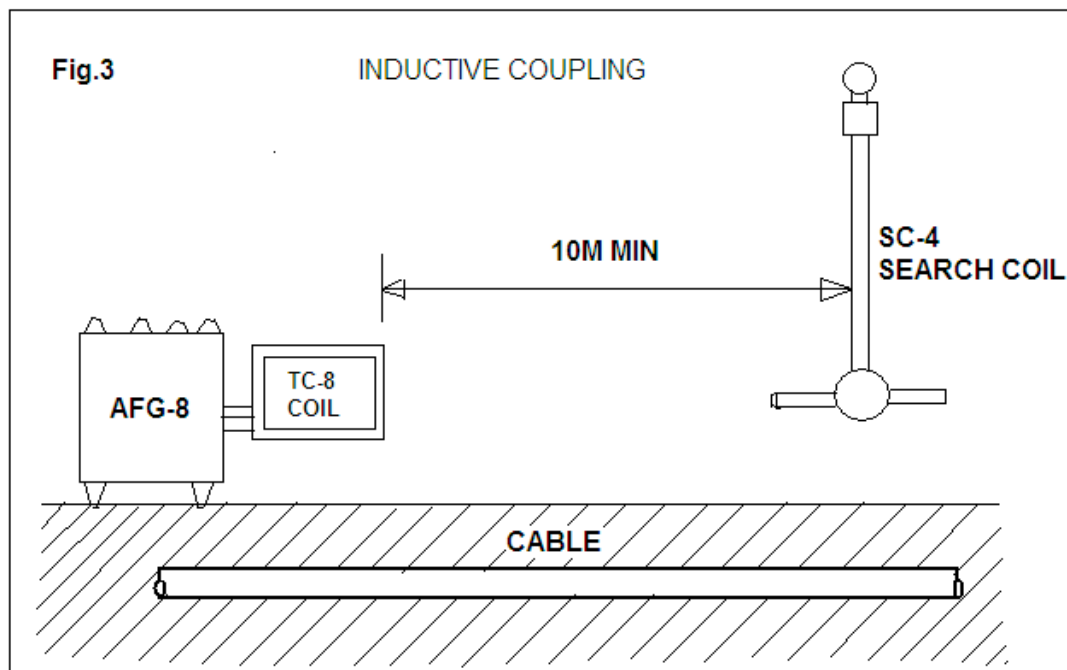
1. Connect the circuit as shown in the below figure.
2. Switch ON the AFG-8 as per the procedure given in (i).
3. Choose the frequency 9820Hz in AFG-8 & AFR-4.
4. Adjust the sensitivity and volume control as needed.
5. Adjust the power selection knob to 1 W position.
6. Change the impedance and find out the value for which maximum power is transferred.
7. Proceed with the route tracing procedure.
8. Start with Capacitive coupling method, trace some length of the section and then preferably go for inductive coupling as the cable may have branch off, from the bunch.
9. This method can be used to solve the problem of heavy induction near exchange and then follow the route by using inductive coupling.

### **Draw the cable route diagram**



### **(iii) Inductive Coupling method**

If disconnection of cable is not possible, then inductive method of coupling has to be selected. This method is also useful when access for connection above ground surface is not available, especially useful to test route where other end of the cable is not available. (Refer Fig.3)



**Procedure of cable route tracing by “Inductive Coupling Method”:**

1. Switch ON the AFG-8 as per the procedure given in (i).
2. Switch ON the Receiver AFR-4 as given above.
3. Choose the frequency 9820Hz in AFG-8 & AFR-4.
4. 9820 Hz frequency is to be selected on Transmitter coil T-8.
5. First know the cable position by using ‘Capacitive Coupling’ route tracing up to some distance.
6. Connect the T-8 coil to the Transmitter and keep it along/above the cable as shown in fig.3
7. Care should be taken that the transmitter / transmitter coil is not kept above or close to metallic surface. This will result loss of power transmitted as it would be absorbed due to the presence of metallic objects under earth.
8. Start route location at least 10 to 15 meters away from the transmitter.
9. Proceed as done in case of ‘Galvanic Coupling method’.

**Draw the cable route diagram:**



**Date:**

**Signature of Trainee**