

इरिसेट

IRISET

ब्लॉक सिग्नलिंग प्रयोगशाला

BLOCK SIGNALLING LABORATORY

प्रयोग सं. बी एस एल - 06

EXPERIMENT NO.: BSL - 06

नाम

Name : _____

अनुक्रमांक

Roll No : _____

पाठ्यक्रम

Course : _____

दिनांक

Date : _____

प्राप्तांक

Marks Awarded : _____

अनुदेशक के आक्षेप

Instructor's Initial : _____

Study of modification required to circuits of Neale's Instrument in 25 KV RE area

When a conductor runs parallel to and in the vicinity of traction catenary (25KV AC), transfer of power from the catenary to the conductor takes place due to induction by which voltage is being induced in the neighboring circuits. These voltages are referred to as induced EMF and are caused by:

1. Electro -static induction.
2. Electro - magnetic induction.

The EMF thus induced would interfere with the signalling circuits and may also prove to be a source of potential danger to the maintenance and operating staff.

The Electro-statically induced EMF can be eliminated by switching over to underground cables. The electro -magnetically induced EMF can be minimized by using metallic sheathed cables and earthing them at either end. The electro - magnetic induction in a lead sheathed cable is about 118 volts per 1 Km length of cable under normal conditions of 1000 Amp of Traction current. The maximum voltage that can be safely handled is about 400 volts AC. Hence, the induced voltage should be restricted to 400 Volts. This in turn implies that the maximum length of a cable that can be used is about 3.5 Kms. If any circuit is to be controlled beyond this distance an isolation transformer has to be used for an AC circuit and a repeating relay for DC circuit at the end of every 3.5 Km length of cable conductor.

Since the block section normally extends beyond 3 Kms and the above quoted methods of limiting the induced voltage are not suitable, a low pass filter circuit is used which allows the DC voltage to pass through without any hindrance but offers very high impedance for the induced voltages. The filter unit is inter-posed between the line and the block instrument at either end of the block section. Lightning arrestor (Phillips type 4378) are also connected between each line and earth. The filter circuit along with the earth connected to the condensers is effective only if its integrity is constantly checked. To achieve this, the filter circuit is made a part of the block circuit and a failure of any component of filter circuit or its associated earth would result in failure of the block circuit itself.

On account of this, the earth return feature of the block circuit is retained as an exception in RE area.

Since the chokes are provided in the filter circuits at either end of the block line in series, distortion of DC Pulses would occur. So the conventional bell circuits cannot be effectively adopted. Instead, an oscillator is designed to generate a 150 Hz signal is used to transmit the block bell code. At the receiving end, these signals are converted to DC pulses by a combination of diode and condenser and a bell relay is energized. This bell relay, in turn operates a local single stroke bell. The telephone circuit is also superimposed on the bell circuit.

Since distortion of DC pulses is taking place due to the presence of chokes in the filter unit, no instrument using DC polar code can be adopted in AC traction area.

Modifications: Along with Neale's Token Block Instruments, following equipments are used and connected as per the diagram:

- (1) Filter unit
- (2) VF transformer
- (3) Block bell unit is used
- (4) Two external relays i.e. BNR1 and BNPR1 (Slow to release relay)

Fill in the blanks:

1. This instrument can be seen in RE area with a _____, in series with the instrument to protect it from _____ voltage. In addition, two number of external relays namely _____ & _____ are also used to prevent energisation of PR due to momentary discharge of _____ inside the filter unit, when the bell plunger is released. Bell circuit is isolated and DC is converted to _____ with the help of _____ and works on a pair of conductors with a frequency of _____ Hz. Single stroke bell works with the pickup of _____ relay, which is externally provided. Block Telephone works on another pair of conductors. The block circuit working is however superimposed on _____
(Filter unit, Induced AC, BNR1, BNPR1, Condenser, AC, Oscillator, 150, BXR, Telephone pair)

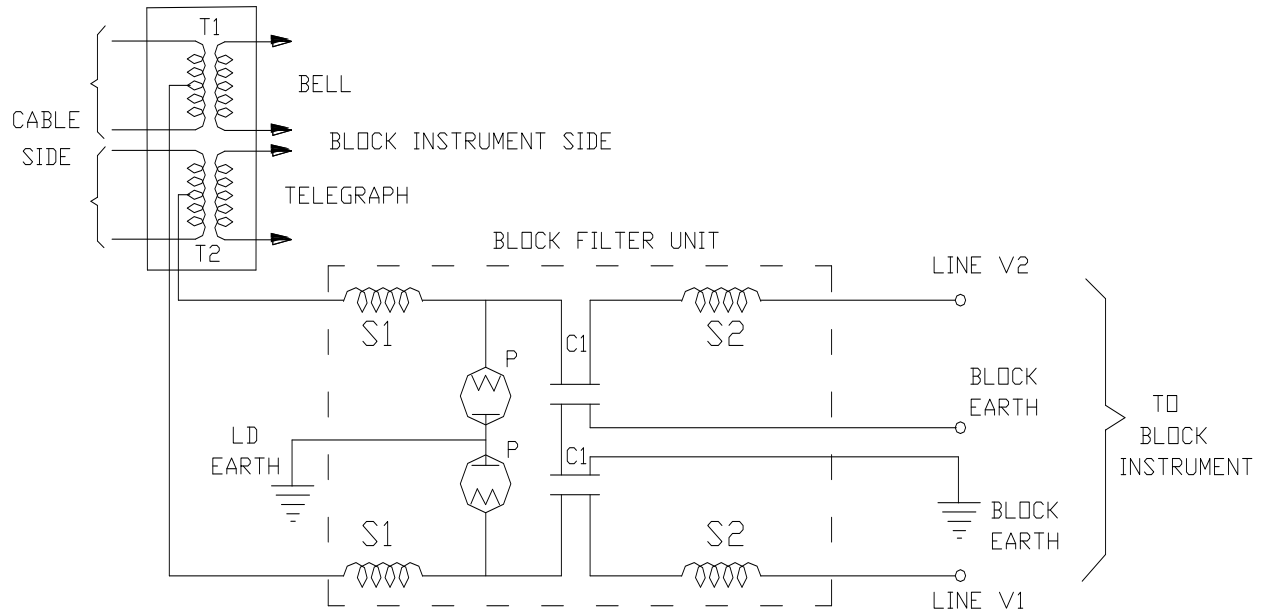
2. Purpose of making BNPR1 Relay 'slow to Release'

When bell plunger is pressed BNR1 relay picks up first and then BNPR1 relay picks up. when the bell plunger is released BNR1 relay drop immediately but BNPR1 relay drops after a time lag, thus the condenser inside the block filter unit has been discharged with the 5000 ohms resistances. These two 5000 ohms resistances come into the circuit through the _____ contacts of _____ relay and through the _____ contacts _____ relay. This arrangement ensures to isolate the PR relay from line circuit during the release lag of _____ relay. Isolation of _____ relay thus prevents release of TCF lock or TGT lock to ensure safety. (Front, BNPR1, Back, BNR1, BNPR1, PR)

3. Purpose of two resistances: In the design of the circuit, two resistances each of _____ ohms value are connected in parallel to ensure safety. Instead of one single resistance two _____ resistances are connected in _____ for efficient functioning. (5000 Ohms, 5000 Ohms, Parallel)

4. Earth return circuit for block working in RE area:

Adequate protection against unsafe conditions in RE area is catered by the provision of block _____ units at either end. The arrangement of using earth return ensures the physical availability of the filter circuit components namely (condenser and earth) in the circuit. This ensures that the block circuit itself is put out of use if there is any break in the components of block filter unit. Hence _____ return circuit is permitted only in block line circuits as an exception in RE area in order to maintain the efficiency of the block filter unit. **(Filter, Earth)**



T1 & T2 VOICE FREQUENCY TRANSFORMERS

S1 PROTECTIVE CHOKE { $R = 50 \Omega$
 $Z \text{ AT } 50 \text{ Hz} = 40,000 \Omega$
 TEST VOLTAGE = 600 Volts

S2 PROTECTIVE CHOKE { $R = 40 \Omega$
 $Z \text{ AT } 50 \text{ Hz} = 20,000 \Omega$
 TEST VOLTAGE = 50 Volts

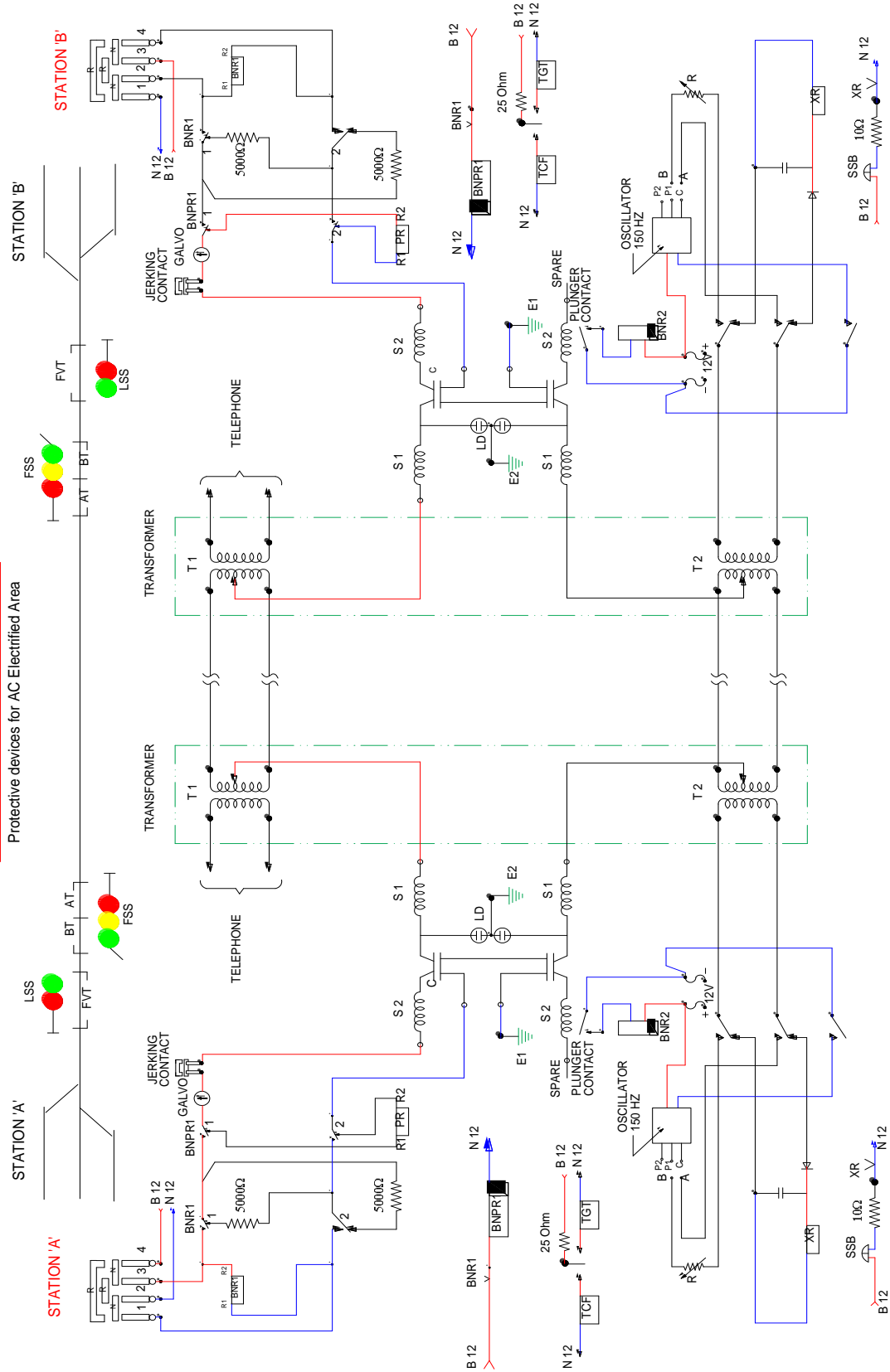
C1 4 TERMINAL CONDENSER $C = 10 \text{ micro farad}$

P LIGHTNING ARRESTOR GASEOUS TYPE, FLASH VOLTAGE 150 Volts

FILTER UNIT

NEALE'S BALL TOKEN BLOCK INSTRUMENT

Protective devices for AC Electrified Area



Signature of the trainee