

An electronic relay for telecommunication equipment

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ABSTRACT. In telecommunication practice, a polarised relay, an electromechanical device, is used to repeat information from a main source to a number of segments. These relays have their own limitations when speed of transmission is increased. The authors have developed an electronic relay, which is much cheaper and highly efficient in operation. This electronic relay can operate on very high speeds and uses very few components.

1. Introduction

1.1. In telecommunication practice, to boost a telegraph signal, an electromechanical device, known as polarised relay, is used as a repeater. These are also used for a simultaneous repetition of signals on different paths from a common source.

1.2. The flux from a permanent magnet (polarising flux) is super-imposed on the exciting flux in the airgap. The exciting (control) and the polarising flux assist each other on the one side of the airgap and oppose on the other side. Therefore, the resultant effect on the armature depend on the direction of the control flux or, in other words, on the direction in which the current flows in the coil.

1.3. Despite its capability for reliable operation, it has certain deficiencies which makes its use in modern high speed communication not so easily practicable.

1.4. A comparative study of both relays, viz., electro-mechanical and a fully electronic relay will indicate the superiority of the latter. A comparison of merit of electronic relay over mechanical relay is given below :

<i>Electromagnetic relay</i>	<i>Electronic relay</i>
(1) Maximum in rush peak, i.e., contact current causing radio interference.	Nil
(2) Time constant for building up of magnetic flux is very high causing distortion	Change over is instantaneous and have no distortion.

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| (3) Mechanical inertia is of the order of a milli-second or so contributing to distortion. | Does not arise. |
| (4) Minimum D.C. energising current for its operation is 8 Ma. | Input impedance being of the order of 6 M. ohms draw negligible current and does not overload the parent line |
| (5) Keying speed is limited by current build-up time, stroke time, transient delay in change over etc. | Being solid state device, the speed depends on the components used and very high speed up to 9600 bits/sec could be obtained |
| (6) Inherent distortion due to 5 above is 3-5 per cent. | No inherent distortion |
| (7) Nearby strong electric fields hampers smooth operation. A minimum distance of 12 mm between two adjacent relays is necessary to avoid mutual interference. | Magnetic field has no effect in the operation |
| (8) Eroding of contacts needing frequent adjustment | Nil. No periodic maintenance is required |

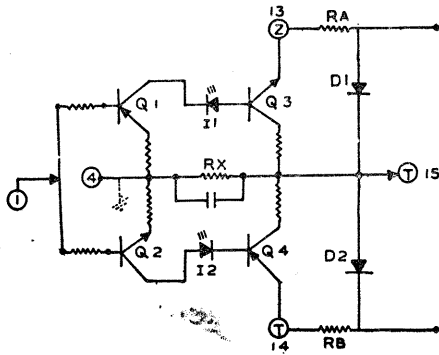


Fig. 1. Schematic diagram of the electronic relay
(Note: Read 14 A instead of 14 T)

2. General

2.1. Basing on experience on using electro-mechanical relays and to reduce the inadequacies, the authors took up designing of a fully electronically operated relay to replace the existing electro-mechanical relays.

2.2. The components are so selected and deployed such as to occupy an area of 30 mm × 60 mm and has the same size as the thermoplast cover of SIEMENS type (Tr 1 s 63a) polarised relay. The base is made identical to that of SIEMENS relay and 16 pin base configuration.

2.3. The relay components can be mounted on p.c. boards with relevant edge connectors to form a bank of a large number of relays. The relay is provided with two visual indicators to show the mark-space transition.

2.4. The relay has an absolute protection from open or dead short circuit condition.

3. Circuit (Fig. 1)

3.1. As the circuit shown in Fig. 1 is simple and self-explanatory, functioning of the same is not detailed in full.

3.2. In brief transistors Q1 and Q2 forms as a buffer to the keying section comprising of Q3-Q4. L.E.D. I₁ and I₂ are used for the purpose of visual indication of the signal transition. Rx is provided to protect transistors Q3-Q4 on open circuit condition while D1 and D2 used as a clamp to safeguard Q3-Q4 when the output is extended to an inductive load, as the collapsing field is likely to damage the Keyer. The numbers indicate the pin positions at the base. RA and RB on ± T B are to restrict the current while T is the output.

3.3. The input impedance is high and requires 6 to 10 Microamperes only for keying. Application of more than 2 Ma will overload and block the relay from operation.

3.4. A drop of 8-1/2 per cent between the voltage and the output keying voltage occurs. This can be attributed to the circuit components.

3.5. As indicated under 2.4, the circuit is fully protected both from open and short circuit condition. As such overloading the output will not damage the relay.

4. Conclusion

The prototype was tested on different operational conditions for speeds from 50 to 300 bauds. The relay does not add any distortion to the injected signal. It worked without any trouble in continuous run during the test period of three months.