Telephones for Railway Services

THE telecommunication system used for controlling traffic on the British railways has created one of the principal demands for the battery call telephone. The majority of railway circuits are omnibus working, with some form of selective ringing depending upon the operational needs. These forms range from simple discrimination between a special station and the ordinary stations, which are called by simple code ringing, and quite complex forms, such as an eight-code selective system with code ringing on some if not all of the code units.

Problems of supply and interchangeability of telephone equipment arose quite early in the history of traffic control and a solution adopted by at least one railway company was to instal simple telephone instruments having only speech and local bell circuits, providing separate key and relay equipment for calling. This arrangement simplified the position to some extent but was by no means as successful or economical as had been expected. With the growth of this type of communication, circuits were resolved into a small number of forms with a large measure of uniformity only in the equipment used by any one company, no general agreement having been reached.

At about this time, the Company was asked by one of the railway authorities to develop a polarized relay that would be smaller and more robust than the one then in use and would be interchangeable with the normal relay. As a result, plain, differential and polarized relays of the older pendant armature type were submitted, all three being interchangeable.

The formalization of circuits already mentioned and the quantities involved had led to the consideration of some measures of internal standardization in equipment, but at least one company was providing the call facilities integral with the telephone instrument, employing three types appropriate to their main classes of circuits. This practice reacted on the telephone manufacturer in that it complicated stock problems and owing to lack of uniformity led to increased production costs; the Company therefore took the opportunity to discuss the problems with its chief customers, and with their co-operation introduced a somewhat limited form of internal standardization which overcame to a large extent the supply difficulties and gave the desired reduction in prime cost of the principal types of equipment then in use.

Fig. 1—Three-button Table Instrument

This was certainly a step in the right direction but it is only in comparatively recent years that complete standardization has been effected through the efforts of the Railway Signalling Committee.

In 1944, this Committee issued five standard specifications setting out the basic circuit and component requirements, and the disposition of equipment for table and wall battery call telephones. In preparing these specifications consideration was given to the operational needs and efficiency standards of the railway companies of Great Britain and the linking of these with the production resources of the telephone manufacturers, with the object of simplifying supply problems. From the commencement of the work the Company was invited to co-operate, and submitted a list of suggestions for standardization, with particular reference to manufacturing problems. Active association with subsequent development led eventually to the production at Beeston of samples embodying the final recommendations of the Railway Signalling Committee.

As is usual with standard specifications, these cover the essentials of size, performance, interchangeability of principal components, etc., to ensure efficiency yet reduce maintenance and spares to a minimum. This limitation of the range of components tends to increase the volume of production, thus keeping prime cost at a reasonable level. Freedom in certain detail is permitted and future improvements are not excluded so long as they are submitted and approved at the tender stage.

The speech circuit is specially devised for railway use and employs a standard Post Office No. 21 induction coil. The local circuit of 1 ohm winding, battery and microphone, is entirely separate and isolated from the line, thus the possibility of the line obtaining an unwanted earth or any stray current from this source is almost negligible.

The speech circuit has improved anti-side-tone properties and a 2 μf blocking condenser prevents it from acting as a shunt across the signalling bell or relay.

In the range of instruments conforming to the specifications there are two groups :— wall telephones for general use, with bell calling, and table telephones, mainly for office use, with buzzer calling. Typical examples are illustrated in Figs 1 and 2 and wiring is uniform in plan throughout each group.

Fig. 2—Four-button Wall Instrument with inner buttons shrouded

Battery calling is effected by means of the code-ringing push button keys which are non-locking and are provided and wired to suit the requirements of the particular system for which the instruments are intended, as is explained later.

The simple 1-button telephone is arranged for the direct operation of its bell or buzzer but the 2, 3 and 4-button instruments are provided with a relay for operating the audible signal.

This relay may be of the plain or polarized type and it will be seen, by reference to the list of instrument codes at the end of this

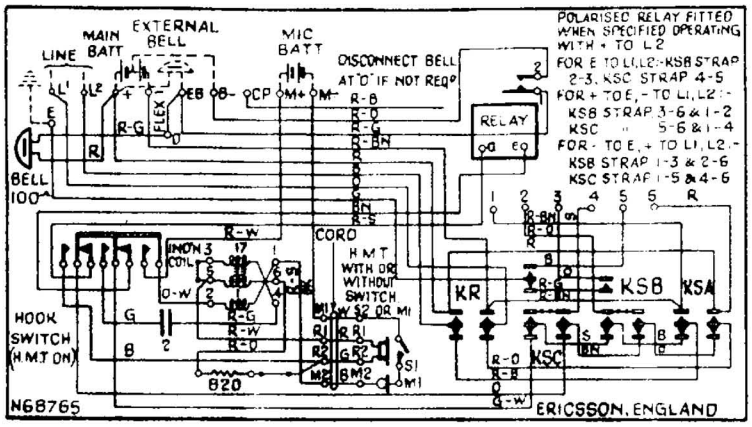

Fig. 3—Paster Wiring Diagram for Four-button Wall Instrument

interchangeability, instruments with polarized or non-polarized relays have an extra wire in the local cable for connecting to the centre point of a differential relay if this should ever be wanted. One end of this wire is connected to a CP terminal, as may be seen in Fig. 3, the other end being tied back ready for connection to the relay.

article, that calling arrangements are comprehensively covered by the association of the different key combinations with each type of relay.

The only other variable item is the micro-telephone which may or may not have a pressel switch in the transmitter circuit and is of British Post Office standard pattern. A cradle switch contact is normally provided in this circuit irrespective of whether or not a pressel switch is fitted. By cutting out extraneous sounds, the H.M.T. switch is an aid to listening in noisy situations.

The CP terminal is conveniently placed for easy wiring to the earth or battery terminal, as required by the system of signalling. To provide for the use of an external bell where the bell in the instrument is not required to operate, a terminal plate D is fitted to which one side of the instrument bell is connected, the connection to the EB terminal, and thus to the relay contact, being by a flexible wire with spade termination. This latter can be disconnected and turned out of position, leaving only the extension bell in operation, but allowing simple reconnection of the local bell at any time.

Bells and buzzers are 100 ohms resistance and operate on 50 m.a.

Relays are of the B.P.O. 3000-type, 5000 ohms resistance and in order to facilitate

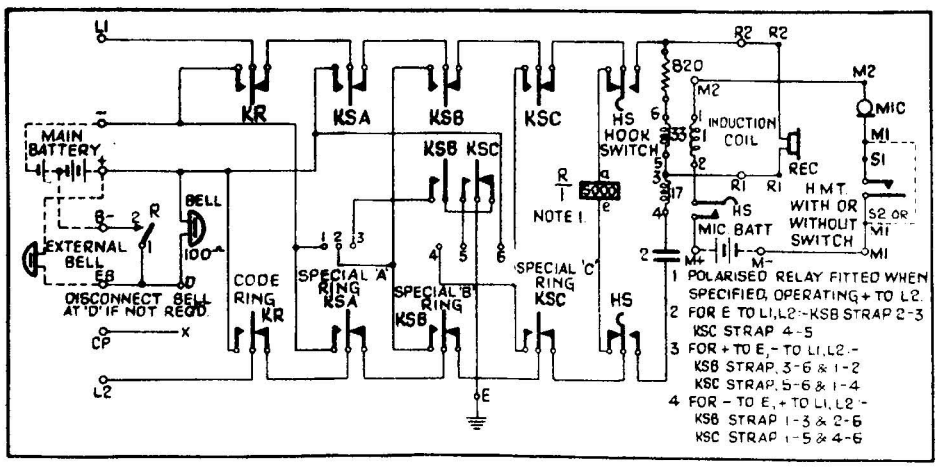

Fig. 4—Schematic Circuit of Four-button Wall Instrument

In order to provide for the differences in the wiring of the code-ringing keys to suit the various systems, as previously mentioned, the keys are wired to a terminal strip inside the instrument and their functioning is controlled by strapping the appropriate terminals in accordance with the paster wiring diagram in the telephone.

Means of " blanking off " unwanted keys by a shroud or cover to prevent their use, can be provided, so that a multiple key instrument can be used for any lesser key combination.

All equipment is readily accessible in both the wall and table instruments as the front of the wall set is hinged in the usual manner and the whole chassis of the table set can be removed from the moulded case by releasing three screws.

A typical schematic circuit, of the type N1181 (RSC.1002) is shown in Fig. 4. Other instruments follow the same general circuit in principle.

List of Codes of the Standardized Telephones.

WALL SETS.

Code No.	Railway Code	Relay	Ring Keys	HMT Switch
N.1181	3 RSC.1002 B P	Polarized	4	Switch
N.1181A	4 RSC.1102 B NP	Normal	4	Switch
N.1181B	1 RSC.1002 A P	Polarized	4	None
N.1181C	2 RSC.1002 A NP	Normal	4	None
N.1182	3 RSC.1001 B P	Polarized	2	Switch
N.1182A	4 RSC.1001 B NP	Normal	2	Switch
N.1182B	1 RSC.1001 A P	Polarized	2	None
N.1182C	2 RSC.1001 A NP	Normal	2	None
N.1183	2 RSC.1004 B	None	1	Switch
N.1183A	1 RSC.1004 A	None	1	None

TABLE SETS.

Code No.	Railway Code	Relay	Ring Keys	HMT Switch
N.1200	7 RSC.1000 D P	Polarized	3	Switch
N.1200A	8 RSC.1000 D NP	Normal	3	Switch
N.1200B	5 RSC.1000 C P	Polarized	3	None
N.1200C	6 RSC.1000 C NP	Normal	3	None
N.1201	3 RSC.1000 B P	Polarized	2	Switch
N.1201A	4 RSC.1000 B NP	Normal	2	Switch
N.1201B	1 RSC.1000 A P	Polarized	2	None
N.1201C	2 RSC.1000 A NP	Normal	2	None
N.1202	2 RSC.1003 B	None	1	Switch
N.1202A	1 RSC.1003 A	None	1	None

NOTE :—Since this article was written, the railways have been nationalized.