TRUNK DEMAND SERVICE

INTRODUCTION

Demand service, which is now in general use on the trunk system, was introduced in 1930 to cater for the increasing use by subscribers of the existing trunk-telephone network. The adoption of the demand system has resulted in a greatly improved trunk service, almost comparable in speed of connexion with the local junction service. With demand service, a subscriber requiring a trunk call is at once connected directly to an operator at the Trunk Exchange, who, after taking particulars from the caller, proceeds to set-up the connexion, without releasing the subscriber's line. This Pamphlet explains the principles of traffic circulation and control, and gives brief details of the equipment and circuits employed.

The introduction of demand service necessitated a revision of the existing trunk switchboard equipment. In addition, new circuits have been designed to speed-up signalling and improve supervisory facilities. The system, which is known as the sleeve-control system, is described in Educational Pamphlets, Telephones, 1/2 and 1/3.

PRINCIPLES OF TRAFFIC CIRCULATION

Inland Trunk Traffic

Calls between subscribers on different exchanges must be handled in such a way that the best use is made of the line plant. The provision of direct routes between exchanges can only be justified when the community of interest is sufficient to allow the routes to be economically employed.

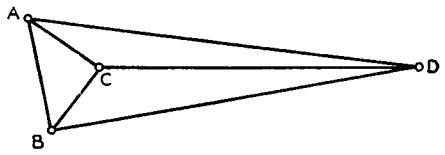


FIG. 1

In the scheme shown in **Fig. 1** the provision of direct routes could only be considered if the community of interest between each and every exchange is of some magnitude. The amount of trunk traffic originated at any one exchange is, however, limited,

FIG. 2

and it is usually economical to connect the exchanges A, B, C and D in the manner shown in **Fig. 2.** In this case the route between exchanges A and C will be carrying the trunk traffic originated at A for exchanges B, C and D; also, the incoming traffic to exchange A originated at the other three exchanges. Exchange C, therefore, acts as a switching centre for the trunk traffic of the four exchanges. On consideration, it will be seen that C need not be a local exchange but may be an exchange used solely as a switching point to obtain economy of line plant.

To effect this combination of trunk traffic, the country is divided into Group Areas, and arrangements are made to concentrate the trunk traffic originated in each area at some convenient exchange; this exchange is known as a Group Centre and acts as a distributing centre for the traffic within its area and for outgoing and incoming traffic to and from other areas. **Fig. 3** shows a typical area in which G is the Group-centre Exchange.

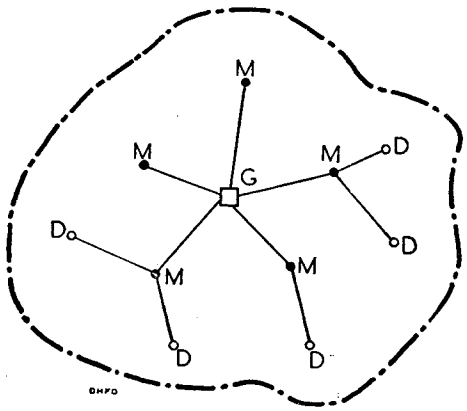
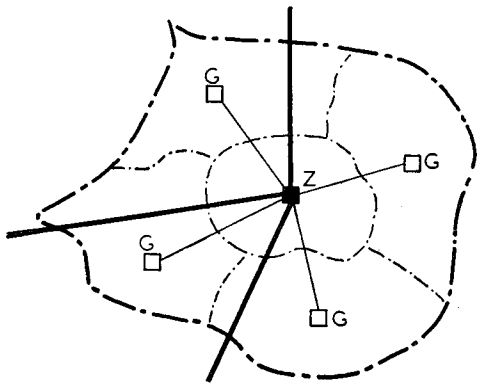


FIG. 3

It is not economical to provide direct routes between a Group Centre and every exchange in an area and, where direct routes are not provided, traffic to the Group Centre is routed via an intermediate exchange having a direct route. An exchange having a direct route to its Group Centre is known as a "Minor Exchange," whereas an exchange without such a direct route, being dependent on an intermediate minor exchange for its connexions, is known as a "Dependent Exchange." In Fig. 3, the minor exchanges are indicated by the letter M and the dependent exchanges by the letter D.

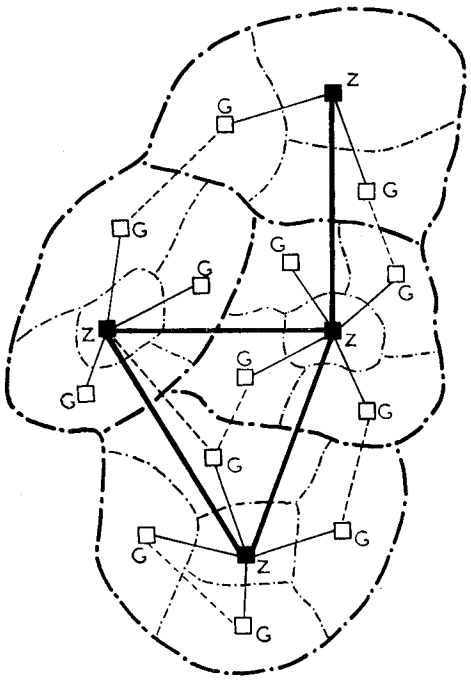
Since it is impracticable to inter-connect all group-centre exchanges by means of direct routes, certain of the group centres, which are suitably situated, are selected to serve as trunk-switching centres for long-distance calls. These selected trunk-switching centres serve their adjoining group centres for calls



—— ZONE TO ZONE ROUTES
——— GROUP TO ZONE CENTRE ROUTES
FIG. 4

to and from similar large areas as shown in **Fig. 4.** The large areas are known as " Zones " and the trunk-switching centres as " Zone-centre Exchanges." Direct routes are provided between most of the zone centres.

Direct routes are provided between group centres when justified by the amount of traffic, as by this arrangement the inter-group traffic can be handled without being passed via a zone centre. For the same reason, a group-centre exchange may also have routes to a zone centre other than its own and to group centres in other zones. **Fig. 5** shows a typical arrangement of zone and group areas.



—— ZONE TO ZONE ROUTES
——— GROUP TO ZONE CENTRE ROUTES
- - - - - DIRECT ROUTES FOR INTER-GROUP TRAFFIC
FIG. 5

The Positions necessary for trunk working at group centres form part of the local-exchange switchboard, and in non-director automatic areas both the assistance and the trunk traffic are dealt with at the same auto-manual switchboard. In non-director areas subscribers dial ' O ' for both classes of traffic, hence the trunk and junction multiples are extended over all the Positions. This method of working enables economies to be effected in the number of Positions required, and is known as " Joint-trunk working." Originally, zone centres were provided with separate suites of Positions for handling trunk traffic, and the subscribers dialled '94' to reach the trunk operator. Joint-trunk working is, however, now being extended to provincial zone-centre exchanges, and subscribers will dial ' O ' for both assistance and trunk calls.

Continental and Overseas Traffic

Consideration must be given to the handling of continental, overseas and ships calls. For these services, all calls are extended to the International Exchange. This centre serves as a switching point between the zones in Great Britain and the continental and overseas main-switching centres such as Paris, Berlin and New York. It is also used as a switching point for inter-overseas traffic, e.g. traffic between Australia and America is routed via this exchange.

TRAFFIC CONTROL

Demand Service

The ideal condition in trunk service, as in all services, is the provision of sufficient circuits to ensure that a disengaged outlet is available for every call. This condition, however, cannot obtain in practice, as it involves an uneconomical provision of plant. When the number of originated trunk calls is heavy it is not possible to complete calls immediately, but if a trunk circuit can be secured within one minute, a calling subscriber's circuit is held connected to the trunk switchboard and the subscriber remains at the telephone until the call matures. Such a service is known as " Demand Service."

Delay Service

Although demand service is standard for normal working, a ' delay ' service is resorted to on congested routes when traffic is abnormal. When delay service is in force, particulars of a call are recorded and the subscriber is informed that he will be called later (i.e. when the operator has completed the connexion).

Outline of Demand Working

The time required for setting-up and clearing calls has to be taken into consideration when determining the number of circuits required for demand working. Even at a peak period of traffic each circuit is not ' revenue earning ' for 60 minutes in the hour ; in fact, the ' paid time ' per hour of a trunk circuit under earlier systems was rarely more than 30-40 minutes. The demand system of working has been developed on the basis of speedier traffic circulation by improved operating methods and technical aids,

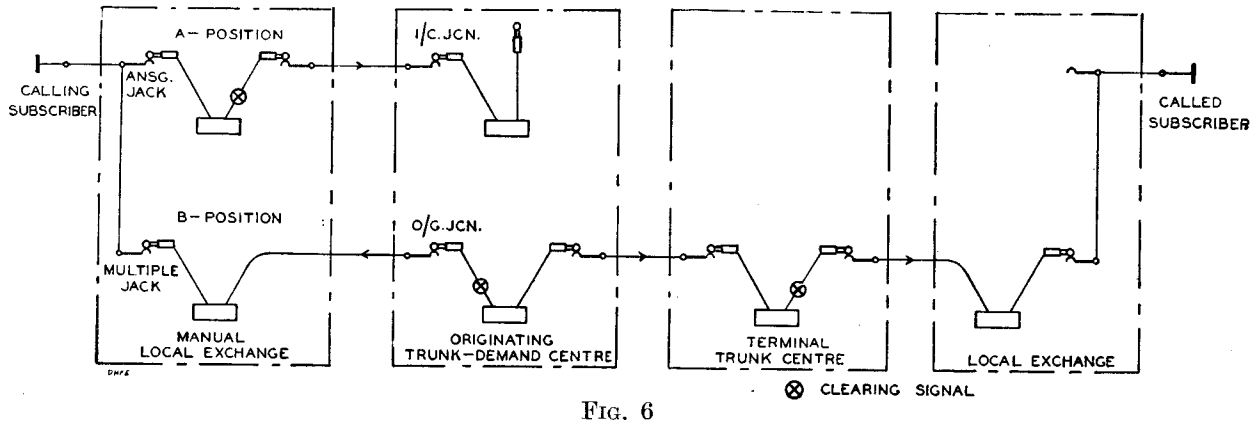


FIG. 6

thereby securing the equivalent of providing more circuits by increasing the 'paid time' per hour.

The speedier traffic circulation is achieved by giving the operator at the originating group centre the control of a call from start to finish, including timing. To permit the trunk circuits to be released immediately a call finishes, the supervisory signal given to the operator is controlled by the gravity switch of the calling subscriber's instrument.

In minor manual exchanges the A-Position cord circuits are used to answer all subscribers' calls, but as these are not equipped for through signalling, trunk calls extended to the demand centre are reversed by the demand operator over another junction circuit via the B-Position of the local exchange, see **Fig. 6.** As the B-Position cord circuits give the through-signalling facility, this reversal provides gravity-switch control of the supervisory at the demand centre. Call reversal does not normally take place on a call from an automatic exchange (see **Fig. 7**), as gravity-switch supervision is given directly by the automatic equipment.

International, overseas and ships calls are not controlled by local demand-centre operators, as they would have to possess the necessary language qualifications to enable them to deal with these calls.

One of the operating aids of the new system is the more extensive use of alternative routing when all circuits on a direct route are engaged. The main trunk circuits introduce very little transmission loss, and the use of several circuits in tandem does not unduly degrade transmission.

SWITCHBOARDS

Formerly, it was the practice to provide separate suites of Positions to handle demand traffic, local assistance traffic, and incoming or through traffic. Now that the trunk-demand traffic from local subscribers is, under joint-trunk working, combined with assistance traffic, it is not necessary to provide separate suites of positions for different classes of traffic.

The switchboard sections are wider and deeper than the previous standard C.B. type, thus giving larger keyboards and more operating space. A three-Position section has seven panels per section. The Positions may be equipped for joint-trunk, delay or for incoming traffic by variation in details such as the number of cord circuits, time checks, etc.

Joint-Trunk Positions

Joint-trunk Positions have one multiple of answering equipments, and another multiple of outgoing trunks and junctions. They are the control Positions and deal with the connexion of calls, on demand, from the subscribers within the group area.

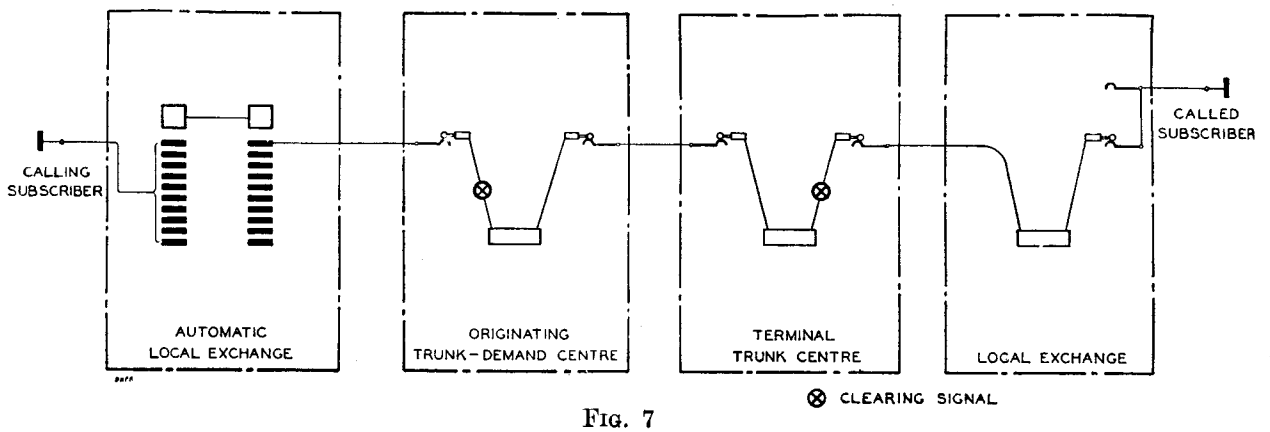


FIG. 7

Delay Positions

Delay Positions are similar to joint-trunk Positions, except that very few incoming circuits appear on them. When routes are working on a delay basis, operators at delay Positions receive, by ticket, particulars of recorded calls and obtain connexion with the outgoing-trunk circuits as they become disengaged. The subscribers are then called and connected.

The cord circuits of joint-trunk and of delay Positions are equipped with timing apparatus. These Positions control all outgoing traffic from the area they serve, and the operators are provided with route and rate information.

Incoming Positions

Incoming Positions have incoming-trunk lines connected to the multipled answering equipment, and have also a multiple of outgoing trunks and junctions. These Positions are used to connect incoming calls to local exchanges via the junction multiple, and any through calls to distant trunk exchanges via the outgoing trunk multiple. As the originating trunk exchange times and controls calls, cord circuits on incoming Positions are not equipped with timing apparatus and an operator at an incoming Position can handle a greater number of calls per hour than an operator at a joint-trunk or a delay Position. The incoming Positions are, therefore, equipped with more cord circuits than either joint-trunk or delay Positions.

FUNCTIONS OF TYPICAL CIRCUITS

Demand Circuits

Demand circuits are used at zone centres, not using joint-trunk working, to receive calls 'on demand' from ordinary automatic subscribers served by :—

(*a*) A director exchange. The subscriber dials 'TRU' for this service.

(*b*) A non-director exchange at a group centre which is also a zone centre, or a nearby minor exchange where the subscriber dials '94.'

NOTE.—'TRU'- and '94'-level circuits are barred to coin-box callers, who are required to dial 'O' (combined assistance and demand circuits). When the local auto-manual switchboard is a minor exchange, the 'O'-level operator extends coin-box callers to the appropriate group centre, either by exclusive circuits or by joint access into '94' circuits.

Combined Assistance and Demand Circuits

Combined assistance and demand circuits are 'O'-level terminations at auto-manual switchboards which receive calls for assistance or trunk connexions 'on demand' at joint-trunk Positions.

Record Circuits

Record circuits are circuits incoming to group or zone centres from manual exchanges, either direct or via the '94' level of a minor exchange. The trunk operator does not receive a supervisory signal when the subscriber clears, as through signalling is not applied via the A-Position cord circuit (calls set up by means of these circuits are reversed, as previously explained). Because of these conditions, circuits from manual exchanges are known as "Record" instead of "Demand" circuits.

SEQUENCE OF OPERATION OF A CALL FROM A MANUAL SUBSCRIBER

The sequence may be followed by reference to Fig. 6. When the local exchange is called, the 'A' operator makes connexion direct to the demand centre by means of a 'record' circuit. Here the call appears on a joint-trunk Position, where the demand operator takes particulars and attempts to complete the connexion by selecting a free outgoing trunk in the multiple. Simultaneously, the demand operator obtains connexion with the B-Position in the calling exchange and requests that the calling subscriber's line be overplugged. This indicates to the 'B' operator that the engaged test may be disregarded. When the subscriber is connected via the multiple on the B-Position, the incoming 'record' circuit is released by the demand operator, which causes a clear to be given to the operator on the local A-Position, who severs the original 'record' connexion.

If disengaged trunk circuits are not available, the operator, after reference to routing records, attempts to set-up the call over an alternative route. If the connexion cannot be established within one minute, the subscriber is told that he will be rung later and is asked to replace his receiver. A ticket with the particulars of the call is then sent to a delay Position, where such calls are handled in rotation by a delay operator.

At the distant end the trunk circuit from the joint-trunk Position terminates on an incoming Position where, if the called subscriber is in that particular area, connexion is made by means of an outgoing junction, or, if in a distant zone, a through connexion to that zone is made.

When the call is finished, the demand operator receives a clear from the calling subscriber; the operator at the incoming Position receives a clear from the called subscriber, and both operators then take down the connexion.

It will be noticed that the demand operator has control of the call and is responsible for setting-up and timing the call and for ascertaining that the transmission over the circuit is satisfactory.

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(404/8218) Wt. 2917—8317 27,500 1/39 H & S Ltd. **Gp. 404**