Nationwide Operator Toll Dialing

FOREWORD

The Independent telephone industry is interested in the new nationwide operator toll dialing plan and wants to know more about it. In particular it wants to know what implications, if any, this plan may have for an individual company. It may be some time before answers to all conceivable questions on this subject can be furnished but in the meantime some interesting and useful information is available.

Nationwide operator toll dialing contemplates a combination of scientific development and new operating technique by which improved toll service can be rendered more economically than with facilities and practices generally prevailing at the present time. When the new plan is established substantially, toll calls from one end of the country to the other will be completed under the control of the operator's dial or key sender equipment, in many cases without the assistance of a second operator. The service improvement to the telephone customer through the reduction in time required to complete a toll call by this method is quite apparent.

Because the new plan for handling long distance calls will operate on a nationwide basis, the complete coordination of toll practices and facilities of all participating companies, Bell and Independent alike, must be attained. The design features of the nationwide operator toll dialing plan, however, contemplate continued operation on a ringdown basis in those cases where conditions do not warrant conversion. It will be practicable, therefore, for each Independent company to decide for individual locations whether or not the toll dialing features are sufficiently attractive to make it desirable to provide the necessary equipment.

The American Telephone & Telegraph Co. has made available for publication, through the Dial Interexchange Committee of the United States Independent Telephone Association, memoranda (dated August 13, 1945) pertaining to the nationwide operator toll dialing plan. These memoranda will be published as a series of five articles. The first, beginning with this issue provides a general description of the plan. Subsequent articles will give the operational features.

F. E. NORRIS, Chairman
USITA Dial Interexchange Committee

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OPERATOR toll dialing has been in use for sometime in a number of rather small networks in various parts of the country. Within several years after the end of the war, methods will be available to inaugurate a nationwide operator toll dialing plan which will enable long distance operators to dial calls, directly and unassisted, straight through to the called telephone even though it be at the other end of the continent. In order to realize the full advantages of this plan, it is essential that provision be made for the inclusion of Independent telephone offices, where desired by the Independent companies, as well as Bell offices. In addition to Independent telephone companies in this country, the plan will be designed to be broad enough to include telephone companies in Canada to the extent they wish to be included in the plan.

Among the many factors involved in this project, there are three outstanding ones:

(1) Development of a national numbering plan which may be used universally by all outward long distance operators to complete a call to a telephone reached through any central office connected with the nation's toll network.

(2) A new arrangement of toll dial switching equipment which functions in response to the operator's dial and has capacity for performing many operations economically.

(3) Modification of the present General Toll Switching Plan — the basic routing plan for toll calls — to provide for handling nationwide dialed traffic. This consists essentially of determining the points at which would be located the new toll switching equipment mentioned above. There is expected to be less than 150 such cities and they will be designated "control switching points."

Operator toll dialing offers impressive opportunities for further improvement in the speed of long distance connections, in the accuracy and reliability of service and in over-all economies of operation. The Bell System plans to make very general use of this operating method as soon as materials and manpower are available. The complete conversion of the inward and through boards to dial operation is anticipated within the next 10 or 15 years. However, the design features contemplated for Bell System toll offices provide for continuing operation on a ringdown basis in those cases where conditions do not warrant conversion. It will be entirely practicable, therefore, for each Independent company to decide for individual locations whether or not the toll dialing features are sufficiently attractive to make it desirable to provide the necessary equipment. However, the advantages of the toll dialing plan can be realized more fully as greater numbers of offices throughout the country are equipped to participate in the plan.

In general, the preferable time to introduce toll dialing is at the time when conversion is being made from manual to dial equipment for the local equipment. This usually involves a new toll board, the cost of which is minimized with toll dialing because this will reduce the amount of switchboard equipment required.

Present Toll Dialing

Operator toll dialing has been used in limited areas for some years in both Bell and Independent networks, some of the earliest installations on record occurring on toll circuits between various Independent exchanges in Ohio. At the present time, more than 130,000 calls a day, or 5 per cent of the daily 2,700,000 toll board calls over Bell System lines now are being handled by this method.

Briefly, under this method the customer dials the usual code to reach the outward toll operator, who, in turn, completes the call through toll dial equipment without the assistance — in most cases — of another operator. With this method, on a station-to-station call, the toll operator, after dialing the necessary codes and the called number, can cut out of that connection and proceed with other calls, since she will receive a signal when the called telephone answers or a flashing signal if the called subscriber's line is busy. If the circuits are busy, she will receive a distinctive signal, and when a circuit becomes available another [illegible] number to

dial again. Provision is made for the operator to reach toll inward, information and other operators if their assistance is necessary in the completion of a call.

Although this type of dialing now is in use in isolated networks in various parts of the country, certain developments and changes in methods and facilities are necessary to interconnect these networks and expand them into a nationwide system.

NEW DEVELOPMENTS NECESSARY FOR NATIONAL TOLL DIALING

Present Step-by-Step Toll Dialing

Many hundreds of communities, small and moderately large, have for years been furnished local telephone service through step-by-step dial central offices. Gradually the reach of the dial mechanism has been extended out to neighboring towns and cities—even to those at some distance—and today operators are dialing toll calls over step-by-step toll dialing networks over fairly wide areas in Connecticut, Ohio, Michigan and other places.

In brief, the operator, after receiving from the customer the number he wants in another place, takes up a circuit to the called place and dials the called number, or, in the case of a switched call, first dials a code to secure a circuit to the point beyond and then dials the called number.

For example, on a call from Middletown to Columbus, Ohio (See *Fig. 1)*, the operator at Middletown plugs into a toll circuit to Columbus in her multiple and dials the Columbus telephone number as listed in the directory. If the call is to Akron, the Middletown operator likewise plugs in a circuit to Columbus, but dials a code which causes the switches at Columbus to connect her with a circuit to Akron and then dials the listed number at Akron. If she were authorized to dial through to Youngstown, she would reach Akron as on an Akron call but would then dial an additional code to reach Youngstown and then the Youngstown listed number. Many similar examples of this method are common in networks throughout the Independent field.

Obviously the method now employed in these isolated networks could be applied to the routing of a toll call through any desired number of switching points, transmission permitting. Note, however, that under this method each switching point would involve the dialing of additional digits by the operator. On a toll call involving three switching points, as many as 16 digits might have to be dialed.

Moreover, under the method of operation now used in limited areas, the operator must know the exact route

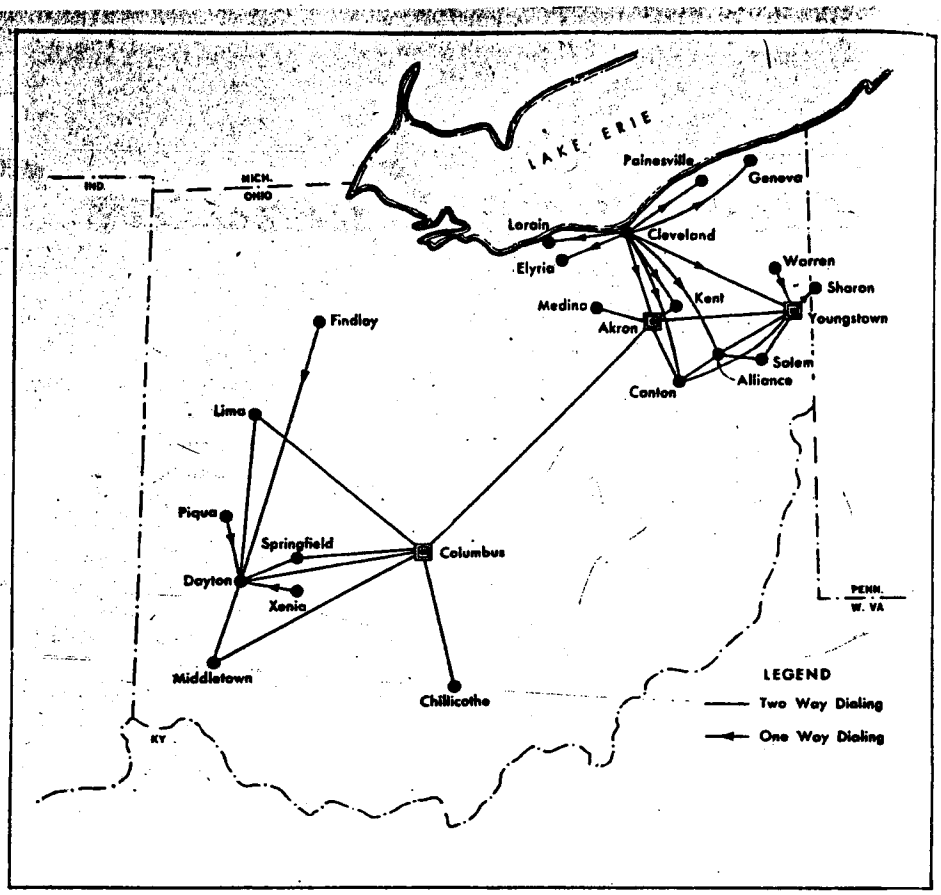


Fig. 1

and must know, before she starts to dial, the codes necessary to get through each of the switching points involved. Also, if the circuits at any point along the line are busy and an alternate route is available, she must dial a new set of codes to use that route.

To avoid these difficulties in a nationwide toll dialing system in which definite codes are established for the destination points, it is necessary to provide facilities whereby the code dialed by the originating operator is translated to the extent necessary to route the call through all of the intermediate switching points. Also facilities must be provided for the automatic selection of alternate routes to avoid any call being blocked at any point along the preferred route by an "all trunks busy" condition.

It is proposed in the Bell System to provide these common control switching arrangements with crossbar toll switching equipment. Other types of dial equipment may be used where common control switching arrangements are required so long as provision is made for coordinated operation with other equipment in the nationwide toll dialing system.

EDITOR'S NOTE: *With reference to this and the three preceding paragraphs, it is understood that step-by-step automatic equipment, which is widely used by Independent companies, may be arranged on a "Director" basis to provide digit translation, alternate trunk routing and the various other features provided by crossbar equipment, to meet the requirements of a nationwide toll dialing system in which definite codes are established for the destination points.*

Characteristics Required of Control Switching Equipment

For satisfactory nationwide operator toll dialing, it obviously is necessary to have the equipment determine the routing at the important switching centers designated "control switching points." On this basis, a code is assigned which represents the destination of a call, the dial equipment selects the route, operates switches at intermediate points, tries alternative routes if necessary and completes the call.

For the larger places, the No. 4 toll switching system, already in service in Philadelphia, will, with slight modifications, be adequate. This system permits calls originating in surrounding step-by-step networks to be dialed into the Philadelphia panel and crossbar dial offices or routed from one step-by-step network through Philadelphia to other step-by-step networks.

This new system utilizes crossbar switching equipment and is of the common control type, providing a high degree of flexibility and speed in the handling of calls. The common control

equipment enables the called number to be registered in storing circuits, called senders, after which it is analyzed, or "translated"; and then, depending on the destination of the call and the type of switching equipment which will be called upon to complete it, a choice of routing and pulsing automatically is determined, a circuit to the called point is selected and the signals which will locate the called number are forwarded to the destination. At this stage the common control equipment is released and becomes available for handling other calls leaving the call connected through the crossbar switches with release under control of the originating operator. The equipment functions as an outward toll tandem board, an inward toll board and a through switching toll board, but does not replace outward positions of the present type.

For busy periods when toll lines are congested, operators are located at a group of delayed-call positions and these operators can complete the calls in the order of filing as circuits become available.

Important transmission improvements and economies are obtained by the use of four-wire switching through the equipment and the automatic switching-in of repeaters whenever they are required.

The No. 4 equipment can receive the called number in terms of dial pulses or of pulses from operators' key sets. For inward ringdown or straightforward calls it provides positions of the call-distributing type without cords or multiple at which the operators key up the desired number, thus recording it in the sender and permitting the completion of such calls as if they had been dialed by the originating outward operator. Completion of calls through any kind of dial equipment or to manual offices is provided.

Experience with the Philadelphia installation demonstrates that this type of equipment, with appropriate modifications, can be used in a nationwide operator toll dialing system.

While the present No. 4 system includes most of the features required for nationwide operation, additional features also are being incorporated to make provision for automatically selecting the most direct route to a distant city.

Transmission of Signals

The long distance transmission and reception of signals or pulses will be an important factor in selecting toll circuits, establishing connections and, finally, in giving the outward operator supervision of both ends of the connection. Arrangements also must be made for the disconnection of circuits at through switching points under the control of the outward operator.

These signals must follow the general route of the call, but need not be transmitted in all cases over the same circuits on which the conversation takes place. In some cases, direct current circuits will be used between cities, but for the longer distances it is expected the signals will be sent over the regular voice frequency or carrier talking circuits.

In any event, the technique of long distance transmission of telephone and telegraph currents which has been developed so extensively in this country will play a most important part in the extension of toll dialing on a nationwide basis.

Universal Numbering Plan

Development of nationwide operator toll dialing requires, as a concurrent step, development also of a nationwide numbering plan and a simple scheme of destination codes to permit reaching any toll center in the long distance network and thus any central office and any telephone. Through this plan, the same code can be universally used by all outward operators for reaching any particular office, and this one code is transmitted forward by the equipment and reused at all intermediate switching points. (Shorter-haul toll calls will continue to be completed without the use of the national toll codes.)

To set up this universal numbering plan, the country is being divided into from 60 to 75 numbering-plan areas. Each of these will be designated by a distinctive three-digit area code. Each office within an area will be designated by a three-digit office code, not conflicting with the code of any other office within the area nor with any area code. Thus each office in the country will be assigned its own distinctive six-digit code made up of a three-digit area code and a three-digit office code.

Any toll call can be completed by dialing a maximum of 10 digits; the six digits of the area and office code and the four digits of the called telephone number. On calls between points in the same numbering plan area, the area code will not be required and only seven digits need be dialed. Area codes will contain the digit "1" or "0" in the first or second place, while office codes will never have these digits in the first or second place. This enables the equipment to recognize from the first two digits dialed whether a 10-digit inter-area or a seven-digit intra-area call is being made.

The accompanying map *(Fig. 2)* illustrates how such a nationwide numbering plan might look. It will be noted that the boundaries of the numbering plan areas generally follow state lines. To the extent that it is feasible, an entire state will be included in one numbering plan area, so that the operator can readily associate the numbering plan code with the state name. Examples of this might be the states of Washington, Maine, Connecticut and New Jersey.

The larger states, such as New York, Illinois, Texas and California, will be divided into two or more numbering plan areas each; and in some cases such as North and South Carolina, it will be possible to combine two states in the same numbering plan area.

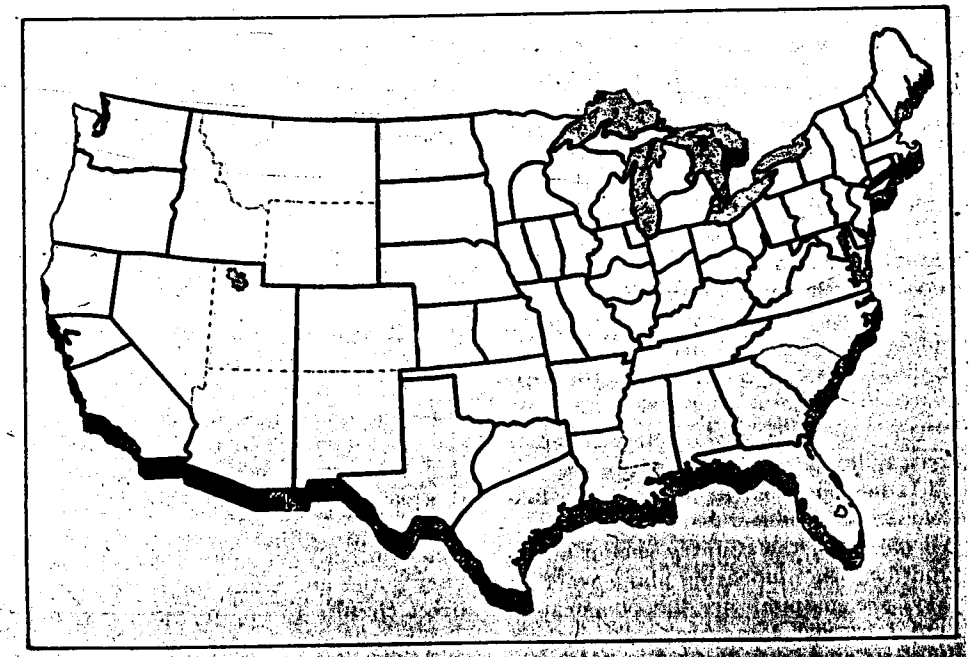


Fig. 2

No change in customers' telephone numbers or local dialing practice is necessary. For the three-digit office codes which designate the offices within a numbering plan area, and which will be non-conflicting, the first two letters of the community or office name plus a numeral generally will be used. These codes are for the use of toll operators only. For the seven-digit cities with two-letter, five-numeral numbering plans for customer use, operators will use the same office codes as customers. It is anticipated that all seven-digit cities will be on this basis by the time the new routing system is widely adopted.

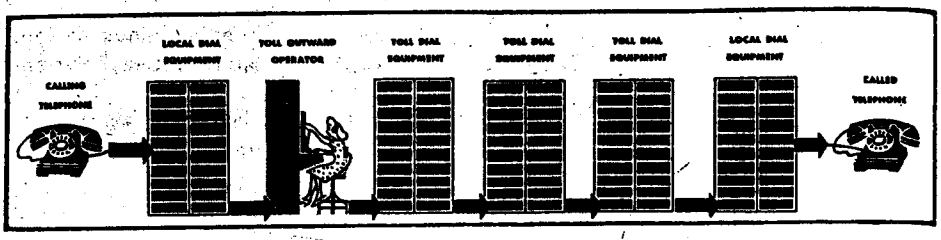
For six and five-digit cities, the code for the use of toll operators will be the existing office code with one or two added digits. For four-digit offices, the code will be three added digits.

On many calls, the entire code dialed by the operator can be derived from the information furnished by the calling customer with reference only to very simple code information on the bulletin at the operator's position. For example, on a call from Fargo, N. D., to Newark, N. J., Market 2-2100, the Fargo operator would determine from her bulletin that the New Jersey code is 312 and would dial 312 followed by the listed number MA2-2100. On a call to Newark from Camden, N. J., both of which are within the same numbering-plan area, the area code would not be required and the operator would simply dial the listed number MA2-2100.

There are numerous cities located near state boundaries which have close community of interest with places just over the boundary. Well-known examples of this are Philadelphia-Camden, N. J.; Detroit-Windsor, Ontario; and Washington-Alexandria, Va. Wherever possible the area around such cities will be included in the numbering plan area of both the adjacent states. Central office code conflicts in the adjacent cities will be eliminated and this, together with their inclusion in both numbering plan areas, will make it possible, in such cases, for operators to dial across the state boundaries without the use of numbering plan area codes. With such an arrangement an operator in Philadelphia may dial a number in Camden using only seven digits, but would have to dial 10 digits to reach a Newark number.

The numbering plan arrangements contemplated are designed to include all Independent exchanges in the establishment of the numbering plan areas. All offices in the country should be included in the numbering plans, whether they are manual or dial, to provide operators with a code for calls to those offices. Cooperative work will be necessary among the companies involved in order that proper codes may be assigned to each exchange.

Diagrammatic representation of manual toll operation. The operators in different cities are linked together by toll circuits.



Diagrammatic representation of operator toll dialing. The equipment in different cities is linked together by toll circuits.

RELATION TO GENERAL TOLL SWITCHING PLAN

The General Toll Switching Plan has an important part in the development of nationwide toll dialing. This plan provides the basic routing arrangements, under existing methods of operation, for all calls which require one switch or more at intermediate points. It set up eight regional centers, at New York, Atlanta, Chicago, St. Louis, Dallas, Denver, Los Angeles and San Francisco—all of which are directly interconnected. To these regional centers are connected some 140 primary outlets throughout the country, and to these in turn are connected all the rest of the toll centers—some 2,400. This makes it possible to complete a call from a toll center at one end of the country to a toll center at the other end with a maximum of four switches. Such a call would be routed from originating toll center over the direct circuit to its primary outlet, switched to its regional center, switched to the distant regional center, switched there to a primary outlet and finally switched at that point to the terminating toll center. Fewer switches than this would be required in practically all cases because the economical design of the toll plant has resulted in the establishment of direct circuits between many points at great distances from each other. A great number of toll centers are connected directly to more than one primary outlet and many toll centers have direct circuits to one or more regional centers. Though not essential to the plan, these circuits provide more direct routes not requiring so many intermediate switches. For transmission reasons, the plan requires that gain is provided at all primary outlets and regional centers.

The General Toll Switching Plan forms a firm foundation on which to build the extension of toll dialing. Using this plan, with the major switching points already established for manual operation, it appears practicable to locate crossbar switching systems, providing the features necessary for "control switching points," at important switching centers including the present regional centers and most of the present primary outlets. This provision of "control switching" equipment at not more than 150 points will be adequate to give every outward operator in the 2,400 toll centers direct access to such equipment. The remaining toll centers may have step-by-step toll equipment or a simplified form of crossbar toll equipment.

OPERATION WITH NATIONAL PLAN IN EFFECT

A call from Gettysburg, Pa., to Fresno, Calif., a three-switch call, will illustrate the method of handling calls. For comparison, the present manual operating method is first described for this same connection.

Present Manual Operation

The routing of many calls across the country involves one or more switches which are made at toll centers, usually primary outlets or regional centers which have been specially designated and equipped for this purpose in accordance with the principles outlined in

(Please turn to page 34)

Toll Dialing

(Concluded from page 16)

the General Toll Switching Plan. These switching points, together with about 175 additional toll centers, making about 325 in all, have been selected for operating purposes as the key points in the toll routing network and designated as Class 1 offices.

Each central office in the country is connected to a toll center, which, if not one of the 325 Class 1 toll centers, has direct circuits to one of them. The 325 Class 1 toll centers either have direct circuits to the others or know the first intermediate point to reach in the direction of the called place. Therefore, all an operator needs to know to route a call is the toll center serving the called community and the Class 1 toll center through which its inward and outward traffic is routed. (Approximately 80 per cent of all calls are completed over direct circuits and no routing information is required. Of the remainder, about 17 per cent are one-switch and 3 per cent are multi-switch.)

Under the present method of operation, when a customer in Gettysburg places a long distance call to Fresno, the Gettysburg operator goes to the routing instructions and finds that Fresno is a toll center and that Los Angeles is its Class 1 office. The Gettysburg operator reaches Baltimore, which is its Class 1 office, and says to the Baltimore through operator, "Fresno, Calif., via Los Angeles." Baltimore says, "I will give you Pittsburgh," if this is its route to Los Angeles. Reaching Pittsburgh, the Gettysburg operator again asks for Fresno via Los Angeles. Since Pittsburgh has direct circuits to Los Angeles, the next office answering will be Los Angeles, and the Gettysburg operator will then ask for Fresno, and when Fresno answers will give the operator there the called number.

If the circuits from Baltimore to Pittsburgh are busy, an alternate route will be used, the Baltimore operator saying, "I will give you Cleveland," and the advancement of the call will follow the procedure already outlined.

Operator Toll Dialing Method

In order to have the necessary switches made at intermediate points under the nationwide operator toll dialing plan, the operator needs to know only the area and central office codes. Since Fresno is a five-digit city, the national toll code would be, for example, 514 for the numbering plan area and 37, which is FR on the dial, added [illegible] five digits of the listed number, [illegible] 10 in all.

[illegible]ming, for illustrative purposes, [illegible] future routing would be the [illegible] the Gettysburg operator would [illegible] a circuit to Baltimore, and dial [illegible] digits into sender equipment [illegible] at Baltimore, a control switching [illegible] Baltimore, Pittsburgh, Los [illegible] and Cleveland will be control [illegible] points which might be used [illegible] completion of this call. The [illegible]ment at Baltimore would translate [illegible] national toll code and determine that the first route is via Pittsburgh. It would select a Pittsburgh [illegible] if one were available, and would send along the entire 10 digits dialed by the Gettysburg operator. (Incidentally, the pulsing system used between control switching points will be much faster than the step-by-step pulses generated by the operator's dial.) At Pittsburgh the equipment would select a Los Angeles circuit but would send forward only the Fresno central office code and telephone number, assuming Fresno is in the same numbering area with Los Angeles. If the Baltimore-Pittsburgh circuits were all busy, the equipment at Baltimore automatically would try the alternate route through Cleveland and the Cleveland equipment would advance the call to Los Angeles.

At Los Angeles—if that were the first control switching point—the equipment would select a circuit to Fresno and would convert the pulses received from Pittsburgh or Cleveland to the correct number of step-by-step digits and send them out over the circuit to control selection of the called subscriber's telephone at Fresno. If Fresno itself becomes a control switching point this conversion to step-by-step pulses would occur there.

If the call were for a telephone served by an office tributary to Fresno, the operator at Gettysburg would dial 10 digits as on the call to Fresno, but, of course, with a different office code. When the call reached Los Angeles, the equipment there would recognize from the office code that the call was for a tributary of Fresno and would prefix to the called number sent out over the Fresno circuit the necessary digits to [illegible] the switching operation in [illegible] Fresno were a control switching point, the Los Angeles equipment would send forward only the com[illegible] it had received.

CONCLUSION

[illegible]plicated central office [illegible] required at "control [illegible]" to make operator toll [illegible] it is apparent that [illegible] standpoint this

Answers to Traffic Questions on Page 25

(1) In clearing a circuit, if the office at which the connection terminates challenges, say, "Clear this circuit," and after receiving acknowledgement, ring again and clear the circuit in the usual way. If an intermediate operator other than the first challenges, pass the clearance order to her and after receiving acknowledgment, again clear the circuit as above unless you are certain that there is but one intermediate switch, in which case, ring on the circuit and then release it. If you are to repeat the verbal clearance, when the operator at the first intermediate office challenges, say, "Clear to (office to which clearance was passed)," and release the circuit as soon as acknowledgment is received.

(2) The circuit is held 15 minutes. If no report is received from the distant office at the expiration of this period, reach the distant operator, say, "AG," and wait for a report.

If you are told to clear the circuit and to AG in a specified interval of time, use the original precedence time if you again encounter a delay when you make the subsequent attempt.

(3) Please refer to the preface for the answer.

(4) The rate to the toll station is used.

(5) Use your judgment as to when to make the next attempt. For example, add two hours to the time the report was received following reports U today, UD, NRG (party not paged), or NRG CF, or use 2:00 p. m. following a report of U afternoon received during morning hours, 7:00 p. m. following a report of U evening received during day hours, or 9:00 a. m. following a report of U (or UD) tomorrow (or given day) or UX. If the attempt time would fall within night hours or on a Sunday or holiday, consult your supervisor before making any subsequent attempt time entry.

method of handling long distance calls is simple. Its advantages have been implied throughout this discussion; they may be summarized briefly thus—

(1) By 1940, average speed of service on all Bell System long distance calls had been brought down to 1.4 minutes, with an average of about three minutes on multi-switch calls. With toll dialing, the speed on multi-switch calls is expected to be close to that of direct-circuit traffic and the average speed about one minute.

(2) The service will be more accurate and less subject to interruptions and cut-offs.

(3) The service will be more uniform and dependable, since fast inward and through service will be available 24 hours a day to the full extent of available facilities. The value of this in peaks of traffic and in emergencies during off-hours is apparent.

(4) Fast switching will reduce holding time, and automatic alternate routing will make more routes and circuits available for a given call, thus tending to make more efficient use of the toll circuit layout.

(5) There will be substantial operating and equipment advantages.

(6) The plan is flexible in application so that it need not affect the time of conversion of an Independent office to local dial, and when this conversion is made, provision for dial handling of toll calls can be included or omitted, as seems preferable to the owner at the time.

The provision of operator toll dialing has an important place in the post-war plans of the Bell System. It will bring to the country's telephone users a faster, more efficient, more dependable — and, therefore, more useful — long distance service. Much work will have to be done in the years immediately ahead; but accumulated experience and the present toll plant together provide a sure foundation on which to build.

(To Be Continued)

Nationwide Operator Toll Dialing

FOREWORD

The following is the second of five articles. The first article, referred to in the following as the "August 13 memorandum," furnished a general description of the plan. (TELEPHONY, January 12, page 13.) This and subsequent articles discuss the operational features of nationwide operator toll dialing. In particular, the current article provides a brief statement defining the scope of this and subsequent articles in their relationship to the "General Description" and also discusses the proposed minimum features when an office is to be arranged for toll line dialing and other features that are desirable but not essential.

Throughout this and subsequent articles the proposed minimum features are identified by phrases such as "should provide," "should be provided" and "should be arranged" while the desirable features are designated by phrases such as "it is desirable" and "may be arranged."

The current article also discusses toll centers and tributary offices.

This information is made available to the industry by the American Telephone & Telegraph Co., through the Dial Interexchange Committee of the United States Independent Telephone Association.

F. E. NORRIS, Chairman
USITA Dial Interexchange Committee

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I. GENERAL

A SEPARATE memorandum dated August 13, 1945 (TELEPHONY, January 12, page 13), gave a general description of the nationwide operator toll dialing plan with particular attention to Independent company aspects. That memorandum described numbering plan arrangements in some detail, emphasizing the importance of including all offices in the country in national numbering plans whether they are manual or dial in order to provide operators with a code for calls to those offices. The August 13 memorandum also discussed the need for common control systems in perhaps 150 of the major switching points in the country, pointing out that the rest of about 2,400 toll centers could have toll dialing equipment without senders, such as the present step-by-step toll dialing equipment or a simplified form of crossbar equipment. To avoid duplication, these and other items discussed in the August 13 memorandum are not repeated in the present memorandum, though they need to be considered in connection with future engineering of any toll center or tributary office.

The term *toll line dialing* as used in this memorandum describes a method of operation which enables an outward toll operator to complete calls on a fully automatic basis to dial subscribers in a distant city or area. Calls to subscribers in manual offices may also be completed through dial switches at intermediate points. The operator has control of the entire connection, both its completion and release and receives switchhook supervision from the called as well as the calling station.

Although sender systems will be required at control switching points in the nationwide network, it is expected that many calls will be completed on a dial basis without requiring use of a sender system. Direct circuit calls which do not involve a control switching point at either originating or incoming end will be handled by the operator dialing the local called number over the direct trunk. To the extent found desirable, this form of operation, i.e., not routing through control switching points, can be extended to switched traffic to nearby places. A separate system of codes for the selection of the toll route will be used for this purpose. Since a large part of traffic on which both Independent and Bell System companies are jointly involved may be of this kind, the description of operating practices in the present memorandum relates chiefly to methods and arrangements for handling such traffic which may often employ step-by-step equipment. The August 13 memorandum covers in some detail the handling of traffic employing sender systems and if the arrangements described herein are provided the offices so equipped will operate with sender systems without further modification.

II. TOLL LINE DIALING

A. Toll Centers

2.01 Outward Toll Switchboard

2.011 Operating Procedure

At an originating toll center provided with the minimum features discussed in this memorandum, the operating procedure will be as described below.

As soon as the operator has recorded the details of the call she may plug into an idle dial line to the terminating toll center, if she has a direct circuit to that point, and dial the called number as listed. On calls that are switched at an intermediate toll point, she may precede the listed subscriber number with digits of a code provided for the purpose. The operator's cord supervisory lamp remains lighted until the called subscriber answers at which time it will go out. While the called subscriber is being rung, the audible ringing signal is received by the outward toll operator. When the called subscriber hangs up, the outward operator's cord supervisory lamp will light again to indicate the end of the call. If an all trunks or line busy condition is encountered, the cord supervisory lamp will flash at 120 or 60 IPM respectively.

If the call is intercepted, the outward operator's cord supervisory lamp remains lighted in order to avoid false charging.

The toll line dialing system makes use of "start dialing signals." These signals indicate to the operator when she may start or should stop dialing. For instance, when the equipment at the distant end of the toll line is ready to receive pulses, the start dialing lamp lights and the operator dials while the lamp is lighted. When connection is made to equipment which is not ready to receive the pulses, the start dialing lamp will go out and the operator should stop dialing until it lights again. Where outgoing senders are used, the sender starts and stops pulsing in accordance with the start dialing signals.

If the call is for a subscriber at a community dial office which is tributary to the terminating toll center, it will be necessary for the outward operator to determine by reference to a bulletin, the arbitrary code digits which must be dialed ahead of the listed number. This arbitrary code begins

with "1." If the call is for a subscriber at a ringdown tributary point the operator also will determine from her bulletin the arbitrary code which must be dialed to reach the tributary operator. This code also begins with "1." As soon as connection has been made to the ringdown tributary group, the outward operator's cord supervisory lamp will be retired.

If the call requires assistance from an operator at a distant toll center such as the inward, outward delayed, or information operator, the outward operator dials the arbitrary codes 121, 11X and 131, respectively. The X in the 11X code for the outward delayed operator is a number provided by the outward delayed operator to identify her position to the called subscriber. On calls to inward and outward delayed operators, arrangements to permit re-ring signals in both directions are provided so that the operators may be recalled to the connection without setting up the call over again. On calls to subscribers and information operators re-ring signals are not used.

2.012 Equipment Arrangements. The outward toll switchboard should be arranged either for dialing or key pulsing. It should also be provided with means for receiving supervisory signals from the dial toll line. These signals include the "start dialing" signal referred to below, as well as switchhook signals and the same facilities will receive them as receive the switchhook signals. Switchboards such as the Bell System No. 3 toll and No. 11 switchboards (or Independent company boards of the sleeve supervision type) require very little modification to provide this feature. Switchboards of the No. 1 toll variety with the supervision on the tip and ring require a major modification to provide the necessary dialing and supervisory arrangements and the start dialing feature can be readily installed at that time. Cordless and key pulsing type switchboards require outgoing senders to send the dial pulses so, instead of the start dialing feature requiring a modification in the switchboard, changes may be necessary in these outgoing senders to recognize the start dialing signals.

In the smaller switchboards it may be satisfactory to arrange the positions for dial cord dialing. In this case, the toll line jack multiple will be provided with additional jacks used only for dialing. The supervisory signals may be received on a lamp in the multiple basis or on the supervisory signal associated with the regular cord circuit. The lamp in the multiple is associated directly with the dial toll line jack into which the operator plugs and this avoids the necessity of arranging the cords of the switchboard to receive the supervisory signals.

Detailed conversion procedures are available for Bell System switchboards and it is assumed that similar procedures readily can be provided for switchboards of Independent manufacture.

The dial toll lines appearing in the outward toll switchboard, in addition to applying the proper per cent, break dial pulses, also should provide, under control of the outward operator, means for sending re-ring signals over the toll line signaling channel. The re-ring signal is one dial pulse. Reference to Division IV will show the characteristics of the dial and re-ring pulses.

2.02 Incoming Switching Equipment. Toll line dialing calls incoming to the toll center make use of dial switching arrangements which should provide access from dial toll line to local numbers, tributary offices, operators at the toll center and at through switching offices to either dial or ringdown toll lines to other toll centers.

The arrangements of the switches should be such as to permit connection to local numbers without the use of prefixed digits. It also should permit the assignment of standard codes for reaching inward, outward delayed and information operators. The uniform codes proposed for this purpose are:

Inward operator—121
Outward delayed operator—11 followed by the leave-word number of the delayed call operator
Information operator—131

At through switching toll centers it is desirable to make provision for reaching delayed through or call-order operators. The code for this purpose should be 151. At some toll centers it is desirable to make provision for getting access to the toll testboard or the one-milliwatt 1,000 cycle source for testing purposes. The codes 101 and 102 should be used here.

2.03 Other Features Provided at Incoming Toll Center. In addition to the switching mechanism to provide access to the completing trunks and toll lines at the incoming toll center there are, of course, the various types of trunks to local offices, tributaries and operators at the toll center. The general features which should be provided by the trunks and their associated equipment are:

2.031 Busy Signals. The equipment in the toll and local offices at the toll center should provide visual flashing busy signals. The line busy signal should be a 60 IPM flashing supervisory signal superimposed on the usual 60 IPM tone. The all trunks busy signal should be a 120 IPM flashing supervisory signal without tone. These 120 IPM visual flashing signals should be provided by the selectors used to reach toll lines or toll completing trunks.

A desirable feature for toll centers

COMING CONVENTIONS

Minnesota Telephone Association, St. Paul Hotel, St. Paul, January 28, 29 and 30, 1946.

Texas Telephone Association, Adolphus Hotel, Dallas, Texas, March 11 and 12, 1946.

Kentucky Independent Telephone Association, April 4 and 5, 1946. No hotel named as yet.

Nebraska Telephone Association, Paxton Hotel, Omaha, April 9 and 10, 1946.

Iowa Independent Telephone Association, Ft. Des Moines Hotel, Des Moines, April 11 and 12, 1946.

United States Independent Telephone Association Executives' Conference, Edgewater Beach Hotel, Chicago, April 16 and 17, 1946.

Ohio Independent Telephone Association, Deshler-Wallick Hotel, Columbus, April 23 and 24, 1946.

Indiana Telephone Association, Severin Hotel, Indianapolis, May 1 and 2, 1946.

Illinois Telephone Association, Pere Marquette Hotel, Peoria, May 8 and 9, 1946.

Wisconsin Independent Telephone Association, Park Hotel, Madison, May 14, 15 and 16, 1946.

New York State Telephone Association, Hotel Onondaga, Syracuse, May 22 and 23, 1946.

Pennsylvania Independent Telephone Association, Lawrence Hotel, Erie, June 4, 5 and 6, 1946.

Michigan Independent Telephone Association, September 18 and 19, 1946 (tentative). No hotel named as yet.

United States Independent Telephone Association, Stevens Hotel, Chicago, October 14, 15 and 16, 1946.

switching is done between toll lines, an additional flashing signal (30 IPM) to indicate that all toll lines are busy and a change in the rate of flashing (120 IPM) to indicate when a toll line has become available.

2.032 Start Dialing Signals. Start dialing signals should be used to start and stop the pulsing from senders or to inform operators to start or stop dialing. These signals are required for toll line dialing whenever the toll line or trunk terminates in equipment which may not be ready to receive pulses immediately. The two cases where this applies are: Toll offices making use of senders, and community dial offices in which the incoming trunks terminate on line circuits.

The toll office switches used with trunks which send back start dialing signals should be arranged so that during the trunk hunting interval and for a brief time thereafter, a stop dialing signal will be sent back over the toll line. This signal should be continued without interruption under control of the trunk. The outward operator should not dial nor should the outgoing sender pulse the succeeding digits until the equipment at the distant office is ready to receive them. The toll line or trunk in this case should be in the on-hook condition when idle, but should change to the off-hook or stop dialing condition as soon as it is seized. The time required for this shift from on-hook to off-hook should be covered by the toll office switch stop dialing indication mentioned earlier. The seizure signal should cause the equipment to prepare for the reception of pulses and when this has been done, the stop dialing condition should change to the start dialing or on-hook condition.

The toll line dialing system should be designed so that it is not necessary on the usual call to stop dialing between digits since in most offices the equipment is ready to receive pulses when the trunk to that office is seized. Provision should be made, however, so that one start dialing signal can be received in the sender between digits. A start dialing signal should include both the stop and the start dialing condition. This means, however, that any incoming senders which may be used to switch calls should be arranged to receive all the remaining digits once it is attached to the toll line or trunk.

2.033 Dial Tone. On trunks terminating on line circuit equipment at community dial offices, dial tone should usually be furnished by links or switches when the equipment is ready to receive pulses. Because of this, even though the equipment provides start dialing signals, dial tone should ordinarily be superimposed on the start dialing or on-hook condition. Inasmuch as some forms of voice frequency signaling will not function in the presence of dial tone, extra equipment may be required in certain cases at the toll center end of the trunk to prevent the dial tone from being passed back to the toll line equipment.

2.034 Audible Ringing Signal. The usual audible ringing signal should be provided on subscribers' lines while the called station is being rung. This signal is not required from trunks used to reach operators in the toll office.

2.035 Common Battery Supervision. Common battery supervision should be provided at all local stations and is highly desirable on all stations, including toll stations wherever possible, rather than magneto operation. Only in this way can the maximum benefits of toll line dialing be obtained.

2.036 Start of Ringing. At the toll center, it is desirable that the automatic start of ringing type of toll completing train should be used for completing inward toll calls. When this type of train is not provided, a line seizure signal usually should be sent back from the local to the toll office, by the toll completing train, when the subscriber's line is reached. In this case, the line seizure signal should be used to start the machine ringing automatically on toll line dialing calls. The manual start of ringing type of toll completing train should be used for outward delayed toll calls.

2.037 Release of Connection. The release of the connection should be under the control of the outward operator. There may be cases, however, where joint control (release under control of both the operator and the called subscriber) trunks are used between the toll and local or community dial offices to complete toll line dialing calls. If so, it is desirable that the trunks at the toll office end be arranged so that the holding condition for the toll office switches will be removed long enough to permit these switches to release on disconnect of the distant outward operator even though the called subscriber's receiver is still off the hook. Under this situation the busy condition should be reapplied to the completing trunk to prevent reselection by the toll office switches until the called subscriber has placed the receiver on the hook.

2.038 Intercepting. Where toll line dialing is used, the intercepting equipment should be arranged so that answering supervision is not given. In other words, an off-hook signal should not occur when the intercepting operator answers. This is to avoid false timing and charging by the outward operator on this type of call. In this case, the intercepting facilities may also be arranged so that the intercepting operator can identify toll calls. When a tone is used for this purpose the intercepting operator should be able to remove it without retiring supervision to the toll operator. A key should also be provided so that the intercepting operator may flash the supervisory lamp of the calling operator. These flashes should be sent under control of a timed relay which limits the off-hook interval of the flash in order to avoid charging. This interval normally should be of the order of .3 to .5 seconds.

Toll centers usually are provided with local intercept service. Where this is not the case, outward operators dialing into such an office, need to be warned by a bulletin notice that intercept service is not provided and therefore any "Don't Answer" conditions should be verified before being given to the calling customer.

2.039 Re-ringing on Trunks to Operators. The toll lines and trunks to operators should be arranged to permit ringing in both directions on toll line dialing calls. The need for this is brought out by the following example: In order to complete a leave-word call it sometimes is necessary for the outward delayed operator to recall the originating operator or vice versa. In this case, it is desirable that the operators can recall each other by ringing to avoid setting up the connection again when it is necessary to recall.

B. Tributaries

Dial tributaries or community dial offices in many cases will be reached by toll line dialing facilities so that the distant outward operator may complete to the tributary subscriber on a fully automatic basis.

If the dial tributary also has a switchboard it will be desirable that it have the features discussed under Toll Centers to the extent needed to handle outward toll traffic.

2.04 Incoming Switching Equipment. There are advantages in having incoming tributary trunks terminate on switches rather than on subscriber line circuits. The relative merits of the two methods of termination are discussed in some detail in Division IV.

2.05 Other Features Provided at Tributaries.

2.051 Dial Tone. When the trunk terminates on subscriber line equipment, dial tone should be applied, in the usual case, when the equipment is ready to receive dial pulses. As covered in section 2.033 under Toll Centers extra equipment is required in some cases at the toll center to prevent this tone from interfering with the setting up of the call.

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Toll Dialing

(Continued from page 30)

2.052 Start Dialing Signals. When the trunks terminate in line equipment, start dialing signals should be provided. The start dialing signal informs the operator or sender when to stop and start dialing. The stop-dialing indication is an off-hook supervisory signal while the start-dialing indication is an on-hook signal. In some cases subscribers in community dial offices may be reached by way of a tandem office of the community dial office type. If toll line dialing is involved in this case, only one of the series of trunks used to reach the terminating office should be connected to a line circuit, as the sender at the toll office is not arranged to accept more than one start dial signal between digits.

2.053 Busy Signals. Visual flashing signals to indicate to the outward toll dialing operator when the called line is busy should be provided at the tributary office. This flashing signal should be at a 60-IPM rate with busy tone.

Visual flashing all trunks busy signals are also desirable since, if the same flashing signal is used for both line busy and all trunks busy conditions, a false report may be given to the calling subscriber. The operator would continue to attempt to complete the call unless instructed otherwise by the calling subscriber. The flashing signal should be at a 120-IPM rate without tone.

2.054 Audible Ringing Signal. Audible ringing signals should be provided on connections to subscriber's lines in order to inform the outward operator that the called line is being rung.

2.055 Common Battery Supervision. Common battery supervision should be provided on all subscriber lines terminated in the tributary dial office. This feature provides the outward toll operator with cord lamp supervision required for timing the call. Where magneto toll stations are involved they should be converted to common battery supervision and terminated on the tributary dial equipment or reterminated at the toll center. This will avoid the need for monitoring at the toll center on any calls to and from stations connected to the dial tributary.

[illegible] Intercepting. Because of the cost of this type of equipment it is ordinarily limited to offices having 500 or more lines. It is felt, however, this service should be provided in offices adjacent to Metropolitan ar

In offices not equipped for intere ing service a uniform distinctive nal is desirable when a vacant terminal is reached. Signals used other purposes such as line busy audible ringing should not be used this purpose since they give the cal party and operator false indicati If a distinctive tone cannot be g the equipment should be arrange that no signal is returned on the

Calls to vacant levels or codes wi the dial office should receive the a treatment as calls to vacant termi

(To Be Continued)

Nationwide Operator Toll Dialing

FOREWORD

This, the third of five articles, discusses the proposed minimum design features of a Bell or Independent community dial office which would enable the CDO to function satisfactorily with its operator office (usually a toll center which might also similarly serve a number of other Independent company or Bell System CDO's or manual tributaries). The second article in this series appeared in the January 19 issue, page 28.

F. E. NORRIS, Chairman
USITA Dial Interexchange Committee

* * *

III. COMMUNITY DIAL OFFICE FOR OPERATION WITH AN OPERATOR OFFICE

A. Features Provided for Operator Office Operation

An operator office may perform the operating work for a number of community dial offices of various types. It is apparent that certain of the operating features provided in each of the community dial exchanges should be the same so that the same operating practices can be used at the operator office for all of the community dial offices.

3.01 Joint Operator and Station Control of Connections on Calls Originating at the Community Dial Office. The equipment should be arranged so that the calling customer can flash the operator without breaking down the connection. The operator also should be able to change cords without breaking the connection.

3.02 Operator Control of Connections on Calls to Community Dial Subscribers. The equipment should be so arranged that the called party can flash the operator without breaking down the connection but the operator should have control of the release of the connection.

3.03 Common Battery Supervision. Common battery supervision should be provided on toll as well as local stations in place of magneto operation. Only in this way can the maximum benefits be obtained since this provides the operator office operator with uniform cord lamp supervision on calls to all community dial telephones.

Magneto service lines sometimes need to be rebuilt or improved before an office is converted to community dial. A magneto toll station operated from a manual tributary should be converted to common battery or reterminated at a toll center when the tributary is converted to dial operation. This will avoid the need for monitoring supervision at the toll board on any calls to and from stations connected to the dial tributary.

3.04 Uniform Type of Coin Telephone Service. Postpayment coin telephones have been used quite generally in small community dial installations and for economic reasons this type of service is preferred. It is highly desirable that the type of coin service provided in the community dial offices served from an operating center be uniform. As an exception standard prepayment coin service, where justified in one or more offices, should be satisfactory, particularly if the operator office is arranged for handling this type of service.

3.05 Uniform Identification Signals for Coin Telephones. All community dial offices should have the same tone signal to indicate to the operator that the calling telephone is postpay coin. A single spurt of dial tone is the preferred signal.

Postpay telephones can be served over the same trunk group with other classes of service, while prepay telephones generally require a separate group of trunks. The separate trun group identifies them as coin and there fore no identification signal is neces sary.

3.06 Audible Ringing. Automati ringing of the called telephone wit accompanying ringing induction in forms the operator that a connectio has been established and that ringin current is being applied.

The cost of this feature is not larg and its advantages are so apparen that it is desirable to provide it in mos dial offices. Its provision is importan from the viewpoint of uniformity t the operator office operator.

3.07 Busy Signals. The equipmen at the community dial office should pro vide visual flashing busy signals. Th line busy signal should be a 60 IPM flashing supervisory signal superim posed on the usual 60 IPM tone. Th all trunks busy signal is also desirabl and where provided should be a 12(IPM flashing supervisory signal with out tone.

3.08 Alarm Signals.

3.081 Handled by Operator Office Operators. These signals indicate to the operator the various types of equip ment troubles in the dial exchanges The alarm signals may be used with o without an alarm sender.

Where the alarm sender is used th equipment at the CDO should be ar ranged for the following method o operation at the operator office:

When a trouble condition occurs a the community dial office a regula trunk to the operator office should be seized either immediately or after a measured delay and the answering jack lamp lighted.

When the operator answers, no special indication of the trouble condition should be given. It appears to be an abandoned call except that the cord supervisory lamp remains dark and the trunk should not release until the alarm checking terminal has been dialed.

The operator dials an assigned number over another trunk to reach the alarm checking connector terminal in the community dial office. Where trunks are arranged for dial back operation the operator dials the alarm checking terminal number back over the same trunk over which the alarm signal was received.

Where an alarm sender is not used

Best Story of the Week — What's Yours?

A thief, somewhat of a psychologist, sought, in his own little way, to aid the victim of his wrongdoing. Here is the story:

When George F. Massengill of Kansas City, Mo., returned to his hotel room after a short absence, he found about $50 worth of his clothing missing. On a desk was this note: "Call HA 1500, Extension 241."

The telephone number was that of police headquarters; the extension, the burglary and robbery bureau.

the equipment at the CDO should be arranged with an alarm checking terminal in order that the operator office periodically can dial this terminal to ascertain if there are trouble conditions.

One of the following signals should be present whenever the alarm checking terminal is called indicating the nature of the trouble.

Major Alarms	Alarm Transmitted After Delay of:	Signal or Alarm Checking Terminal
Main and common fuses	0	No tone
Ringing failure	1-4 Min.	No tone
Low or high voltage	1-4 Min.	No tone
End cell control	1-4 Min.	No tone
Master charge control relays	1-4 Min.	No tone
Line finder control blocked	1-4 Min.	No tone
Line finder start lead ground	1-4 Min.	No tone
Excessive Number of Permanent Signals	0	Dial tone

Minor Alarms	Alarm Transmitted After Delay of:	Signal or Alarm Checking Terminal
Individual fuses	0	Busy tone
Ringing transfer	1-4 Min.	Busy tone
Release magnet	1-4 Min.	Busy tone
Permanent Signals Less Than Excess Number	20-60 Min.	1-Ring code
No Trouble	.....	2-Ring code

3.082 Handled by Maintenance Desk at Operator Office. In the larger offices it sometimes is desirable to use a *separate alarm trunk* arranged to bring in one of two lamp signals on an alarm panel at the office responsible for the maintenance of the particular dial office involved. The two lamps and jacks are provided to show major and minor trouble conditions.

The signaling conditions on this alarm trunk at the dial office end should usually be 115-ohm battery and 0 ohms ground on the tip and ring, the polarity being determined by whether a major or minor alarm is to be sent.

At the test desk end the signaling condition usually should be a 2,500-ohm bridge including two relays, one of which is polar.

3.09 Verification Arrangement. Verification arrangements should be provided where feasible, particularly in offices near metropolitan areas, in order that emergency calls may be completed to a busy line. These facilities also permit verification of a line busy condition.

In smaller offices verification calls may be completed through the regular switching train by dialing a preliminary or supplementary code in addition to the listed subscriber's number. The arrangement most generally used is to dial a code followed by the number to be verified.

In large offices the verification trunk may terminate in switching equipment which has access to the test train and in this case only the number to be verified need be dialed.

Wherever verification facilities are used they should be of such a type as to permit a uniform method of operation to be used with all the community dial offices involved.

The signaling conditions on verification calls should be the same as for regular calls except that busy signals are not obtained.

3.10 Busy Line Cut-In Equipment. Where it is not feasible to provide verification arrangements, it is desirable to employ busy line cut-in equipment appliqued to each of the few important lines which should be provided with means for accepting emergency calls while busy on other calls when an arbitrary number is dialed. The signaling conditions on the busy line cut-in calls should be the same as for regular calls except that usual flashing busy signals are not obtained.

3.11 Reverting Call Arrangements. Two general methods of making reverting calls are used in community dial offices; with one arrangement the customer simply dials the number of the other party on his line and with the second arrangement he must dial a reverting call code followed by one or more digits for the ringing code of the called station. It does not appear practical to eliminate either of these two methods, and therefore, either one or both of them may be used in the community dial offices served by a common operator office. However, the reverting call arrangement should be limited to the two described, so that in giving instructions to community dial customers on making reverting calls, the operator office operator will not have to distinguish between more than two methods.

3.12 Intercepting. Because of the cost of this type of equipment it ordinarily is limited to offices having 500 or more lines. It is felt, however, that this service should be provided in all offices adjacent to metropolitan areas.

In offices not equipped for intercepting service a uniform distinctive signal is desirable when a vacant line terminal is reached. Signals used for other purposes such as line busy or audible ring-

ing should not be used for this purpo since they give the calling party a operator false indications. If a distin tive tone cannot be given the equipme should be arranged so that no signal returned on the call.

Calls to vacant levels or codes with the dial office should receive the san treatment as calls to vacant termina

B. Miscellaneous

3.13 Tandem Community Dial Offi Trunks. Certain community dial offic may be connected with the operator o fice through a dial tandem point.

3.131 Calls from Community Di Office to Operator Office. There a three general methods of switching ta dem calls to the operator office throug these tandem points:

(a) One Digit Tandem Operation. With this method the subscriber in th community dial office reaches the oper tor office by dialing the usual "0" whic causes the community dial office to s lect a trunk to tandem. At the tande office this trunk is automatically co nected to one of a common group of o erator office trunks without the need c extra digits.

(b) Dual Function Operation. Wit this method the subscriber in the con munity dial office reaches the operato office by dialing the usual "0". In thi case, the community dial office equi ment selects a trunk to tandem an automatically sends a digit "1" to th tandem equipment. At the tande point where the trunk terminates on selector, a connector or a line circui which requires extra digits to connec through to the desired point, this digi "1" is used to select one of a commo group of trunks to the operator office

This dual function trunk also per mits subscribers at the community dia office to dial subscribers at the tanden office over the same trunk used to reac the operator office. Furthermore thi trunk can be used to reach other com munity dial offices. In either of thes cases, of course, the first digit dialed must not be the digit "0".

(c) Dial Selection at Tandem by On or More Tandem Digits. With thi method an additional digit such as an other "0" is needed to reach the opera tor office. Subscribers in other com munity dial offices also can be reached by the use of extra digits.

3.132 Calls from Operator Office to Community Dial Office. All of thes tandem trunks will work with the usua operator office trunks at the operato office end.

Calls from the operator office to th community dial office reached through a tandem office require the use of extra digits.

With nationwide operator toll dialing it should be possible to reach the most remote CDO from anywhere in the na tion by having the outward operator at the originating toll center dial 10 digits.

(Please turn to page 3

Operator Toll Dialing

(Concluded from page 18)

the first three of these would represent the area code, leaving seven digits to deliver the call from the last control switching point to the final CDO and ring the called telephone. Usually three of these seven digits will be needed to get through the terminating toll center (if it is a step-by-step office) and select a toll connecting trunk to the tributary office. It appears, therefore, that in most cases a direct circuit will be desirable between the toll center and each CDO in order to avoid calling in an operator at the toll center to complete incoming calls to the CDO from the national network. This point may need to be considered in connection with plans for the use of tandem CDO operation.

3.14 Dial-Back Operator-Office Trunks. Dial-back operator-office trunks are trunks over which an operator may receive an incoming call from a community dial office and complete it by dialing back over the same trunk to subscribers in the community dial office where the trunk terminates or via that community dial office, functioning as a tandem office to subscribers in a community dial office beyond. This type of trunk is desirable where excessive back haul would otherwise be involved.

In general, trunks of this type have disadvantages from an operating viewpoint for use with an operator office employing a large toll board because the supervision is different from that on regular operator-office trunks. However, there may be cases where avoidance of long back-haul would suggest their use.

There are two general types of dial-back trunks: (1) (Simple dial-back) the type where the calling subscriber holds the line while the operator dials back over the same trunk to reach the called party, and (2) (dual dial-back or dual call) the type where the calling subscriber has hung up and the operator dials back over the trunk twice, once to reach the calling party and again to reach the called party. Each of these types may be of two varieties: (1) The trunk conductors to the operator office may be left bridged on the connection to provide monitoring and supervision, and (2) the trunk conductors to the operator office may be cut-off and no monitoring or supervision provided once the call is established.

Local conditions determine the type of trunk to be used. For instance, if the operator must time the call, the trunk conductors should be left bridged.

These trunks require that the operator be able to dial back against a receiver on or off-the-hook condition. Also an extra digit may be required in order to permit the operator to dial back.

On those calls on which the calling subscriber holds the line, the supervision should be as follows: While the operator is dialing the first digit of the called number, the cord supervisory lamp should be dark. The lamp should light after the first digit is dialed and remain lighted until the called subscriber answers. After this the lamp should follow either the called or calling subscriber switch-hook.

On those calls where the calling subscriber hangs up, the supervision should be as follows: While the operator is dialing the first party the cord lamp should remain lighted which goes dark when that subscriber answers. Then the operator dials the first digit of the second subscriber's number while the cord lamp is dark. The cord lamp is lighted during the dialing of the remaining digits of the second subscriber's number and goes out when that party answers.

The signaling on dial-back community dial trunks should be the same as for operator office trunks except that provision must be made for dialing back against a receiver off-the-hook condition.

(To Be Continued)

Nationwide Operator Toll Dialing

FOREWORD

This is the fourth of five articles made available to the industry by the American Telephone & Telegraph Co. through the Dial Interexchange Committee of the United States Independent Telephone Association. This article discusses signaling and miscellaneous matters that affect the operational features outlined in previous articles and matters relating to interconnecting the several types of offices. The third installment of this series appeared in the January 26 issue, page 16.

F. E. NORRIS, Chairman
USITA Dial Interexchange Committee

* * *

IV. MISCELLANEOUS

A. Signaling Arrangements Items

DC loop, DC composite and DC simplex signaling may be used with toll line dialing and operator office operation for toll line and trunk signaling. Signaling employing AC facilities may also be used.

4.01 Types of Signaling Systems.

4.011 DC Loop. Loop signaling normally employs a pair of conductors over which pulsing and supervision are obtained by combination of opening and closing the loop, reversing battery and ground and marginal currents. DC loop signaling may be used on interoffice, community dial, toll switching, recording-completing and some toll line dialing trunks. This type of signaling requires less equipment than the composite type; but precludes the use of phantom arrangements. It can be used for handling calls originating at local and tributary offices which terminate at the associated toll office or tributaries of the toll office.

The resistance range of dial loop signaling trunks is generally 0 to 1,200 ohms. In certain cases, such as in the AB toll transmission selector, this range can be made 1,200 ohms to 2,400 ohms by use of a relay having different adjustment values.

With loop signaling the pulsing bridge at the sending end of the trunks is usually zero ohms but may be as much as 200 ohms. Pulsing is accomplished by opening and closing the bridge at the sending end.

The term "% break" of dial pulses is defined by the formula

$$\% \text{ break} = \frac{\text{open interval} \times 100}{\text{open interval} + \text{closed interval}}$$

For 10 pulses per second this becomes, on the average,

$$\% \text{ break} = \frac{\text{open interval} \times 100}{.10 \text{ secs.}}$$

Thus, if the open interval of the dial pulse is .060 secs., the formula gives

$$\% \text{ break} = \frac{.060 \times 100}{.10} = 60\% \text{ break.}$$

The limits proposed for interchange of pulses between Bell and Independent companies are listed below:

	% Break Will Lie Within Limits Below From 9-11 p.p.s.
Input at Toll Office to.....	49 - 73% (1) and (2)
Trunk Terminating in Local Office of Toll Center	50 - 70% (4)
Input at Toll Office to.....	47 - 71% (1) and (3)
Trunk Terminating in Community Dial Office...	50 - 70% (4)

NOTES: (1) The bands shown here are for step-by-step intertoll dialing and can be shifted up or down as much as 3 per cent should conditions require, but the band width should not be widened. Where common control switching equipment using senders is used, these values should be 59.5 per cent - 67.5 per cent.

(2) These limits apply to pulses delivered to toll switching trunks terminated in AB toll transmission selectors. The pulsing contacts should be shunted with two m.f. and 500 ohms in series.

(3) These limits apply to pulses delivered to community dial and other trunks terminating in local type selectors. The pulsing contacts should be shunted by two mf and 600 ohms in series.

(4) These limits apply to toll offices without intertoll dialing selectors and are for 8-12 pps. The pulsing contacts should be shunted by two mf and 600 ohms in series.

The interdigital time usually provided by senders is 0.6 secs. The minimum interdigital time with dialing should be as near 0.6 secs. as feasible in order to allow time for trunk hunting.

The re-ring signal used on trunks employed by outward operators to reach other operators on a dial basis, should be a pulse of 50 to 120 milliseconds duration.

4.012 DC Composite and Simplex Signaling. Composite signaling provides three signaling channels and one earth potential compensating channel for each quad (two pairs) or phantom group. Occasionally composite signaling channels are obtained from the phantom leads of a quad or two pairs. This is known as composite on the phantom.

Simplex signaling provides one channel for each pair by using the two wires in parallel. One channel may also be obtained by using two pairs in parallel. This is known as a simplex on a phantom.

The fundamental signaling circuit used with both composite and simplex signaling employs a ground return making it necessary with toll line dialing and on trunks to community dial offices which encounter material differences in earth potential at the two ends to employ an earth potential signaling channel to neutralize the effects of the earth potential difference.

It should be noted that where desirable the DC composite and simplex channels need not follow the talking channel:

(*a*) *Composite Sets.*

Two kinds of composite *sets* are used with composite signaling.

(1) Suitable for either 48-volt signaling or 130-volt telegraph.

(2) Suitable only for 48-volt signaling.

The terms "heavy duty" and "light duty," respectively, may sometimes be used by Independent manufacturers to refer to these two arrangements. The terms Type C for the first case and Types D and E for the second are ordinarily used in the Bell System.

The term "heavy duty" refers to the Independent manufacture composite set equipment which is suitable for either 48-volt signaling or 130-volt telegraph conditions. This composite set uses coils having higher inductance and

larger current carrying capacity than the light duty coils, and is comparable to the Bell System Type C composite set which should be used in combination with two or four mf. condensers connected to ground from each signaling lead, for short or long haul composite signaling. The Type C composite set may also be used for telegraph purposes by increasing to six mf. the capacity from each signaling lead to ground.

The term "light duty" refers to the use of the Independent manufacture light duty composite set which is for 48-volt application and is unsuitable for telegraph, with its higher voltage. This arrangement is comparable to the comparatively inexpensive Bell System Types D or E composite sets. The Type D composite set is intended for use with a short range signaling circuit on community dial office trunks, switching trunks and tributary trunks where voice repeaters are not involved. Type E composite sets are for use with cable intertoll dialing circuits where the maximum range capability of the associated signaling circuit is not required.

The Type C composite sets are being superseded by the Type E sets in the Bell System for toll circuit application to two-wire cable circuits. For four-wire cable and open wire *toll circuit* cases, however, the Type C is the present standard.

The Type D or light duty composite set is intended for use on non-repeatered community dial office, toll switching and trunks to tributaries of toll centers where comparatively inexpensive equipment is required. The same type of retardation coils is used in this set as in the Type E set but the arrangement of the composite set circuit is different in that the Type D set has the retard coils connected outside the repeating coil while the Type E set has them connected to the inside winding terminals of the repeating coils.

(*b*) *Composite Signaling Equipment.* Two kinds of composite signaling equipment are available.

(1) Short haul
  Combined Unit
  Separate Unit
(2) Long haul

The Independent manufacture is a short haul combined unit suitable for operation on trunks having loop conductor resistances up to 1,200 ohms of cable. The equipment made by the Bell System is described below.

(*1*) *Short Haul (4,800 ohms loop resistance of cable or 100 miles of open wire).* The short haul signaling equipment consists of two varieties:

Combined Unit. The combined unit variety combining the repeating coils, composite sets and composite signaling equipment into one unit is intended for use on community dial office trunks, toll switching trunks and trunks to tributary offices of toll centers where comparatively inexpensive equipment will suffice. This equipment is suitable for operation on trunks having loop conductor resistances up to 4,800 ohms of cable or 90 miles of 104 copper wire with 45 to 50-volt battery. Shorter ranges are obtained with 40 to 56-volt battery.

Two equipment arrangements are available, (a) a single circuit or (b) a phantom group which may be equipped for one, two or three circuits as required. Both include the line repeating coils, composite sets for connecting the signaling leads from the signaling circuit to the repeating coil, and the signaling circuit with its line balancing network. The latter includes retardation coils, condensers and resistances. To further reduce its cost the signaling equipment test jacks are omitted on these units. This fact and the type of composite set coils ordinarily preclude the use of this equipment on intertoll dialing connections except on the tributary trunks which may be the last link in the toll connection. No provision is made for the use of this equipment at points having voice repeaters. However, it may be used with the present types of single channel type carrier systems. The single circuit unit is intended primarily for use with an open wire phantom group or a cable quad to obtain a fourth signaling channel in cases where the earth potential neutralizing leg is not required, but it may be used as a single circuit.

Separate Unit. The separate unit variety, in which the composite signaling circuit is a separate unit from the repeating coil and composite set, is universal in its use for toll lines and trunks. This arrangement is suitable for use with or without voice repeaters on circuits having up to approximately 4,800 ohms of cable or 100 miles of open wire line with 45-50-volt battery. Somewhat shorter ranges are obtained with 40-56-volt signaling battery. This arrangement should generally be used with toll lines which do not include an intermediate voice repeater. However, arrangements are available which may be used where a 19-ga. cable toll line of 50 miles or less in length includes an intermediate voice repeater. Where an intermediate voice repeater is employed, the signals should be by-passed around it. The unit is furnished only on a phantom group basis and includes test jacks to expedite maintenance.

These phantom group signaling arrangements are furnished with the associated networks for balancing the signaling circuits mounted on a separate unit, and the unit may be equipped for one, two or three circuits as required. The repeating coil and composite set should be ordered and mounted separately.

(*2*) *Long Haul (8,000 to 12,000 ohms loop resistance of cable).* This arrangement is primarily for toll line dialing and as used in the Bell System employs either the Type C or Type E composite sets. The range with Type C sets is 12,000 ohms, loop conductor resistance (130 miles of 19-ga. cable) whereas the range with Type E sets is only 10,000 ohms. This circuit is suitable for operation with terminal and one intermediate voice repeater. Optional equipment arrangements are available for economy reasons but these reduce the upper limit to 8,000 ohms. (110 miles of 16-ga. or 90 miles of 19-ga.)

Like the short haul separate unit type composite signaling arrangement, this circuit is furnished on a phantom group basis with the networks for balancing the signaling circuits mounted on separate units. Similarly, also test jacks are furnished to expedite maintenance. The unit may be equipped as required, for one, two or three circuits. This circuit operates only on 45 to 50-volt battery. It employs more sensitive relays and more elaborate networks than the short haul circuits, and consequently is more expensive.

4.013 AC Signaling. At present voice frequency carrier telegraph equipment is required for signaling where DC channels are not available such as with carrier telephone systems. This method of signaling appropriates one of the telephone channels for the sole purpose of obtaining signaling and telegraph channels.

Another method is contemplated and further information will be made available later.

(*To Be Continued*)

Nationwide Operator Toll Dialing

FOREWORD

This is the fifth and final article in a series which discusses the Nationwide Operator Toll Dialing Plan. The current article continues the discussion of signaling and miscellaneous matters that affect the operational features outlined in previous articles. The fourth article in this series appeared in the February 2 issue, page 18.

F. E. NORRIS, Chairman
USITA Dial Interexchange Committee

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4.02 Application of Signaling Systems to Trunks and Toll Lines.

4.021 Loop Signaling

(a) General. There are three methods of applying loop signaling to trunks and toll lines:

(1) Reverse Battery Supervision. Reverse battery supervision gets its name from the fact that to change from the on-hook to the off-hook condition, the battery to ground are reversed on the tip and ring talking conductors.

(2) Wet-Dry Supervision. Wet-dry supervision gets its name from the fact that to change from the on-hook to off-hook condition the battery (wet) is removed (dry) from the talking conductors.

(3) High-Low Supervision. High-low supervision is named from the fact that the on-hook (high resistance bridge) supervision is changed to the off-hook condition by lowering the bridged resistance.

(b) For Toll Line Dialing.

(1) Reverse Battery Supervision Trunks. Where the trunk to the local or tributary office is of the reverse battery supervision type and appears on the toll line dialing switches at the toll center for the completion of toll line dialing calls, the toll center end should present towards the local end a polar bridge of not over 600 ohms except during pulsing when the bridge is zero ohms.

The local or tributary office end in this case should present towards the toll center end for the receiver on the hook condition, 48-volt battery on the ring and ground on the tip each through not more than 500 ohms including the resistance of the relay or relays which receive signals from the toll center.

The receiver off-hook condition should be the same as the on-hook condition except that the battery and ground are reversed.

(2) Wet-Dry Supervision Trunks. Where the trunk to the local office is of the wet-dry supervision type the toll center end appearing on the switch banks should present to the local end a non-polar bridge of not over 750 ohms except during pulsing when a polar bridge of about 60 ohms is employed.

In this case, the local office end of the trunk should present to the toll office end during pulsing 48-volt battery on the ring and ground on the tip each through not more than 500 ohms including the resistance of the relay which receives the signals.

As soon as the called line is reached, the battery and ground at the local office end should be reversed as an on-hook signal. This causes the toll office end to "cut-through" after a timed spurt of 20-cycle current has been sent to the local office end to start the machine ringing. The "cut-through" should remove the polar bridge and substitute the repeating coil with its 750-ohm non-polar bridge.

When the called party answers, the off-hook condition should be given. This is a "dry" condition and the battery should be removed at the local office end.

Thus the trunk should be "dry" (no battery) during talking or off-hook and wet (battery) during on-hook.

A serious objection to the use of wet-dry supervision trunks is the "joint control" of release (both the operator and called party must disconnect before the connection is released). This feature is undesirable on toll line dialing calls where the release of the connection should be under the control of the calling operator only.

(3) High-Low Supervision Trunks. These trunks should be used, in the toll line dialing case, from manual tributaries to toll centers to permit the tributary operator to dial subscribers in the toll center or other tributaries of the toll center. They should not be used for dialing between toll centers except on one-way toll lines not used for switching to other toll lines. The Bell System signaling conditions are as follows:

Manual End—Idle or Disconnect Condition. In the idle condition the manual end of this trunk has a high-low polar bridge of about 30,000 ohms including the relay which receives the signals from the toll center end.

Manual End — Seizure Condition. The seizure or plug-in-jack condition is a high-low polar bridge of not over 600 ohms including the signal receiving relay.

Manual End — Pulsing Condition. Usually the pulsing condition is zero ohms in series with the pulsing contacts.

Dial Toll Center End — On-Hook Condition. Usually the dial toll center end in the idle or on-hook condition has 48-volt battery on the ring and ground on the tip each through not more than 500 ohms including the resistance of the signal receiving relay.

Dial Toll Center—Receiver Off Hook. Same as on-hook condition except with battery and ground reversed.

(c) Operator-Office Application of Loop Signaling. Loop signaling operator office trunks may be two-way or one-way in either direction. The operator-office end should use high-low and the dial office end use reverse battery supervision arrangements.

(1) Two-way Trunks between Operator Offices and Community Dial Offices.

Operator Office End — Cord not in Jack. Usually, the resistance of the high-low polar bridge, including the relay which receives the signals from the community dial office, should be about 30,000 ohms when the operator's cord is not plugged into the jack of the trunk.

Operator Office End—Cord in Jack. When the cord is in the jack of the trunk the resistance of the high-low polar bridge should not be over 600 ohms including the signal receiving relay except that it is not over 200 ohms during pulsing.

Community Dial Office End — Receiver On-Hook. Usually the receiver

on the hook condition should be 48-volt battery on the ring and ground on the tip each through not more than 500 ohms including the resistance of the relay which receives the signals from the toll office.

Community Dial Office End — Receiver Off-Hook. Same as on-hook condition but with battery and ground reversed.

(2) One-way Operator Office Trunk —Outgoing at Operator Office.

Operator Office End—Idle or Disconnect Condition. Signaling bridge should be open.

Operator Office End — Seizure and Holding Condition. Signaling bridge should not be over 700 ohms including the polar relay.

Operator Office End—Pulsing Condition. The pulsing is generally done through a bridge of zero ohms but in any case it should not be over 200 ohms.

Community Dial Office End — On and Off-Hook Condition. Same as for two-way trunk.

(3) One-way Operator Office Trunk —Outgoing at Community Dial Office.

Operator Office End — Cord not in Jack. Usually the resistance of a high-low polar bridge including the relay which receives the signals from the community dial office should be about 30,000 ohms when the cord is not in the jack. This should be the same as for the two-way operator office trunk.

Operator Office End — Cord in the Jack. Usually the resistance of the high-low polar bridge including the relay should not be over 600 ohms. This should be the same as for the two-way operator office trunk.

Community Dial Office End — Idle Condition. Usually the signaling bridge is open. However, in those cases where the two-way trunk is used on a one-way basis the bridge should be closed.

Community Dial Office End — Off Hook Condition. Usually the seizure and off-hook condition should be 48-volt battery on the tip and ground on the ring each through not more than 500 ohms including the resistance of the relay or relays which receive signals from the operator office.

Community Dial Office End — On-Hook Condition. Same as off-hook but with battery and ground reversed.

4.022 Composite and Simplex Signaling. When Bell System composite or simplex signaling is used, the signaling conditions at both ends of the trunk are as follows:

(a) Calling End—Idle or Disconnect Condition. This condition is ground on the signaling lead through the signaling relay winding.

	% Break Will Lie Within Limits Below from 9-11 p.p.s.	
Battery Limits at Calling End 40-56 (2)	Input Permitted to Signaling Lead at Calling End	Output Delivered by Called End When Bell System Circuit Is Used
Volts		
At 40 volts	49.5 - 60.5%	48.5 - 67.5%
At 56 volts	53.5 - 64.5%	48.5 - 67.5%
Battery Limits at Calling End 45-50 (3)		
Volts		
At 45 volts	45.0 - 67.0%	42.0 - 74.0%
At 50 volts	47.0 - 69.0%	42.0 - 74.0% (4)

(1), (2), (3) and (4) — See notes below Table II

Table I (CX Signaling) (1). Circuits from toll centers or tributaries terminating in toll centers with battery limits of 45-50 volts (Bell System equipment).

(b) Calling End—Seizure and Holding Condition. This condition is 48-volt battery on the signaling lead through the signaling relay winding. This battery may vary from 40 to 56 volts in manual toll centers, 45 to 50 volts in dial toll centers, and 42 to 56 volts in community dial offices.

(c) Calling End—Pulsing Condition. Pulses are intervals of ground on the signaling lead corresponding to the "break" of the usual dial. The limits of pulses delivered to the sending lead of the composite signaling circuit at the calling end are shown in Tables I and II: These tables show the output of the corresponding circuit when it is also used at the called end. The limits shown for both the calling and called ends are for the "worst circuit condition."

NOTE: The arrangement of the Bell System composite and simplex circuits is such that very little change is required in the composite and simplex signaling equipment units of either the Bell or Independent manufacturers to permit them to operate satisfactorily with the Bell type on one end and the Independent type on the other.

The interdigital time usually provided by senders is 0.6 secs. The minimum interdigital time when dialing should be as near 0.6 secs. as feasible in order to allow time for trunk hunting.

The re-ring signal used on trunks employed by outward operators to reach other operators on a dial basis should be a pulse of 50 to 120 milliseconds duration.

	% Break Will Lie Within Limits Below from 9-11 p.p.s.	
Battery Limits at Calling End 45-56 (1)	Input Permitted to Signaling Lead at Calling End	Output delivered by Called End If Bell System Circuit Were Used
Volts		
At 40 volts	46.0 - 65.0%	45.0 - 72.0%
At 56 volts	46.0 - 65.0%	41.0 - 68.0%
Battery Limits at Calling End 45-50 (2)		
Volts		
At 45 volts	45.0 - 67.0%	42.0 - 73.0%
At 50 volts	47.0 - 69.0%	42.0 - 73.0%

NOTES FOR TABLES I AND II

(1) The limits shown in the tables are for step-by-step intertoll dialing in the 45 to 50 volt cases. Where common control switching intertoll dialing (senders) is used, the % break limits should be easier to meet.

(2) This would apply to a toll office without intertoll dialing switches.

(3) This would apply to a toll office with intertoll dialing switches.

(4) The extreme limits (42 - 74%) will be obtained at the contacts of the incoming CX relay *only* with *through dial switching* at the calling end and all involved circuits in the *"worst circuit condition."* Since the probability of getting the extreme limits (42 - 74%) is very small it is felt that a band 4 to 6% narrower than this may ordinarily be expected.

Table II (CX Signaling) (1). Circuits from toll centers to community dial offices with battery limits of 42-52 volts (Bell System equipment).

4.023 AC Signaling. This method should be used only on intertoll trunks. AC signaling is required where DC channels cannot be made available, as, for example, with carrier systems such as Types C, H, J, K and L, and more information on this subject will be made available later.

B. Termination of Operator Office Trunks

There are numerous advantages both from the standpoint of toll dialing and of operator office operation that result from the termination of operator office trunks on incoming switches at community dial offices. It is fundamental to toll dialing operation that the originating operator have at all times positive indication as to when the switching equipment is available to receive dial pulses and when to stop dialing if at any point in the connection equipment is not available to receive any pulses not yet dialed. When operator office trunks are terminated on incoming switches the lamp signal which indicates to the originating toll dialing operator that she may dial should continue lighted throughout the dialing operation, thus making interruption or waiting on the part of the operator unnecessary.

This advantage comes about because the incoming trunk is directly connected to a switch which has access to subscriber lines and the equipment is always available to receive pulses after the trunk has been seized. Furthermore, when the operators at the operator office are accustomed to reaching customers at their exchange or at the community dial offices served by them without waiting for start dialing indication considerable operating and service advantages accrue from having all offices with which they work uniform in this regard. The larger the operator office and the greater the number of community dial offices served from the operator office, the more important this consideration becomes.

There are other advantages that accrue from incoming switch termination of operator office trunks. Incoming switches should provide access at all times even though all subscriber switching paths are busy or out of order. This is especially important during periods of overload or in emergencies. With incoming switches verification service can be obtained at a small cost per incoming switch, whereas with line circuit termination a much greater cost is involved since each link or talking path in the office must be provided with this feature. With incoming switch termination a reduction of one or two subscriber links can ordinarily be made from the number required where the trunks are terminated on line circuits.

The trunks from an operator office may, of course, be terminated on line circuits at a community dial office in the same manner as subscriber lines instead of incoming switches. When operator office trunks are so terminated and the community dial office is to be connected with the toll dialing network, arrangements need to be made at the community dial office to provide the start dialing signal to indicate to the calling operator [illegible] sender that the equipment [illegible] munity dial office is available [illegible] ceive dial pulses. It should be [illegible] however, that an operator originating a call for an office equipped in this manner must wait for the start dial signal after the trunk to the community dial office has been seized before dialing the called number. If any reason the start dialing signal is not observed, a partial dial may result or a wrong number may be reached.

In small offices of less than 30 [illegible] the relative cost of incoming switches is greater than line circuits, since the same number of links will, in many cases, be required with either arrangement of trunk termination. Also, the ratio of trunks to lines in these offices is higher and this results in a relatively higher cost per line for incoming switches.

As in the case of the start dial signal, it is fundamental that with either type of trunk termination a busy flashing signal (60 IPM) with busy tone to the calling operator when a busy line is encountered be provided for toll dial operation.

V. TRANSMISSION CONSIDERATIONS

The transmission objectives for connections established by means of toll dialing should be the same as for connections set up on a manual basis. However, the changes in traffic arrangements in Independent company areas resulting from the introduction of dial operation may lead to plant rearrangements affecting transmission.

» The first commercial telephone switchboard placed in service in New Haven, Conn., on January 28, 1878, employed a method of signalling accomplished by sending over the line to the subscriber's station, current from a buzzer known as "Coy's Chicken." This buzzer caused all receivers on the line to give out a grating sound which attracted the subscriber's attention. If the wanted subscriber heard the grating sound and answered, all others presumably hung up—unless they were interested in the affairs of their neighbors.

» Paul Porter, chairman of the FCC, was asked by the telephone company if he wanted an unlisted number.

"It makes no difference," sighed the father of pretty and personable Betsy Goodloe Porter, "I have a 14-year-old daughter and nobody can get through those busy signals on our home phone."

» In 1904 a writer suggested that there should be a word to cover a conversation held over a telephone. He said, "It is a waste of time to say 'referring to our conversation held over the telephone.' There should be a good word evolved to cover this. 'Telelogue' has been suggested. This means a word from afar. While the word seems to cover the point it is not very euphonious."

» Telephone lines are like highways—when too many persons want to travel the same road at the same time a traffic jam results.