SWITCHING SYSTEMS MANAGEMENT

DIAL FACILITIES

355A COMMUNITY DIAL OFFICES

GENERAL

CONTENTS PAGE

Figures

CONTENTS PAGE

1. GENERAL

1.01 This section covers the description, operation, and determination of quantities of equipment for the 355A step-by-step community dial office (CDO) system.

1.02 This section is reissued to include information on the 355A CDO intercept arrangements and rotary out-trunk switches (ROTS).

1.03 Reference in this section to methods, planning, data requirements, service levels, and equipment quantities are based on American Telephone and Telegraph Company recommendations.

1.04 The title of each figure includes a number(s) in parentheses which identifies the paragraph(s) in which the figure is referenced.

2. DESCRIPTION

2.01 The 355A office uses step-by-step switching equipment and is intended for use in CDOs having from 100 to approximately 1500 lines. In cases where growth has exceeded original estimates and floor space can be made available, it is possible to expand a 355A office beyond 1500 lines.

2.02 Provision has been made in this system for handling the various classes of service and traffic features commonly required in community dial areas. In addition, optional facilities are also available for other services for which there may be limited demand. Generally, these services are similar to those provided with the 350A step-by-step office with the alarm, testing, power, ringing, and other features being simplified.

CLASSES OF SERVICE

2.03 The following classes of service are provided in the 355A terminal per station (TPS) office:

(1) ***Flat Rate:***

Individual
PBX trunk
2-Party selective
4-Party semiselective
8-Party semiselective
10-Party divided code

(2) ***Message Rate:***

Individual
PBX trunk

(3) ***Coin Box:***

Postpay
Prepay
Pre-postpay

FEATURES

2.04 Features available in the 355A office include the following.

(a) ***Intercept:*** All calls to unused subscriber numbers and vacant levels should be intercepted. Intercepting by operators may be accomplished by standard intercept circuits and concentrating arragements, employing either separate interoffice trunks or combining this traffic over operator office trunks. A more economical means of intercepting is the provision of a recorded announcement system located in the same building with the CDO. The various recorded announcement systems are covered in Traffic Facilities Practices, Division M, Announcement Facilities. The 355A intercept arrangements are described in Part 3 of this section.

(b) ***Verification:*** The provision of verification facilities is recommended for all offices. It is important that operators have some means of gaining access to busy subscriber lines for handling emergency calls and for verifying busy lines. Verification facilities may be provided by separate verification trunks terminated on verification distributors having access to the test connectors in each connector group. Access to the test distributors is also provided via a level of the selectors terminating operator office trunks. Customers must not be permitted access to test trains. For obvious reasons it is essential that they be prevented from reaching a subscriber number on a "no-test" basis and thus overriding a busy line. The arrangements available to block subscriber access to busy lines are covered in Figure 1.

(c) ***Line Lockout:*** Line lockout offers service protection where the CDOs serve lines which by the nature of their construction or severe weather conditions are exposed to conditions causing frequent permanent signals. Line lockout provides timing arrangements whereby lines becoming permanent for predetermined intervals are "locked out", thus freeing line finders and associated first selectors for other traffic. The removal of the condition causing the permanent signal restores the line to service.

(d) ***Line Load Control:*** Line load control is an optional feature which enables lines which are considered essential to the public welfare to be assured of continuity of service during times of disaster and extreme emergency. Line load control is accomplished by temporarily denying originating service to some or all of the lines not considered essential. Heavy peaks of traffic which would originate from the nonessential lines could block traffic from essential lines if the line load control procedures were not implemented. It is recommended that 10 percent of the noncoin lines be treated as essential lines and the remaining 90 percent be treated as nonessential lines. When in operation, the line load control feature does not interfere with calls already established or with calls incoming to nonessential lines. Since the percentage of

essential lines is variable, the desired arrangement should be specified in the traffic order.

EQUIPMENT ARRANGEMENTS

2.05 Almost all switching equipment in the 355A office mounts on shelf frameworks of universal construction 6 feet 0-1/2 inches long which in turn mount on universal single-sided switch frames either 9 feet 0 inches or 7 feet 0 inches high. Using this arrangement, any switch unit may be mounted in any location on the frame in a manner similar to mounting relay rack units on a miscellaneous relay rack.

2.06 Other equipment, such as trunks, may be mounted either on a shelf unit or on a miscellaneous relay rack frame. Three relay rack frames occupy the space of one switch frame. This provision for mounting trunks and relay units either on switch frames or relay racks permits maximum use to be made of frame and floor space.

OPERATION AND USE

2.07 The 355A step-by-step system is an electromechanical switching system. The equipment responds directly to the customer's dialing, with each digit controlling a switch in the operation of the equipment.

2.08 When the calling subscriber lifts the receiver, a line finder switch operates to connect the subscriber directly to an associated first selector switch which returns dial tone. When the first digit of the called subscriber's number is dialed, the first selector switch will operate to connect either to another selector switch, a connector switch, or a trunk, depending on the size of the office and the destination of the call. On a local call, the last two digits dialed operate the connector switch to complete the connection between the calling subscriber and the called subscriber.

2.09 Each stage of switching is made up of step-by-step switches which step vertically and rotate horizontally through the operation of a series of springs, ratchets, pawls, and magnets. The operation of step-by-step switches is covered in detail in Dial Facilities Management Practices, Division H, Section 2b(1), Step-by-Step Local and Toll System Description.

2.10 The various switching stages (line finders, selectors, and connectors) are tied together through patterns of cross-connects and cabling. The path of a call is described in Traffic Facilities Practices, Division A, Section 1d, Sampling and Reliability of Data.

DETERMINATION OF REQUIREMENTS

2.11 Switching equipment must be furnished in sufficient quantities to provide satisfactory service at the lowest possible cost. This objective can only be met by having valid historical usage data which can be projected to the end of the engineering period. These data are used in conjunction with capacity tables, based on mathematical and empirical data, to calculate the quantity of equipment required to meet a specified service objective. The actual service is then compared with the engineering objective to ensure optimum utilization of the equipment consistant with service standards.

TRAFFIC BASE AND MEASUREMENTS

2.12 Traffic usage data should be obtained for every business day of the year. The busy season is defined as the three months, not necessarily consecutive, with the highest average busy hour hundred call second (CCS) load per main station. Any method of estimating average busy season loads other than obtaining all the busy season days is subject to sampling error as covered in Traffic Facilities Practices, Division A, Section 1d, Sampling and Reliability of Data.

2.13 Equipment may be provided using the average busy season (ABS) busy hour or the 10-high-day average busy hour, whichever is controlling. The ABS busy hour is the hour in the busy season which has the highest average CCS load. The 10-high-day busy hour is the hour having the highest 10-high-day average CCS load. The high-day busy hour is the highest of the 10 busy hours used for the 10-high-day base. The 10-high-day data include only those days which would recur annually. Extremely high days caused by a catastrophe or unusually severe weather (which would not be expected to recur annually) are excluded. Such a day is called an "odd-ball" day. The collecting, selecting, and summarizing of data and reliability checks on the data collected are covered in more detail in the subsections of the Dial Facilities

Management Practices found in Division H, Section 1c, Data Administration.

2.14 The basic data from serveral busy seasons are projected, by various trending methods, to the end of the engineering period. The projection should take into account such factors as new businesses moving into the area, zoning changes, or any other changes which could have an effect on the growth of the area or customers' calling habits. The forecasted data are put into a format, such as originating CCS per main station or terminating CCS per terminal, which can be used in conjunction with the information covered in Traffic Facilities Practices, Division D, Sections 5b through 5e, to determine equipment quantities.

2.15 Any local office having more than 1000 main stations should be equipped with a traffic usage recorder (TUR). The operation of the 3B TUR is discussed in detail in Bell System Practices Section 822-103-150 and Circuit Description (CD) 99359-01. Additional information on the 3B TUR is available in Traffic Facilities Practices, Division B, Section 10, Load Measurement Facilities, 3A TUR and 3B TUR General Description.

2.16 In offices not equipped with a TUR, usage data may be obtained through the use of portable usage recording devices, manual switch counts, or peg count and holding time studies.

SERVICE CRITERIA AND PERFORMANCE CHECKS

2.17 The probability of blocking a call through a step-by-step train is approximately the sum of the probability of blocking of each stage. The recommended criteria for a 355A step-by-step office are shown in Figure 2. Four percent blocking is the maximum level acceptable for local traffic. However, equipment configurations in small step-by-step offices having either one or two stages of selector switching are such that incoming traffic merges with local traffic at a stage in the train where it encounters the same blocking rate as local traffic. This is not appropriate for incoming traffic; therefore, design objectives for 3- and 4-digit step-by-step offices provide a 2 percent ceiling for blocking on such calls, resulting in less than 4 percent blocking on local calls.

2.18 Studies show that when dial tone is delayed over 3 seconds, the delay results in unsatisfactory disposition of the attempt in approximately one-half the cases. The subscriber either abandons the call or begins to dial before dial tone is received. Therefore, the service objective for dial tone is set low at 1-1/2 (1.5) percent dial tone delay over 3 seconds in the ABS busy hour, not more than 5 percent dial tone delay over 3 seconds in the average 10-high-day busy hour, and not to exceed 20 percent dial tone delay over 3 seconds in the high-day busy hour.

2.19 When equipment is installed and operating, the network administrator can measure its performance and compare it to the engineering objective.

2.20 Conventional dial tone speed measuring equipment is normally not practical for small dial offices. An optional measurement of dial tone delay performance may be accomplished by measuring the occupancy on AFB leads. This measurement gives directly the probability of delay greater than zero which, in a step-by-step office, is only slightly higher than the probability of delay greater than 3 seconds. A fast scan is recommended. In spite of a small base, the overall accuracy should be at least as good as the conventional test call approach because there is less sampling error. In addition to being low in cost, this means of measuring dial tone delay requires no line equipment, places no-test calls, and is less subject to equipment troubles.

2.21 Actual usage data on selectors or connectorss can be compared to the tables in Traffic Facilities Practices, Division H, Section 5b, to determine the adequacy of the number of switches provided per selector or connector group. If the number of switches is inadequate, service can be seriously affected.

3. INTERCEPT EQUIPMENT

3.01 The intercept equipment in 355A CDOs provides the capability for intercepting calls to vacant selector levels, vacant connector terminals, and disconnected or changed subscriber numbers. Equipment for trouble intercepting is not required in these offices.

3.02 Intercepted traffic is routed for operator handling to a distant switchboard or terminates on a recorded announcement in the office. Operator-handled intercept calls require an outgoing

intercept trunk circuit. This circuit is cross-connected to one of the following three facilities:

(a) Two-way operator office trunks

(b) One-way recording-completing trunks

(c) A trunk group dedicated for intercept and verification calls only.

3.03 One-way facilities similar to the recording-completing trunks will be required for CDOs intercepting in those areas served by an automatic intercept center (AIC). Machine announcement intercept traffic terminates on a recorded announcement system in the office.

3.04 Intercepting circuits for intercepting connector terminals and vacant local and toll selector levels are available. For operator-handled intercepts, these circuits are terminated on the banks of a 22-point trunk finder switch. The trunk finder switch serves as a concentrator for connecting the various intercept circuits to the outgoing intercept trunk circuit. The outgoing trunk, arranged to trip the ringing on connector intercepted calls, is connected directly or through a trunk switch to trunk facilities for the operator unit. (Refer to Part 4 of this section.)

3.05 The outgoing intercept trunk circuit may be equipped with a trunk switch for selecting an idle 2-way operator office trunk or a recording-complete trunk to a switchboard or desk.

3.06 A 7A recorded announcement system is used in CDOs for machine announcements on intercepted calls. A machine intercepting trunk arranged for controlled transfer of an intercepted call to an operator facility may be provided in CDOs.

3.07 Intercepting arrangements for CDOs equipped for automatic number identification and terminating on automatic intercept service facilities are described in Dial Facilities Management Practices, Division H, Section 2f, Step-by-Step Intercept Arrangements.

3.08 Intercepting arrangements typical of 355A CDOs are shown in Figure 3.

OPERATION AND USE

3.09 The 22-point trunk finder switch is used to concentrate several intercepting circuits on one or two outgoing intercept trunk circuits to an operator office.

3.10 Outgoing intercepting trunk circuits may be equipped with a trunk selection switch. This switch is used for routing intercept calls on the regular operator traffic interoffice trunks. If this switch is not provided, certain trunks in the interoffice group will be required for intercepting traffic to the operator office. A class-of-service tone is sent to an operator to identify the intercept calls.

3.11 Machine announcement intercept trunks to a 7A recorded announcement system, with controlled transfer, will transfer an intercepted call to an operator for assistance after two or four announcements. A class-of-service tone is furnished to the operator to distinguish an intercept call from other operator calls. A trunk selector switch is required for accessing either the operator office or the recording-complete trunk when controlled transfer is provided. This arrangement is used for intercepting calls to vacant selector levels, local and toll, and vacant connector terminals.

3.12 The connector intercept circuit for intercepting changed or disconnected subscriber numbers is connected through an outgoing intercepting trunk to an operator. The outgoing trunk is arranged to provide a class-of-service tone to the operator.

3.13 The method of operation for the 7A recorded announcement system is described in Traffic Facilities Practices, Division M, Section 3b, Announcement Facilities—Small Offices.

DETERMINATION OF REQUIREMENTS

3.14 Intercept traffic to a switchboard, desk, or AIC is provided on a limited basis from CDOs with a maximum of 1500 lines. Generally, two outgoing intercept trunk circuits are provided for the routing of all intercept traffic to an operator. These two trunks may be arranged to share the traffic that is directed to an operator.

3.15 Two outgoing intercept trunks are recommended in CDOs served by a separate trunk group, or verification-intercept group, from an operator

office. Two interoffice trunk facilities are provided for these functions.

3.16 A separate one-way outgoing interoffice trunk group is used for those CDOs with intercept traffic terminating on the Automatic Intercept System. Two outgoing intercept trunk circuits are recommended for this traffic.

3.17 Two intercept circuits should be provided for vacant selector level intercept.

3.18 Two intercept circuits are recommended for vacant or unused connector terminals. Selector vacant level intercept may be used in smaller offices.

3.19 One intercept circuit per connector group is recommended for intercepting changed or disconnected subscriber numbers.

3.20 One 7A recorded announement system is provided per CDO.

4. ROTARY OUT-TRUNK SWITCH EQUIPMENT

4.01 Rotary out-trunk switch (ROTS) equipment units consist of rotary selector switches and associated banks arranged to mount on a shelf unit with a 10-switch capacity.

4.02 A ROTS circuit consists of a 206-type selector switch and two relays to control its operation. The brushes or wipers are connected to either a selector level trunk or an auxiliary trunk. The banks of the selector unit are connected to outgoing trunks or repeater switches.

4.03 Equipment arrangements for ROTS units may be equipped as shown in Table A.

4.04 The ROTS circuits, functioning together to give common access to a group or subgroup of trunk circuits, are known as one ROTS group. An ROTS group may consist of from 3 to 30 ROTS circuits and are mounted on standard relay rack bays.

OPERATION AND USE

4.05 A common use of ROTS equipment in a 355A CDO is to access the outgoing trunks to a serving toll central or operator office. ROTS may also be used on 2-way interlocal or extended area service (EAS) trunks to another building or distant CDO. While the use of this equipment is limited in small and unattended offices, there may be extensive requirements for ROTS switching arrangements in 355A offices included in a metropolitan area trunking plan. Equipment arrangements for metropolitan area offices are covered in Traffic Facilities Practices, Division D, Section 4e-1, Rotary Out-Trunk Switches.

4.06 Preselecting ROTS equipment is recommended at the CDO when outgoing centralized automatic message accounting/automatic number identification (CAMA/ANI) to the toll network is provided on more than ten outgoing trunks. With graded selector level multiple trunking for more than ten trunks, ROTS equipment is provided with direct and secondary access trunking as covered in Traffic Facilities Practices, Division D, Section 4e-1, Rotary Out-Trunk Switches.

4.07 ROTS may be provided in CDOs to access 2-way trunk groups of more than ten trunks when the selector level subgroups are limited to the 10-terminal capability of the selectors. These 2-way trunk groups may be operator office trunks to switchboards and EAS facilities or interload trunks to a distant dial office. When these groups are equipped with a minimum of twelve 2-way trunks, access to all the trunks in the group from a maximum of ten selector level trunks may be provided on ROTS. A maximum of twenty-two 2-way trunk circuits may be served by one ROTS group. When the 2-way trunk group contains 11 trunks, it is possible to provide selector level access for ten trunks if the eleventh trunk is the first-choice multiple appearance at the operator switchboard and the first choice selected by the switching equipment at the distant office. ROTS are not required with this arrangement.

4.08 When ROTS are provided for accessing trunk circuits, in a 2-way trunk group, selector level trunks will ***not*** connect directly to the operator office or dial office trunk groups.

4.09 When the rotary switches access fewer than 22 trunks, the unused bank contacts are multipled with working contacts to avoid excessive switch hunting.

DETERMINATION OF REQUIREMENTS

4.10 Preselecting ROTS group requirements for CAMA/ANI and combined outgoing Traffic Service Position System trunk groups is covered in Traffic Facilities Practices, Division D, Section 4e-1, Rotary Out-Trunk Switches.

4.11 ROTS groups required for operator office and EAS interlocal 2-way trunk groups are provided on an "as-required" basis. It is expected that these groups will not exceed the 22-trunk capacity of the ROTS groups. Direct trunk connections are not required when using ROTS on these groups. See Figure 4 for typical equipment arrangements.

4.12 When the projected CCS loads for operator or EAS trunk groups exceed the 10-trunk selector switch capacity, graded selector multiple trunking arrangements are usually provided. A sufficient number of selector level trunks is installed for direct connections to all trunk circuits in the trunk group.

TABLE A

206 SELECTORS	APPLICATIONS	REMARKS
3 or 5	Between trunks from office beyond tandem and trunks to operator office	Not arranged for preselection of trunk
10	From selector bank multiple circuit to operator office	Not arranged for preselection of trunk
10	From selector levels or auxiliary trunks	Initial unit arranged for preselection
10	From selector levels or auxiliary trunks	Supplementary unit arranged for preselection

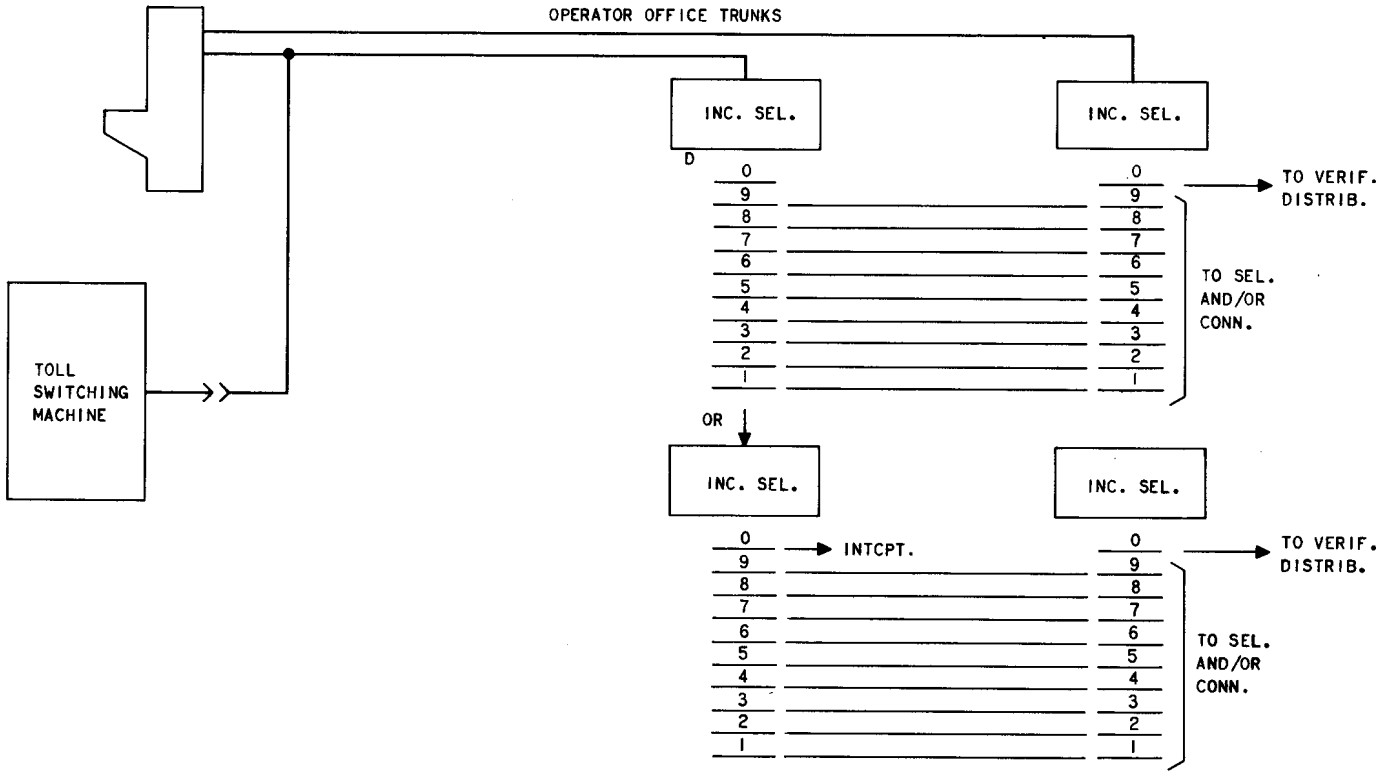


Fig. 1—Blocking Verification From Customer Access (Sheet 1 of 2) (2.04)

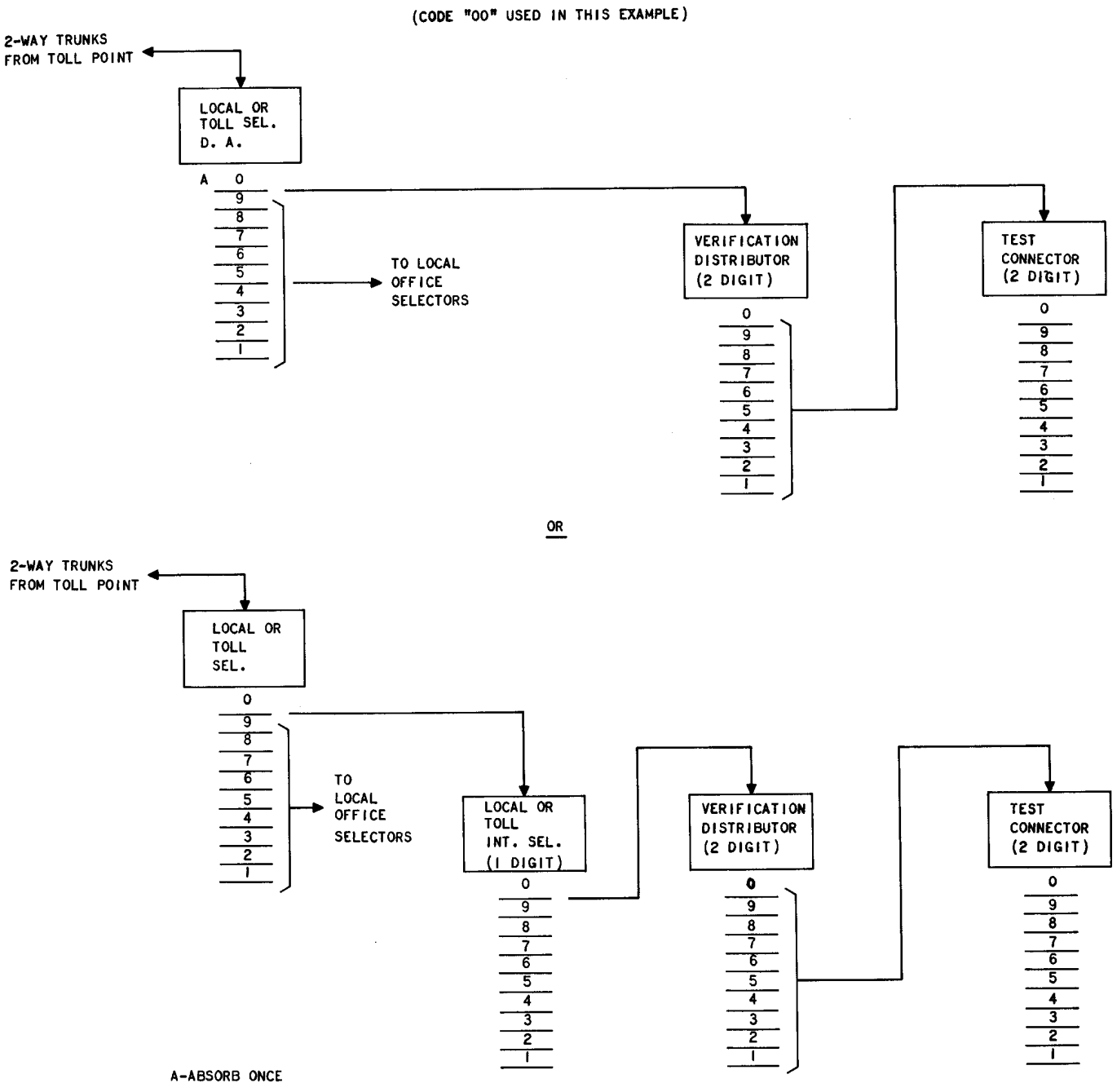
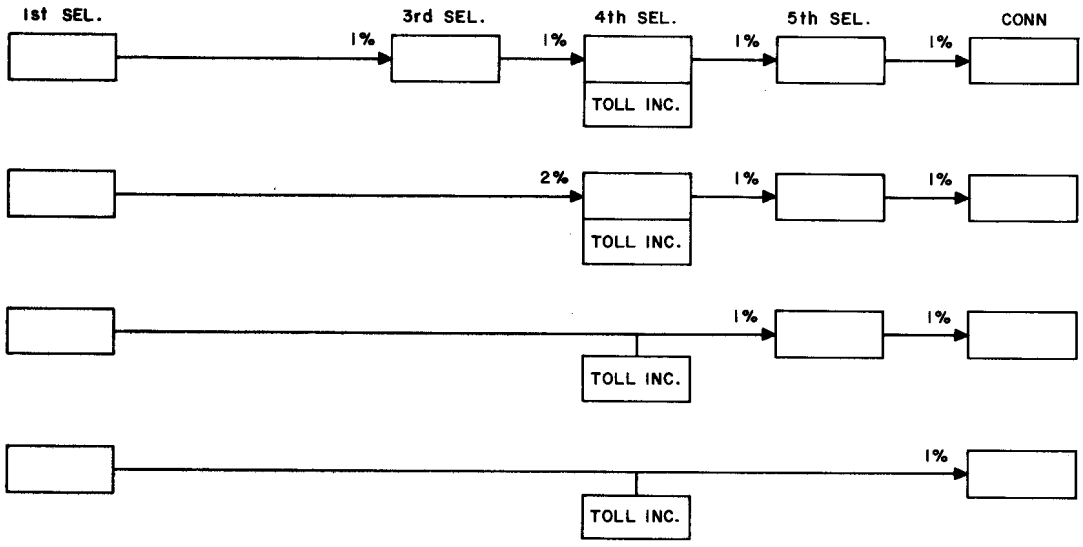


Fig. 1—Blocking Verification From Customer Access (Sheet 2 of 2) (2.04)



	BLOCKING RATE	
	LOCAL TO LOC.	INC. TOLL
	4%	2%
	4%	2%
	2%	2%
	1%	1%

Fig. 2—Blocking Criteria (2.19)

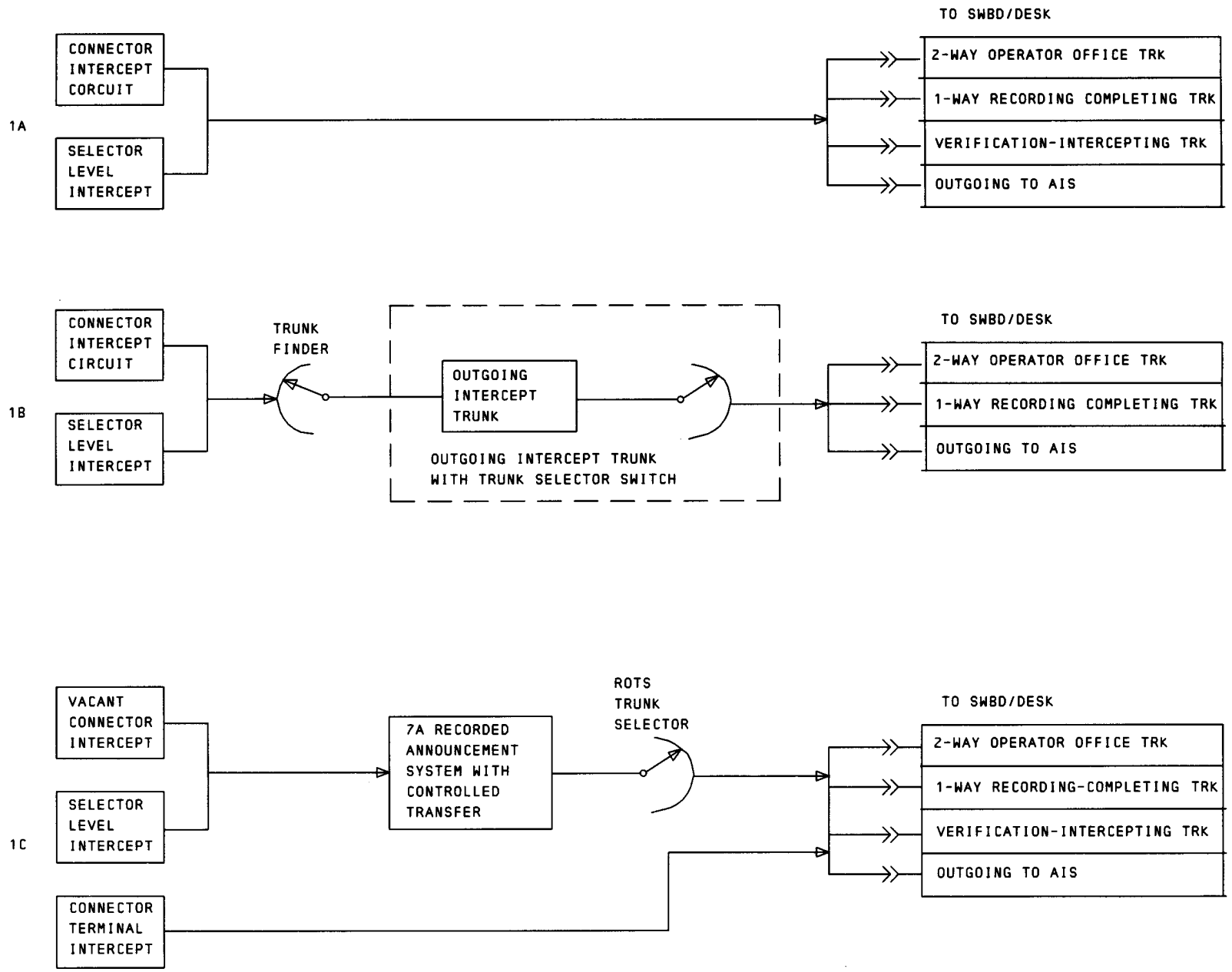


Fig. 3—Intercepting Trunk Arrangements for a Typical 355A CDO (3.08)

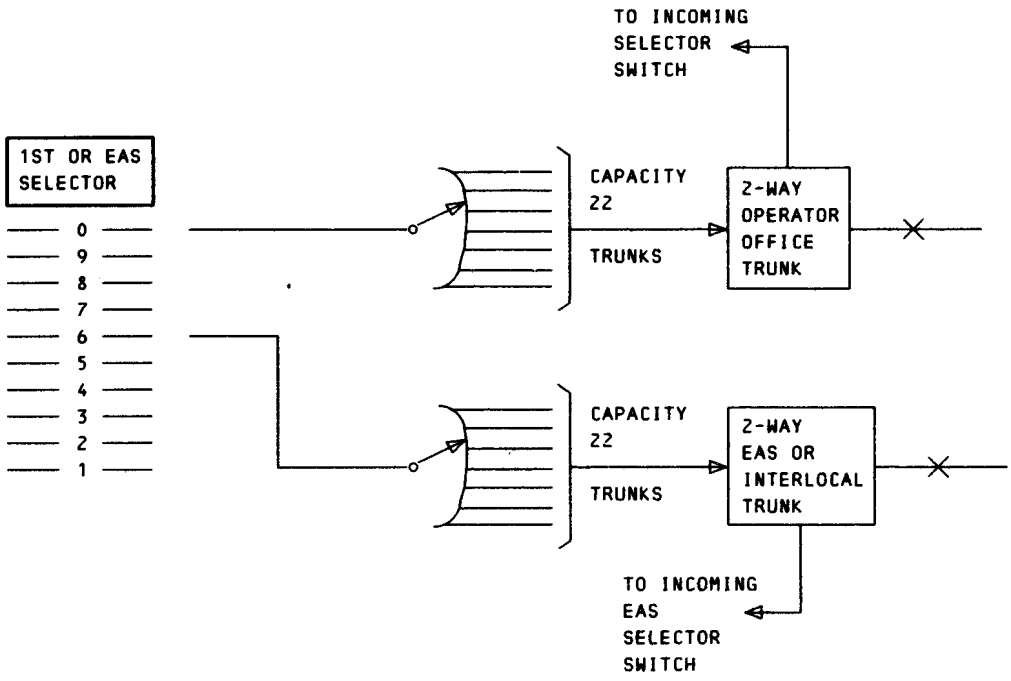


Fig. 4—Typical Out-Trunk Switch Arrangements for Operator Office and EAS Trunk Groups (4.11)