

3A AUTOMATIC CALL DISTRIBUTING SYSTEM GENERAL DESCRIPTIVE INFORMATION

CONTENTS	PAGE	CONTENTS	PAGE
1. GENERAL	3	D. Volume Control Potentiometer	13
2. FUNCTIONS OF PRINCIPAL ELEMENTS	4	E. Central Office Key	13
A. Incoming Trunk	4	F. PBX Key	13
B. Attendant Trunk	4	G. Transfer In Key	13
C. Trunk Finders	7	H. Release Key	13
D. Gate Circuits	7	I. Hold Key	13
E. Group and Test Circuit	7	J. Dictate Key	13
F. Common Group Circuit	7	K. Checking Key	15
G. Selector Switch	8	L. Audible Key	15
H. Attendant Position Circuit	8	M. Calls Waiting Lamp	15
I. Night Service Trunk	8	N. Flashing Key	15
J. Transfer Trunk	8	O. Night Service Key	15
K. Announcement Circuit	9	P. Dial	15
L. Announcement Machine	9	Q. Adjustable Auxiliary Signal	15
M. Trunk Identification Control Circuit	9	5. FUNCTIONS OF SUPERVISOR LAMP CABINET	15
N. Hold Circuit	9	A. Trunk Lamps	15
O. Conference Circuit	9	B. Position Status Lamps	15
P. Automatic Selection and Auxiliary Trunk Circuit	9	C. Alarm Lamps	16
Q. Supervisor Position	9	D. Control Keys	16
R. Supervisor Lamp Cabinet	10	E. Audible Alarms	16
S. Trunk Test Circuit	10	6. FUNCTIONS OF RECORDER-REPRODUCER CONTROL CONSOLE	16
3. FUNCTIONS OF ATTENDANT CONSOLE (FIG. 2)	10	A. Channel Keys	16
A. Incoming Trunk Key	10	B. Dictation Key	16
B. PBX Outgoing Trunk Key	10	C. Dictation Checking Key	16
C. Central Office Outgoing Trunk Key	10	D. Release Key	16
D. Conference Key	10	E. Selector Circuit Operation	16
E. Hold Key	10	F. Reproducer Trouble Release	17
F. Release Key	12	7. FUNCTIONS OF TRAFFIC DATA REGISTERS	17
G. Flash Key	12	A. Position Peg Count Registers	17
H. Supervisor Calling Key	12	B. Abandoned Calls Peg Count Register	17
I. Transfer Key	12	C. Incoming Trunk Peg Count Registers	17
J. Calls Waiting Lamp	12	D. Trunk Group Usage	17
K. Dial	12	E. Total Incoming Trunk Waiting Usage	17
L. 4-Wire Keys	12	F. Position Manned Usage	17
M. Flush Mounted Key Arrangement	12	G. Position Busy Usage	17
4. FUNCTIONS OF SUPERVISOR CONSOLE	13		
A. Monitoring Key	13		
B. Tens, Units and Group Keys	13		
C. Signaling Key	13		

CONTENTS	PAGE	CONTENTS	PAGE
H. After Call Release Work Time . . .	17	G. Outgoing Call to the Central Office .	43
I. Speed of Service Indication . . .	18	H. Outgoing Call to the PBX	44
8. CUSTOMER OPERATIONS OF		I. Hold Circuit	44
ATTENDANT CONSOLE	18	J. Talking to the Supervisor	44
A. Incoming Call	18	K. Abandoned Call Checking	45
B. Transferring Calls	18	L. Attendant Recalls Distant Operator .	45
C. Outgoing Call to the Central Office		M. Identification of Faulty Trunk . .	45
or Dial Selected Trunk	19	N. 4-Wire Circuit Operation	45
D. Call to the PBX	19	O. Night Service	45
E. Conference Circuit	19	P. Calls Waiting Lamp	46
F. Hold Circuit	20	Q. Use of the Dial	46
G. Calling the Supervisor	20	R. Transmitter Amplifier	46
H. Calls Waiting Lamp	20	11. SUPERVISOR CONSOLE CIRCUIT	
I. 4-Wire Circuit	20	OPERATIONS	46
J. Identification of Faulty Trunk . .	20	A. Monitoring and Talking to an	
K. Recorded Delay Announcement . .	20	Attendant	46
L. Live Announcement	20	B. Transferred Call	47
9. CUSTOMER OPERATIONS OF		C. Central Office Trunk	47
SUPERVISOR CONSOLE	20	D. PBX Extension	47
A. Monitoring and Talking	21	E. Hold Circuit	47
B. Transferred Call	21	F. Release Circuit	47
C. Central Office Trunk	21	G. Recalling Distant Operator	47
D. PBX Extension	21	H. Night Service	47
E. Hold Circuit	21	I. Calls Waiting Circuit	48
F. Release Circuit	21	J. Delay Announcement Controls . .	48
G. Flash Circuit	21	12. SUPERVISOR LAMP CABINET	
H. Audible Cutoff Circuit	21	OPERATIONS	48
I. Night Service	21	A. Trunk Lamps	48
J. Delay Announcement Machine		B. Position Status Lamps	48
Controls	22	C. Alarm Lamps	49
K. Calls Waiting Lamp	22	D. Functions of Keys	49
L. Trunk Lamps	22	E. Audible Alarms	49
M. Position Status Lamps	22	13. OTHER MISCELLANEOUS EQUIPMENT	
N. Alarm Lamps	22	OPERATIONS	49
O. Control Keys	23	A. Incoming Trunk Identification Using	
P. Audible Alarms	23	THE CALL DIRECTOR Set as Selector	
Q. Incoming Trunk Identification Using		Equipment	49
THE CALL DIRECTOR Set	23	B. Traffic Data Peg Count Registers .	50
R. Traffic Data Peg Count Registers .	23	C. Traffic Usage Recorder	51
10. ATTENDANT CONSOLE CIRCUIT		D. Recorder-Reproducer	52
OPERATIONS	24	E. Delay Announcement Machine . .	53
A. Incoming Call	24	F. Totalizer	54
B. Trunk Finder Operation	25	G. Tone and Alarm Circuit	54
C. Incoming Trunk Identification . .	34	H. Group and Test Alarm Circuits . .	57
D. Delay Announcements	34	I. Aisle Pilots	57
E. Transferring a Call	35	J. Alarm Extension	58
F. Conferencing	39	K. Trunk Test Circuit	58
		L. Auxiliary Trunk Circuit from	
		Switchboard to Central Office . .	58

CONTENTS	PAGE
14. EQUIPMENT ARRANGEMENTS	58
A. Major Components	58
B. Distributing Frame Equipment	58
C. Power Supply	58
15. WORKING LIMITS	59

1. GENERAL

1.01 The 3A automatic call distributing system (ACD) described in this section is a large call distributing system located at the customer's premises and is used for the automatic distribution of incoming calls to a team of service attendants. The calls are served substantially in their order of arrival and are routed to the attendants in the order of their availability. The system is intended for the use of airlines, public utilities, retail stores, mail order houses, etc for handling their order and information types of calls. The system is designed for up to 198 trunks and up to 200 service positions. The system should not be applied to installations that will not grow beyond 56 incoming trunks and 60 positions. In those instances the more economical 2A ACD system should be provided.

1.02 Other salient features are the:

- (a) Provision for direct lines to the central office and the local PBX for use by the attendant.
- (b) Provision for contacting the supervisor.
- (c) Provision for transferring of incoming calls to other locations.
- (d) Provision for using the incoming trunk circuits to make outgoing calls from the attendant position or from an associated PBX.
- (e) Provision for transferring incoming trunks to an associated PBX or another ACD system during night service.
- (f) Provision for connecting recorded or live delay announcements to incoming trunks.
- (g) Provision for identifying the originating city of an incoming trunk.
- (h) Provision for a supervisory cabinet.

1.03 The equipment is designed for providing from the minimum to the maximum number of trunks and positions as required by growth in increments of single units. Since the system is step-by-step equipment, equipment layout is similar to other step-by-step systems. Shelf units are provided for 10 or 20 finders and selectors.

1.04 The system is designed for location on the customer's premises and is installed in a separate equipment room or enclosure. If the customer has an equipment room for his PBX equipment, the ACD equipment will generally be installed at the same location.

General Operation

1.05 When a subscriber dials the number assigned to the call distributing system, he is connected automatically to an idle attendant. The attendant receives a zip tone and the name of the originating city if calls originate from different cities.

1.06 The attendant talks with the subscriber, takes his order, or provides information he may require. If the attendant does not have the information the subscriber desires, she may transfer the call to another location for assistance. This location may be the supervisor, an extension on the local PBX, or a special location. When the attendant transfers the incoming circuit, she loses all contact with the subscriber. If the attendant desires to retain contact with the subscriber, she can reach the desired third party; and then conference the third party, the subscriber, and herself. At the completion of the conference, the attendant can release the third party and resume conversation with the subscriber.

1.07 An option is provided in the circuit to give a delayed announcement to the subscriber. When the subscriber dials the system number and an idle attendant is not immediately available, the subscriber will receive a ringing tone. After a timed interval (up to 24 seconds), the subscriber will be connected to a recorded delay announcement machine. After the announcement the subscriber can be connected to an attendant if one becomes available. If after another timed interval there is still no attendant available, the

subscriber will be connected to another announcement trunk if this is provided. When this connection is made, the subscriber receives a live announcement and can talk to the attendant.

1.08 The ACD has outward lines to the local PBX and central office. The attendant is also able to call the supervisor.

1.09 A supervisor lamp cabinet and position circuit is available which permits the supervisor to monitor each attendant, talk to any attendant, and make and receive calls to and from the central office or the local PBX. The supervisor lamp cabinet indicates usage on all incoming trunks and the status of each attendant position. The position available lamp indicates if the position is occupied and whether the attendant is ready to receive an incoming call or is busy with other work. The position busy lamp indicates whether she is busy on an incoming or outgoing call. When the attendant is calling the supervisor, a buzzer sounds at the supervisor console and the position available indicator lamp flashes.

1.10 A calls waiting lamp is also provided in each attendant and supervisor console. These lamps light and a buzzer sounds when an incoming call is waiting for an attendant position.

2. FUNCTIONS OF PRINCIPAL ELEMENTS

Fig. 1 is a block diagram showing the principal elements of the 3A ACD system. In the following paragraphs the functions of these elements are described.

A. Incoming Trunk*

2.01 The incoming trunk provides a connection from the calling subscriber through the central office to an attendant. The call may also originate from the local PBX, over a private line, from a toll operator, or over a tandem circuit.

2.02 When seized from the originating end, the incoming trunk after entering the incoming trunk gate, signals the trunk finder that

connection to an attendant is required. An audible ringing tone is returned to the subscriber until he is connected to an attendant. Just before the subscriber is connected to the attendant, the attendant hears a zip tone followed by the identification of the city of origin if this feature is provided.

2.03 If an attendant is not available, the subscriber is connected to a recorded delay announcement machine in about 24 seconds. After the announcement, the subscriber can be connected to an attendant if one becomes available. If after another timed interval there is still no attendant available, the subscriber is connected to another announcement trunk. When this connection is made, the subscriber receives a live announcement and can talk to the attendant. Both of these announcement features are optional.

B. Attendant Trunk

2.04 The attendant trunk acts as a link between the incoming trunk and the attendant position. If the attendant is ready to receive an incoming call she will operate the IN key on her console. This signals the attendant trunk which enables the attendant finder to receive an incoming call. It also lights the position available (PA) lamp at the supervisor lamp cabinet.

2.05 When an incoming trunk is seized it is connected through the step-by-step switches to an attendant trunk.

- (a) The attendant trunk connects a momentary zip tone to the attendant position.
- (b) The incoming trunk lights the position busy (PB) lamp and extinguishes the PA lamp.
- (c) The incoming trunk provides a circuit for holding the attendant trunk finder.
- (d) The transmission path to the attendant position circuit is closed.

When the subscriber disconnects or the attendant operates the release (RLS) key, the attendant trunk releases the connections to the incoming trunk.

* Refers to coordinates in Fig. 1

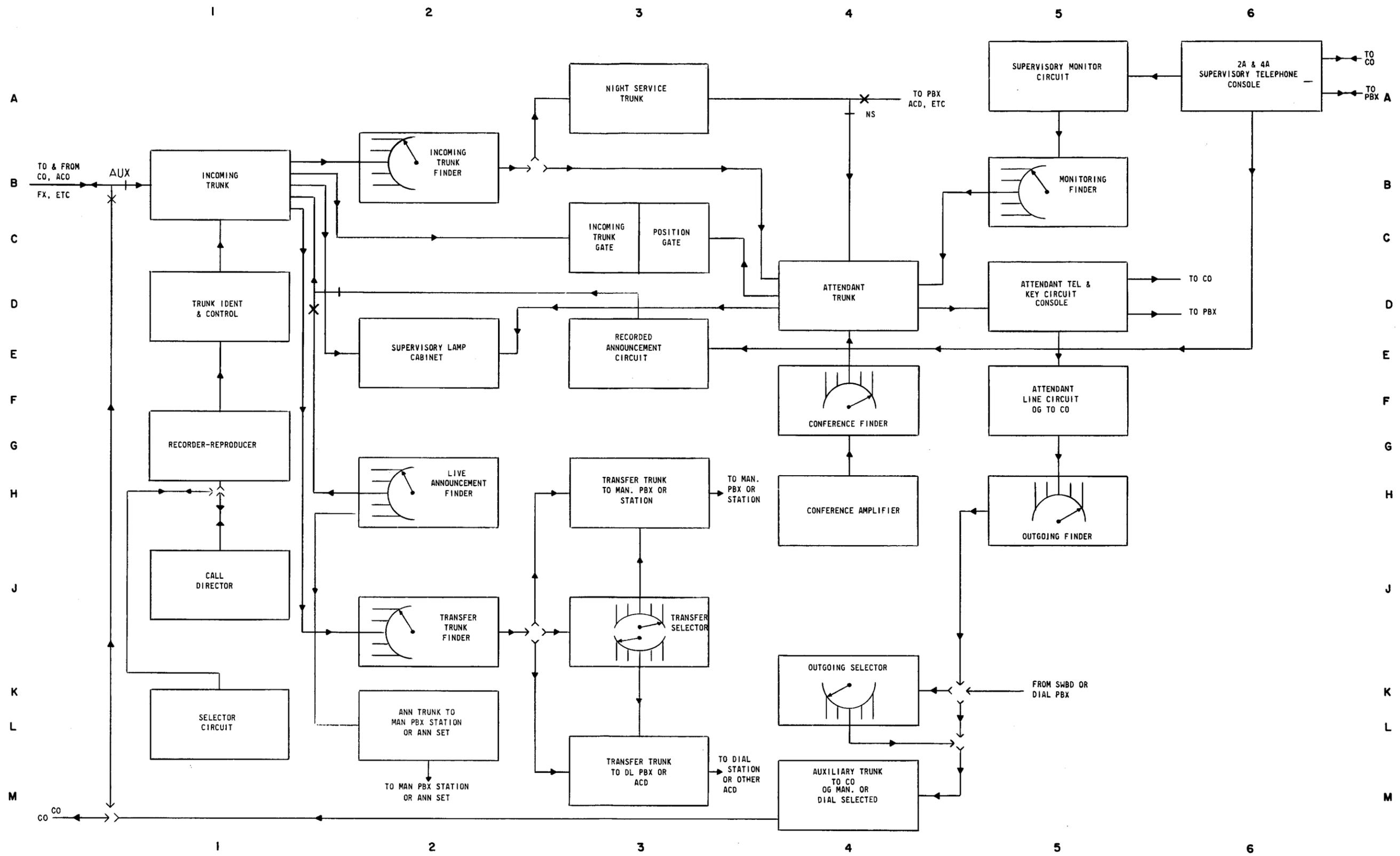


Fig. 1 - No. 3A Automatic Call Distributing System Functional Schematic

C. Trunk Finders

2.06 Trunk finders provide means for interconnecting the incoming trunks with the attendant trunks, the transfer trunks, the live announcement trunks, or the attendant telephone circuits with the outgoing trunks. A trunk finder is also used to interconnect the supervisor monitoring circuit with the attendant trunk circuits. Two hundred point trunk finders are used for the 3A ACD. There are a maximum of 198 trunks, 200 attendant trunks, and as many transfer, announcement, and outgoing trunks as required by the customer. Trunk finders are also used when low-loss conference circuits are required.

2.07 The following connections are made to terminals of the switch banks:

- (a) The incoming trunks are connected to the switch banks of the incoming trunk, transfer trunk, and announcement trunk finders.
- (b) The attendant trunks are connected to switch banks of the outgoing trunk and the supervisor monitoring circuit finders.
- (c) The incoming, attendant, and outgoing trunks are connected to the switch banks of the conferencing trunk finders.
- (d) One finder is provided for each attendant, transfer, announcement, outgoing, conference trunk, or supervisor monitoring circuit.

2.08 The bank multiple of the finders is designed to give each trunk, as nearly as possible, an equal chance of having a finder find the trunk on the lowest level in the bank. This is accomplished by means of the so-called slipped multiple in which there is a slip of one level between adjacent finders so that the 20 lines (10 lines on one level of each bank) which appear on the first level of a finder appear on the second level of the next finder. Ten finders permit a complete slip cycle; and if the number of finders in a group exceed 10, the cycle is repeated as far as possible. This is more completely described in 10.12.

D. Gate Circuits

2.09 The system is arranged so that incoming calls are served substantially in the order of arrival and attendants substantially in the order of availability.

2.10 In order that the incoming trunks may be served in the proper order, the gate opens and admits all trunks waiting for an attendant. The gate then closes. When all trunks have been served, the gate reopens and admits all trunks with calls waiting. This cycle is repeated continuously as long as incoming calls are waiting to be served.

2.11 In order that the attendant trunks may be served in the proper order, the gate opens and admits all attendant trunks available. The gate then closes. The trunks within the gate are served and when all have been served, the gate reopens and admits all attendant trunks available. This cycle is repeated continuously as long as attendants are ready to serve.

2.12 If a gate circuit fails, the common group circuit recognizes this, releases the gate circuit, and allows the incoming trunks or the attendant trunks to be served in numerical sequence.

2.13 When a position is not available and an incoming trunk is inside the trunk gate, a calls waiting lamp is lighted at each attendant console, at the supervisor console, and at other strategic locations. During night service operation the calls waiting lamp control is made inoperative.

E. Group and Test Circuit

2.14 This circuit is associated with the incoming, transfer, announcement, auxiliary outgoing, or conference trunk finders. When a trunk calls for a connection, the group circuit of the trunk determines which finder in the subgroup should start hunting for the calling line. If no idle finder is available in the subgroup, the group circuit connects the start lead to the next subgroup.

2.15 This circuit also is arranged to detect the following trouble conditions:

- (a) A grounded start lead.
- (b) Foreign potential on the start lead.
- (c) A call blocked condition.

F. Common Group Circuit

2.16 The common group circuit combines the gate circuits and the group and test circuits described in D. and E. for the use with

SECTION 981-236-100

the incoming trunk finders. In addition, it contains alarm circuits:

- (a) To indicate failure of either the position or trunk gate circuits.
- (b) Battery test keys to check that the double winding relays operate when either winding is opened for a test.

G. Selector Switch

2.17 The selector switch is a trunking switch; its purpose is to select an idle trunk in a particular trunk group, which will properly route calls to completion. Unlike the line finder which automatically seeks the line calling for service, the selector depends on the attendant dial for its operation. The vertical movement of the wipers is controlled directly by the pulsing of the attendant dial, while the rotary wiper movement is under control of the selector switch itself.

2.18 Selectors may be used with transfer trunks or for outgoing trunks to the central office.

H. Attendant Position Circuit

2.19 The attendant position is used in conjunction with the attendant trunk to receive calls from incoming trunks. In addition:

- (a) The attendant can transfer incoming calls in conjunction with the transfer trunk to other locations.
- (b) The attendant can make calls to the central office and the PBX.
- (c) The attendant can arrange for a conference between the incoming trunk, herself, and a third party over a central office or PBX trunk.
- (d) The attendant can release the incoming trunk before the subscriber hangs up.
- (e) The attendant can initiate a flash to a calling operator.
- (f) The attendant can summon the supervisor for assistance.
- (g) The attendant can place the line connected to the position in the hold condition. Operation of a key for outgoing calls to

the central office and to the PBX, or when transferring a call puts the incoming trunk automatically on hold.

- (h) The attendant can recall the identification of the originating city.

I. Night Service Trunk

2.20 The night service trunk is arranged to connect incoming calls to the night service attendant.

2.21 The incoming call is connected via the incoming trunk and attendant trunk finder to the night service trunk when the latter is energized by the supervisor (NITE key is operated to ON). No calls will be received by the regular attendant after the night service trunks are activated until the incoming calls are rerouted to the attendant positions by the supervisor. There is no interruption to service on incoming calls to the regular attendants which are already answered when the NITE key is operated; nor on calls connected to the night service operator when the use of the night service trunks is discontinued.

J. Transfer Trunk

2.22 Two types of transfer trunks are provided: a ringdown and a dial type. The trunk is arranged to accept calls that have been transferred by an attendant to a transfer point which may consist of a central office, a PBX trunk, or another attendant. The attendant to whom the call is transferred or a manual PBX attendant is signalled by means of interrupted ringing.

2.23 When using a dial type of transfer trunk, for example, one going to an automatic PBX, the first idle transfer trunk finder finds the incoming trunk. The desired location is then dialed. The incoming trunk is split away during the dialing period to allow the attendant to dial. When the called party answers, the attendant adds the incoming trunk by reoperating the IN key. After the transfer point answers, control of the transfer finder comes under control of the transfer point. If the distant party doesn't answer, the control of the transfer finder remains under control of the ACD attendant. If the ACD attendant wishes to release her position circuit after the transfer connection is com-

pleted so that she can attend to other calls, she operates the RLS key.

K. Announcement Circuit

2.24 If the incoming trunk is not connected to an attendant within a timed interval (approximately 15 to 27 seconds), the subscriber is connected to the announcement machine. If after receiving this recorded announcement, an incoming trunk still is not connected to an attendant after a second timed interval, the subscriber is connected to second announcement trunk, if provided. If a second announcement is provided, an announcement finder after finding the incoming trunk connects it generally to a service attendant who will supply a live announcement.

L. Announcement Machine

2.25 The announcement machine contains a drive motor, a magnetic recording drum, a recording and playback head, an erase coil, and control equipment. It automatically adjusts the length of the playback cycle to reproduce only that portion of the drum which has been recorded. The maximum recording time is 2 minutes, however, the recording cycle will be adjusted for a maximum of 10 seconds. The controls for recording and playback are mounted on the supervisory cabinet.

M. Trunk Identification Control Circuit

2.26 This circuit provides:

- (a) Control for operating the recorder-reproducer to identify to an attendant audibly the city of origin of an incoming trunk. The control assures that a complete announcement is received by the attendant and releases the incoming trunk from this circuit at the conclusion of an announcement.
- (b) Control for recording the city of origin on the recorder-reproducer drum. It also furnishes the recording attendant a visual recording time indicator.
- (c) For releasing trunks directly to attendants positions in case of recorder-reproducer failure. The failure is indicated by the alarm circuit.

2.27 This circuit is arranged to work with the recorder-reproducer and amplifier circuit. The recorder-reproducer is designed to furnish six simultaneous recording channels of approximately 1.6 seconds in length. These recordings are repeated seven times during one revolution of the recording drum. The amplifier is used to erase previous recordings and to dictate new recording onto the recording drum. THE CALL DIRECTOR set is associated with the recorder-reproducer to control the recording, check the playback, and select the desired channel. Twenty four channel keys are provided.

N. Hold Circuit

2.28 The hold circuit prevents release of an incoming trunk whenever a central office, PBX, or transfer trunk is selected; or the HOLD key is operated.

O. Conference Circuit

2.29 The conference circuit permits an attendant to establish a connection to a line such as the PBX or central office while maintaining a connection to an incoming call; and then setting up a conference call among the incoming line, the outgoing line, and herself by operating the CONF key.

P. Automatic Selection and Auxiliary Trunk Circuit

2.30 The automatic selection circuit provides a connection from the attendant position to an auxiliary trunk for outward service to a central office. The auxiliary trunk finder hunts for the calling position, then connects to the incoming trunk equipment and uses the same conductors to the central office to provide the outgoing trunk. The attendant may hold the outgoing trunk by operating the HOLD key.

Q. Supervisor Position

2.31 The supervisor position circuit provides means for monitoring and talking to attendants, receiving transferred calls from attendants, and making calls to or receiving calls from PBX or central office. The supervisor has keys which allow her to select automatically any one of 200 positions for monitoring or signalling an attendant. The supervisor can record an announcement on the delayed announcement machine and check it for proper content and

operation. She has a control key to place the system on night operation and enable the night service trunks.

R. Supervisor Lamp Cabinet

2.32 The supervisor lamp cabinet has 198 lamps to indicate when calls are waiting on incoming trunks. There are 400 lamps to indicate whether positions are occupied, ready to receive incoming calls, or are busy. There are alarm lamps which indicate system operation conditions, and a key is available to enable the announcement circuits.

S. Trunk Test Circuit

2.33 The trunk test circuit is a portable test circuit to permit testing of incoming and auxiliary outgoing trunks and give a visual indication of the test functions. Means are also provided for testing the recorded delay announcement operation.

3. FUNCTIONS OF ATTENDANT CONSOLE (FIG. 2)

3.01 An attendant console is provided at each desk and is equipped with keys, lamps, a dial, and a telephone set for use of the attendant to control the required service functions.

3.02 Keys and lamps are provided on the console performing the functions described in the following paragraphs. The lamps are integral parts of some keys and illuminate the key when the lamp lights.

A. Incoming Trunk Key

3.03 The incoming (IN) trunk key is a locking, illuminated, pushbutton key. When this key is operated, the attendant can receive incoming calls from the distributing system. The lamp lights steadily when an incoming call is connected to the attendant or when the incoming trunk is on hold. When an incoming trunk is seized and connected to the position, the operator hears a zip tone; and if the incoming trunk identification feature is provided, the name of the originating city.

B. PBX Outgoing Trunk Key

3.04 The PBX outgoing (PBX OUT) trunk key is a locking, illuminated, pushbutton key. When this key is operated, the lamp lights

steadily, and the attendant is connected directly to a trunk to the manual PBX operator or to the switching equipment of a dial PBX. With a manual PBX, the PBX operator completes the connections. With a dial PBX, the attendant dials the desired number when a dial tone is received.

C. Central Office Outgoing Trunk Key

3.05 The central office outgoing (CO OUT) trunk key is a locking, illuminated, pushbutton key. When this key is operated the CO OUT lamp lights and the attendant is connected to (a) a direct line to the central office, (b) an auxiliary out trunk to the central office, or (c) a selector for dialing a dial selected trunk. When the dial tone is received, the attendant dials the desired number. When all outgoing trunks to the central office are busy no dial tone is received. If a central office trunk is multiplied to more than one attendant console the CO OUT lamp is used as a busy indicator.

D. Conference Key

3.06 The conference (CONF) key is a nonlocking, illuminated, pushbutton key. It is used for establishing conference connections between an incoming call, the attendant, and an outgoing line. If, after answering an incoming call, the attendant wishes to add another party to the connection (other than a transfer point), she operates the PBX OUT or CO OUT key and makes the call to the desired party. Operating the PBX OUT or CO OUT key automatically places the incoming trunk on the hold condition. When the connection is established, the attendant operates the CONF key. When the conference is on a bridged basis the CONF lamp lights immediately. When the conference is a low-loss conference, the CONF lamp lights when a conference line finder is attached. When the lamp lights, the calling party, the attendant, and the called party are connected together.

E. Hold Key

3.07 The hold (HOLD) key is a nonlocking, nonilluminated, pushbutton key. The hold circuit is so arranged that operating the PBX OUT, CO OUT, or any TRS- key automatically puts the incoming trunk on hold. The only time that an incoming trunk has to be put on hold manually is if the attendant wishes to talk to

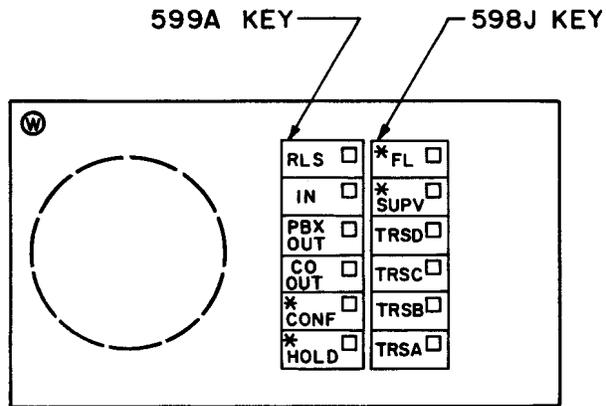


FIG. 2 A

*NONLOCKING

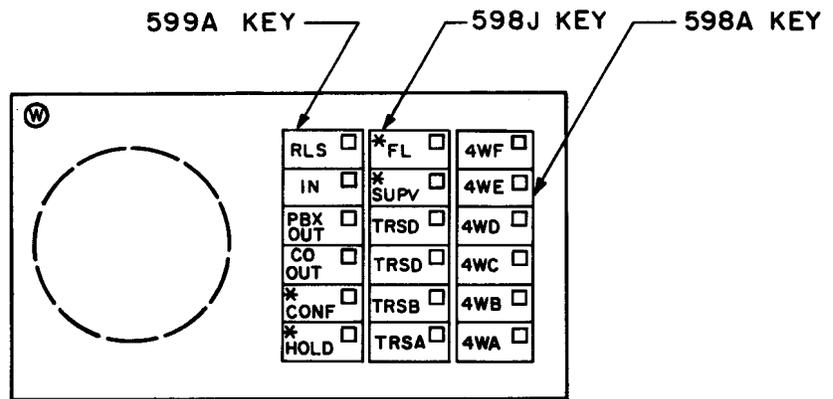


FIG. 2 B

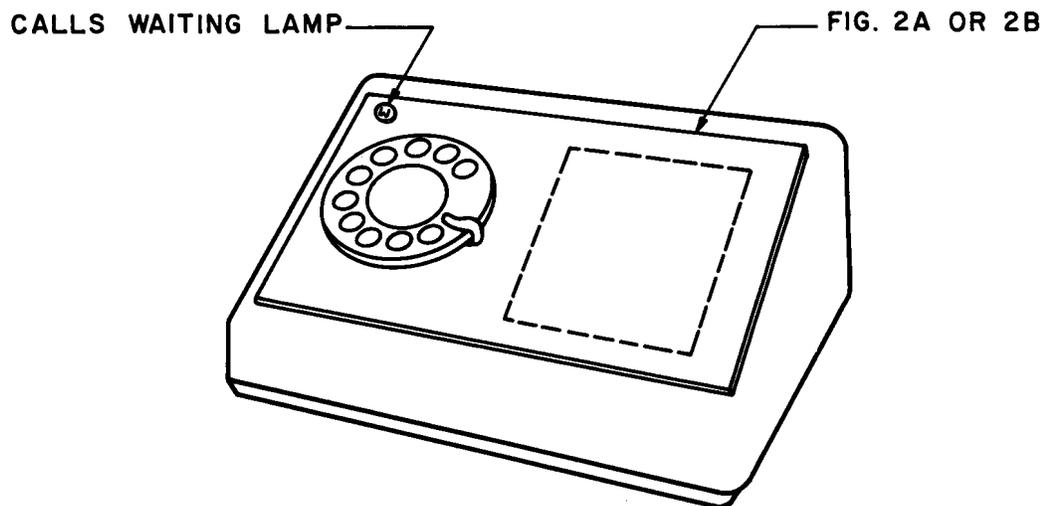


Fig. 2 – Attendants Console For New Call Distributing System

the supervisor and does not wish the customer to hear the conversation. When the attendant wishes to be reconnected to the incoming trunk, she reoperates the IN key. The lamp associated with the held circuit remains lighted.

F. Release Key

3.08 The RLS key is a nonlocking, nonilluminated, pushbutton key. The operation of the RLS key releases any circuit connected to the position.

G. Flash Key

3.09 The flash (FL) key is a nonlocking, nonilluminated, pushbutton key. Operation of the FL key permits the attendant to:

- (a) Recall the originating operator on incoming calls from toll switchboards or from an associated PBX.
- (b) Flash the incoming trunk lamp at the supervisor console in the event that the incoming trunk is in trouble.
- (c) Recall the identification of the originating city.

H. Supervisor Calling Key

3.10 The supervisor (SUPV) key is a nonlocking, illuminated, pushbutton key. When the attendant wishes to call the supervisor, she operates the SUPV key. The PA lamp at the supervisor position flashes at a 120-ipm rate while the SUPV key is operated. If the supervisor calls the attendant, the SUPV lamp lights and a low-level tone is connected to the attendant position circuit while the supervisor signaling (SIG) key is operated. The attendant answers by operating the SUPV key and the SUPV lamp becomes steady. The SUPV key must be operated at the same time as the SIG key to complete the connection. If the attendant wishes to split off the incoming trunk, the HOLD key is operated before the SUPV key. The SUPV key must be operated at the time that the SUPV lamp is lighted to establish the talking connection.

I. Transfer Key

3.11 The transfer (TRS) key is a locking, nonilluminated, pushbutton key. The key is used to transfer incoming calls to an associated

PBX or other transfer locations. One transfer finder is associated with each transfer trunk. The customer may order as many transfer trunks as desired. If a dial PBX is not associated with the ACD, dial transfer may be provided if desired by the use of selector equipment.

3.12 If the call is to be transferred, the attendant operates a transfer key. If it is a dial transfer trunk, she will receive a dial tone and can dial the desired number. If it is a direct transfer trunk, she will receive a ringing tone if an idle trunk is available. When the called party answers, the attendant connects the calling party by operating the IN key. The calling party, the original attendant, and the attendant to whom the transfer is made are all connected together. The original attendant may then drop off the connection by operating the RLS key. The connection then is held between the caller and the new attendant under control of the point to which the transfer was made. If the originating attendant gets a busy signal from the called number on the transfer trunk and wishes to release it, she operates and releases the FL key, then the IN key, and finally reoperating the TRS key to start another transfer call.

J. Calls Waiting Lamp

3.13 The calls waiting (CW) lamp lights and a buzzer sounds whenever a call is waiting and an attendant is not available.

K. Dial

3.14 A dial is provided for use with central office, dial PBX, and dial transfer trunks.

L. 4-Wire Keys

3.15 If the console is used with 4-wire circuits, six 4-wire (4W) keys are provided. When these keys are operated, the telephone set is changed to 4-wire operation and connected to circuits associated with the operated locking, illuminated, pushbutton 4W keys.

M. Flush Mounted Key Arrangement

3.16 The flush mounted key arrangement has the same key layout as the consoles and provides the same features as described in 3.01 to 3.15.

4. FUNCTIONS OF SUPERVISOR CONSOLE

4.01 A supervisor console provides the various supervisory features required for some installations. The layout of the console is shown in Fig. 3. This console is provided as a packaged unit. The following apparatus is provided in the console.

A. Monitoring Key

4.02 The monitoring (MON) key is a locking, illuminated, pushbutton key. When the supervisor wishes to monitor an attendant, operation of the key lights the MON lamp and prepares the supervisor monitoring circuit for keying the position number of the attendant. If the attendant calls the supervisor, (a) the MON key is operated, (b) the position number of the calling attendant is keyed, and (c) the SIG key is operated to complete the connection.

B. Tens, Units and Group Keys

4.03 Ten tens T0 to T9, ten units U0 to U9, a GRP0 and a GRP1, illuminated, nonlocking, pushbutton keys are provided. These keys are used to key the number of the position which the supervisor wishes to monitor or talk to. After the MON key is operated, the supervisor operates one of the tens T0 to T9, one of the units U0 to U9 keys, then either the GRP0 or GRP1 key. The lights associated with the operated keys light.

C. Signalling Key

4.04 The SIG key is a nonlocking, nonilluminated, pushbutton key. Operation of this key lights the SUPV lamp of the selected attendant console and connects low-level tone to the position circuit.

D. Volume Control Potentiometer

4.05 The volume (VOL) potentiometer is a control knob for adjusting the gain of the monitoring amplifier.

E. Central Office Key

4.06 The central office (CO) key is an illuminated, locking, pushbutton key. When this key is operated, the supervisor can originate a call to the central office or answer an incoming

call from the central office. The CO lamp flashes at 60 ipm on an incoming call and a bell rings. The lamp lights steadily when a call is answered or originated.

F. PBX Key

4.07 The PBX key is an illuminated, locking, pushbutton key. When this key is operated the supervisor can originate a call to the associated PBX or answer an incoming call from the associated PBX. The PBX lamp flashes at 60 ipm on an incoming call, and a bell rings. The lamp lights steadily when a call is answered or originated.

G. Transfer In Key

4.08 The transfer in (TRS IN) key is an illuminated, locking, pushbutton key. When a call is transferred to the supervisor, the lamp flashes at 60 ipm and a bell rings. When the TRS IN key is operated, the supervisor is connected to the incoming transfer trunk and the TRS IN lamp lights steadily.

H. Release Key

4.09 The RLS key is a nonilluminated, locking, pushbutton key. When this key is operated any circuit connected to the supervisor position is released.

I. Hold Key

4.10 The HOLD key is a nonilluminated, nonlocking, pushbutton key. When the HOLD key is operated, the connected central office, PBX, or incoming transfer trunk is placed in a hold condition until the reoperation of the associated key. The lamp associated with the held trunk remains lighted.

J. Dictate Key

4.11 The dictate (DIC) key is an illuminated, nonlocking, pushbutton key. When the DIC key is operated the recorded delay dictation machine is readied for dictation. The DIC lamp lights when dictation may begin and goes out at the end of the dictation period or when the DIC key is released. The dictation machine is set for a maximum 10-second dictation period.

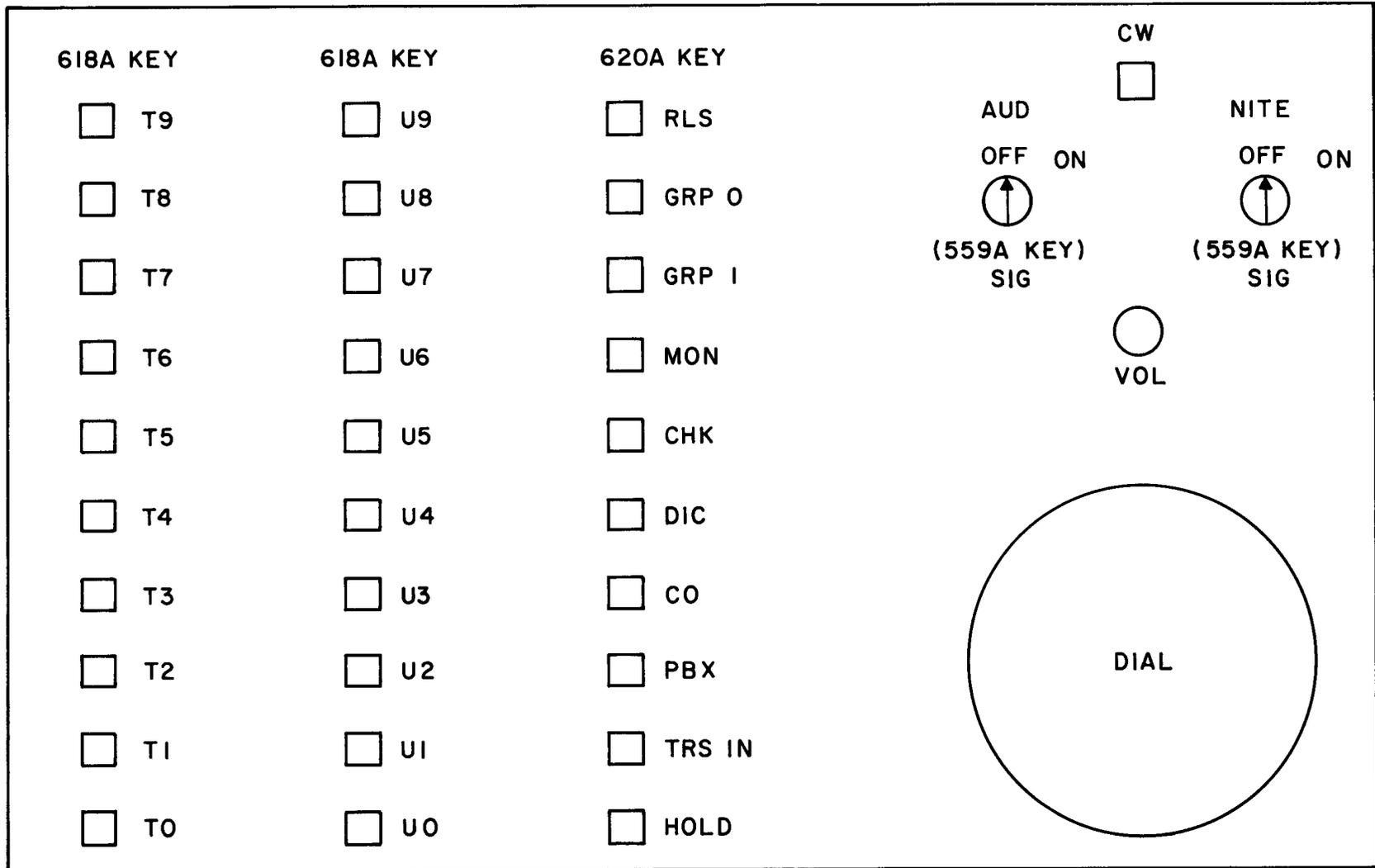


Fig. 3 - Supervisor Console

K. Checking Key

4.12 The checking (CHK) key is a nonilluminated, locking, pushbutton key. When the CHK key is operated the announcement recorded on the announcement machine is played back to the supervisor. The CHK key is released by operation of the RLS key.

L. Audible Key

4.13 The audible (AUD) key is a nonilluminated, turn type key. When this key is turned to ON, the calls waiting buzzer becomes operative. When this key is turned OFF, the calls waiting buzzer is silenced.

M. Calls Waiting Lamp

4.14 The calls waiting (CW) lamp lights whenever an unanswered call is waiting, and an attendant is not available.

N. Flashing Key

4.15 The flashing (FL) key is a nonilluminated, nonlocking, pushbutton key. When operated, the supervisor can flash the originating or called operator.

O. Night Service Key

4.16 The night service key (NITE) is a nonilluminated, turn type key. When this key is turned to ON, the night service trunks are placed into service and the attendant positions are disconnected from the system. When this key is turned to OFF, the system operates normally. When this key status is changed, established connections are not affected.

P. Dial

4.17 A dial is provided for use with central office and dial PBX trunks.

Q. Adjustable Auxiliary Signal

4.18 The buzzer or tone operated device provided as an auxiliary signal is adjustable.

5. FUNCTIONS OF SUPERVISOR LAMP CABINET

A supervisor lamp cabinet is provided, containing lamps and keys for supervisory functions.

A. Trunk Lamps

5.01 One hundred ninety-eight incoming trunk (TK-) lamps with white lamp caps are provided, one per incoming trunk, designated TK 0 to TK 197. The TK- lamp, corresponding to the incoming trunk, lights when an incoming call is waiting on that trunk to be connected to an attendant. It is dark when no call is waiting or when the trunk is in use and connected to an operator or transfer trunk.

B. Position Status Lamps

5.02 Two hundred lamps with white lamp caps are provided, one per position, designated PA 0 to PA 199. Two hundred lamps with red lamp caps are provided one per position, designated PB 0 to PB 199. The lamps function to indicate the following conditions.

5.03 Position is unoccupied:

- (a) PA lamp is dark.
- (b) PB lamp is dark.

5.04 Position is occupied and no keys are operated at attendant console:

- (a) PA lamp flashes at 60 ipm.
- (b) PB lamp is dark.

5.05 Position is occupied and IN key is operated on attendant console:

- (a) PA lamp is lighted.
- (b) PB lamp is dark.

5.06 Position is busy on an incoming call:

- (a) PA lamp is dark.
- (b) PB lamp is lighted.

5.07 Hold on incoming call:

- (a) PA lamp flashes at 60 ipm.
- (b) PB lamp is lighted.

5.08 Hold on incoming call, position is busy on an outgoing call:

- (a) PA lamp is dark.
- (b) PB lamp is steady.

5.09 Position is busy on an outgoing call only:

- (a) PA lamp is dark.
- (b) PB lamp flashes at 60 ipm.

SECTION 981-236-100

5.10 Attendant requests service assistance:

- (a) PA lamp flashes at 120 ipm.
- (b) PB lamp has same indications as in 5.03 to 5.09.
- (c) A gong sounds.

5.11 Attendant makes a transfer call:

- (a) PA lamp flashes at 60 ipm.
- (b) PB lamp is lighted.

C. Alarm Lamps

5.12 The following alarm lamps with red lamp caps are provided. When a lamp is lighted it indicates the following condition:

- (a) Lamp PWR indicates power equipment failure.
- (b) Lamp CF indicates failure of some common equipment.
- (c) Lamp FA indicates a fuse failure.

D. Control Keys

5.13 A turn type key is provided for enabling the recorded (R) and the live (L) announcement trunks. When the key is operated to the R position, the recorded delay announcement feature is enabled. When the key is operated to the R & L position, both the recorded and live announcement trunks are enabled.

E. Audible Alarms

5.14 The following audible alarm apparatus is provided:

- (a) A buzzer sounds whenever an alarm lamp or the calls waiting lamp lights.
- (b) A buzzer sounds in the supervisor console whenever an attendant is calling for service assistance.

6. FUNCTIONS OF RECORDER-REPRODUCER CONTROL CONSOLE

6.01 THE CALL DIRECTOR set with 30 keys is provided for controlling the recording on the recorder-reproducer channels and checking their operation if no more than 24 cities are to be identified. The following keys are provided on THE CALL DIRECTOR set.

A. Channel Keys

6.02 The channel (CHAN) key is an illuminated, locking, pushbutton key with a maximum of 24 per set. When a CHAN key is operated the attendant hears the recorder-reproducer output channel at the point where the incoming trunks are connected.

B. Dictation Key

6.03 The dictation key is an illuminated, nonlocking, pushbutton key. When a new city of origin is to be recorded on a channel, the attendant operates the desired CHAN key, then operates and holds the DIC key. When the recorder is ready to accept dictation, the DIC lamp lights. At the end of the 1.6-second period the lamp goes out, then after approximately 0.2 seconds lights again at the beginning of the new recording period. The attendant records the message seven times. At the end of the seventh recording, the DIC key is released.

C. Dictation Checking Key

6.04 The dictation checking (DIC CHK) key is a nonilluminated, locking, pushbutton key. When the attendant wishes to check the recording on a recorder-reproducer channel before restoring the circuit to normal, the DIC CHK key is operated. This releases the previously operated CHAN key, but locks the channel circuit to the amplifier circuit. The attendant telephone circuit is now connected automatically to the output of the reproducer-amplifier and the message recorded on this channel is heard.

D. Release Key

6.05 The release (RLS) key is a nonilluminated, nonlocking key. When this key is operated, any locked-in key and circuit releases.

E. Selector Circuit Operation

6.06 If more than 24 cities are to be identified, a selector circuit is used for choosing the desired channel on the recorder-reproducer for recording and checking the recording on the various channels. Instead of THE CALL DIRECTOR set a 500-type telephone set is provided with DIAL, CHAN, DIC, DIC CHK and RLS keys. When a channel recording is to be checked or changed the DIAL key is operated and the num-

ber of the desired channel is dialed using 2 digits. After the channel is dialed, listening or recording can be done in the same manner as described for THE CALL DIRECTOR set operation.

F. Reproducer Trouble Release

6.07 If the recorder-reproducer fails while the drum is in the announcement area, any incoming trunk connected to the recorder-reproducer releases. An alarm sounds and an alarm lamp lights. The lamp is located with the tone and alarm circuit.

7. FUNCTIONS OF TRAFFIC DATA REGISTERS

7.01 For administration of the system and engineering trunks and positions, certain traffic message registers are provided. These registers, some of which are provided optionally, are as follows.

A. Position Peg Count Registers

7.02 One message register is provided per attendant position to count the number of incoming calls answered by an attendant.

B. Abandoned Calls Peg Count Register

7.03 One message register is provided for the system to score the number of calls connected to the ACD system but abandoned before the customer is connected to an attendant.

C. Incoming Trunk Peg Count Registers

7.04 One message register is provided for each trunk group to score the total number of incoming calls connected to the trunks originating from a certain city or location.

7.05 One message register is provided to score the total number of incoming calls connected to the system.

D. Trunk Group Usage

7.06 To record the total time that incoming and outgoing trunks of a group are used, traffic measuring devices are provided which record this information on three message registers. Two registers are used alternately to score trunk usage for a predetermined length of time. When one register is scoring, the other register retains

the count accumulated during the previous period. This stationary register can be read any time during this noncounting interval. At the end of the interval the stationary register is reset to zero and starts to score, while the second resettable register becomes stationary. The length of the scoring interval can be varied for 15, 30, and 60 minutes by the supervisor. The third register is cumulative and is not resettable.

7.07 Three registers can also be provided, operating in the same manner as described above but used to indicate total incoming and outgoing trunk usage.

E. Total Incoming Trunk Waiting Usage

7.08 To record the total time that incoming trunks are waiting to be answered, traffic measuring devices are provided which record this information on three message registers. The two automatically resetting registers operate in the same manner as described in 7.06. The counting interval for these registers can be varied for 15, 30, and 60 minutes by the supervisor. The third register is cumulative and is not resettable.

F. Positions Manned Usage

7.09 To record the total time that the positions are manned, traffic measuring devices are provided which record this information on three message registers. The two automatically resetting registers operate in the same manner as described in 7.06. The counting interval for these registers can be varied for 15, 30, and 60 minutes by the supervisor. The third register is cumulative and is not resettable.

G. Position Busy Usage

7.10 To record the total time that positions are busy, traffic measuring devices are provided which record this information on three message registers. The two automatically resetting registers operate in the same manner as described in 7.06. The counting interval for these registers can be varied for 15, 30, and 60 minutes by the supervisor. The third register is cumulative and is not resettable.

H. After Call Release Work Time

7.11 A traffic usage recorder is provided to measure the length of time that an attendant position is manned but the attendant

SECTION 981-236-100

is neither handling a call nor available to take a call.

7.12 At some large installations the traffic registers can be photographed for record purposes.

I. Speed of Service Indication

7.13 To measure the speed of service, two lamps are provided. When trunks are waiting inside the trunk gate for attendants, an amber lamp lights. When any trunk has waited inside the gate for more than 50 seconds, a red lamp lights. When the trunk gate opens, the red lamp is extinguished.

8. CUSTOMER OPERATIONS OF ATTENDANT CONSOLE

8.01 A console is provided for the use of each attendant. This console has lamps, keys, and a dial to allow the attendant to carry out the duties assigned to her.

A. Incoming Call

8.02 When an attendant plugs the headset into the operator headset jack, no calls will be received until the IN key is operated. She may attend to any assignment other than receiving service calls. The PA lamp associated with the position flashes at the supervisor console at this time.

8.03 If the attendant is ready to receive an incoming call, the IN key is operated. The PA lamp associated with the position lights steadily at the supervisor console.

8.04 If an incoming call has been waiting for service or if an incoming line is seized at this time, it is connected to the idle attendant. Just before the customer is connected to the attendant, the attendant hears a zip tone and the IN lamp lights steadily. The transmission circuit is completed and the attendant may communicate with the customer. If area identification is provided on the trunk, the city of origin of the trunk is heard after the zip tone and before cut through to the customer. The PA lamp at the supervisor console goes dark and the PB lamp lights steadily.

8.05 If the attendant misses the area identification announcement, she may recall it by operating and releasing the FL key.

8.06 If the attendant has occasion to flash the calling or assisting operator she can do so by operating and releasing the FL key.

8.07 When the attendant has completed talking with the customer, she can release the incoming trunk by operating the RLS key.

8.08 To make the position available again for receiving incoming calls the IN key is reoperated.

B. Transferring Calls

8.09 The attendant can transfer a call by operating the TRS key. If transfer is to one location only, manual transfer can be used. If transfer is to more than one location, it is necessary to dial the location desired.

8.10 When manual transfer trunks are provided and the transfer key is operated, an idle trunk finder finds the incoming trunk to which the attendant is connected. The IN key releases but the IN lamp remains lighted and the incoming trunk is connected to the hold circuit. If a trunk is idle, the calling attendant receives ringing tone and the called party automatic ringing. If all transfer trunks are busy the attendant does not receive a ringing tone nor any busy indication. When the party at the transfer point answers, automatic ringing stops. The original attendant can now reoperate the IN key and the calling party, the attendant, and the called party are connected together.

8.11 When the called party answers she assumes control of the incoming trunk. The original attendant can release her position by operating the RLS key. The incoming line remains connected to the transfer point, the IN key releases, and the IN lamp is extinguished. The ACD attendant is now free to attend to other business.

8.12 When dial transfer trunks are provided and the transfer key is operated, an idle trunk finder finds the incoming trunk to which the attendant is connected. The attendant receives a dial tone. The number of the transfer point is dialed and when it is selected by the

dial equipment, automatic ringing is started. Operation from here on is the same as for the manually selected trunk described in 8.10. If all trunks in the dial equipment are busy, the attendant receives a busy tone. If all dial trunks in the ACD equipment are busy, the attendant does not receive a dial tone until an ACD dial transfer trunk becomes idle.

8.13 If the transfer point does not answer or if all trunks in a group are busy and the attendant wishes to reconnect to the calling customer, she operates and releases the FL key and then reoperates the IN key. If the attendant wants to make another transfer attempt or switch to another transfer point, she can do so by reoperating the TRS key.

8.14 When the attendant makes a transfer call the associated PA lamp in the supervisor lamp cabinet flashes at 60 ipm and the PB lamp lights steadily.

C. Outgoing Call to the Central Office or Dial Selected Trunk

8.15 The CO OUT key can be used in several different ways:

(a) If a direct line is used to the central office it may be multiplied to several attendants. When the CO OUT key is operated the CO OUT lamp lights. This indicates to the other attendants using the same outgoing trunk that the trunk to the central office is busy. If the CO OUT lamp is not lighted, the attendant operates the CO OUT key. The CO OUT lamp lights and dial tone is received from the central office. The desired number then can be dialed.

(b) If the auxiliary outgoing trunk is used to the central office, the CO OUT lamp lights when the CO OUT key is operated. An outgoing trunk finder finds the attendant position and the dial tone is received from the central office. The desired number then can be dialed. If all auxiliary outgoing trunks are busy no dial tone will be heard.

(c) Dial selected trunks are used when it is desired to reach more than one outgoing location. When the CO OUT key is operated the CO OUT lamp lights and the dial tone is received. The attendant dials the code of the

group of trunks she wishes to reach, then completes dialing required on that group of trunks.

8.16 If the attendant was connected to an incoming trunk when the CO OUT key is operated, the IN key is released and the connection is held automatically by the hold circuit. The IN lamp remains lighted steadily.

8.17 When the attendant has completed the call to the central office, she can release the central office line by operating the RLS or IN key. If an incoming trunk was on hold, she can release the central office trunk and return to the incoming call by operating the IN key.

8.18 When a call is made on the central office trunk, the associated PA lamp in the supervisor lamp cabinet remains dark and the associated PB lamp flashes at a 60 ipm rate.

D. Call to the PBX

8.19 When an attendant wishes to make a call to any PBX extension or any outward trunk appearing in the PBX, she operates the PBX OUT key. The PBX OUT lamp lights. In a manual PBX the switchboard operator answers and completes the call, while in a dial PBX a dial tone is received if an idle circuit is available. The attendant completes the call by dialing.

8.20 If the attendant was connected to an incoming trunk when the PBX OUT key was operated, the IN key is released and the connection is held automatically by the hold circuit. The IN lamp remains lighted steadily.

8.21 When an attendant has completed the call to the PBX she can release the PBX line by operating the RLS or IN key. If an incoming trunk was on hold, she can release the PBX circuit and return to the incoming call by operating the IN key.

8.22 When a call is made on the PBX trunk, the associated PA lamp in the supervisor lamp cabinet remains dark and the associated PB lamp flashes at a 60 ipm rate.

E. Conference Circuit

8.23 Conferencing circuits are provided either with normal bridging loss or with low loss. Conference calls are established in the same way

in either case. When the attendant wishes to establish a conference call, the PBX OUT or CO OUT key is operated and the call to the desired party is completed in the usual way. When the called party answers, the attendant operates the CONF key. The calling party, the attendant, and the called party are now connected together for conferencing. When low loss is not provided, the CONF lamp lights as soon as the CONF key is operated. When low loss is provided, the CONF lamp lights when a conference line finder is attached and all parties are connected together. If the CONF lamp does not light, all conference line finders are busy and the attendant has to wait until a line finder becomes idle before a conference can be completed.

8.24 The attendant can release the conference by operating the RLS key or the attendant can pick up the incoming party by reoperating the IN key. The conference finder and the called party are released. If the attendant wishes to talk to the called party the PBX OUT or CO OUT is reoperated. The incoming line will be put on hold and the conference finder will be released.

F. Hold Circuit

8.25 When the PBX OUT, CO OUT, or any TRS- key is operated and an incoming trunk is connected to the position, it is automatically put on hold. The only time that an incoming trunk is not held automatically is when the attendant wishes to talk to the supervisor and does not wish the customer to hear the conversation. She can then hold the incoming trunk by operating the HOLD key. When the attendant wishes to be reconnected to the incoming trunk when it is on hold, the IN key is reoperated. A central office or a PBX trunk can be held by operating the HOLD key. The attendant can pick up the held circuit by reoperating the CO OUT or PBX OUT key.

G. Calling the Supervisor

8.26 If the attendant wishes to call the supervisor, she operates the SUPV key. This flashes the associated PA lamp at the supervisor position, at a 120-ipm rate and sounds a gong while the SUPV key is operated. When the supervisor answers, the SUPV lamp will light

and a tone will be heard in the headset. The SUPV key must be operated when the SUPV lamp is lighted to complete the talking connection. If the attendant wishes to split off the incoming party, she operates the HOLD key before operating the SUPV key.

H. Calls Waiting Lamp

8.27 If an incoming call is waiting for an attendant and no attendants are available, the CW lamp lights and a buzzer sounds.

I. 4-Wire Circuit

8.28 To connect to a 4-wire circuit, one of the 4W keys is operated. The associated 4W lamp lights. The circuit associated with the operated key is connected to the attendant telephone circuit, which is changed to 4-wire operation. Manual or dial operation can then be used.

J. Identification of Faulty Trunk

8.29 The incoming trunk connected to the attendant trunk can be identified by operating the FL key on the attendant console. The TK- lamp in the supervisor lamp cabinet, associated with the trunk, flashes in unison with the operation of the FL key.

K. Recorded Delay Announcement

8.30 If there are no attendants available and incoming trunks are waiting, the trunks are routed to a recorded delay announcement machine after a predetermined time interval. The announcement received by the customer states that a delay may be expected.

L. Live Announcement

8.31 After an incoming trunk has received a recorded delay announcement and attendants are still not available, the trunk is connected automatically to a live announcement trunk after a predetermined time interval.

9. CUSTOMER OPERATIONS OF SUPERVISOR CONSOLE

9.01 A console and a lamp cabinet containing keys, lamps, and a dial are provided for the supervisor to allow her to carry out the duties assigned to her.

A. Monitoring and Talking

9.02 When the supervisor wishes to monitor an attendant, the MON key is operated. The MON lamp lights and the supervisor set is prepared for dialing. The supervisor operates the nonlocking tens T0-T9, units U0-U9, and GRP0 or GRP1 keys corresponding to the attendant position number. These operated keys light. The monitoring circuit connects the monitoring amplifier and the receiver circuit of the supervisor headset to the dialed attendant position circuit. The supervisor can hear all parties connected and the attendant. The supervisor has control of the volume of the monitoring amplifier by the operation of the VOL control potentiometer.

9.03 If the supervisor wishes to talk to the attendant, she operates the SIG key. Every time the SIG key is operated, tone is connected to the attendant telephone circuit, and the SUPV lamp in the attendant console lights. When the attendant operates the SUPV key with the SUPV lamp lighted, the talking circuit is completed and the supervisor can talk with the attendant.

9.04 When the attendant calls the supervisor, the PA lamp associated with the calling position flashes at 120 ipm and a gong sounds. The supervisor operates the MON key and the tens, units, and group keys of the calling position. The monitoring circuit functions to connect the supervisor telephone set to the calling attendant position circuit. When the lamps and keys are operated as described in 9.03 they can talk to one another.

B. Transferred Call

9.05 The attendant can transfer a call to the supervisor. On an incoming call transferred to the supervisor, the TRS IN lamp flashes at 60 ipm and a bell rings. When the TRS IN key is operated, the TRS IN lamp becomes steady and the incoming party is connected to the supervisor.

C. Central Office Trunk

9.06 The central office trunk is a 2-way circuit at the supervisor console. On an incoming call the CO lamp flashes at a 60-ipm rate and a bell rings. The supervisor answers the call by operating the CO key. The CO lamp becomes

steady and the supervisor is connected to the calling party.

9.07 On making an outward call the supervisor operates the CO key which lights steadily. When dial tone is received, the desired number can be dialed. To release the central office line the RLS key can be operated.

D. PBX Extension

9.08 The PBX trunk is a 2-way circuit at the supervisor console. On an incoming call the PBX lamp flashes at a 60-ipm rate and a bell rings. The supervisor answers the call by operating the PBX key. The PBX lamp becomes steady and the supervisor is connected to the calling party.

9.09 On making an outward call the supervisor operates the PBX key which lights steadily. When dial tone is received, the desired number can be dialed or with a manual PBX, the desired number is given to the operator. To release the PBX line the RLS key can be operated.

E. Hold Circuit

9.10 Operating the HOLD key holds any connection and allows the supervisor to make another call. The lamp associated with the held trunk remains lighted.

F. Release Circuit

9.11 When the RLS key is operated, any circuit connected to the supervisor position is released.

G. Flash Circuit

9.12 When the FL key is operated the supervisor can recall the calling or called operator.

H. Audible Cutoff Circuit

9.13 When the supervisor wants to silence the calls waiting buzzer, she turns the AUD key to OFF. When she wants to hear the calls waiting buzzer, she turns the AUD key to ON.

I. Night Service

9.14 When the ACD is turned down for the night, the supervisor operates the NITE key to ON. The night service trunks are placed

SECTION 981-236-100

into service and the attendant positions are disconnected from the system. When this key is turned to OFF, the system operates normally. When this key is turned from one state to another, any established connections remain connected until completion of those calls.

J. Delay Announcement Machine Controls

9.15 When the supervisor wishes to dictate a new delay announcement message, she operates the DIC key. The dictation machine is readied for dictation and the DIC lamp lights when dictation can begin. At the end of dictation, the supervisor releases the DIC key, stopping the recording. The DIC lamp is extinguished either at the end of the dictation period or when the DIC key is released. At the end of dictation the supervisor can check the recorded announcement by operating the CHK key. To release the machine the RLS key is operated. The supervisor records the message and checks the recording using her headset. The dictation period is limited to 10 seconds.

K. Calls Waiting Lamp

9.16 If an incoming call is waiting for an attendant and no attendants are available, the CW lamp lights and the buzzer sounds. The buzzer can be silenced by operating the AUD key to OFF.

L. Trunk Lamps

9.17 The incoming trunk lamps TK 0 to TK 197 light whenever an incoming trunk is waiting to be connected to an attendant. If the incoming trunk is in trouble, the attendant, to whose position the trunk is connected, can flash the corresponding TK- lamp to assist in identifying the trunk number.

M. Position Status Lamps

9.18 Two lamps are provided for each position designated PA 0 to PA 199 and PB 0 to PB 199, to indicate what the attendant is doing. The following are functions of the two lamps designated PA with a white lamp cap and PB with a red lamp cap.

9.19 Position is unoccupied:

- (a) PA lamp is dark.
- (b) PB lamp is dark.

9.20 Position is occupied and no keys are operated at attendant console:

- (a) PA lamp flashes at 60 ipm.
- (b) PB lamp is dark.

9.21 Position is occupied and IN key is operated on attendant console:

- (a) PA lamp is lighted.
- (b) PB lamp is dark.

9.22 Position is busy on an incoming call:

- (a) PA lamp is dark.
- (b) PB lamp is lighted.

9.23 Hold on incoming call:

- (a) PA lamp flashes at 60 ipm.
- (b) PB lamp is lighted.

9.24 Hold on incoming call, position is busy on an outgoing call:

- (a) PA lamp is dark.
- (b) PB lamp is steady.

9.25 Position is busy on an outgoing call:

- (a) PA lamp is dark.
- (b) PB lamp flashes at 60 ipm.

9.26 Attendant requests service assistance:

- (a) PA lamp flashes at 120 ipm.
- (b) PB lamp has same indications as in 9.19 to 9.25.
- (c) A gong sounds.

9.27 Attendant makes a transfer call:

- (a) PA lamp flashes at 60 ipm.
- (b) PB lamp is lighted.

N. Alarm Lamps

9.28 The following alarm lamps appear in the supervisor lamp cabinet. The purpose of these lamps is to indicate to the supervisor that there is a system irregularity. All alarm lamps have a red lamp cap.

- (a) Lamp PWR indicates power equipment failure.

- (b) Lamp CF indicates failure of some common equipment.
- (c) Lamp FA indicates a fuse failure.

O. Control Keys

9.29 A turn key is provided for enabling the recorded (R) and the live (L) announcement trunks. When the key is operated to the R position, the recorded delay announcement feature is enabled. When the key is operated to the R & L position, both the recorded and live announcement trunks are enabled.

P. Audible Alarms

9.30 The following audible alarm apparatus is provided:

- (a) A buzzer sounds whenever an alarm lamp or the calls waiting lamp lights.
- (b) A buzzer sounds in the supervisor console whenever an attendant is calling for service assistance.

Q. Incoming Trunk Identification Using THE CALL DIRECTOR Set

9.31 The following keys are provided on the 30-button THE CALL DIRECTOR set:

- (a) The CHAN key is an illuminated, locking key with a maximum of 24 per THE CALL DIRECTOR set. When a CHAN key is operated the attendant is able to hear the recorder-reproducer output channel at the point where the incoming trunks are connected.
- (b) The DIC key is an illuminated, nonlocking key. When a new city of origin is to be recorded on a channel, the attendant operates the desired CHAN key, then operates and holds the nonlocking DIC key. When the recorder is ready to accept dictation, the DIC lamp lights. At the end of the 1.6-second period the lamp goes out, then after approximately 0.2 second lights again at the beginning of the new recording period. The attendant records the message seven times. At the end of the seventh recording, the DIC key must be released promptly.
- (c) The DIC CHK key is a nonilluminated, locking key. When the attendant wishes to check the recording on a recorder-reproducer channel before restoring the circuit to

normal, the DIC CHK key is operated. This releases the previously operated channel key but locks the channel to the amplifier circuit. The attendant telephone circuit is connected automatically to the output of the reproducer amplifier and the recorded message is heard on the selected channel.

- (d) The RLS key is a nonilluminated, nonlocking key. When this key is operated, any locked-in key releases.

9.32 If more than 24 cities are to be identified, a selector circuit is used for choosing the desired channel on the recorder-reproducer for recording and checking the recording on the various channels. Instead of THE CALL DIRECTOR set, a 500-type telephone set is provided with DIAL, CHAN, DIC, DIC CHK and RLS keys. When a channel recording is to be checked or changed the DIAL key is operated and the number of the desired channel is dialed using 2 digits. After the channel is dialed listening or recording can be done in the same manner as described for THE CALL DIRECTOR set operation.

R. Traffic Data Peg Count Registers

9.33 To allow administration of the system and engineering the number of trunks and attendant positions required certain message registers are provided. These are read at certain recurring intervals as needed. The following message registers are provided optionally.

9.34 Position Peg Count Registers

A message register is provided for each attendant position to score the number of incoming calls answered by the attendant.

9.35 Abandoned Calls Peg Count Register

One message register is provided per system to score the total number of calls abandoned by the customers before connection to an attendant.

9.36 Incoming Calls Per Trunk Group Register

One message register is provided to score the number of incoming calls in a trunk group. This register count includes the abandoned calls.

9.37 Total Incoming Calls Register

(a) Three message registers are provided to score the total number of incoming calls. One of the message registers is nonresettable and scores continuously the total number of incoming calls. It scores one-digit for every ten calls. The other two registers are used alternately to score trunk usage for a predetermined length of time. When one register is scoring, the other register retains the count accumulated during the previous period. This stationary register can be read any time during this noncounting interval. At the end of the interval, the stationary register is reset to zero and starts to score, while the second resettable register becomes stationary. This cycle is continuously repeated. These registers also score one-digit for ten incoming calls.

(b) The length of scoring interval can be varied for 15, 30, and 60 minutes by the supervisor.

9.38 Trunk Group Usage

Three message registers are provided to register the total time that trunks in a group are in use for incoming and outgoing calls. One of the message registers is nonresettable and the other two are electrically resettable. They operate in a manner similar to that described in 9.35. These registers score one for each trunk in use indication.

9.39 Total Trunk Usage

Three message registers are provided to register the total time that all trunks are in use for incoming and outgoing calls. One of the message registers is nonresettable and the other two are electrically resettable. They operate in a manner similar to that described in 9.35. These registers score one for each trunk in use indication.

9.40 Total Incoming Trunk Waiting Usage

Three message registers are provided to measure the total time that incoming trunks are waiting to be answered. One of the message registers is nonresettable and the other two are electrically resettable. They operate in a manner similar to that described in 9.35. These registers score one for each trunk waiting indication.

9.41 Position Manned Usage

Three message registers are provided to register the total time that positions are occupied. One of the message registers is nonresettable and the other two are electrically resettable. They operate in a manner similar to that described in 9.35. These registers score one for each position manned indication.

9.42 Position Busy Usage

Three message registers are provided to register the total time that positions are busy. One of the message registers is nonresettable and the other two are electrically resettable. They operate in a manner similar to that described in 9.35. These registers score one for each position busy indication.

9.43 After Call Release Work Time

A traffic usage recorder is provided to measure the length of time that an attendant position is manned but the attendant is neither handling a call nor available to take a call.

9.44 Speed of Service Indication

To measure the speed of service, two lamps are provided. When trunks are waiting inside the trunk gate for attendants, an amber lamp lights. When any trunk has waited inside the gate for more than 50 seconds, a red lamp lights. When the trunk gate opens, the red lamp is extinguished.

10. ATTENDANT CONSOLE CIRCUIT OPERATION

A. Incoming Call

10.01 Calls to the ACD can originate from subscribers in the local area, from the associated PBX, or from distant cities. Calls in the local area may be from subscribers in the same central office as the ACD, from another central office, or through a tandem office. Long distance calls may be via foreign exchange lines, the DDD network, or private lines.

10.02 Two types of supervision are provided for incoming trunks: loop and reverse battery, so that the trunk can be used from all types of local central offices, toll and tandem offices, and PBXs or private lines. When the incoming trunk is seized by closing the loop at the distant end, ringing is applied toward the ACD and ringing tone is applied toward the

calling party, either by the central office circuit or from the incoming trunk. The selected trunk waits outside the incoming trunk gate until all trunks inside the gate have been served. When all trunks inside the gate have been served, the gate opens for a short interval and the trunks that have been waiting enter the gate. The trunks that entered the gate indicate this by a ground signal to the gate circuit. These leads are multiplied at the incoming trunk gate which senses these grounds and cannot open again until all grounds are removed.

10.03 If a headset is plugged into a headset jack of an attendant console and the IN key on the console is operated, the position is ready to enter the attendant trunk gate when the common group circuit opens the gate. The attendant trunks wait outside the gate until all trunks inside the gate have been served. When all trunks inside the gate have been served, the gate opens for a short interval and the trunks that are ready to serve enter the gate. The trunks that entered the gate indicate this by a ground signal to the gate circuit. These leads are multiplied at the attendant gate which senses these grounds and does not open again until all grounds are removed.

10.04 The operation of the trunk finders is described fully starting in 10.10 below. When an incoming trunk inside the gate calls for service, the trunk finder associated with an idle attendant position hunts for and connects with the terminals of the incoming trunk. Just before cut through a zip tone is connected to the attendant. The loop between the calling party and the attendant is closed and a supervisory circuit is completed. This supervisory circuit is used to release the circuit when the calling party disconnects or the attendant releases the incoming trunk.

10.05 If the attendant disconnects first by the operation of the RLS key, the locked IN key releases. The loop toward the calling party opens and the finder is released. If the calling party disconnects first, the loop from the subscriber opens and releases the supervisory circuit in the attendant trunk. All circuits restore.

10.06 When the attendant headset is not plugged into the headset jacks, the PA and PB lamps associated with the position, and located in the supervisor lamp cabinet, are dark.

10.07 When the attendant plugs the headset into the headset jacks and the IN key is released, the PA lamp associated with the position flashes at 60 ipm at the supervisor lamp cabinet. When the attendant operates the IN key, the PA lamp lights steadily. When an incoming trunk is connected to the attendant, the PA lamp is extinguished and the PB lamp lights. The IN lamp at the attendant console also lights.

10.08 When the trunk is seized the TK lamp associated with the incoming trunk lights at the supervisor lamp cabinet. When the trunk is connected to an attendant or is transferred, the TK lamp is dark. The TK lamp is also dark when the trunk is not in use.

10.09 When incoming trunks are waiting to be connected to attendants and no attendants are available, the CW lamp lights at each attendant and supervisor positions, and a buzzer sounds.

B. Trunk Finder Operation

10.10 Basic step-by-step principles are used on the trunk finders for serving trunks. The finders used are 200-point trunk finders whose wipers have access up to 200 incoming trunks. When an incoming trunk inside the trunk gate calls for service, the trunk finder associated with an idle attendant position hunts for and connects with the terminals of the incoming trunk and cuts through to the attendant position.

Trunk Finder Banks

10.11 Each attendant position has associated with it a trunk finder. Four 200-point finder banks and associated wipers make possible the appearance of the tip, ring, sleeve, and control terminals of 198 incoming and two test trunks before each attendant position trunk finder. The tip and ring terminals of the first 100 incoming trunks appear on the second bank from the bottom. The tip and ring terminals of the second 100 incoming trunks appear on the third bank. The top or fourth bank contains the sleeve terminals of the 200 trunks. The sleeves of the trunks appearing in the second bank make contact with the lower wipers and the sleeves of the lines appearing in the third bank make contact with the upper wipers. Accordingly, each

position of the finder has access to the terminals of two trunks and cuts through to the desired trunk by finding battery on the associated sleeve terminals. If battery is found on both terminals the upper one has preference. The control leads appear on the bottom bank and are connected in the same manner as the sleeve leads. A picture of a typical finder bank layout showing the assignment of the trunks on the finder bank terminals of the first subgroup is shown in Fig. 4. This assignment is such that if fewer than 200 trunks are equipped, the finder will have to rotary hunt over the least number of terminals.

Bank Multiple Slip

10.12 The bank multiple is designed to give as nearly as possible each incoming trunk an equal chance of having a finder find the trunk on the lowest level in the bank when an incoming call is initiated, thereby keeping the average interval before being connected to an attendant to a minimum. This is accomplished by means of the so-called slipped multiple, illustrated in Fig. 5. There is a slip of one level between adjacent finders so that 20 trunks, 10 trunks on one level of each bank, which appear on the first level of a finder, appear on the second level of the next finder to the left. This slip is applied to all levels in the same manner, with the lines which appear on the tenth level of a finder appearing on the first level of the next finder to the left. Ten finders permit a complete slip cycle and if the number of finders in the group exceeds 10, the cycle is repeated as far as possible. Accordingly, in a group of 10 finders each trunk appears once on the first level before some finder. Terminals of any particular line always appear in the same position within a level. A comparison of Fig. 4 and 6 shows the trunk appearances in subgroups 1 and 2.

Subgroup

10.13 The finders before which the same 20 trunks appear on a given level constitute a subgroup. Hence a group of lines appears on the bottom levels of the finders in the corresponding subgroup, refer to Fig. 4, 5 and 6. For example, trunks 1, 21, 41, 61, 81, 101, 121, 141, 161, and 181 appear on the bottom level of the lower bank of subgroup 1 and trunks 11, 31, 51, 71, 91, 111, 131, 151, 171, and 191 appear on the

bottom level of the upper bank of subgroup 1. Trunks 2, 22, 42, etc, and 12, 32, 52, etc, appear on the bottom level of subgroup 2, trunks 3, 23, 43, etc, and 13, 33, 53, etc, on the bottom level of subgroup 3 and so on.

Start Circuit

10.14 The arrangement of the finder start circuit is such that when a call is initiated by an incoming trunk, the first idle trunk finder is started in the subgroup which will take the shortest time to find the trunk. The 20 trunks of a subgroup appear together on the bottom level of the finder bank multiple of the home subgroup of finders. For example, finders 1, 11, 21, 31, etc (see Fig. 7), are the home subgroup for subgroup 1 trunks. The subgroup 1 trunks appear on the tenth level of the home subgroup finders of the second trunk subgroup, on the ninth level of the home subgroup finders of the third trunk subgroup, etc.

10.15 Associated with the 20 incoming trunks of a subgroup is a group relay. The operation of any trunk circuit closes the circuit to operate the group relay, which in turn places a ground on the start or ST- lead to the first finder of its home subgroup. The ST- lead connects to the first finder of that subgroup and when grounded causes that finder, if it is idle, to start. If that finder is busy the ST- lead is cut through to the next idle finder of the subgroup. Thus only *one trunk finder in a subgroup can move at a time*. If all the finders of the subgroup are busy, the start lead is extended to the first finder of the next subgroup in the direction of the bank slip, thus merging the subgroup of trunks whose home subgroup of finders is busy with the nearest subgroup whose home subgroup has an idle finder. When a position is unoccupied or is not ready to serve, the associated finder is conditioned so that it appears busy and thus extends the start lead to the next finder.

Commutator Multiple

10.16 In order that a finder will know to which level it should step vertically before rotary hunting, a vertical commutator is added. The commutator has 10 vertical segments associated with the 10 levels of the line finder. Therefore, when any incoming trunk calls for a trunk

LEVELS	TRK NO.	10	20	40	60	80	100	120	140	160	180	200	UPPER BANK
		9	19	39	59	79	99	119	139	159	179	199	
		8	18	38	58	78	98	118	138	158	178	198	
		7	17	37	57	77	97	117	137	157	177	197	
		6	16	36	56	76	96	116	136	156	176	196	
		5	15	35	55	75	95	115	135	155	175	195	
		4	14	34	54	74	94	114	134	154	174	194	
		3	13	33	53	73	93	113	133	153	173	193	
		2	12	32	52	72	92	112	132	152	172	192	
		1	11	31	51	71	91	111	131	151	171	191	
LEVELS	TRK NO.	10	10	30	50	70	90	110	130	150	170	190	LOWER BANK
		9	9	29	49	69	89	109	129	149	169	189	
		8	8	28	48	68	88	108	128	148	168	188	
		7	7	27	47	67	87	107	127	147	167	187	
		6	6	26	46	66	86	106	126	146	166	186	
		5	5	25	45	65	85	105	125	145	165	185	
		4	4	24	44	64	84	104	124	144	164	184	
		3	3	23	43	63	83	103	123	143	163	183	
		2	2	22	42	62	82	102	122	142	162	182	
		1	1	21	41	61	81	101	121	141	161	181	

Fig. 4 – Trunk Finder Bank Multiple Arrangement Subgroup 1 Showing Trunk Layout Arrangement

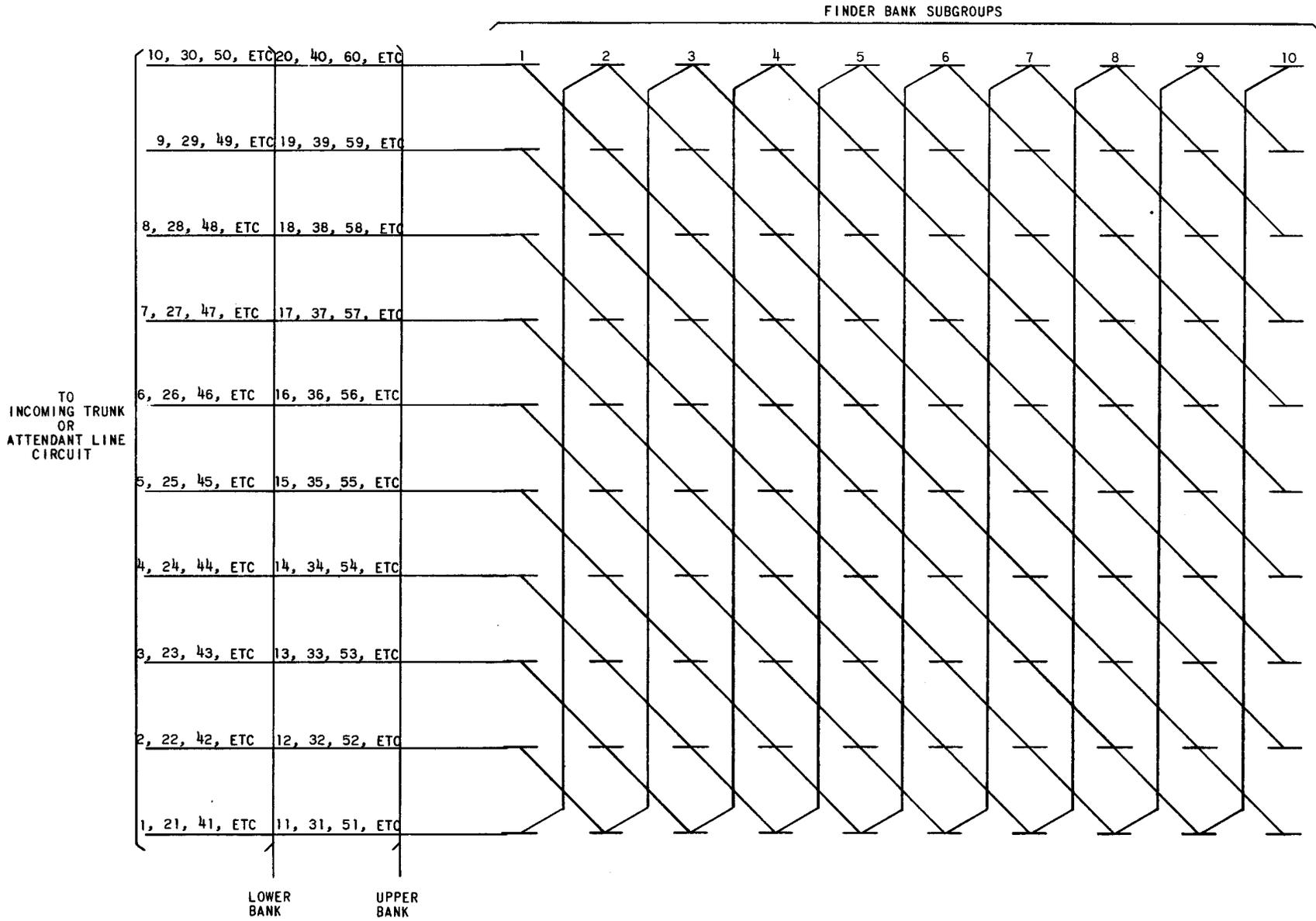


Fig. 5 - Typical Graded Multiple Arrangement For Trunk Finders Incoming and Attendant Trunks

LEVELS	10	11	31	51	71	91	111	131	151	171	191	UPPER BANK
	9	20	40	60	80	100	120	140	160	180	200	
	8	19	39	59	79	99	119	139	159	179	199	
	7	18	38	58	78	98	118	138	158	178	198	
	6	17	37	57	77	97	117	137	157	177	197	
	5	16	36	56	76	96	116	136	156	176	196	
	4	15	35	55	75	95	115	135	155	175	195	
	3	14	34	54	74	94	114	134	154	174	194	
	2	13	33	53	73	93	113	133	153	173	193	
	1	12	32	52	72	92	112	132	152	172	192	
LEVELS	10	1	21	41	61	81	101	121	141	161	181	LOWER BANK
	9	10	30	50	70	90	110	130	150	170	190	
	8	9	29	49	69	89	109	129	149	169	189	
	7	8	28	48	68	88	108	128	148	168	188	
	6	7	27	47	67	87	107	127	147	167	187	
	5	6	26	46	66	86	106	126	146	166	186	
	4	5	25	45	65	85	105	125	145	165	185	
	3	4	24	44	64	84	104	124	144	164	184	
	2	3	23	43	63	83	103	123	143	163	183	
	1	2	22	42	62	82	102	122	142	162	182	

Fig. 6 – Trunk Finder Bank Multiple Arrangement Subgroup 2 Showing Slipped Multiple

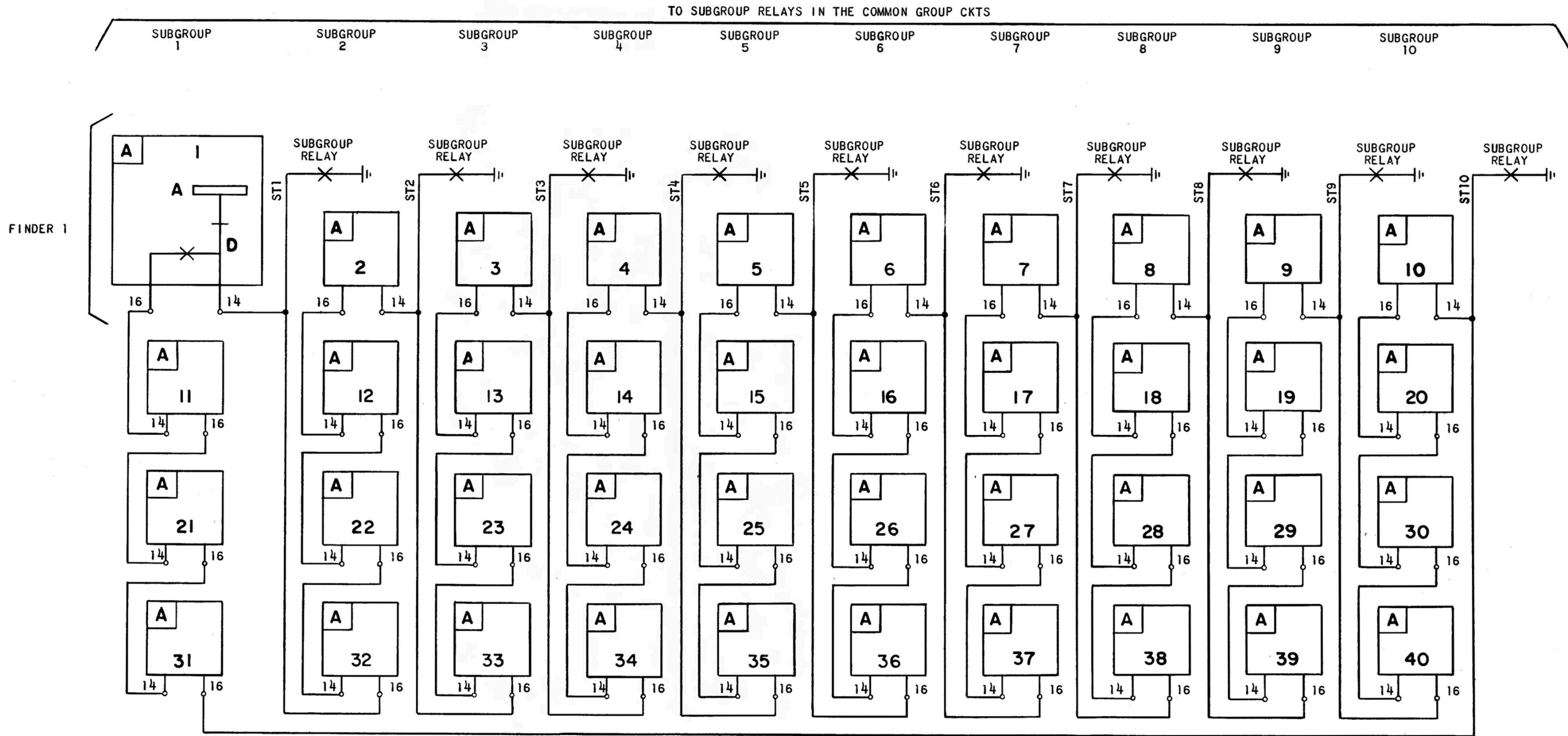


Fig. 7 - Incoming Trunk Finders Start Lead Arrangement For 40 Finders

finder, its corresponding group relay also operates. The operation of the group relay in addition to grounding the start *ST* lead, grounds the commutator segments corresponding to the level of the finders on which the trunk terminals appear. Thus, the finder hunts vertically until it finds ground on a commutator segment. Direct ground is connected to the tenth vertical commutator segment since the finder will not be required to hunt further. After completing its vertical hunt, the finder rotary hunts until it finds battery on the sleeve terminal. The finder then seizes these terminals and cuts through to its associated attendant trunk and console circuit.

Trunk Finder Operation Examples

10.17 When an incoming trunk enters the gate, it connects a ground to the start lead of its subgroup. This ground starts the trunk finder of the first attendant trunk in the chain which is idle and inside the gate. If there is no idle finder in the subgroup, the start lead is extended into the next subgroup in the chain. The interconnection of the start leads and their extension through the various groups is shown in Fig. 7. To illustrate various combinations of trunk and attendant trunk interconnections assume that:

(a) Incoming trunk 21 is inside the trunk gate and attendant 11 becomes idle. Since trunk 21 is in subgroup 1, ground is connected to the *ST1* lead and also commutators are grounded at the various levels of all finders where this subgroup appears. A resistance battery is also connected to the sleeve terminals of all trunk 21 appearances. Since attendant 1 is either busy or the position is unoccupied, its D relay is operated and the ground is passed on to finder 11. Finder 11 starts stepping vertically, finds a ground on the first level and starts rotary hunting. On the second rotary step it finds resistance battery on the lower sleeve, hence it stops and the tip, ring, sleeve, and control leads are closed on trunk 21.

(b) Incoming trunk 21 and 31 are inside the gate and attendant 11 becomes idle. All steps described in (a) take place when finder 11 starts. When it stops on the second terminals of the first level it finds a resistance battery on both sleeves. It gives preference to the upper bank terminals and closes to trunk 31.

(c) Incoming trunks 21 and 41 are inside the gate and attendant 11 becomes idle. Since both trunks 21 and 41 are in subgroup 1, ground is connected to the *ST1* lead and also commutators are grounded at the various levels of all finders where this subgroup appears. Resistance battery is also connected to the sleeve terminals of all trunk 21 and 41 appearances. Since attendant 1 is either busy or the position is unoccupied, its D relay is operated and the ground is passed on to finder 11. Finder 11 starts stepping vertically, finds a ground on the first level and starts rotary hunting. On the second rotary step it finds resistance battery on the lower sleeve, hence it stops and closes to trunk 21. Trunk 41 does not get served at this time.

(d) Incoming trunk 22 is inside the gate and attendant 11 becomes idle. Incoming trunk 22 is in subgroup 2 hence it connects ground start lead *ST2*. The ground on *ST2* is extended through D relays of finders 2, 12, 22, 32, 1 and finder 11 starts. It stops on the second level and rotary hunts two terminals to trunk 22 and interconnects trunk 22 and attendant 11.

(e) Incoming trunk 32 is inside the gate and attendants 2 and 12 become idle. Since incoming trunk 32 is in subgroup 2 ground is connected to the *ST2* lead. Finder 2 starts since it is the first one in the chain. It stops on level 1, rotary hunts two steps and interconnects trunk 32 and attendant 2.

(f) Trunks 26 and 46 are inside the trunk gate and attendant 11 becomes idle. The trunks are in subgroup 6 hence ground is connected to the *ST6* lead. Since no attendants are available in subgroups 6, 5, 4, 3, and 2, the ground is chained all the way back to subgroup 1 where finder 11 starts. It steps to the sixth level where it finds ground on the commutator and rotary hunts to the second terminal. The finder then interconnects trunk 26 and attendant 11.

(g) Incoming trunks 42 and 61 are inside the gate and attendants 21 and 32 become idle. Incoming trunk 61 is in subgroup 1 and trunk 42 in subgroup 2, therefore, ground is connected to the *ST1* and *ST2* leads. Both finders 21 and 32 start. Finder 21 finds ground on commutator level 1 and rotary hunts to trunk 61. Finder 32 finds ground on the first commutator level and rotary hunts to trunk 42.

(h) Incoming trunks 21 and 42 are inside the gate and attendants 23 and 33 become idle. Incoming trunk 21 connects ground to lead *ST1* and incoming trunk 42 to lead *ST2*. Both the *ST1* and *ST2* grounds are extended to finder 23 and it starts. On the ninth level it finds a ground and rotary hunts to pick up trunk 21. Finder 33 now starts, finds ground on the tenth level, and rotary hunts to pick up trunk 42.

(i) These examples demonstrate various combinations that may occur for finder operation. Other combinations are extensions of the above examples.

C. Incoming Trunk Identification

10.18 When calls on incoming trunks originate from different cities, the city of origin is audibly identified to the attendant after she receives the zip tone. The audible identification is from a recorder-reproducer machine. When ringing is tripped on the incoming trunk, the recorder-reproducer is started. The transmission path toward the originating end is opened and the area identification recorder is connected to the attendant headset through the incoming trunk. After area identification is completed, the recorder stops and signals the incoming trunk to cut through the transmission path.

10.19 If the attendant wishes to have the area identification repeated, the FL key is operated. This opens the trunk loop momentarily and causes the recycling of the area identification operations described above. When the trunk loop is opened, a flash is returned to the calling customer. If an operator is involved in completing the call, her cord lamp will flash.

D. Delay Announcements

10.20 The recorded delay announcement feature is enabled by the operation of the delay announcement (DA) key to either the R or the R and L position in the supervisor lamp cabinet. The live announcement feature is enabled by the operation of the DA key to the R and L position. When the DA key is operated to either position, the associated announcement circuit signals its availability to the timing circuits and enables the recorded and live announcement functions.

10.21 If the recorded announcement key is operated at the supervisor console, a recorded announcement is given to the calling subscriber if he is not connected to an attendant during a timed interval. This interval can vary between 12 to 25 seconds depending on when the incoming trunk is seized with respect to the start of the timing cycle controlled by the closing of the incoming trunk gate.

10.22 To insure that an announcement is not given before 12 seconds of waiting time elapses, two separate timers are used. The first timer starts when the incoming trunk gate closes and keeps recycling every 12 seconds while the trunk gate remains closed. When the trunk gate opens and closes, the timer is recycled at the closing of the trunk gate. Relays in the announcement control circuit start a second timer at the end of the 12-second interval. The second timer runs 10 seconds and resets. When incoming trunks are waiting for attendants and timer 1 reaches the end of the 12-second interval, it sends a signal to all waiting trunks and conditions them for receiving the signal from timer 2. When timer 2 reaches the end of its 10-second timing period, it sends a signal to the incoming trunks. All incoming trunks that have received the signal from timer 1, now trip ringing and the transmission paths connect to a common announcement bus bar. Incoming trunks that have not received the signal from timer 1 continue ringing and do not connect to the announcement bus. The recorded announcement machine is started and 3 seconds later the recorded announcement is connected to all incoming trunks connected to the bus bar. At the end of the announcement, all trunks that have received a recorded announcement are returned inside or outside of the trunk gate, depending on where they were at the start of the announcement. At this time these trunks are readied to receive live announcement, if this feature is available. If the trunk gate opens while trunks are in announcement, trunks outside the trunk gate will be placed inside the gate.

10.23 If an attendant becomes available during recorded announcement, the attendant trunk circuit seizes an incoming trunk inside the trunk gate. Thus the customer on that trunk may get a partial announcement, however, this is satisfactory because the attendant is now ready to serve him.

10.24 If, after receiving a recorded announcement, the trunk is not connected to an attendant during a timed interval, the customer will be connected to a second announcement trunk. This announcement trunk can be served by an attendant or an answering machine. Timing is by the same two timers used for timing the connection of the recorded delay announcement feature. Second announcement timing is reduced by the 3 seconds it takes for the announcement machine to start and the length of the recorded announcement. The first timer, as before, conditions the incoming trunk to receive the second timer signal. When the second timer signal is received, the waiting incoming trunk signals the associated subgroup control relay that an incoming trunk is ready for a second announcement.

10.25 The second announcement trunk can connect to a 500-type telephone set, a PBX extension, or an answering set on a ring-down basis and is associated with a trunk finder. When an incoming trunk requests a second announcement, its associated subgroup relay starts a trunk finder hunting for the incoming trunk on its bank multiple. When the incoming trunk is found, it is connected to the announcement trunk, which in turn starts automatic ringing toward the attendant or answering set. When the attendant or answering set answers, ringing is tripped and the customer on the incoming trunk can talk to the attendant or if an answering set is used, a second recorded announcement will be made. All functions of an answering set may now be utilized. While the trunk is ringing, control is retained by the incoming trunk. After the trunk is answered, control is transferred to the announcing source. While the incoming trunk is connected to the second announcement trunk, it is taken out of the incoming trunk gate if it was inside. After announcement, it is returned inside the gate if it was originally in it. If during second announcement an attendant becomes available, a trunk in second announcement will not be connected to her. If the trunk gate opens during second announcement, an incoming trunk outside of the gate and receiving second announcement will be placed inside the gate at the end of announcement.

10.26 Standard trunk finders are associated with the second announcement trunks. The method for trunk finding is similar to that

described starting in 10.10, with the exception that the start circuits are shown in Fig. 8 instead of Fig. 7. The number of finders on a mounting unit are four. The start leads are connected on the basis of ten subgroups as shown in Fig. 8. If more than four trunk finders are provided, it is possible to connect them so that if ten finders are provided each subgroup will have a finder where its trunks appear on the first level of the finder banks. If less than ten finders are provided, it is possible to arrange the subgroups so that the lowest possible level is available to those subgroups that do not have a finder where they appear in the first level. Fig. 9 is an example showing connections for eight finders. For example, if four finders are provided, they would be connected to have subgroups 1 to 4 on the first bank levels, if eight finders are provided they would be connected to have subgroups 1 to 8 on the first bank levels, if 12 finders are provided, the first ten would be connected to have subgroups 1 to 10 on the first levels, the eleventh finder subgroup 1 on its first level and the twelfth finder subgroup 2 on its first level and so on.

E. Transferring a Call

10.27 When an attendant wishes to transfer a call on the incoming trunk to another location such as another attendant, the supervisor, the PBX, etc, she operates a transfer key which causes the transfer control circuit to select an idle transfer trunk and connect it with the incoming trunk.

10.28 Two general types of transfer trunks are available: one is a manual type using automatic ringing to signal the called party; the second is a dial type with the connection completed by the ACD attendant by dialing through the associated local PBX switching equipment or if there is no associated dial PBX by dialing through selector switches provided in the ACD.

10.29 If transfer is required to one location only, manual transfer can be used. If transfer is required to more than one location, it is necessary to dial the location desired.

10.30 When the manual type of transfer trunk is connected to an incoming trunk, automatic ringing starts. When the called party an-

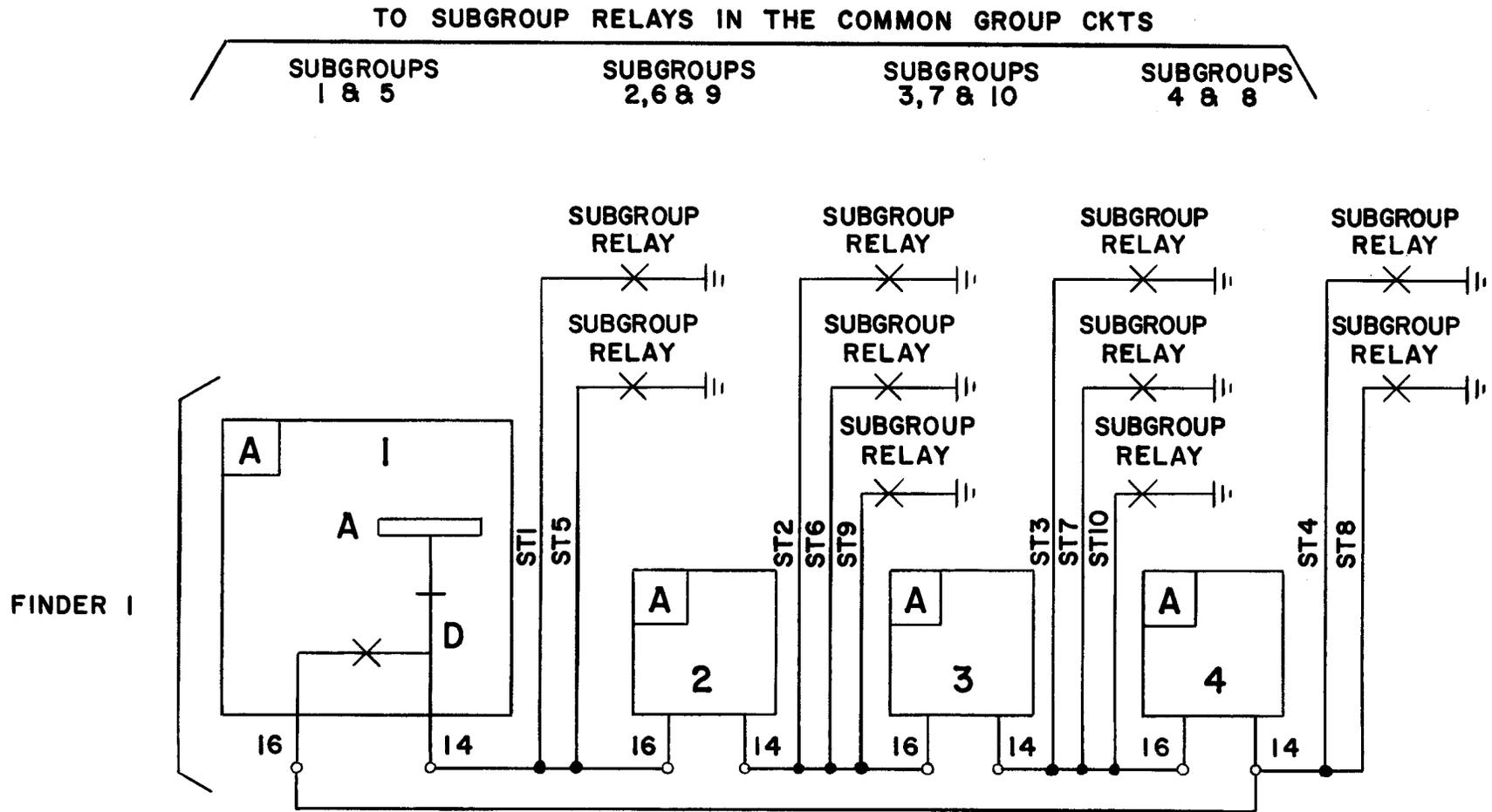


Fig. 8 - Second (Live) Announcement Finders Start Lead Arrangement For 4 Finders

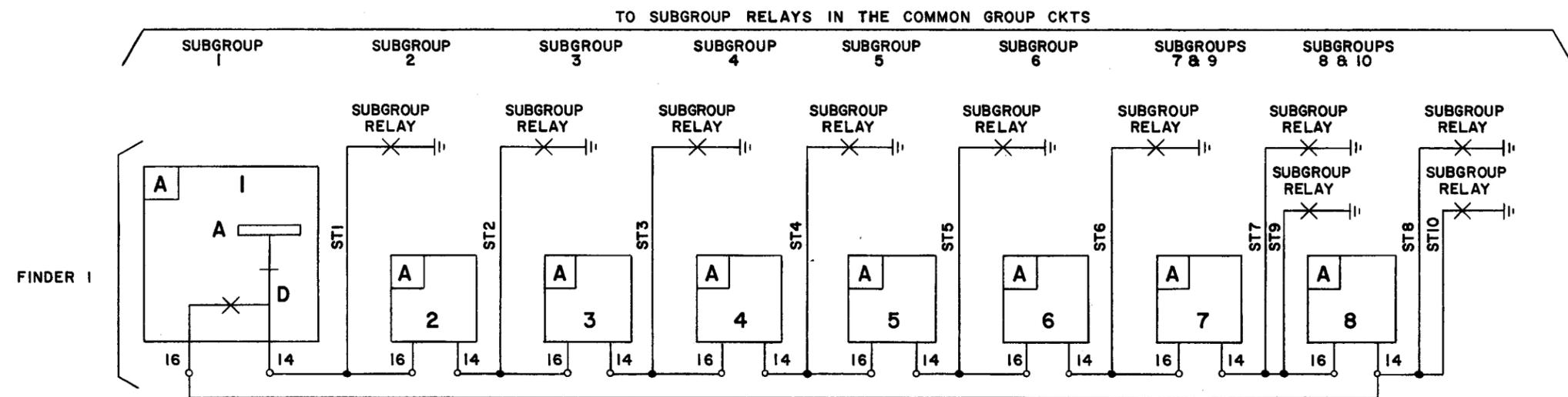


Fig. 9 - Second (Live) Announcement or Conference Finders Start Lead Arrangement For 8 Finders

swers, control of the incoming trunk is transferred from the attendant trunk to the transfer trunk.

10.31 When a dial type of transfer trunk is selected, the incoming trunk is automatically split away from the attendant trunk so that it will not interfere with dialing on the transfer trunk. When dial tone is received, the attendant dials the desired transfer point number. At the completion of dialing, ringing of the called party starts automatically. When the called party answers, ringing is tripped, and the ACD attendant reoperates the IN key to connect the incoming trunk, the transfer trunk party, and herself together. Control of the incoming trunk is shifted from the attendant trunk to the transfer trunk.

10.32 The ACD attendant can now release her position circuit by operating the RLS key. This releases the trunk finder of the attendant trunk and the ACD position, but does not disturb the connection between the incoming trunk and the transfer trunk.

10.33 When the transfer point does not answer or is busy, the ACD attendant can release the transfer trunk by operating and releasing the FL key and then operating the IN key. This releases the TRS key. The transfer trunk finder releases. The connection between the incoming trunk and the attendant trunk is held.

10.34 The transfer attendant can flash the originating operator without releasing the connection, but only after the ACD attendant has released the circuit.

10.35 The transfer point or the calling party can disconnect first. When either party disconnects, the transfer trunk finder releases. If the transfer point disconnects while the ACD attendant is still attached, the transfer finder releases, but the incoming trunk remains connected to the ACD attendant trunk.

10.36 When a transfer key is operated, the IN key releases but the IN lamp remains lighted, as the incoming trunk is put on hold. The operated TRS key does not light. The PA lamp associated with the position flashes at 60 ipm at the supervisor lamp cabinet and the associated PB lamp lights steadily.

10.37 If all trunks of a manual transfer group are busy, the attendant does not receive a ringing tone. This indicates the all trunk busy condition. If dial transfer trunks are used, the attendant receives busy tone when all transfer trunks are busy or if the called trunk is busy.

10.38 When dial transfer is used and an associated PBX is not available, transfer selectors are provided as required. These selectors operate in the same way as associated PBX selectors.

10.39 Standard trunk finders are associated with the transfer trunks. The method for trunk finder operation is similar to the method described in 10.10 to 10.16, with the exception that the start circuits are interconnected as shown in Fig. 10 instead of Fig. 7. The number of finders on a shelf unit are either 10 or 20.

10.40 When selectors are required, a selector is associated with each line finder. When dial tone is received from the selector, the attendant can dial any one of ten digits. The selector steps to the level and rotary hunts over the available trunks on that level from one to ten. If an idle trunk terminal is found, the selector connects the transfer trunk finder to the transfer trunk on that selector terminal. Automatic ringing will start on a manual trunk or another dial tone may be received from a connected central office, PBX, or tie line.

10.41 If more than ten locations must be reached, second selectors are provided or else a special selector is used with 2-digit dialing. If second selectors are used, the first selector steps to the level of the first digit then rotates to find an idle second selector. The second selector steps to the level of the second digit dialed then rotates to an idle trunk. If a 2-digit dialing selector is used the selector steps to the desired level on the first digit, then rotary steps on the second digit.

F. Conferencing

10.42 The attendant can set up a conference among the incoming trunk, a line to the central office, a PBX or tie line, and herself. To obtain the third party the attendant operates the CO OUT or PBX OUT key. The IN key is

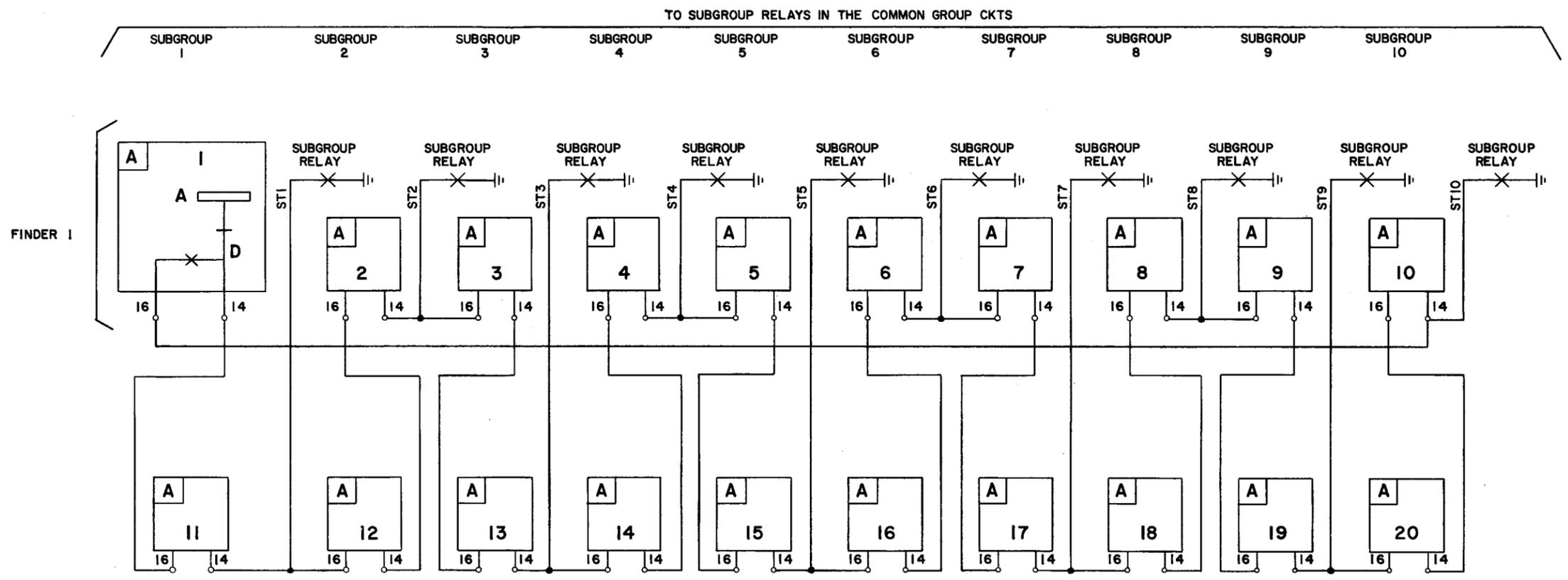


Fig. 10 – Transfer Trunk and Outgoing Trunk Finders Start Lead Arrangement For 20 Finders

released but a holding bridge is placed across the incoming trunk. After obtaining the third party, the attendant operates the CONF key. With the conference key operated the incoming trunk, the attendant trunk and the outgoing trunk are interconnected.

10.43 Conferencing circuits are provided either with normal bridging loss of the attendant telephone circuit or with low loss. Conference calls are established in the same way in either case. When low loss is not provided, the CONF lamp lights as soon as the CONF key is operated. When low loss is provided, the CONF lamp lights when a conference line finder is attached and all parties are connected together. If the CONF lamp does not light, all conference line finders are busy and the attendant has to wait until a line finder becomes idle before a conference can be completed.

10.44 The attendant can release the conference by operating the RLS key or the attendant can pick up the incoming party by reoperating the IN key. The conference finder and the called party are released. If the attendant wishes to talk to the called party the PBX OUT or CO OUT key is reoperated. The incoming line is put on hold and the conference finder is released.

10.45 The conference finder has four banks. The three lower banks are used for the incoming trunks, the attendant trunks and the outgoing trunks. The top bank is used for the control leads. Because it is a four bank finder, only 100 circuits can be connected to it. Therefore, the first 100 attendants are connected to one set of conference finders and the second hundred attendants are connected to another set of conference finders. One conference finder is used for each conference circuit. The customer can order as many conference finders as desired. The shelf for the conference finders comes in groups of eight and can be mounted on relay racks. The bank multiples are slipped in the same way as described in 10.12 except that a complete cycle is not completed in the wiring for the eight finders. If more than eight finders are provided for a group of 100 positions, the ninth subgroup should be connected to the ninth finder and the tenth subgroup to the tenth finder. The eleventh finder would be then controlled by first subgroup and the cycle repeated. In the

same manner, the trunks in the ninth subgroup would be connected to the first level of the bank multiple of the second group of eight finders, and the tenth subgroup to the second level, the first subgroup to the third level and so on. Fig. 9 shows the connection of the start leads for the first eight finders.

G. Outgoing Calls to Central Office or Other Trunks

10.46 If a direct line is used to the central office, it may be multiplied to several attendants. When the CO OUT key is operated the CO OUT lamp lights. This indicates to the other attendants using the same outgoing trunk that the trunk to the central office is busy. When the attendant operates the CO OUT key and dial tone is received from the central office, the desired number can be dialed.

10.47 If the auxiliary outgoing trunk is used to the central office, the CO OUT lamp lights when the CO OUT key is operated. An outgoing trunk finder finds the attendant position and dial tone is received from the central office. The desired number then can be dialed. If all auxiliary outgoing trunks are busy no dial tone will be heard.

10.48 Dial selected trunks are used if it is desired to reach more than one outgoing location. When the CO OUT key is operated, the CO OUT lamp lights and dial tone is received. The attendant dials the code of the group of trunks she wishes to reach.

10.49 To put the central office trunk on hold, the attendant operates the HOLD key. The CO OUT key releases. The hold circuit in the attendant line circuit to the central office is operated and holds the connection to the central office. The attendant position is freed for other operations. When the CO OUT key is reoperated, the normal connection from the attendant position to the central office is restored.

10.50 When a call is completed, the attendant releases the circuit by operating the RLS key. The line finder and selector release. If the called party has hung-up, the central office switches are released and the auxiliary trunk releases. If the called party has not hung-up, the central office switches have not released. The auxiliary trunk holds the circuit so that false

seizure of the incoming trunk will not take place. When the central office switches release, the auxiliary trunk restores the incoming trunk to normal, ready for a seizure from the central office.

10.51 On an incoming call when the trunk is seized by the central office, the auxiliary trunk is made busy and the line finder is signaled that this trunk is not available for outward service.

10.52 When the position seizes a trunk to the central office, the associated PB lamp at the supervisor lamp cabinet flashes at 60 ipm, indicating to the supervisor that the attendant is busy on an outgoing call.

10.53 When auxiliary outgoing trunks are used each attendant console has associated with it a line circuit to the central office. When the CO OUT key is operated at the console, this circuit functions to start a finder and hunts for this line on the finder bank multiple and connects it through to the auxiliary trunk circuit. If selectors are not provided, one finder is provided with each central office trunk. If selectors are provided, a selector is associated with each line finder and the number of line finders and selectors can be reduced depending on the number of simultaneous outward calls desired by the customer.

10.54 Standard trunk finders are used and operate as described in 10.10 to 10.16. Start circuits are interconnected as shown in Fig. 10. The number of finders on a shelf unit are either 10 or 20.

10.55 Selectors operate as described in 10.40 and 10.41.

H. Outgoing Call to the PBX

10.56 When the PBX OUT key is operated, a PBX trunk is selected and the PBX OUT lamp lights. If the trunk terminates in a manual PBX, the operator is signaled and she completes the call. If the trunk terminates in a dial PBX, dial tone is received and the attendant completes the call by dialing the desired number. When the PBX trunk is used the associated PB lamp at the supervisor lamp cabinet flashes at 60 ipm.

I. Hold Circuit

10.57 The hold circuit places a shunt across the circuit to which it is connected. The hold circuit is automatically applied to the incoming trunk when a TRS- CO OUT or PBX OUT key is operated. The only time that the HOLD key has to be operated with the incoming trunk is if the attendant wishes to talk to the supervisor without the customer on the incoming trunk hearing the conversation. The HOLD key can also be operated if an outgoing call to the PBX, central office, or a 4-wire circuit is to be held. The hold circuit is so arranged that the holding shunt is placed across the circuit to be held before the mechanically interlocked IN, CO OUT, PBX OUT or 4W releases.

10.58 The hold circuit is released by the re-operation of the IN, PBX OUT or CO OUT key.

J. Talking to the Supervisor

10.59 To call the supervisor the attendant operates the SUPV key. While the SUPV key is operated, a 120-ipm flash is connected to the position PA lamp at the supervisor lamp cabinet and a buzzer sounds steadily. The supervisor keys the calling position number, the same way as for monitoring, then operates the SIG key. This lights the SUPV lamp at the attendant position and a tone is connected to the attendant headset. The attendant again operates the SUPV key while the SUPV lamp is lighted and completes the talking circuit between the attendant and the supervisor. It is necessary that both the SUPV and SIG key be operated simultaneously in order to complete the talking connection.

10.60 If the supervisor calls an attendant, the desired attendant position is keyed as for monitoring. When the SIG key is operated, the SUPV lamp lights and a tone is heard in the called attendant headset. The attendant operates the SUPV key, while the SUPV lamp is lighted, and the talking connection is completed. The SUPV lamp will now be extinguished.

10.61 Once the talking circuit between the attendant and supervisor is completed, only the supervisor can release the connection by operating the RLS key.

K. Abandoned Call Checking

10.62 When an incoming call is connected to a recorded or live announcement, the ACD equipment returns a charge condition by going off-hook. If the calling party abandons the call during or after a delay announcement, the ACD equipment remains in the off-hook condition and holds the incoming trunk. The central office associated with the ACD receives the subscriber's disconnect and starts to time out. This time-out varies in different types of local offices from a few seconds to 4 minutes.

10.63 When an attendant becomes available the associated finder hunts for the waiting incoming trunk. When the incoming trunk is found, cut-through is delayed, and the answering bridge toward the central office is changed from a low to a high resistance circuit. If the subscriber has abandoned the call, this high resistance bridge drops the central office equipment, which releases the incoming trunk. The incoming trunk signals the finder to release without cutting through to the attendant. If the subscriber has not abandoned the call, the incoming trunk is cut through to the attendant after a delay of about 500 milliseconds.

L. Attendant Recalls Distant Operator

10.64 When the incoming call is from a distant operator, the attendant may initiate a recall to the distant operator by operating and releasing the nonlocking FL key. The loop toward the calling operator is opened every time the FL key is operated and closed when the key is released. This signal is transmitted to the operator and her cord circuit lamp will flash. When the FL key is operated, the attendant's trunk is locked to the operated FL key to prevent its release.

10.65 If the area identification feature is provided, the city of origin announcement is repeated every time the attendant operates the FL key.

M. Identification of Faulty Trunk

10.66 If an incoming trunk is in trouble, the attendant connected to it can assist the supervisor in identifying it. If the attendant finds an incoming trunk in trouble, she will call the supervisor and advise her of the trouble.

Then the attendant operates and releases the FL key several times. This opens and closes the loop toward the incoming trunk and causes the TK-lamp, in the supervisor lamp cabinet, associated with the connected incoming trunk to flash in unison with the operation of the FL key.

N. 4-Wire Circuit Operation

10.67 When 4-wire circuits are terminated at the attendant console, they are connected to the six 4W- keys. The 4-wire circuits can be used for 2-way service. On an incoming call, the calling 4W- lamp flashes and a buzzer sounds. The attendant answers by operating the associated 4W- key. The lamp becomes steady and the 4-wire circuit is connected directly to the attendant telephone set which is changed to 4-wire operation.

10.68 On outgoing calls the circuits can be either manual or dial selected. If manual operation is used, six trunks can be connected to an attendant. If dial selection is used only one 4W- key is assigned. With manual service, operation of the 4W- key starts automatic ringing toward the terminating end, or an operator is reached who completes the call. With dialing circuits, when the 4W- key is operated, dial tone is received and the desired number is dial selected. The associated 4W- lamp lights steadily when the key is operated. Any 4W- key can be released by the operation of the RLS key or another locking key such as another 4W- IN, CO OUT, PBX OUT etc, key.

O. Night Service

10.69 When the night service key is operated at the supervisor console, certain incoming trunks are connected to associated night service trunks. A call received during night service operation is processed by this trunk the same way as a regular call except that the night service trunk rings the night service attendant, who generally will be located at a different location than the ACD.

10.70 For night service, the incoming trunk finder is connected to the night service trunk instead of the attendant position. The night service trunk provides interrupted ringing toward the night service attendant. When the night service attendant answers, ringing is tripped both in the night service trunk and at the

calling office. Supervision is controlled by the calling party and the night service attendant. The night service attendant can initiate a flash through the incoming trunk to a calling operator.

10.71 If a regular call is in progress when the night service key is operated, the incoming trunk connected to the attendant trunk prevents its transfer to night service operation until completion of the call in progress. At the end of the call, the attendant trunk is connected to the night service trunk. Conversely, if a night service call is in progress when the night service key is released, the night service trunk prevents release of the attendant trunk until completion of the call in progress.

P. Calls Waiting Lamp

10.72 The calls waiting lamps are lighted at all attendant and supervisor consoles and a buzzer sounds, if the attendant trunk gate is open indicating that no attendants are available, and if the incoming trunk gate is closed, indicating that there are calls waiting. When a position becomes available, the calls waiting lamps are extinguished and the buzzer is silenced.

10.73 During night service the calls waiting control is made inoperative. The supervisor can also make the calls waiting feature inoperative by operating the CWO CO key in the supervisor lamp cabinet. The buzzer alone can be made inoperative if the supervisor operates the AUD key to OFF in the supervisor console.

Q. Use of the Dial

10.74 A rotary dial is provided for use with central offices, dial PBXs, dial transfer, and dial 4-wire trunks. The dial operates in the usual manner. When the dial is pulled off-normal, the transmitter is removed from the circuit, the receiver is shorted, and a short is placed across the called circuit. When the dial is released, the short is pulsed to actuate the dial pulse receiving equipment. At the end of the dial travel the circuit is restored to normal.

R. Transmitter Amplifier

10.75 An amplifier is provided for the telephone set transmitter to provide amplification and make its efficiency approximately equal to the T1 transmitter of the 500-type set.

11. SUPERVISOR CONSOLE CIRCUIT OPERATIONS

A. Monitoring and Talking to an Attendant

11.01 The monitor circuit permits the supervisor to select a particular attendant position and connect her own telephone receiver to it. The selection is performed by means of the nonlocking, pushbutton keys T0 to T9 for tens selection; U0 to U9 for units selection; GRP0 or GRP1 key for group selection; and locking, pushbutton key MON.

11.02 To monitor on a particular position, the supervisor operates the MON key. This prepares the circuit for key selection. The ten button T- is operated, followed by the unit button U- and the GRP0 or GRP1 key, corresponding to the number of the position to be monitored. The monitoring circuit operates to select the attendant position dialed. The MON, and the selected T-, U-, and GRP- lamps light. The supervisor telephone circuit is bridged across the attendant position circuit on a high impedance basis with a monitoring amplifier in the circuit. The attendant cannot detect when the supervisor monitoring circuit is connected to her telephone set. The supervisor has a volume control potentiometer located at the console, designated VOL. The monitoring level can be adjusted with this potentiometer by changing the gain of the monitoring amplifier.

11.03 The monitoring circuit can be released by operating the RLS key. The operation of the RLS key releases the MON key, which opens the monitoring path to the operator and restores the supervisor circuit to normal.

11.04 When the supervisor wishes to talk to an attendant, the attendant position is dialed as described in 11.02. The supervisor operates the SIG key in her console. Operation of the SIG key lights the SUPV lamp at the attendant console and connects a low level tone to the attendant telephone set. This low level tone can also be heard by the party on any circuit connected to the attendant. The attendant operates the SUPV key while the SUPV lamp is operated and completes the talking connection by removing the monitoring amplifier from the circuit.

11.05 The release of the connection is under control of the supervisor. To release the connection, the supervisor operates the RLS key.

This opens the path to the dialed attendant and reinserts the monitoring amplifier into the supervisor talking path.

11.06 If the attendant calls the supervisor, the PA lamp associated with the calling attendant flashes at 120 ipm and a gong sounds. The supervisor dials the calling attendant position number and operates the SIG key. This lights the SUPV lamp at the calling attendant position. When the attendant operates her SUPV key at the time that the SUPV lamp is lighted, the talking circuit is completed and the interconnection is locked under the control of the supervisor.

B. Transferred Call

11.07 When a call is transferred from an ACD attendant, the key telephone unit provided for this purpose rings the supervisor's position. The TRS IN lamp flashes at 60 ipm. The supervisor answers by operating the locking key TRS IN. The TRS IN lamp becomes steady, the bell stops ringing, and the talking circuit is completed among the calling attendant, the calling subscriber, and the supervisor. At the end of the conversation, the supervisor releases the call by operating the RLS key. This releases the TRS IN key which releases the key unit and the transfer trunk.

C. Central Office Trunk

11.08 The central office trunk is a 2-way circuit at the supervisor console. On an incoming call, the key telephone unit flashes the CO lamp at 60 ipm and rings a bell. The supervisor answers the call by operating the CO key. The CO lamp becomes steady and the supervisor is connected to the calling party.

11.09 On making an outward call, the supervisor operates the CO key. The central office trunk is seized and the CO lamp lights steadily. When dial tone is received, the desired number can be dialed. To release the central office line the RLS key is operated.

D. PBX Extension

11.10 The PBX trunk is a 2-way circuit at the supervisor console. On an incoming call the key telephone unit flashes the PBX lamp at 60 ipm and rings a bell. The supervisor answers

the call by operating the PBX key. The PBX lamp becomes steady and the supervisor is connected to the calling party.

11.11 On making an outward call the supervisor operates the PBX key. The PBX trunk is seized and the PBX lamp lights steadily. When dial tone is received, the desired number can be dialed or with a manual PBX the desired number is given to the operator. To release the PBX line the RLS key is operated.

E. Hold Circuit

11.12 To hold any connection the HOLD key is operated. A hold is put on the associated key unit allowing the supervisor to make a call on another circuit. The lamp associated with the held trunk remains lighted. The monitoring circuit does not have to be held as it can be released only by the RLS key.

F. Release Circuit

11.13 When the RLS key is operated any circuit connected to the supervisor position is released. The monitoring circuit is released by releasing the MON key and opening all the locking circuits. Other circuits like the TRS IN, CO, PBX, etc, are released because of the mechanical linkage of the RLS key with other locking keys.

G. Recalling Distant Operator

11.14 When the incoming call is from a distant operator, the supervisor may initiate a recall to the distant operator by operating and releasing the nonlocking FL key. The loop toward the calling operator is opened every time the FL key is operated and closed when the FL key is released. The loop opening and closing is transmitted to the operator and her cord circuit lamp flashes. When the FL key is operated, the supervisor position is locked to the operated FL key to prevent its release.

H. Night Service

11.15 The supervisor changes the ACD to night operation by operating the NITE key to ON. The supervisor returns the ACD to normal operation from night service by operating the NITE key to OFF. The night service operation is described in 10.69.

SECTION 981-236-100

I. Calls Waiting Circuits

11.16 When the attendant trunk gate is open indicating that no attendants are available, and the incoming trunk gate is closed, indicating that calls are waiting, the calls waiting lamps are lighted at all attendant and supervisor consoles and a buzzer sounds. When a position becomes available, the calls waiting lamps are extinguished and the buzzer is silenced.

11.17 During night service the calls waiting control is made inoperative automatically.

11.18 The supervisor can make the calls waiting feature inoperative by operating the CWO CO key in the supervisor lamp cabinet.

11.19 The buzzer alone can be made inoperative by the supervisor by operating the AUD key to OFF in the supervisor console.

J. Delay Announcement Controls

11.20 The recorded delay announcement trunks are placed into service by the operation of the DA key to either the R or the R and L position, and the second announcement trunks by the operation of the DA key to the R and L position in the supervisor lamp cabinet. When this key is operated to either position, the associated trunks signal their availability to the circuit. Complete operation is described starting in 10.20.

11.21 The recorded message of the delay announcement can be changed by the supervisor from her console. When the nonlocking DIC key is operated the announcement set is conditioned to erase the existing recording and to receive a new recording. The previous recording is erased in about 4 to 7 seconds. When the machine is ready to receive recording, the DIC lamp lights. The supervisor can dictate directly from the headset. When recording is completed, the DIC key is released, stopping the recording machine. The DIC lamp is extinguished when the key is released or at the end of the recording period. The maximum recording period is set to approximately 10 seconds.

11.22 The message dictated on the announcement set can be checked by operating the locking, nonilluminated CHK key. When the key

is operated, the supervisor hears the recorded message in her headset. At the end of the message the RLS key is operated, which releases the CHK key and stops the machine.

12. SUPERVISOR LAMP CABINET OPERATIONS

A. Trunk Lamps

12.01 One hundred ninety-eight incoming trunk lamps are provided, one per incoming trunk. The lamps are designated TK 0 to TK 197 corresponding to the incoming trunk numbers. The lamp associated with the incoming trunk lights whenever that trunk is waiting to be connected to an attendant trunk. The lamp becomes dark when the trunk is connected to an attendant trunk.

12.02 The attendant can flash the TK- lamp of the incoming trunk connected to her position by operating the FL key. Every time the loop is opened when the FL key is operated, the relay which transmits the loop open condition, also lights the associated TK- lamp. This is used to identify a trunk in trouble.

B. Position Status Lamps

12.03 Two lamps are provided for each position, designated PA 0 to PA 199 and PB 0 to PB 199, to indicate what the attendant is doing. The following are functions of the two lamps designated PA, with white lamp cap, and (PB), with red lamp cap.

12.04 Position is unoccupied:

- (a) PA lamp is dark.
- (b) PB lamp is dark.

12.05 Position is occupied and no keys are operated at attendant console.

- (a) PA lamp flashes at 60 ipm.
- (b) PB lamp is dark.

12.06 Position is occupied, operator ready for incoming call, and IN key is operated on attendant console:

- (a) PA lamp is lighted.
- (b) PB lamp is dark.

12.07 Position is busy on an incoming call:

- (a) PA lamp is dark.
- (b) PB lamp is lighted.

12.08 Hold on incoming call:

- (a) PA lamp flashes at 60 ipm.
- (b) PB lamp is lighted.

12.09 Hold on incoming call, position is busy on an outgoing call:

- (a) PA lamp is dark.
- (b) PB lamp is steady.

12.10 Position is busy on an outgoing call:

- (a) PA lamp is dark.
- (b) PB lamp flashes at 60 ipm.
- (c) PBX OUT and CO OUT calls.

12.11 Attendant request service assistance:

- (a) PA lamp flashes at 120 ipm.
- (b) PB lamp has same indications as in 12.04 to 12.10.
- (c) A gong sounds.

12.12 Attendant makes a transfer call:

- (a) PA lamp flashes at 60 ipm.
- (b) PB lamp is lighted.

C. Alarm Lamps**12.13** The following alarm lamps with red lamp caps are provided. When a lamp is lighted it indicates the following condition:

- (a) Lamp PWR indicates power equipment failure.
- (b) Lamp CF indicates failure of some common equipment.
- (c) Lamp FA indicates a fuse failure.
- (d) Other alarm lamps are provided in the tone and alarm circuit.

D. Control Functions of Keys

12.14 A turn type key is provided for enabling the recorded and the live announcement trunks. When the key is operated to the R position, the recorded delay announcement feature is enabled. When the key is operated to the R & L position, both the recorded and live announcement trunks are enabled.

E. Audible Alarms**12.15** The following audible alarm apparatus is provided:

- (a) A buzzer sounds whenever an alarm lamp or the calls waiting lamp lights.
- (b) A buzzer sounds in the supervisor console whenever an attendant is calling for service assistance.

13. OTHER MISCELLANEOUS EQUIPMENT OPERATIONS**A. Incoming Trunk Identification Using THE CALL DIRECTOR Set or Selector Equipment**

13.01 A 30 button THE CALL DIRECTOR set can be provided to control the recording and listening functions of the recorder-reproducer used for incoming trunk identification.

13.02 Twenty-four illuminated, locking CHAN keys are provided for selecting one of a maximum of 24 recording channels on the recorder-reproducer. When a new city of origin is to be recorded on a channel, the attendant operates the desired CHAN key. When the nonlocking DIC key is operated, and held, the recording amplifier and the recorder is readied to receive dictation. The attendant uses the transmitter associated with THE CALL DIRECTOR handset for dictation.

13.03 Each channel of the recording machine contains seven segments, hence the attendant must repeat each announcement at least seven times. The attendant can start dictation when the DIC lamp lights and must complete it before it is extinguished. Each recording period is about 1.6 seconds. At the end of the recording period the light goes out for about 0.2 of a second. When the DIC lamp lights again, the recorded announcement is repeated. After the seventh announcement, the DIC key must be released to prevent erasure of the recorded announcement. This must be done as the erase coil is located directly ahead of the record-reproduce coil so that erasure just precedes the recording.

13.04 Before restoring the recorder-reproducer channel to normal, the attendant generally checks the new dictation by operating the dictate check (DIC CHK) key. The previously operated channel key is released, but the chan-

nel is locked to the amplifier circuit. The telephone circuit of THE CALL DIRECTOR set is connected automatically to the output of the recorder-reproducer amplifier and the recorded message is heard in the receiver of the associated CALL DIRECTOR handset. If the dictation is satisfactory, the attendant releases the channel by operating the RLS key.

13.05 The attendant can check any recorder-reproducer channel by operating the desired CHAN key. The recorder-reproducer output channel is checked at the point where the incoming trunk is connected, thus verifying not only the recorded information but also the transmission level heard on the incoming trunk.

13.06 If more than 24 cities are to be identified, a selector circuit is used for choosing the desired channel on the recorder-reproducer for recording and checking the recording on the various channels. Instead of THE CALL DIRECTOR set a 500-type telephone set is provided with DIAL, CHAN, DIC, DIC CHK and RLS keys. When a channel recording is to be checked or changed the DIAL key is operated and the number of the desired channel is dialed using two digits. After the channel is dialed, listening or recording can be done in the same manner as described for THE CALL DIRECTOR set operation.

B. Traffic Data Peg Count Registers

13.07 Peg count registers, traffic usage recorders, and totalizers are provided as aids for administration of the system and engineering the number of trunks and positions required. All leads for controlling the registers are provided but the register equipment is optional at the request of the customer or the telephone company.

13.08 Position Peg Count Registers

A message register is provided for each attendant position to score the number of incoming calls answered by the attendant. The register is scored when a momentary ground is connected to a lead from the attendant trunk circuit when an incoming trunk is connected to it.

13.09 Abandoned Calls Peg Count Register

One message register is provided per system to score the total number of calls abandoned by the customer before connection to an attend-

ant. The register is scored when a momentary ground is connected to a lead from the incoming trunk if the trunk is released before it is connected to an attendant position. If experience indicates that there are many abandoned calls, a totalizer is provided.

13.10 Incoming Calls per Trunk Group Register

One message register is provided to score the number of incoming calls in a trunk group. This register count includes the abandoned calls. The register is scored when a momentary ground is connected to a lead from the incoming trunk during the ringup period.

13.11 Total Incoming Calls Register

(a) When registration of pulses has to be counted from many sources, the regular message register is not fast enough and a totalizer is provided. A totalizer is an electronic counter which collects peg count information from 200 sources, sums up the count, and scores a register once for each ten counts received.

(b) The pulses that operate the registers of the incoming calls per trunk group also drive the totalizer.

(c) Three message registers, driven by the totalizer, are provided to score the total number of incoming calls to the ACD. One of the message registers is nonresettable and scores continuously the total number of incoming calls. It scores one digit for every ten calls. The other two registers are used alternately to score the number of incoming calls for a predetermined length of time. When one register is scoring, the other register retains the count accumulated during the previous period. This stationary register can be read any time during this noncounting interval. At the end of the interval, the stationary register is automatically reset to zero and starts to score, while the second resettable register becomes stationary. This cycle is continuously repeated. These registers also score one digit for ten incoming calls.

(d) The length of scoring interval for the alternately used registers can be varied for 15, 30, and 60 minutes, under control of the supervisor.

13.12 Trunk Group Usage

- (a) A traffic usage recorder is employed to measure the traffic load carried by a group of circuits.
- (b) Three message registers are provided to record the total time that a group of trunks are in use for incoming and outgoing calls. One of the message registers is non-resettable and the other two are electrically resettable. They operate in a manner similar to that described in 13.11.
- (c) For measurement, a ground is connected to a lead from each trunk on incoming and outgoing calls from seizure to release.

13.13 Total Trunk Usage

- (a) The same traffic usage recorder employed for trunk group usage is used for total trunk usage.
- (b) Three message registers are provided to record the total time that all trunks are in use for incoming and outgoing calls. One of the message registers is nonresettable and the other two are electrically resettable. They operate in a manner similar to that described in 13.11.

13.14 Total Incoming Trunk Waiting Usage

- (a) A traffic usage recorder and three message registers are provided to measure the total time that incoming trunks are waiting to be answered. One of the message registers is nonresettable and the other two are electrically resettable. They operate in a manner similar to that described in 13.11.
- (b) For measurement, a ground is connected to a lead from each incoming trunk from seizure to position answer.

13.15 Position Manned Usage

- (a) A traffic usage recorder and three message registers are provided to record the total time that positions are occupied. One of the message registers is nonresettable and the other two are electrically resettable. They operate in a manner similar to that described in 13.11.

- (b) For measurement, a ground is connected to a lead from each position while a headset plug is inserted in the position headset jacks.

13.16 Position Busy Usage

- (a) A traffic usage recorder and three message registers are provided to record the total time that positions are busy. One of the message registers is nonresettable and the other two are electrically resettable. They operate in a manner similar to that described in 13.11.
- (b) For measurement, a ground is connected to a lead from each position circuit when the position is connected to an incoming trunk (even when it is on hold), a PBX out trunk, a CO OUT trunk, or the supervisor.

13.17 Speed of Service Indication

- (a) To measure the speed of service, two lamps are provided. When trunks are waiting inside the trunk gate for attendants, an amber lamp lights. When any trunk has waited inside the trunk gate for 50 seconds, the red lamp lights. When the trunk gate opens, the red lamp is extinguished.
- (b) For measurement, a ground is connected to a lead whenever the trunk gate is closed, which operates apparatus for lighting the amber and red lamps and for timing the 50-second interval.

13.18 After Call Release Work Time

- (a) A traffic usage recorder is provided to measure the length of time that an attendant position is manned but the attendant is neither handling a call nor available to take a call.
- (b) For measurement, a ground is connected to a lead while a plug is in the position jack and a key is not operated.

C. Traffic Usage Recorder

13.19 A traffic usage recorder (TUR) is employed to measure the traffic load carried by a group of circuits. The recorder is a device that scans each circuit at 100-second intervals and counts the number of circuits found busy in each cycle. Traffic registers are associated with the traffic usage recorder. For 36 readings (one

hour of elapsed time) the register reads in CCS (100 call seconds). This information is used by the traffic and engineering groups with the aid of Poisson Tables to find the probability that all circuits are busy and to calculate the additional trunks required to meet a desired traffic performance.

13.20 The traffic usage recorders used for the ACD are small 200 line step-by-step switch units which can be used for measuring different usages up to a total of 200 lines. If it is desired, several different groups of 200 lines can be connected to the TUR using patch jack techniques to switch to different 200 line groups.

D. Recorder-Reproducer

General

13.21 The recorder-reproducer in conjunction with the record-reproduce amplifier provides facilities required for magnetic recording and reproducing of audio signals in the voice range and is used for trunk identification. It provides six independent recording channels and each channel provides a maximum recording capacity of seven, similar 1.6-second messages. It provides automatic erasure of a given channel simultaneously with the recording. It also provides control signals for operation of associated audio facilities and distributing circuits.

13.22 The recorder-reproducer is motor-belt driven with a speed reducing gear assembly connected to the drum. The recording drum is 1-1/2 inches wide and is impregnated with magnetic iron-oxide particles. Twelve magnetic heads are also included, one head for recording and reproducing and one for erasing the message on each of the six channels. The magnetic heads follow six continuous tracks around the magnetic band and form six independent recording channels.

Power Control

13.23 The recorder-reproducer has a manually operated power switch for the primary control of the motor and a 48-volt dc control relay whose contacts are in series with the power switch. Normally this relay is operated and the recorder-reproducer is running. There is a key on the relay rack MTCE CO which when operated releases this relay and stops the recorder-

reproducer. When this key is operated the alarm is disabled and a guard lamp lights to indicate that the recorder-reproducer is cut off.

Trunk Identification Control

13.24 Just before an incoming trunk is connected to an attendant trunk, it is readied for trunk identification announcement. At the start of the announcement a pulse is received from the recorder-reproducer control circuit. This operates and locks the area announcement relay in the incoming trunk. At the end of area identification, another pulse is received from the control circuit which releases the area announcement relay and cuts the calling party through to the ACD attendant.

13.25 If trunk identification is recalled by the attendant, the cut-through relay is opened and the steps described above for the trunk identification are repeated.

Recording Function

13.26 Recording is controlled by means of the external control circuit and the associated record-reproduce amplifier. When the record key for a given channel of the external control circuit is operated, the magnetic record head of that channel is energized by passing the desired audio signal and a high-frequency recording bias through the record head of the selected channel from the recording circuit of the associated record-reproduce amplifier.

Reproducing Function

13.27 Reproducing is controlled by switching the magnetic record-reproduce head of a given channel to the input of the reproducing circuit of the reproduce amplifier associated with the selected channel. The record-reproduce head is energized by the recorded medium and sends the audio signal to the input of the associated reproduce amplifier where it is amplified and transmitted to the distributing circuit.

Erase Function

13.28 The recorder-reproducer is arranged for simultaneous erasure and recording. The erase head for each of the six channels is located a little ahead of the associated record-reproduce head so that as the recording drum rotates, a

section of the recording band associated with the channel is erased immediately before reaching the recording head. The section of the band is completely erased in one revolution of the recording drum. The erase head is energized by a high-frequency bias current generated in the associated record-reproduce amplifier oscillator circuit.

Recorder-Reproducer Machine Failure Guard

13.29 If the recorder-reproducer stops because of power or mechanical failure while incoming trunks are connected, the trunks are automatically released and the incoming trunks conditioned not to wait for a trunk identification announcement. An alarm is sounded to indicate recorder-reproducer failure.

13.30 If the recorder-reproducer is stopped, the incoming trunk does not receive the start pulse from the trunk identification control circuit and remains cut through. The attendant can talk to the calling customer immediately after receipt of the zip tone.

Record-Reproduce Amplifier

13.31 The amplifier provides two channels of amplification, one for recording and the other for reproducing, with a common amplifier consisting of three stages of voltage amplification, a phase inverter, and a push-pull power output stage. A 2-stage preamplifier is provided in the reproduce channel.

13.32 A remotely controlled transfer relay is provided in this circuit for enabling either the record channel or the reproduce channel. This relay, when in the record condition, also starts the oscillator which provides the high-frequency bias and erase currents to the associated recorder-reproducer. A voice-operated relay circuit gives an indication of the presence, at the output of the amplifier, of a voice signal above a predetermined level. A common power supply operating from 115 volts ac furnishes all power for this circuit, except for the control relay which requires 48 volts dc from an external source. This amplifier is used for reproducing purposes only when the recording is checked after dictation. Each channel has its own amplifier when used for trunk identification purposes. This method of operation allows the recording on a channel without interfering with the operation of the remaining channels.

Number of Connected Systems

13.33 Each channel of the recorder-reproducer contains an individual amplifier. For a 2-vu variation of level, a limit of 25 *simultaneous* connections are permitted. This does not limit the number of incoming trunks connected per channel to 25. It is expected that five 2A systems and three 3A systems can be simultaneously connected to a recorder-reproducer. The chances of 25 simultaneous connections even with this large number of trunks is very small because of the length of time it takes each system to process a call and the probability of all calls coming from the same city in the 1.8 seconds of elapsed time between announcements.

13.34 The gain of each channel reproducer amplifier is adjustable by a potentiometer located on the amplifier. The amplifier is a part of the trunk identification control circuit. The transmission level of the announcement across the receiver of the attendant headset will be about -20 vu.

E. Delay Announcement Machine

Controls

13.35 Starting the delay announcement machine is controlled by the announcement trunks. If trunks are waiting for announcement, the machine is not started until all trunks have been connected to the announcement machine. The machine indicates the end of the announcement by releasing the announcement trunks. If other incoming trunks are waiting for announcement, they are connected before the announcement machine is started again.

13.36 If a calling party releases before the end of the announcement, the connected trunk is released; but if other trunks are connected to the machine, the announcement is completed to them.

General

13.37 The announcement set provides facilities for the magnetic recording and reproducing of audio frequency signals in the voice range. It contains a power supply, relay controls, recorder, and amplifier. The recorder contains a drive motor, magnetic recording drum and head, erase coil, control solenoids, and various switches. It embodies a variable-cycle fea-

ture which automatically adjusts the length of the cycle to reproduce only that portion of the drum which has been recorded. The maximum recording time is 2 minutes. For ACD use the recording cycle will be limited to approximately 10 seconds. The amplifier provides amplification for both recording and reproducing, an automatic volume control feature for minimizing variations in level of the recorded speech, and a high-frequency oscillator to provide the bias current required for magnetic recording.

Recording an Announcement

13.38 The announcement record cycle may be controlled either locally or from the supervisor console. For remote control the DIC key is operated at the supervisor console. For local recording the control key is operated to the DICTATE position. A 52-type telephone set is used for recording the announcement locally.

13.39 When the DIC key is operated, the amplifier input is connected to the headset and the amplifier output to the recording-reproducing head. The bias oscillator is started, and it generates a high-frequency bias current required for magnetic recording. The automatic volume control is enabled and the erase coil is energized by the high-frequency oscillator.

13.40 The previous recording is erased by a complete revolution of the drum; the adjustable limit switch is returned to the start position; the record-reproduce head is pulled into contact with the recording medium on the drum; and an indication is given that recording may start. The message dictated by the supervisor is recorded on the magnetic band. Speech level should be approximately -20 vu to -30 vu, although the automatic volume control will record satisfactorily speech level ± 10 vu outside of these limits. At the end of recording, when the DIC key is released, the adjustable limit switch assembly is clamped into position to terminate subsequent playback cycles at the end of the recorded announcement. The amplifier circuit is automatically changed to the reproduce function.

Reproducing the Announcement

13.41 Reproduction of the recorded announcement can be controlled either locally or from the supervisor console by operating the

CHECK key, or from the announcement trunks. When the start relay operates the recording drum starts, the record-reproduce head is pulled into contact with the drum and the recorded announcement is reproduced and applied to the headset or the announcement trunk. The output level is approximately 0 vu. At the end of the announcement the limit switch operates the stop relay, which signals the trunks that the end of the announcement has been reached. The reproduce head is returned to the start position and the machine is ready for another announcement cycle.

F. Totalizer

13.42 The totalizer circuit is an electronic device which collects peg count information from a maximum of 200 sources, sums up the count, and scores a register once for each ten counts received.

G. Tone and Alarm Circuit

13.43 This circuit is used in conjunction with the connecting circuits of the No. 3A automatic call distributing system to provide visual and audible alarm signals at the supervisor console, central office, and common equipment. It also provides traffic registers, trouble registers, tone supply, audible ringing tone, and flashing circuits.

13.44 This circuit is used to detect the following types of trouble conditions and other alarm indications and tests.

(a) <i>Alarm Lamps</i>	LAMP	PAR
1. Battery cut-off failure alarm	BCO	13.44
2. Release magnet alarm	RM	13.45
3. Calls blocked alarm	CB	13.47
4. Grounded start lead alarm	S	13.48
5. Chain failure alarm	C	13.49
6. Power failure alarm	PWRA PWRB	13.50
7. Gate failure alarm	G	13.52

	LAMP	PAR
8. Shelf fuse alarm	FA	13.56
9. Ringing machine failure	RMF	13.57
10. Area identification machine failure	AM	13.58
11. Delay answer announcement machine alarms	CT BF	13.59
12. Shelf permanent signal alarm	PS	13.61
13. False ground on start lead indication	ST-	13.65
(b) Nontrouble Conditions		
Position available lamp	PA	13.53
Calls waiting lamp	CW	13.54
Battery test key indicators	TA TB	13.55
Subgroup lamps	G-	13.62
(c) Control Keys		
Grounded start lead alarm release	SR	13.48
Gate alarm release	GR	13.52
Battery test keys	TA TB	13.55
Testing stepping of a finder	CG	13.63
Incoming trunk busy lamp circuit	BY	13.64

13.45 This circuit also contains:

- (a) A zip tone supply to notify an attendant of the presence of an incoming call and a machine ringing lamp supply to provide the audible ringing supply.
- (b) Registers for the totalizer circuit, all trunks busy, and trouble peg count.
- (c) A relay to provide interrupted ground for the 60 ipm and the 120 ipm flashing circuits.

Battery Cut-off Circuit

13.46 The battery cut-off control circuit is used to provide a means to prevent current drain when the ACD is unattended. When the

NITE key is ON certain control relays are operated to provide operating grounds for the ACD. When the NITE key is OFF these control relays are released. An alarm circuit is so wired that if all these control relays are operated or released no alarm is initiated. If, however, one relay is operated and the others released or vice versa, the BCO lamp will light and an alarm bell will sound.

Shelf Release Magnet Alarm

13.47 The primary winding of the release magnet relay supplies battery to the release magnets in the line finder and selector circuits on each shelf and operates each time a release magnet on the associated shelf is operated. The operated release magnet relay energizes the release timing relay in the common group equipment and prepares an operating path for the release magnet auxiliary relay. With normal operation, the release magnet of the switch is energized for only the time required for the switch to restore to normal and in this case the release magnet timing relay does not have time to operate. If for any reason the switch fails to restore to normal, the release timing relay will operate after a delay of 15 to 30 seconds. The operated release timing relay operates the release magnet auxiliary relay on the shelf. The auxiliary relay locks to the release magnet relay, lights the shelf RM lamp, the aisle pilot RM lamp and the RM lamp at the tone and alarm circuit.

13.48 When the switch restores to normal the release magnet and the auxiliary release magnets release extinguishing all the RM lamps.

Calls Blocked Alarm

13.49 When one or more originating trunks have been admitted through the trunk gate and one and more occupied and idle positions have been admitted through the position gate and trunk finders do not start, the common group circuit operates to start all idle trunk finders operating until all waiting incoming trunks have been answered or no more attendants positions are idle. When this occurs, the CB lamp lights at the tone and alarm circuit indicating a call blocked condition.

Grounded Start Lead Alarm

13.50 If a trouble ground occurs on any start lead of any trunk finder group, the start lead trouble relay operates and the S lamp lights. The start lead trouble relay locks under control of the SR key, which must be operated to extinguish the S lamp when the trouble is cleared.

Chain Circuit Alarm

13.51 If the chain circuit of any trunk finder group should be crossed with ground or battery the C lamp will light.

Power Supply Alarm

13.52 When either the 111A or 105E power plants are provided and an alarm occurs in the power plant, the PWRA and PWRB lamps light. The PWR lamp also lights at the supervisor console. A power failure alarm is transmitted to the central office, if this feature is provided. If only the PWRB lamp is lighted, it indicates that the alarm battery fuse has operated.

13.53 If the PBX power plant is used and power fails, the alarms are given in the PBX.

Gate Alarm

13.54 A trouble ground or battery in the trunk or position gate circuit causes the lighting of the G lamp. The gate circuit affected by the failure automatically opens to allow all seized trunks or all idle positions inside the gate. When the trouble is cleared, the alarm has to be retired by the operation of the GR key.

Position Available Lamp

13.55 The PA lamp lights whenever an attendant is available to serve an incoming trunk.

Calls Waiting Lamp

13.56 The CW lamp lights whenever a trunk is inside the trunk gate and a position is not available to serve it.

Battery Test Keys

13.57 Several of the relays in this circuit are double wound with one winding energized through fuse A and the other through fuse B. Other relays are furnished in duplicate with each relay on one of the above fuses. This is done to insure continuity of operation in case one of the fuses should operate. To check that the circuit is functioning on either fuse alone, one of the test keys should be operated. The operation of the TA test key, for instance, disconnects battery A from the relays and provides another path for supplying battery B to the circuit, lights the TA guard lamp and disconnects battery from the gate alarm circuit to prevent bringing in a false gate alarm. With either key operated traffic should proceed through the group circuit in the usual manner. When the TB key is operated the TB guard lamp lights.

Shelf Fuse Alarm

13.58 Whenever a fuse blows the FA lamp lights at the shelf, the aisle pilot COM lamp lights, the FA lamp lights at the tone and alarm circuit, and the FA lamp lights at the supervisor console.

Ringling Machine Failure

13.59 When the ringling machine fails, the RMF lamp lights at the tone and alarm circuit, and the COM aisle pilot lamp lights.

Area Identification Machine Failure

13.60 When an area identification machine fails the AM lamp lights. There are also individual AM- lamps to indicate which machine failed.

Delayed Answer Announcement Machine Alarms

13.61 If the control lead of the delayed answer announcement machine becomes grounded the CT lamp lights.

13.62 If power to the delayed answer announcement machine fails the BF lamp lights.

Shelf Permanent Signal Alarm

13.63 If a selector circuit becomes permanently short circuited, the ring becomes grounded or a receiver is left off-hook, the per-

manent signal alarm operates after a timed interval. The PS lamp lights in the tone and alarm circuit, the PS lamp lights on the shelf where the trouble occurred, and the aisle pilot lamp PS lights. When the permanent signal condition is removed, the lights are extinguished.

Subgroup Lamp

13.64 When an originating trunk circuit has been admitted through the trunk gate, it causes the operation of a group relay. The operation of the group relay grounds the segments of switch commutators corresponding to the bank level on which the trunk is located, grounds the start lead for the corresponding subgroup of finders, and lights the corresponding subgroup lamp G- in the common group circuit.

Testing Stepping of a Finder

13.65 To test the stepping of the finder, the CG key is operated. When the CG key is operated, the commutator level of the test trunk is not grounded in this test condition and the finder hunts to the top level, then steps to the eleventh rotary to give a busy tone.

Incoming Trunk Busy Lamp Circuit

13.66 Operating the BY key causes the busy relay to operate and connect ground to light the busy lamp of any busy incoming trunk circuit.

False Ground on Start Lead Indication

13.67 One pair of ST1 and ST2 lamps light each time a single trunk enters the trunk gate. These lamps are in series with the start relays and light each time one is operated. If several trunks in different groups enter the trunk gate, none of the lamps light due to the high resistance of the windings of the start relay. If one of the *ST* leads becomes grounded, the associated ST1 and ST2 lamps light and the start relay operates. The lamp will indicate the group in which the trouble ground appears while the operated start relay causes a call blocked alarm to come in after a short time interval. If a call comes in at this time from a trunk appearing on a group other than the one associated with the trouble ground, the lamp associated with

the trouble ground will be retired momentarily and a lamp associated with the other group will momentarily light falsely.

Common Failure Alarm

13.68 The winding of the common failure relay supplies battery to light the common equipment alarm lamps. Each time an associated alarm lamp lights, this relay operates. The operated relay supplies ground to light the CF lamp in the supervisor lamp cabinet, and supplies ground to operate the alarm relay.

13.69 The common failure relay operates when any one of the following lamps light:

AM	G
BCO	PS
BF	RM
C	RMF
CB	S
CT	HI-LO

Alarm Relay

13.70 The alarm relay is operated when any alarm lamp lights. The alarm relay supplies ground to operate the bell and buzzer at the common equipment and at the supervisor position respectively, and ground to the central office alarm circuit and/or the PBX miscellaneous alarm circuit.

H. Group and Test Alarm Circuits

13.71 Group and test alarm circuits are provided for the transfer trunk, secondary announcement, outgoing trunk, and conference finders. If trouble develops in any of these circuits there are four lamps, one for each group and test alarm circuits, to indicate common alarms. These alarms are indicated by the:

- (a) CI lamps for chain circuit alarm, see 13.49.
- (b) CB lamps for calls blocked alarm, see 13.47.
- (c) S lamps for grounded start lead alarm, see 13.48.

I. Aisle Pilots

13.72 Aisle pilots are provided to assist in finding the aisle location of the trouble.

SECTION 981-236-100

- (a) PS lamp is a shelf permanent alarm signals, see 13.61.
- (b) RM lamp is a shelf release magnet alarm, see 13.45.
- (c) COM lamp lights whenever any of the following alarms operate:
 - Shelf fuse alarm, see 13.56.
 - Ringing machine failure, see 13.57.
 - Group and test circuit failure, see 13.69.
 - Whenever the alarm relay of the tone and alarm circuit operates.
 - Whenever a fuse blows on a miscellaneous fuse panel.

J. Alarm Extension

13.73 The alarms can be extended to the central office or to the associated PBX.

K. Trunk Test Circuit

13.74 The trunk test circuit is a portable test circuit mounted in a test box. It is connected to the trunk under test by means of patch cords. Battery and ground are connected to the test circuit also by means of a patch cord. Jacks are provided for an operator headset. The repairman controls the operation of the tests by means of keys in the test circuit, and is supplied visual indications of trunk operations.

13.75 The following tests can be performed from the trunk test circuit:

- (a) High-low supervision test.
- (b) Reverse battery supervision test.
- (c) Outgoing test when trunk is arranged for outward service.
- (d) Delayed answer announcement tests.

L. Auxiliary Trunk Circuit from Switchboard to Central Office

13.76 When the auxiliary trunk is seized from the switchboard, the transmission path is cut through toward the switchboard and opened toward the incoming trunk. The PBX operator receives dial tone from the central office and can dial the desired number.

13.77 When the incoming trunk associated with the line is seized by the central office the auxiliary trunk is made busy.

14. EQUIPMENT ARRANGEMENTS

A. Major Components

The major components provided for the system are as follows.

14.01 Step-by-step frames and relay racks used for mounting trunk finders, selectors and relay units. A typical equipment layout is shown in Fig. 11, 12, and 13.

14.02 The attendant console which contains keys, lamps, a dial, and the attendant telephone circuit. Face equipment layout is shown in Fig. 2 and a photograph in Fig. 14.

14.03 Supervisor console which contains keys, lamps, a dial, and the supervisor telephone circuit. Face equipment layout is shown in Fig. 3 and a photograph in Fig. 15.

14.04 Supervisor lamp cabinet which contains lamps and keys. A photograph of a lamp cabinet is shown in Fig. 16.

14.05 THE CALL DIRECTOR console for controlling the recording and checking of area identification on the recorder-reproducer channels or a 500-type set when dialing is used for selecting channels of the recorder-reproducer.

14.06 Announcement set for recording delay announcements.

14.07 Recorder-reproducer for incoming trunk identification.

B. Distributing Frame Equipment

14.08 If distributing frame space is available at the customer's location, it may be used, otherwise any standard floor type frame can be provided.

C. Power Supply

14.09 The 48-volt supply can be provided from:

- (a) The PBX power plant.
- (b) A batteryless rectifier system.
- (c) A rectifier system with battery reserve.

14.10 The dc supply:

- (a) The 10-volts dc for attendant and supervisor console lamps.
- (b) The 48-volts dc for supervisor lamp cabinet.

14.11 AC driven interrupter.**14.12** Frequency generator for ringing generator and ringing tone supply.**15. WORKING LIMITS**

Battery supply 45-52 Volts.

15.01 Incoming Trunk—high-low supervision:

- (a) Maximum external loop resistance 1200 ohms.
- (b) Minimum insulation resistance 30,000 ohms.

15.02 Incoming Trunk—reverse battery supervision:

- (a) Maximum external loop resistance 1600 ohms.
- (b) Minimum insulation resistance 30,000 ohms.

15.03 Night service trunk circuit:

- (a) Maximum external loop resistance 600 ohms.
- (b) Minimum insulation resistance 30,000 ohms.

15.04 Dial transfer trunk and circuit:

- (a) Maximum external loop resistance 1670 ohms.
- (b) Minimum insulation resistance 30,000 ohms.

15.05 Manual transfer trunk circuit:

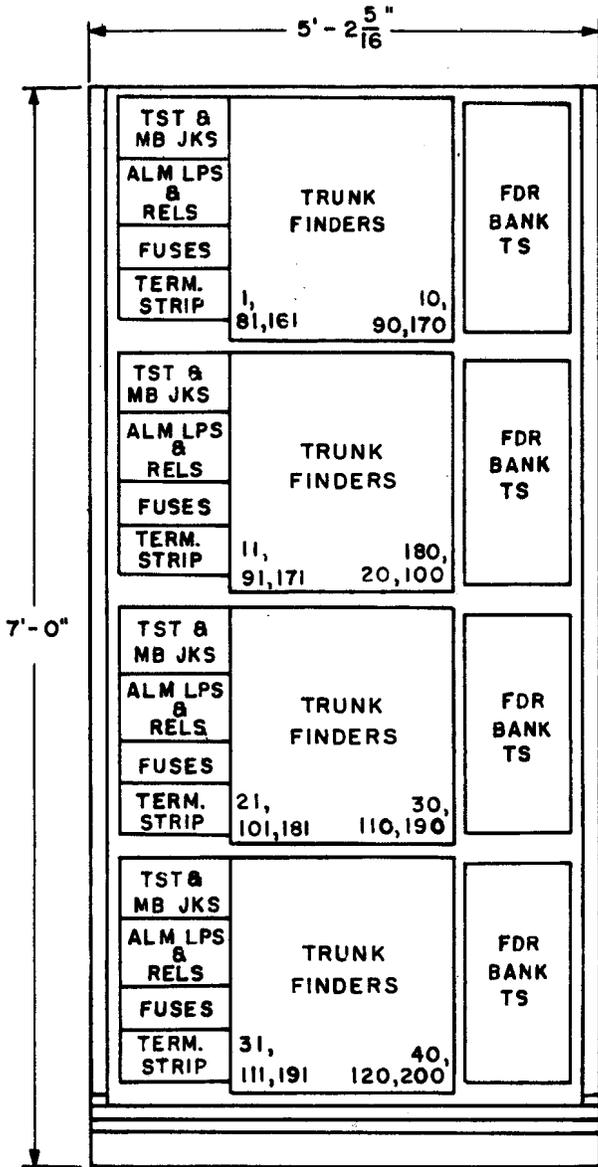
- (a) Maximum external loop resistance 1400 ohms.
- (b) Minimum insulation resistance 20,000 ohms.

15.06 Finder circuits:

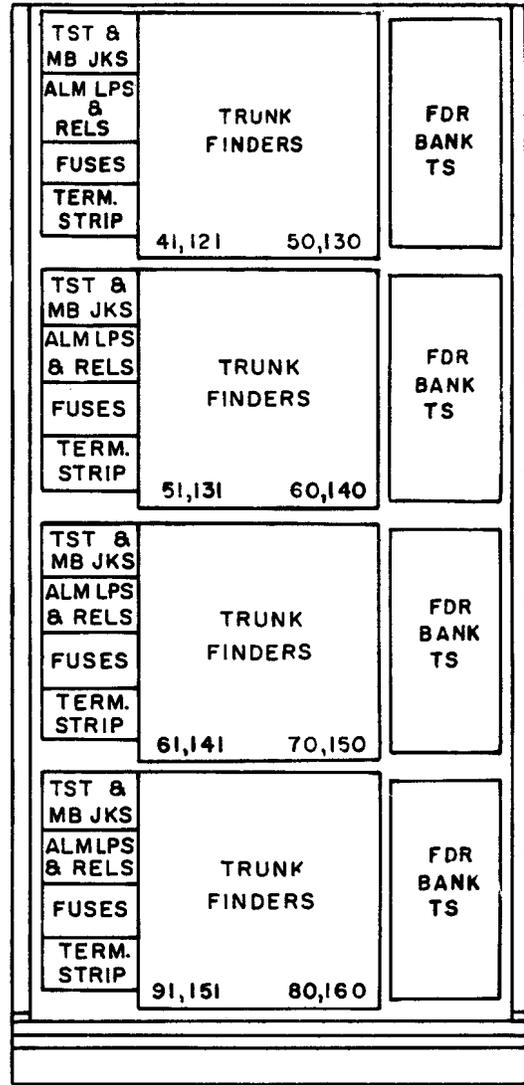
- (a) Maximum external resistance of the sleeve from the bank terminal to holding ground 13 ohms.

15.07 Selector circuit:

- (a) Maximum external loop resistance 750, 850, or 1000 ohms.
- (b) Minimum insulation resistance 15,000 ohms.

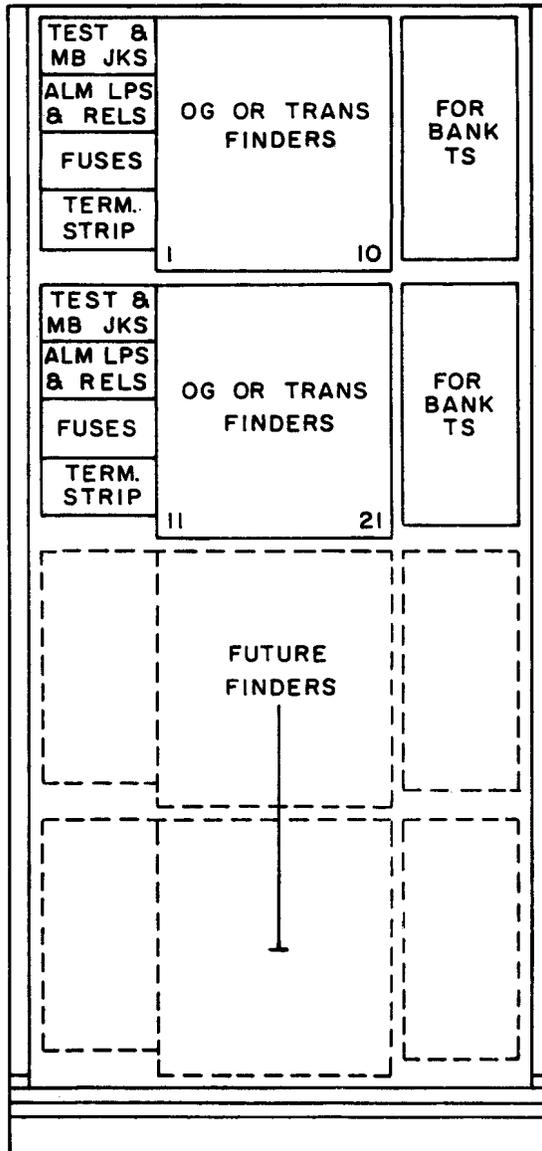


FRONT VIEW

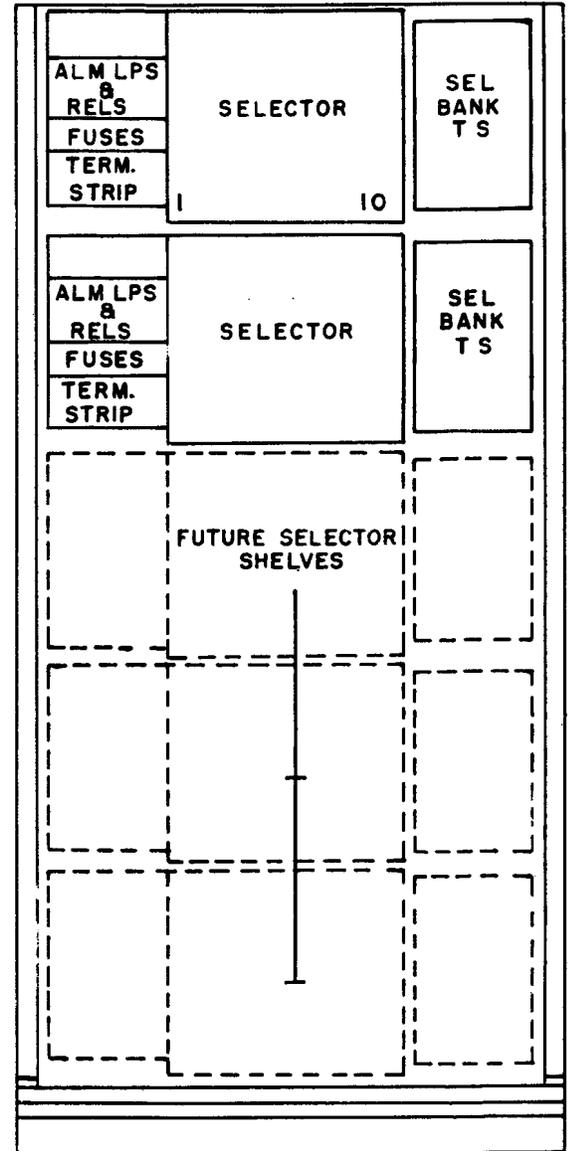


REAR VIEW

Fig. 11 - Typical Equipment Arrangement For Trunk Finders Mounted on 1, 2, or 3 Switch Frames



FRONT VIEW



REAR VIEW

Fig. 12 – Typical Equipment Arrangement For OG or Trans Finders and Selectors

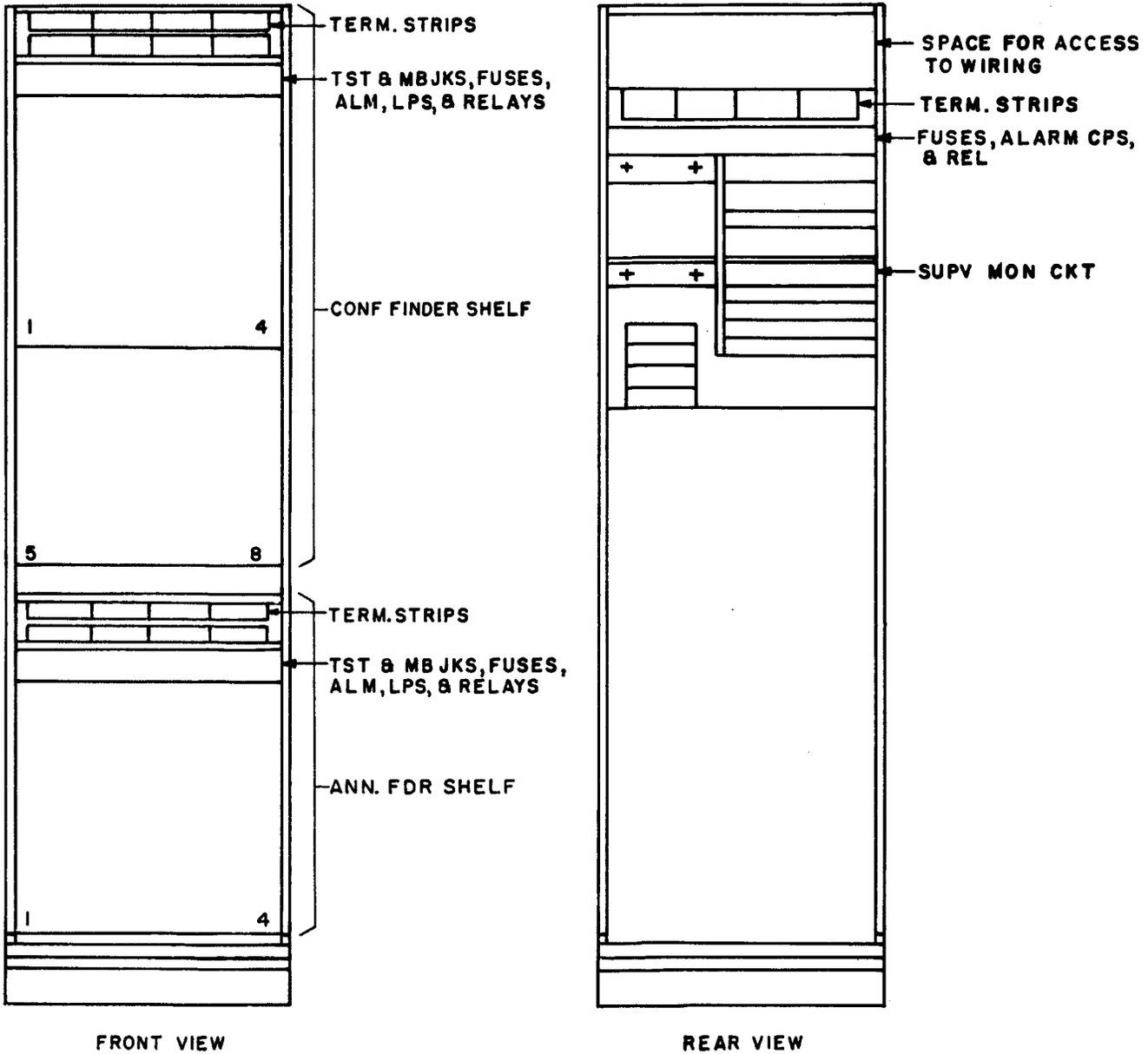


Fig. 13 - Typical Equipment Arrangement For Conf Finder Shelf, Ann. Finder Shelf and Supervisory Monitor Circuit Mounted on Rel Rk Type SW FR

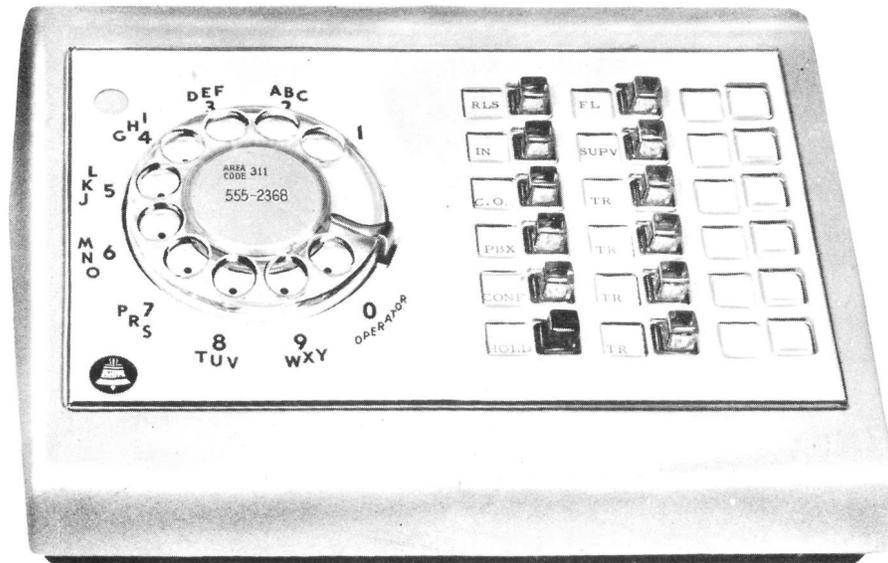


Fig. 14 – Attendant Console

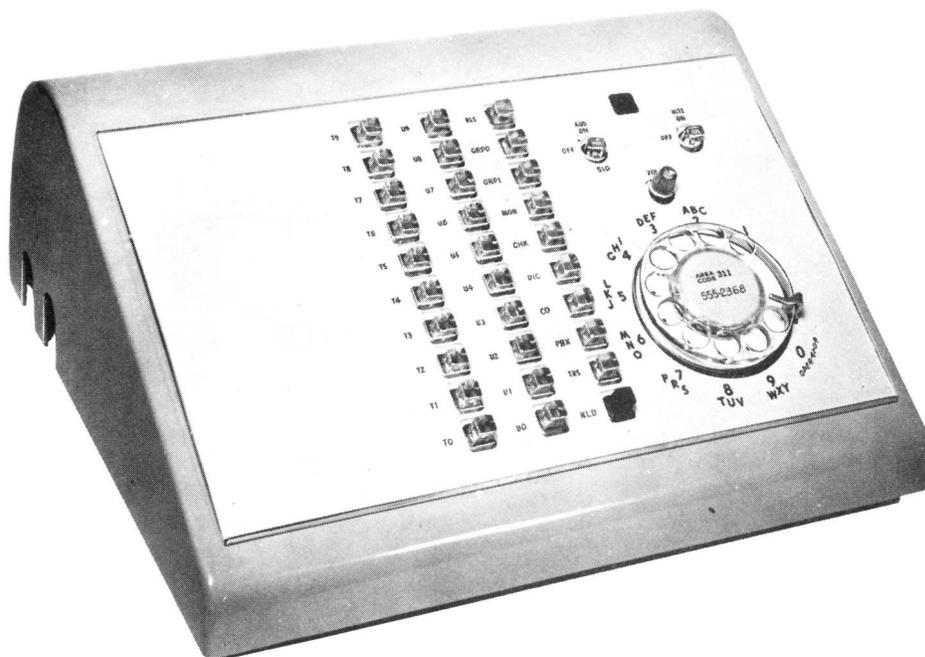


Fig. 15 – Supervisor Console

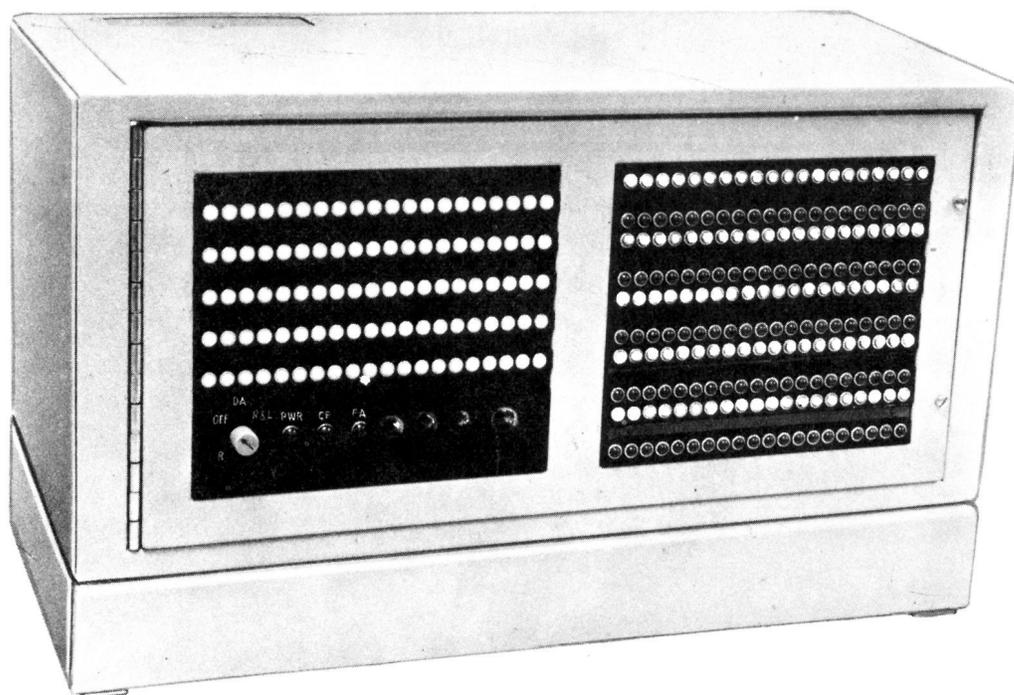


Fig. 16 – Supervisor Lamp Cabinet