

SWITCHING SYSTEMS MANAGEMENT
CROSSBAR TANDEM
TRAFFIC SUPERVISORY CABINET

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1. GENERAL

- 1.01 This section describes the application and operation of the Crossbar Tandem "Traffic Supervisory Cabinet." The traffic supervisory cabinet is a network management facility which enables the crossbar tandem network manager to alleviate machine congestion and control traffic entering the machine from its subtending offices.
- 1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.
- 1.03 The title for each figure includes a number(s) in parentheses which identifies the paragraph(s) in which the figure is referenced.
- 1.04 There are three general categories of network management facilities designed for application with crossbar tandem offices. One of these categories covers the various features incorporated in the traffic supervisory cabinet, including the associated recorded announcement facilities. The second category covers the equipment arrangements for dynamic overload controls (DOC). The third covers the recently developed Engineering and Administration Data Acquisition System/Network Management (EADAS/NM), which includes the capability to receive indications from and remotely control the functions of the first two types.
- 1.05 The traffic supervisory cabinet, shown in Fig. 1, provides a unified control point for traffic indicating and traffic regulating functions of a single crossbar tandem. The cabinet has a control panel, shown in Fig. 2, which provides a

series of display lamps which indicate the load status of the major common control components and of the outgoing trunk groups. The panel also provides keys and switches for manual activation of selected traffic controls, for association of recorded announcements with various announcement trunk groups, and for selective routing of traffic to tones and announcements.

1.06 The recommended arrangements for routing to tones and announcements in crossbar tandem offices were revised since the design of the traffic supervisory cabinet. "No Circuit" ineffective toll attempts route first to an announcement instead of tone. By including a location code in the announcement there is provided a better definition of the point of blockage on incoming trunk observations. Ineffective local attempts may be first routed optionally to either tone or announcement.

2. DETERMINATION OF REQUIREMENTS

GENERAL

- 2.01 Network management strategy determines the network management facilities required at the crossbar tandem. The types, quantities, and arrangement of these facilities are determined in consultation with the personnel responsible for the network management of the crossbar tandem. Also, any facilities to be provided should be consistent with the EADAS/NM plans for the network.
- 2.02 Additions to and rearrangement of the various facilities are specified in the network design order, which is the basic source document for the preparation of the Western Electric Company Crossbar Tandem Questionnaire E-8013. Since the questionnaire is used for ordering the crossbar tandem equipment (including quantities, features and arrangements) the questionnaire format may be used as a guide for the network design engineer to furnish the information to be included in the traffic order.
- 2.03 Following is the information to be furnished in the network design order for each of the various types of facilities available. At the present time, the No. 5A announcement system is not listed in Questionnaire E-8061 which covers announcement systems.

TRAFFIC SUPERVISORY CABINET

2.04 A full complement of keys, lamps and switches is provided with the traffic supervisory cabinet, whether or not all are required. The quantities of each are listed below:

- Four sets of keys, lamps, and switches for control of directional reservation equipment (DRE) units.
- 50 keys and lamps for control of alternate routes
- 100 lamps to indicate trunk groups busy conditions
- 33 lamps to indicate equipment and short sender timing
- Two sets of keys and lamps for control of two sender attachment delay recorders (SADR)
- One key and lamp for EADAS/NM supervision transfer
- 10 keys and lamps for dynamic overload control (DOC receiving) exclusion
- Four keys for voice announcement by operator
- 20 keys for route transfer to announcement
- Eight sets of pushbutton keys and switches for connecting announcement channels to announcement connecting trunk groups.

3. TRAFFIC SUPERVISORY CABINET EQUIPMENT ARRANGEMENTS

3.01 The traffic supervisory cabinet; Fig. 1, is a floor-mounted sheet-metal console 50 inches high, 21-1/16 inches wide, and 22 inches deep. It is quite similar to the traffic control console cabinet. The control panel slopes 19 degrees from the vertical, providing convenient access and display of all keys, switches, and lamps. The bottom of the slope is 29 inches from the floor. All of the traffic supervisory circuitry, including control facilities for directional reservation equipment (DRE) but not the DRE units themselves, is located in the cabinet.

3.02 The lower portion of the cabinet contains two rows of terminal strips providing a cross-connection field to permit flexibility in assigning route transfer relays in the marker to the alternate route traffic control keys and to the transfer to announcement keys. Also in the lower portion is a mounting plate containing eight potentiometers and capacitors for adjusting the tone level of each announcement amplifier. Access to the lower front portion of the cabinet is made through a hinged door. The cabinet is designed to be placed against a column or partition.

3.03 There are two vintages of the control panel. The cabinets in Fig. 1 have the earlier vintage control panel and Fig. 2 shows the current vintage. The current arrangement differs from Fig. 1 in the following significant respects:

- (a) Sender attachment delay recorder (SADR) operation control was relocated from the upper left to the upper right of the panel (sender attachment delay (SADA). The key to select 3-second or 7-second delay interval was removed due to removal of the 7-second timing control from the SADR circuit. A second set of keys and lamps were added to accommodate a second SADR (SADB). A key and lamp supervision transfer (SUPT), was added for transfer of the traffic supervisory cabinet functions to EADAS/NM.
- (b) An additional 40 trunk group busy lamps were added in the upper left of the panel.
- (c) DOC receiving lamps receive DOC (RD) and cancellation keys cancel Receive DOC (CRD), provided when the crossbar tandem is a DOC controlled office, were added in the upper right of the panel.

3.04 The features of the traffic supervisory cabinet are described in the order in which they appear in the current vintage of the control panel, reading from bottom to top of the left panel and then top to bottom of the right panel.

A. Directional Reservation Equipment

3.05 Directional reservation controls are located in the lower left portion of the control panel. One key, two lamps (ON-, RSV), and one rotary selector switch (DR-SGP) per trunk group are provided. The ON- lamp indicating that the particular directional reservation circuit is turned

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on. The RSV lamp indicating that the selected number of 2-way trunks, as determined by the selector switch (Directionally reserved subgroup DR-SGP) setting, are being held in reserve for the distant higher ranking office. The setting of the switch to any position 1 to 5 determines the point at which reservation would take effect whenever the ON key is in the operated position.

3.06 A DRE unit is required for each group or subgroup of 2-way intertoll trunks which is to be arranged for directional reservation control. This surface-wired unit consists of two 23-inch mounting plates and is mounted on miscellaneous relay racks. A maximum of four units may be provided.

B. Alternate Route Traffic Control

3.07 Alternate routing of traffic can be controlled at the traffic supervisory cabinet by means of 50 locking keys mounted in the middle left portion of the control panel (Route transfer circuits). Each key controls the operation of a maximum of three route transfer relays in the markers. One lamp per key is provided to indicate the position of the key. The operating telephone company provides the designation strips for use on the lamp socket mountings of the alternate route traffic control keys.

3.08 As described in Section 5 of this practice, there can be provided in each marker a maximum of 100 AK-type relays to perform the functions of route transfer, group busy and second route (for multiple routing control) relays. In the route relay type marker, this equipment is mounted on the auxiliary marker frame. In the ring type marker, the equipment is mounted in the right bay of the marker route unit.

Note: It should be understood that the assignment of the group busy relays for route transfer and second route functions reduces the number of relays available for the group busy function.

C. Indicators of Trunk Group Busy

3.09 Five rows of 20 lamps and associated designation strips are provided in the upper left portion of the control panel to indicate when a trunk group is in a busy condition.

D. Indicators of Equipment Busy

3.10 Located across the top of the control panel are lamps and designation strips. The lamps are in the following sequence from left to right:

<u>TYPE</u>	<u>DESIGNATION</u>	<u>QUANTITY</u>
All Markers Busy	AMB	1
All Transverters Busy	ATVB	1
Cancel Short Sender Timing	CSST	1
Busy Sender Group	BSG	5
Short Sender Time Out	STO	5
Sender Load Register	LR	5
Incoming Register Group Busy	RGB	15

3.11 The cancel short sender timing (CSST) lamp is provided only in a crossbar tandem arranged as a controlling DOC office. One busy sender group (BSG) and short (sender) time out (STO) lamp is provided for each sender group associated with an intersender timing control circuit. One sender load register (LR) lamp is provided for each sender group equipped with a load register. When a predetermined number of senders in a sender group becomes busy, an indication is transmitted by the sender make busy frame which causes the sender load register (LR) lamp to light. Sender load registers are now rated manufacture discontinued (MD). One incoming register group busy (RGB) lamp is provided for each group of 10 or fewer 3-digit incoming registers and for each group of 20 or fewer 10-digit incoming registers.

E. Sender Attachment Delay Recorder Control

3.12 In the upper right of the panel a key and three lamps are provided for each of two sender attachment delay recorders.

F. EADAS/NM Supervision Transfer

3.13 When a crossbar tandem is arranged to function with an EADAS/NM system, a SUPT key and a lamp are provided in the SADR control strip.

G. Dynamic Overload Control Exclusion

3.14 When the network in which the crossbar tandem is located is arranged for dynamic overload control (DOC) and the crossbar tandem is a controlled office, a strip of 10 route denial (RD) lamps and a strip of 10 cancel RD (CRD) keys are provided in the upper right of the panel.

H. Voice Announcement by Operator

3.15 Four 3-position keys (Voice Announcement [SWBD]) are provided in the upper right of the panel to permit operator answer of calls directed to one of two selected announcement connecting trunks. One office link frame appearance of the vacant code announcement (VCA), unauthorized code announcement (UCA), misrouted CAMA announcement (MCA) and reorder announcement (ROA) trunk groups is associated with a key.

I. Transfer to Announcement

3.16 Twenty 3-position keys are provided to permit the final route advance to one of two announcements, depending on the position of the key. When a key is in the horizontal position (unoperated) and a marker finds all trunks in the final route busy, normal route advance will occur. Each of the two operated positions (up and down) is associated with a route transfer (AK type) relay in the marker. Each of the route transfer relays may be associated with a different announcement. Formerly, it was recommended that ineffective attempts be routed first to a 120 IPM tone, and then to an announcement. The designations of the lamps conform to that recommendation.

3.17 Recently, those recommendations were revised to the reverse order. In some crossbar tandem offices the keys were rewired to conform to the designation strips. In other offices, the keys were set to "NCA" (to avoid rewiring) and the announcement trunks were arranged to bracket the 120 IPM tone trunks on the office link frame secondary switches. Therefore, the designation of "NCA" and "EMG" on the keys of Fig. 2 do not

necessarily represent the routing in effect locally. The operating telephone company will provide designation strips to indicate the routing selected. Lamps associated with each operated position are provided.

J. Announcement Connecting Trunk Groups

3.18 In the lower right of the control panel are facilities for connecting any one or more of eight announcement connecting trunk groups to any one of six recorded announcement channels of the "No. 5A Announcement System." Eight rotary selector switches provided for this purpose are arranged so that the announcement channels are connected to positions 1 to 6 as required. Each switch represents a particular announcement connecting trunk group and bears the designation of that group. Above the 8 switches is a strip of 8 push button disabling keys, designated the same as the switches. Any or all switches may be set to the same channel. The eight switches are designated as follows, reading from left to right:

Designation	Meaning
FRA	Final Reorder Announcement
ROA	Reorder Announcement
SOA	Sender Overload Announcement
NCA	No Circuit Announcement
MCA	Misrouted on CAMA Announcement
UCA	Unauthorized Code Announcement
VCA	Vacant Code Announcement
EMG	Emergency

A typical assignment of announcement trunk groups and typical phrases used for the announcement is shown in Fig. 3.

4. TRAFFIC SUPERVISORY CABINET OPERATION AND USE

4.01 The control panel of the traffic supervisory cabinet is a unified control point for the status indicating and traffic regulating network management functions for a crossbar tandem. The lamps, keys, and switches of each feature are

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identified in Fig. 2, which differs in minor respects from the original version of the control panel. Following are the features associated with the cabinet:

A. Directional Reservation Equipment

4.02 The purpose of the DRE is to reserve a predetermined number (one to five) of 2-way intertoll trunks for calls destined for the area served by the crossbar tandem during overloads. Those calls which have already penetrated the network will then have a higher probability of completion. Since this control reduces the number of attempts entering the network from the crossbar tandem, the volume of ineffective attempts is also reduced. DRE can be applied to a maximum of 40 trunks in each of four groups or subgroups of 2-way intertoll trunks to higher ranking offices.

4.03 At the control panel a rotary switch (DR-SGP) associated with each of the four trunk groups or subgroups has settings from one to five. When the "ON" switch associated with a group is operated, the directional reservation circuit is energized and the "ON" lamp lights. The RSV lamp associated with the circuit lights whenever reservation is being used to assist in controlling the overload.

4.04 The directional reservation circuit monitors the idle or busy condition of all trunks (up to a subgroup of 40 trunks) within a 2-way trunk group. It causes the release of the group busy (GB) relay for the trunk group, on the group busy frame, when the number of idle trunks monitored has become equal to or smaller than the number manually selected on the rotary switch (DR-SGP) at the control panel on the traffic supervisory cabinet. Although the directional reservation and traffic supervisory circuits are equipped to permit reservation of up to ten trunks in each group, it has been anticipated that reservation of up to five trunks will be sufficient. Therefore, a mechanical stop is provided on all four directional reservation switches on the control panel. This stop prevents making a setting beyond five trunks.

B. Alternate Route Traffic Control

4.05 This feature, activated when a distant office is temporarily overloaded, cancels the alternate routing to that office. This control of the alternate routing of traffic is provided at the control panel by locking keys, each of which controls the operation of a route transfer relay in the marker. The operation of a route transfer relay in the marker cancels the normal alternate route and instead provides a routing to the no circuit (NC) announcement. A lamp per key is provided to indicate that the key is operated to the position to cancel alternate routing. Cancellation of alternate routing can also be effected by dynamic overload control (DOC).

C. Indicators of Trunk Group Busy

4.06 The status of up to 100 outgoing trunk groups is displayed at the control panel by NC indicating lamps, in strips of 20 lamps each, which are activated by the group-busy circuits on the trunk group busy frame as shown in Fig. 4. The outgoing trunk group-busy frame provides a busy indication to the marker when all trunks in a trunk group are busy and causes the NC lamp to light at the traffic supervisory cabinet (Fig. 4). Release of the group busy relay on the trunk group busy frame causes the group busy relay in the marker to operate.

4.07 In order to permit an orderly sequence of lamps to be maintained whenever changes occur in the trunk groups or group busy relays a cross connection field is provided on the group busy frame, Fig. 4. This permits the trunk group busy indications supplied to the traffic supervisory cabinet to be arranged in any sequence designed without making any cross connection changes in the markers.

D. Indicators of Equipment Busy

4.08 Lamps displaying various equipment busy indications are located in the control panel. These lamps are as follows:

<u>TYPE</u>	<u>DESIGNATION</u>	<u>QUANTITY</u>
All Markers Busy	AMB	1
All Transverters Busy	ATVB	1
Cancel Short Sender Timing	CSST	1
Busy Sender Group	BSG	5
Short (Sender) Time Out	STO	5
Sender Load Register	LR	5
Incoming Register Group Busy	RGB	15

4.09 The all markers busy (AMB) and all transverters busy (ATVB) lamps indicate respectively that all markers are busy and all transverters are busy. The cancel short sender timing (CSST) lamp, provided when the crossbar tandem is arranged as a controlling DOC office, indicates that short sender timing has been cancelled, whether due to all markers busy (marker queue), operation of manual marker queue (MMQ) key, or manual cancel short sender timing (MSST) key at the DOC console.

4.10 The busy sender group (BSG) and short sender time out (STO) lamps, provided for the intersender timing control circuit associated with each sender group, indicate respectively that all senders of a group on a sender link frame are busy and that short sender timing is in effect. The sender load register (LR) lamp indicates a predetermined number of senders in a sender group have become busy. This indication is transmitted by the sender make busy frame. Load registers are now rated manufacture discontinued.

4.11 The incoming register group busy (RGB) lamp indicates that all incoming DP registers in a group are busy.

E. Sender Attachment Delay Recorder Control

4.12 Control for one or two sender attachment delay recorders (SADR) are located in the

control panel. The SAD key starts the SADR and the SAD lamp indicates that the SADR is functioning satisfactorily. Associated with each SAD key and lamp are two guard (GD) lamps which light when either of two sender groups of the SADR have reached a preset level of delay.

4.13 The level of delay at which a guard alarm lamp will light is set at the SADR unit by operation of two switches (one for units selection and one for tens) for each group of the two sender groups. The lamp lights whenever the number of sender attachment delays encountered on a sender group during a single scan cycle exceeds the number of delays preselected on the tens and units alarm delay switches. The lamp is extinguished whenever a scan cycle is completed at fewer delays than the preset level.

F. EADAS/NM Supervision Transfer

4.14 When a crossbar tandem is arranged to function with an EADAS/NM facility the traffic supervisory cabinet and its control panel are usually retained to provide complete local backup capability. A supervision transferred (SUPT) key and lamps are provided in the SADR control strip of the control panel. Operation of the key transfers control of the traffic supervisory cabinet functions to the EADAS/NM center and lights the lamp to indicate that EADAS/NM is in control.

G. Dynamic Overload Control Exclusion

4.15 When the crossbar tandem is controlled by dynamic overload control (DOC), it can receive DOC signals from up to 10 higher ranking offices. A strip of 10 route denial (RD) lamps are provided to indicate that a DOC signal has been received from a controlling office. Operation of the 10 associated cancel route denial (CRD) keys excludes the crossbar tandem from control by that controlling office.

H. Voice Announcement by Operator

4.16 One office link frame appearance within the span of each group of MCA, ROA, UCA, and VCA announcement connecting trunks can be arranged for answer by an operator. The operator may be at a 619A call director or at a switchboard. Any of these four office link frame appearances may be connected to either of two trunks to an operator at the call director or switchboard by operation of its 3-position key in the control panel.

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Each of the four keys may be turned from its OFF position to either position 1 or 2 to cause the corresponding relay in the announcement connecting trunk circuit to be operated, provided no other key has been operated to the same position. The operated relay extends the office link frame appearance to the operator on the trunk corresponding to the operated position of the key.

I. Transfer to Announcement

4.17 Twenty 3-position keys associated with 40 route relays or routing treatments in the markers are provided in the control panel to permit the transfer of the normal final route advance to either of two groups of announcement trunks, the choice depending on the position of the operated key. When any of these keys is in its unoperated position, the normal final route advance will occur. Lamps associated with each operated condition are provided.

4.18 Although the operated positions of the keys are designated "NCA" and "EMG" in Fig. 2, the revised routing of ineffective toll attempts (1.06) effectively requires only one route advance transfer at the present time, that being to the "EMG" announcement as locally designated.

J. Announcement Connecting Trunks

4.19 Announcement connecting trunks provide the means of connecting to a recorded announcement, incoming calls which cannot be completed to an idle outgoing trunk of the crossbar tandem. Each group of announcement connecting trunks is assigned to appearances on a pair of office link frames and is cabled to the traffic supervisory cabinet. The primary considerations involved in determining the quantities and arrangements of announcement trunks are (1) to minimize "high and dry" conditions and marker queuing on peak days, and (2) to adequately inform customers, operators and maintenance personnel of conditions encountered and subsequent actions to take.

4.20 At the control panel are facilities for connecting any one or more of eight announcement trunk groups to any one of six recorded announcement channels of the No. 5A Announcement System. Eight rotary selector switches provided for this purpose are arranged so that the announcement channels are connected to switch positions one to six. Each switch

represents a particular announcement connecting trunk group and bears the designation of that group. Any number of switches may be set to the same channel.

4.21 The eight switches are designated as follows, reading from left to right:

Designation	Meaning
FRA	Final Reorder Announcement
ROA	Reorder Announcement
SOA	Sender Overload Announcement
NCA	No Circuit Announcement
MCA	Misrouted on CAMA Announcement
UCA	Unauthorized Code Announcement
VCA	Vacant Code Announcement
EMG	Emergency

4.22 Setting a switch in the seventh position, results in making all announcement trunks in the group busy in the case of MCA, VCA, or UCA groups, or in the transmission of 120 IPM tone to any of the other announcement trunk groups.

4.23 Above the eight switches is a strip of eight push button disabling keys, with the same designation as the switches. Operation of a key results in transmission of 120 IPM tone to its associated announcement connecting trunk group. The key is held operated while the announcement channel selector switch is moved from one setting to another to prevent transmission of parts of announcements as the selector switch passes over positions associated with other announcements.

4.24 In Fig. 3 is shown a typical assignment of announcement connecting trunks. The arrangement is in accordance with the routing of ineffective toll attempts recommended in 1.06. The announcement phrases are shown solely to illustrate the types used and is not presented as a complete listing. The recommended phrases are listed in the central office management circular.

5. ASSIGNMENT GUIDELINES

A. General

5.01 Crossbar tandem switching machines often experience extreme fluctuations in traffic levels and are frequently offered traffic loads in excess of their operational capacities. The optimum utilization of these switching machines can be maintained only if adequate network management controls are available. During periods of traffic overload, the objective of the crossbar tandem network manager is to control the flow of traffic so that circuits are occupied with effective attempts and switching congestion is minimized. To accomplish this objective, corrective action (more specifically, control action) is required. The controls available to the crossbar tandem network manager are applied through the traffic supervisory cabinet.

5.02 The relays and equipment provided by the group busy and traffic supervisory circuits offer a variety of ways to make effective use of the switching capacity of an individual tandem and of the network as a whole. The following paragraphs contain some general assignment guidelines and examples to suggest the possibilities for using this equipment.

5.03 Before developing the assignment plan for the traffic supervisory cabinet the machine administrator should consider the following items:

- (a) Trunking and routing layout to higher ranking and subtending offices including any long lines trunk groups.
- (b) Using historical data, how much traffic does each office send to the tandem on peak days such as Mother's Day, Christmas, etc? The network completion reports can be used to identify easy-to-reach (ETR) and hard-to-reach (HTR) points. The HTR points are good candidates for controls in offices with route transfer and code blocking capabilities.
- (c) Review trunk group data to identify groups which overflow heavily, groups which appear lightly loaded, etc.
- (d) Review individual problems or characteristics especially of subtending offices (such as annual events, tourist attractions, periodic storm damage, flooding, etc).

(e) If the control tandem is part of a metropolitan network, what are the possibilities for controls in the other tandems?

(f) How near is the tandem to capacity? An under-engineered machine or one that experiences frequent equipment outages will probably require more control.

5.04 Upon the development of an assignment plan or method of procedure suited for a specific tandem the following guidelines are offered as general suggestions.

B. Assignment of Trunk Busy Relays

5.05 A trunk busy (TB) relay must be assigned to each trunk in a group or subgroup that is to be associated with a group busy relay. Since the flip-flop arrangement is not recommended with group busy relays, this means that up to 40 trunk busy relays are usually associated with one group busy relay. A trunk busy relay can be wired to up to 3 group busy relays. If more than one group busy relay (up to 3) is assigned to a trunk group or subgroup, only one set of trunk busy relays is assigned. If a trunk group has more than one treatment or is associated with more than one route relay, trunk busy relays are assigned only to the trunks carrying the route relays or treatments that need group busy relays. When trunks are added or discontinued in the group, check to see if trunk busy assignments are involved.

5.06 The number of trunk busy relays installed in an office depends on the number of units intended for one-way and for 2-way trunks. Trunk busy relays intended for use with one-way trunks are arranged to serve 70 trunks. The trunk busy relays in each unit are numbered 00-69. Trunk busy relays used on 2-way trunks requiring DRE are arranged to serve 52 trunks. One-way trunks may if necessary, be assigned to trunk busy relays in a 2-way unit provided no two-way trunks associated with DRE are connected in the same trunk busy unit; however, this is not the most desirable arrangement.

5.07 The sample general purpose relay assignment form shown in Fig. 5 or any other convenient locally designed form can be used to record the trunk busy relay assignments by trunk busy relay group. The list should include the trunk number and trunk group name and ID number, the trunk

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busy relay number and the associated group busy relay number. The blank columns on the form may be used to show a DRE unit assignment or other pertinent information.

5.08 In making trunk busy relay assignments, try to allow space for growth equal to the number of terminals reserved on the office link frame for growth. This is not an equipment requirement, but it makes the cross-connections more orderly for plant personnel.

C. Assignment of Group Busy Relays

5.09 A group busy (GB) relay is a switch designed to activate when all trunk busy relays (up to 80) associated with a specific trunk group are activated. When the group busy relay operates, the marker advances the call by means of its auxiliary second route (SR) relay to the next step in the routing pattern.

5.10 Unlike No. 4 crossbar switching systems, crossbar tandems are provided with a relatively small number of group busy relays. It is essential that selective judgment be used in the assignment of these group busy relays.

5.11 The first step in assigning group busy relays is to look at the trunk groups which generate the most overflows because these trunk groups are the major cause of ineffective overflow link frame (OLF) seizures. Preference should be given in assigning group busy relays to trunk groups which fall into this category.

5.12 The following paragraphs provide a few guidelines for assigning group busy relays:

(a) Assigning group busy relays to route relay markers: In crossbar tandems with route relay markers the following guidelines should be considered in assigning group busy relays.

(1) A trunk group of 85 trunks appears to need three marker group busy relays, one for each subgroup of 40 trunks, and one for the last five trunks. But with only five trunks in the last subgroup, the third group busy relay is probably unnecessary (unless the trunk estimate shows that the group will grow substantially) because the volume of calls routing to the last five trunks should be relatively low. These last trunks, however,

may be a candidate for a "lamp only" group busy on the traffic supervisory cabinet, particularly if it is a final trunk group.

(2) If more than one subgroup of trunks is placed in the same ground supply with group busy relays, idle trunks may be by-passed when the marker is directed to a subgroup and doesn't find an idle trunk and advances to the next ground supply. The problem manifests itself by giving trunk group overflows when the group busy lamp indicates idle trunks.

(b) Assigning group busy relays to tone and announcement trunks can be performed to alleviate ground supply limitations on these trunk groups in offices with route relay markers. Some announcement groups must be assigned in ground supply 5 because when certain types of call failures occur in ground supply 4, the marker can only advance to ground supply 5.

(1) The NCA trunk group must be assigned in ground supply 5.

(2) With a traffic supervisory cabinet, the route relays for the heavy traffic and no circuit and emergency announcement groups associated with 2 and 3 position keys must be assigned in ground supply 5 with group relays. The group busy relays are then wired to alternate route to the route relay for the 120 interruptions per minute (IPM) tone trunks in the center of the NCA group.

(3) All other announcements (VCA, ROA, SOA, MCA, UCA) must be assigned to ground supply 4 with a route advance to the 120 IPM tone trunks in ground supply 5.

(c) In assigning group busy relays with ring markers, the group busy relays principal contribution is reduced marker holding time. The suggestions below may help get the maximum benefit from group busy relays particularly in tandems with a mixture of markers.

(1) In an office with both ring and route relay markers, if it is necessary to have the route relay markers utilize the allotting circuit (Flip-Flop Circuit), the ring markers should not be assigned in the same manner to keep the wiring consistent. The ring marker's

inherent ability to look at every subgroup on every call would be lost if this were done.

(2) When several treatments route to a trunk group with several subgroups, the treatments can be assigned to access the subgroups in different orders. This spreads the traffic more evenly and should reduce the amount of GB—Yes/Marker — No. (This method is not recommended when more than three subgroups exist.)

(d) In assigning group busy relays to no circuit lamps: the NC lamps can be arranged in any order on the cabinet. Without the cross-connect field, the group busy relays are hardwired to the NC lamps on the supervisory cabinet so that group busy 00 is wired to lamp 00, group busy 01 to lamp 01, etc. This is an important consideration if it is desired to have the NC lamps in some kind of order (such as alphabetical by trunk group destination). Without a traffic supervisory cabinet cross-connect field, the assignment is further complicated by the multiple control option which increases the number of contacts available on the group busy relays for route relays or route treatments.

If the traffic supervisory cabinet is equipped with a full complement of 100 NC lamps, 40 of the lamps will be "lamp only" because they will be associated with group busy relay 60-99 which are wired only on the group busy frame and not on the marker frames.

D. Assignment of Route Transfer Keys

5.13 A route transfer (RT) relay is a switch designed to transfer traffic from one trunk group to another. Route transfer relays in the crossbar tandem markers are wired to 2 and 3-position keys on the traffic supervisory cabinet. They allow the machine administrator to reroute or block traffic which has a poor chance to complete on the normal route because of a general overload or a special network problem.

5.14 In practice, the traffic control capability on the traffic supervisory cabinet is limited only by the number of available route transfer relays and route transfer keys, and the needs of the particular office. Depending on how and where they are wired, the associated key can act as an "S" key providing selective cancellation of alternate

routed traffic offered to a trunk group, an "R" key providing regular or alternate routed traffic offered to a trunk group, or may be arranged for code blocking or key reroutes.

5.15 A fully equipped traffic supervisory cabinet can have 50 2-position route transfer keys numbered 100-149 and 20 3-position route transfer keys which carry two numbers; 150-169 for the "up" or NCA position and 170-189 for the "down" or emergency announcement position. Route transfer keys are assigned by the machine administrator. A maximum of 3 route transfer relays are associated with each 2-position switch and a maximum of 6 route transfer relays are associated with each 3-position switch (3 up and 3 down).

5.16 The first step in assigning route transfer equipment is to look at the high usage and final trunk groups which will need selective and regular cancellation keys to deal with general machine and network congestion. The machine administrator can better evaluate possibilities for code blocking and similar arrangements to cancel traffic selectively. The object is to be able to block calls to hard to reach points during overloads. When these calls are given one or two opportunities to complete through the tandem but not allowed to clog machines deep in the network, switching capacity is available to handle calls that are much more likely to become billed messages.

5.17 The following paragraphs provide a few guidelines of ways to assign 2 and 3-position route transfer keys on the traffic supervisory cabinet and route transfer relays in the marker.

(a) Selective cancellation of alternate routing from a trunk group; this "S" key arrangement is the most common key assignment. In effect, the route transfer relay is placed in back of the route relay so that calls overflowing from the first route go to an NC announcement trunk (from a 2-position key) *or* possibly to the second alternate route in the chain (skip routing; although this is more often assigned to a 3-position key).

(b) Regular cancellation of alternate routed traffic to a trunk group; this "R" key arrangement is used most often on 3-position keys on home final groups. In effect, the route transfer relay is placed in front of the route relay for the alternate route; all alternate routed traffic is

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kept off the trunk group and goes instead to a recorded announcement.

(c) Three position keys may be prewired and reserved in an arrangement to deny routing of selected code(s) during an emergency. This is for temporary use and gives the machine administrator the opportunity to deny access of some or all of the markers to the route.

(d) Inter-Regional code blocking is another example of a preplanned blocking arrangement which can be controlled by 2 position keys at the TSC.

(e) A crossbar tandem with a large number of long lines trunk groups may choose to restrict calling to one group into each region which historically carries the highest attempts per circuit per hour (ACH) at peak periods. When peg count and overflow data gathered at the crossbar tandem and higher ranking offices indicates substantial NC and calling rates, the associated key is operated so that only single link connections can be completed. Calls on other trunk groups into that region will not be affected. This same arrangement could apply as well to hard to reach points.

(f) Key Reroutes: During peak periods, during disasters, on holidays, etc., traffic to some points can sometimes be switched via an essentially idle machine which is not part of the normal alternate route pattern. Three conditions must be met: there must be adequate circuits to the via office, switching capacity within the office, and circuits from the via office to the destination. If all the offices involved agree, this reroute can be prewired and controlled from the traffic supervisory cabinet or from the plant quarters.

(g) A route transfer relay and 2-position key may be assigned to toll completing (community dial office and local office) groups and arranged to route to an emergency announcement. This is particularly useful for community dial office because of isolations caused by facility failures or disasters.

Where 2-position keys are in short supply, three position keys may be used. One trunk group is wired to the route transfer relay associated with the "up" position of the key and another to the route transfer relay associated with the "down"

position. Both positions are arranged to go to an emergency announcement. Great care must be taken in selecting the pairs of trunk groups for these keys to reduce the chance that two offices assigned to the same key would be involved in the same disaster.

5.18 The sample general purpose relay assignment form shown in Fig. 5 or any other convenient locally designed form can be used to record 2 and 3-position key assignments with the associated trunk groups and route transfer relays.

E. Assignment of DRE

5.19 A DRE unit must be assigned in a 2-way trunk busy group that does not have any one-way trunks assigned to it. Up to three group busy relays may be assigned to one DRE unit.

5.20 The sample general purpose relay assignment form shown in Fig. 5 or any other convenient locally designed form can be used to record DRE assignments.

F. Assignment of DOC Keys and Lamps

5.21 When DOC circuits are going to be terminated in a crossbar tandem, the exact controls to be taken and the arrangements of the keys and lamps on the traffic supervisory cabinet will need to be worked out with the network manager in the DOC originating office and maintenance.

5.22 The locking keys and the lamps for the DOC circuit(s) are assigned by the machine administrator. The associated route transfer relays (up to three for each circuit) are assigned by circuit provisioning. Of course, DOC installations are coordinated by the higher ranking office which implements the DOC controls on the crossbar tandem.

6. ASSIGNMENT RECORDS

6.01 Accurate up-to-date records are essential to administer a dynamic system. Not only does the control tandem have to know exactly what controls are associated with every signal circuit, the machine administrators in the end offices should also have this information available for their machines. Since there are no standard procedures or responsibilities for assigning some of this equipment, the emphasis in this paragraph will be

on what records and assignments are required rather than on who should initiate and maintain records or what form to use.

6.02 As a general rule, the machine administrator will assign the trunk busy and group busy relays as well as the lamp and key assignments for the traffic supervisory cabinet. The Circuit Provisioning Bureau or centralized circuit group generally assigns the route transfer relays. If there is a separate trunk assignment group, it usually assigns route relays and route treatments. The following two forms shown in Figs. 5 and 6 can be used to assign the various relays, lamps, and keys covered in this section, to record the network

management controls assigned to each trunk group, and to show the traffic supervisory cabinet layout.

- Figure 5, Sample General Purpose, Relay Assignment Record, is an all-purpose, 2-page form which may be used to show group busy and trunk busy relay and 2 or 3-position key assignments.
- Figure 6, Sample Traffic Supervisory Cabinet Trunk Group Controls Record, summarizes the relay assignments and network management controls by trunk group. During unexpected overloads this record can be a valuable ready reference to show what controls can be applied to relieve a congested machine.



Fig. 1—Traffic Supervisory Cabinet

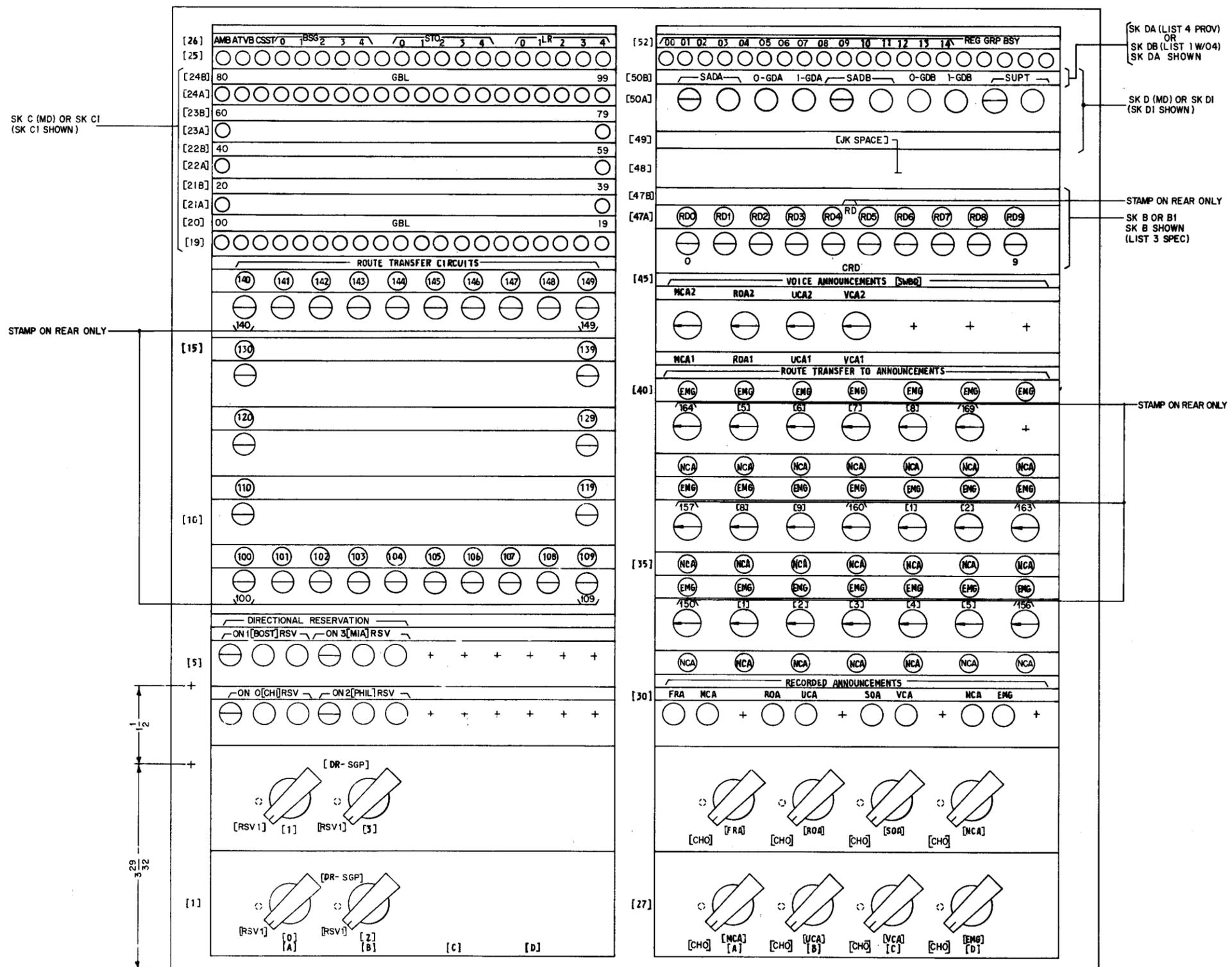


FIG. D

Fig. 2—Traffic Supervisory Cabinet Control Panel Announcements

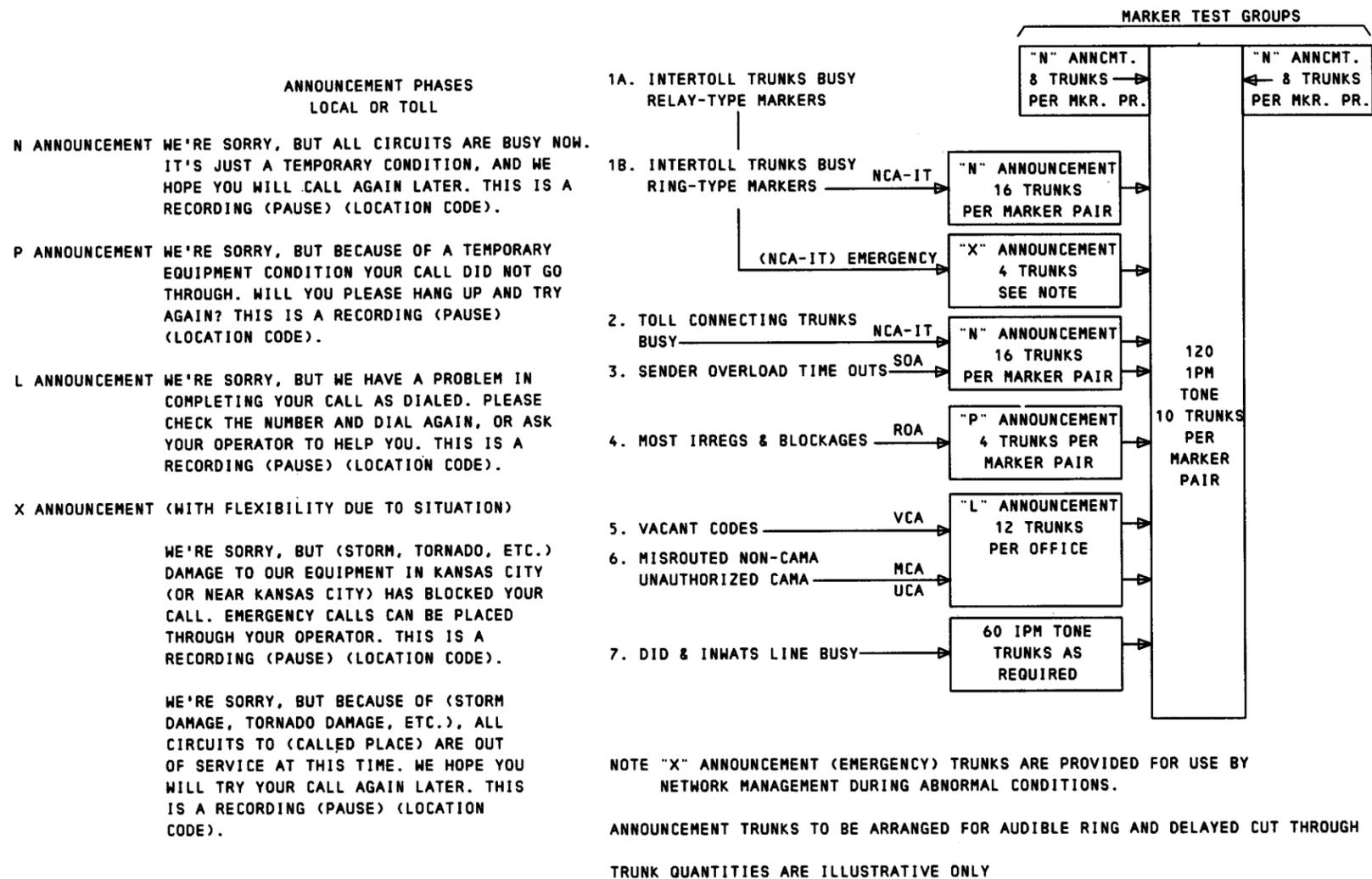


Fig. 3—A Typical Assignment of Tones and Announcements

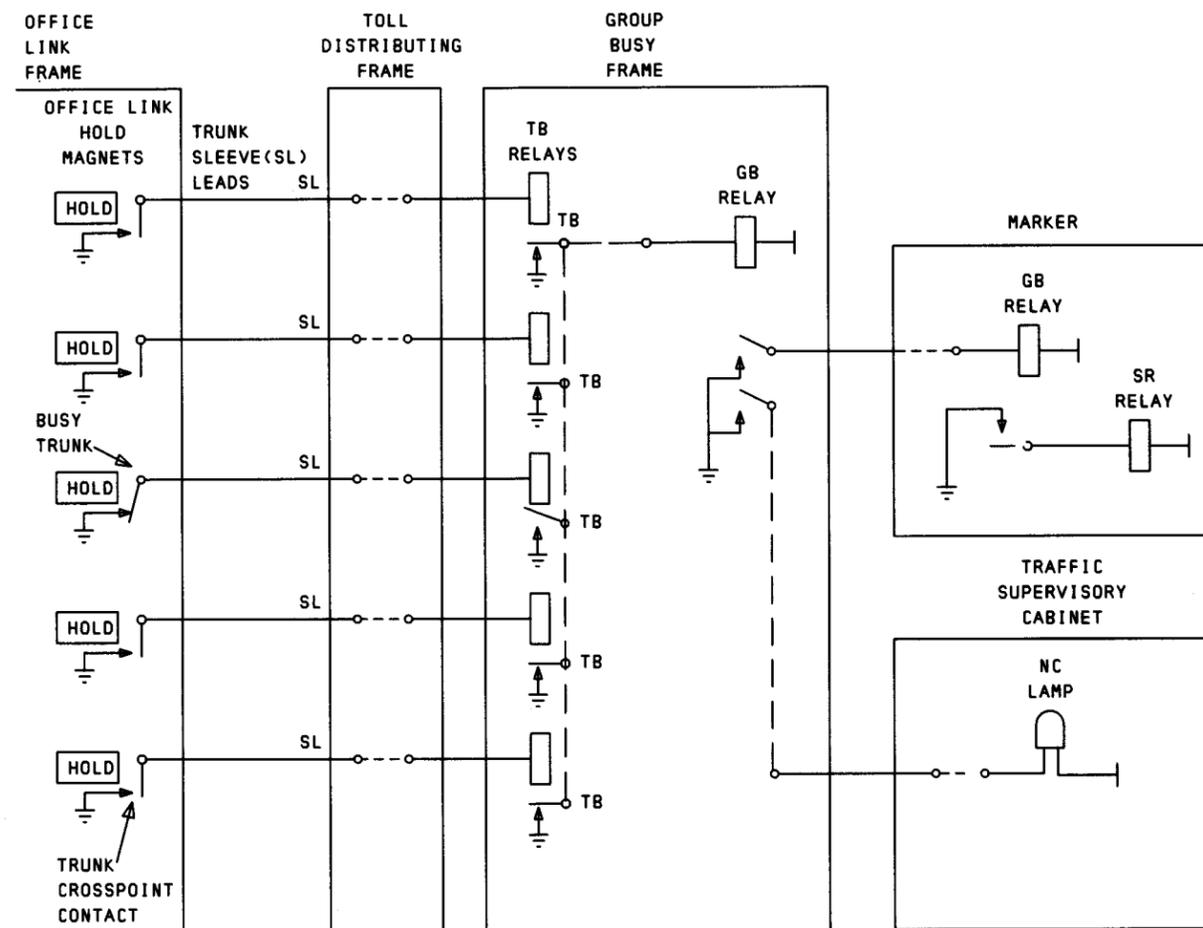


Fig. 4—Illustration of Office Link Frame, Trunk Busy and Group Busy Relay Operation

RELAY
ASSIGNMENT
RECORD

ASSIGNMENT OF: _____

TRUNK GROUP	TRUNK NO.	---- RELAY	---- RELAY	TREAT- MENT NO.	TRUNKS CONNECTING	
					2-W	1-W
		00				
		01				
		02				
		03				
		04				
		05				
		06				
		07				
		08				
		09				
		10				
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RELAY
ASSIGNMENT
RECORD

ASSIGNMENT OF: _____

TRUNK GROUP	TRUNK NO.	RELAY	RELAY	TREAT- MENT NO.	TRUNKS CONNECTING	
					2-W	1-W
		55				
		56				
		57				
		58				
		59				
		60				
		61				
		62				
		63				
		64				
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Fig. 5—Sample General Purpose Traffic Supervisory Cabinet Relay Assignment Record

