subject: PBX Systems - 770A PBX New Features

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FOR YOUR INFORMATION

date: June 19, 1972

JUL 10 1972

file no. gl: 72-06-112
other: E.L. 1927
Supplements E.L. 1370
Topical Index Code 1C1.15C

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to: Chief Engineers (copies sent to General Plant Managers, General Traffic Managers and General Marketing Managers)

MR. CALDERWOOD

from: Engineering Director - Customer Telephone Systems

synopsis: Announces availability of new features for 770A PBX.

* * *

Development work has been completed on several new features for the 770A PBX including Switched Loop Attendant Operation, Secrecy, Two Digit Trunk Access Codes, Mixed Length Station Access Codes, One-Way Outgoing Trunk Circuit, and a Universal Interface Circuit which provides Access to Dial Paging, Dial Dictation and Code Call. Descriptions of these new features, their operations, affected circuits, documentation and ordering information is contained in Attachment A.

Price and availability information is contained in Attachment B.

For additional information, please call Pete Porter on Area Code 303, 427-5225.

W. Schiavone

Engineering Director

RLP:mm

SYSTEM DESCRIPTION

The 770A PBX is a relay logic controlled crossbar PBX growable from 40 to 400 lines and an unlimited number of trunks. Circuits affected by the new features and new circuits required by the new features are consistent with the flexible and growable system configuration and utilize the same standard apparatus used throughout the system.

AFFECTED CIRCUITS

Marker

One marker is required for each system. The additional features have not changed the basic marker functions; however, the detailed operations have been altered to incorporate sequences required for new feature operation.

Register

The basic functions of the register as a dial pulse counter remain essentially unchanged. The register operations have been altered substantially to allow for recognition of two digit trunk codes, to provide a timing function allowing recognition of mixed length station codes with the same initial digits. These changes do not affect the number of registers required except due to the traffic considerations of longer holding times as a result of the timing required on mixed length codes.

Trunk Switch

The trunk switch functions remain the same. The circuit has been changed to allow for the transmittal of additional trunk code control leads to the corresponding trunks through network ports. Sixteen trunk codes are available due to the two digit access changes.

Attendant Trunk

The attendant trunk has been changed to provide switch loop operation. The attendant trunk still functions as a dial "0" trunk directly through the network. In addition, the attendant trunk functions as a loop in switched loop operation, connecting to a Central Office, FX, etc., trunk through the switched loop circuit, and providing a means of connecting that trunk and all necessary control and signaling leads to the console.

Position Circuit

The basic functions of the position circuit remain unchanged. Detailed circuit changes have been made to incorporate switched loop operation.

Two-Way Central Office Trunks

The two-way central office trunk circuit has been changed to interface with the Switched Loop circuit as well as with the direct trunk termination unit. In addition, modifications have provided the options of secrecy, exclude source, and exclude destination operation.

Dial Transfer

A minor modification to the dial transfer circuit was required to provide compatibility with switched loop operation.

NEW CIRCUITS

Switched Loop Control

The switched loop control provides the logic necessary to control switching of trunks to idle loops in the switched loop circuit. One switched loop control unit is required per system.

Switched Loop Unit

The switched loop unit provides the network for connecting trunks to loops. A switched loop unit is capable of handling 20 trunks of the type requiring console control and up to 18 switched loops (attendant trunks). Any number of switched loop units may be provided for additional trunks. The arrangement for the switched loop unit is shown in Figure 1. With 18 loops, not all loops have full access to the trunks. The possible arrangements of full access loops and non-full access loops are shown in TABLE A.

Universal Interface Circuit

This circuit provides an interface between the 770A PBX and peripheral equipment such as Paging apparatus, code call apparatus, or telephone dictation apparatus. One interface circuit (with or without isolation amplifier) is required for each Paging circuit. One interface circuit is also required for each telephone dictation circuit. Code call requires two interface circuits per code call unit.

One-Way Trunks

A one-way outgoing trunk (UM) has been designed and is now available. This trunk may be ordered in increments of 1, 2, or 3 circuits depending on the number required. A single mounting plate can contain up to three outgoing trunk circuits. The one-way incoming trunk (UN) has been discontinued; however, one-way incoming service will be provided by the two-way trunk (UL) arranged accordingly. In addition, the Toll Trunk (UP) has been discontinued. Toll Trunks without re-ring may be ordered as a UM trunk arranged for Toll option. If it is desired that the Toll Trunk terminate on the console for re-ring capability, two-way trunks (UL) must be ordered for the Toll option.

NEW FEATURES DESCRIPTION

SWITCHED LOOP OPERATION

Switched Loop is intended to be served primarily by the 23-type or 53-type console. These consoles have 6 keys for attendant loops as well as an additional field of lamps to be used for Incoming Call Identification (ICI) lamps and trunk group busy lamps (See Figure 2). In switched loop operation, the 770A PBX provides a maximum of three attendant positions. It also provides a maximum of six non-multiple loops per attendant; that is, each attendant has up to six individual loops dedicated to her position only. The switched loop circuit consists of one switch loop control unit and one or more switch loop units. One switch loop unit is provided for every 20 trunks which are normally under the attendant's control. There is no limit to the number of trunks which may be provided. In the 770A PBX the attendant trunks serve also as attendant loops. The attendant loop or trunk which appears on the console has two ports other than the console. One port terminates on the network by which it is accessed on a dial 0 basis, the second port terminates on the switch loop unit, by which it is accessed from incoming trunks.

On incoming trunk calls, a seizure from the distant end will cause the trunk circuit to bid for an idle loop which then will appear on the console as an incoming call with the normal incoming indications. The attendant, upon answering a call, may converse with the Central Office. She can then extend the call inward either by operating "start" and dialing the station code or by depressing a DSS key if available. The loop remains busy during the ringing even if the attendant releases from the call. However, upon answer, the loop will drop. As long as there is an idle loop, an incoming call will come into the console even if the position is busy on another loop. An option is provided in the position circuit which allows the attendant's audible indication to be silenced if she is busy. If all loops are busy, an incoming trunk call will light the calls waiting (CW) lamp. An incoming dial 0 call at this time will receive reorder since all attendant trunks are busy.

In the case of two attendant positions, an even distribution is made between attendants on incoming calls such that the first call in is connected to a loop on the first console, the second to a loop on the second console, the third to the first, fourth to the second, etc. In the case of three attendant positions, an even distribution is made between attendants on incoming calls except calls 10,11 and 12. The following distribution will occur if all 18 loops are provided.

Call	1	2	3	4	5	6	7	8	9
Position	A	B	C	A	B	C	A	B	C
Call	10	11	12	13	14	15	16	17	18
Position	C	B	A	A	B	C	A	B	C

There is no switching from one attendant to an idle attendant once the call has been routed to a loop. If attendant 2 should operate quickly and finish her calls, the second call waiting on attendant 1 will not switch over to attendant 2, but rather wait for attendant 1 to finish. Should all 12 loops become busy (or less if there are less equipped) the incoming call will continue giving ring-back to the distant end, and wait at the switch loop circuit for an idle loop. At the same time, the calls waiting lamp for the attendant at both consoles will light. As soon as a loop becomes idle, this call will connect to that loop and be brought into whichever attendant position corresponds to the idle loop. In the case of incoming attendant trunk calls (dial 0 calls from stations) there is no queuing between attendants. The selection is done on the network side such that a call will come into the first idle loop in the normal trunk selection sequence. Thus, there is no control over which attendant receives the incoming attendant call with the exception that when the position is busied out by the Position Busy Key, all loops (attendant trunks) are indicated as busy both to network calls and to incoming calls.

A dial 0 call from a station can be extended by the attendant to another trunk or to a station by simply depressing the start key and dialing the appropriate station code or trunk access code. In which case, when the attendant releases and the connection is established completely, the loop will drop away. A trunk dialed in this manner provides "through dial" only. If the attendant desires to use straightforward outward completion she must operate the "Dial Out" key. Straightforward outward completion can be provided only with switched loop terminated trunks and only on a maximum of four trunk groups. In addition to standard operation, the switch loop operation will also provide options of lockout and secrecy. With secrecy, the attendant can never converse on a three-way conversation with the trunk party and PBX party simultaneously. The connection is always in the exclude source or exclude destination mode at her control. If she enters on a recall the trunk party will be split and the attendant is connected to the station. On a recall without secrecy she will pick into a three-way conversation, bridged with both the trunk and the station party. She may then exclude source or destination if desired. All other console functions - conference keys, position busy, remote answer, etc., function in the normal manner.

If fixed night connections are provided, the operation of the night key will establish these connections. If flexible night service is provided, operation of the position busy and the night key will prepare the connections for the attendant to set up the flexible night connections. The attendant picks up a loop, operates the Dial Out key, and receives dial tone. She then dials the code assigned to the trunk and the connection will be completed through the switched loop. For 4-digit systems, the dial code assigned may be X20 thru X39 where X is digits 1 to 5. For 3-digit systems the dial code assigned may be 20 thru 39, and for 2-digit systems the dial code may be 1 thru 5. No assigned code can correspond to any single digit code or delayed digit code in the case of a mixed length digit system. The attendant then operates the start key and dials a station code associated with that trunk for night service. If the station is busy and camp-on is provided for this system, the call will camp-on

and make the night connection at the end of the busy call. If camp-on is not provided, the connection cannot be established unless the station is idle. A maximum of 20 trunks may be arranged for flexible night service, all of which must be located within the first three switched loop units.

The 23-type or 53-type console provides the capability of 24 lamps to be used as Incoming Call Identification (ICI) Lamps or Trunk Group Busy Lamps. Since more than one loop may be incoming on a console at a time, the ICI lamps must be associated with each loop key. Several optional arrangements are provided as detailed in Figure 2. One option provides no trunk group busy lamps and four ICI lamps per loop. Alternatively the first column to the left may be dedicated to trunk group busy display, showing the busy/idle status of six different trunk groups, and provides only three incoming call identification lamps per loop. Another possibility exists if only five loops per console are equipped. Four ICI lamps per loop for the five loops that are available may be provided, with the four lamps associated with the vacant key used as trunk group busy lamps. Only trunks which appear on the switched loop unit will have ICI lamps.

Trunk group busy lamp indications will be provided to indicate the busy/idle status of selected trunk groups. The busy/idle status will be indicated when a loop key is depressed, and, since some loops may not have access to all trunks in a group, two situations can occur. For installations with 10 or less loops the busy/idle status will indicate the true condition of the entire trunk group. For installations with more than 10 loops, the busy/idle status will indicate the condition of that portion of the trunk group that the selected loop can access.

Route Advance

Route advance is provided with a maximum of 2 trunk groups. For switched loop systems where straightforward outward completion is provided, these 2 trunk groups must be the same as 2 of the 4 groups providing straightforward outward completion. For systems where route advance is used, the one-way outgoing trunks in the selected trunk group will be selected before two-way trunks in the same group.

TWO DIGIT TRUNK ACCESS

A maximum of 16 two-digit trunk codes will be provided. These codes are restricted to 6X, 7X, 8X and 9X. No mix of single and two-digit codes may be made on the same level. (6 and 62 is not a permissible arrangement; however, 6, 72, 83, etc., is permissible). The second digits of codes need not be any specific digits, nor need they be the same on each level. Class of Service restrictions will operate based on the first digit of the code only. The classes of service are the same as they are in the present 770.

If Toll Restriction is provided, it may be provided only on single-digit, 9 access - no 9X codes will be allowed. Fifteen two-digit codes may then be distributed over the other three levels.

MIXED LENGTH ROOM CODES

Mixed length room codes will become available as part of the same change as two digit trunk codes. With this change the following station code combinations are possible: 1 or 2, and 3-digit or 1 or 2 or 3 and 4-digit. It is possible to have a single digit station code that is the same as the first digit of a three or a four digit room code. In addition, those digits used for a single digit trunk code may also be used as the first digit of a three and/or a four digit station code. These trunk codes will require a delay of 4 seconds to recognize that single digit. However, no two-digit trunk code may begin with the same digit as a station code.

The dial code combinations allowed are shown in TABLE B.

No flexible number pattern may be provided with DSS except by non-standard field modification.

PAGING, TELEPHONE DICTATION, AND CODE CALL

Paging, Telephone Dictation, and Code Call are all provided through the use of a universal interface circuit. One interface circuit per paging circuit is required; this may be provided with or without an isolation amplifier. The attendant will not have a direct key access to the paging feature. In order for the attendant to page, she must dial the trunk access code as does any other station user. The attendant position line side port is then connected to the paging circuit.

Telephone dictation uses one interface trunk to access the recorded telephone dictation trunk circuit, SD-5E038-01. This may be accessed by a single digit or two-digit trunk code as in the case of paging. The control of the dictation unit may be on a Touch-Tone or dial pulse basis.

Code Call requires two interface circuits, one for the calling party and one for the answering party. Both codes may be the same. A one or two-digit trunk code is dialed, followed by the code call desired. The same access code is then dialed to answer the code call, connecting the two parties.

SYSTEM DOCUMENTS AFFECTED

The following circuit drawings are affected and available now:

Circuit	Issue	Title
SD 1E331-01	Issue 5B	Interconnect Circuit
SD 1E332-01	Issue 10B	Marker Circuit
SD 1E334-01	Issue 6B	Trunk Group Circuit
SD 1E335-01	Issue 10B	Position Circuit
SD 1E336-01	Issue 1	Switched Loop Circuit
SD 1E337-01	Issue 11B	Register Circuit
SD 1E338-01	Issue 8B	Attendant Trunk Circuit
SD 1E340-01	Issue 6B	Two-Way Central Office Trunk Circuit

Circuit	Issue	Title
SD 1E341-01	Issue 1	One-Way Outgoing Central Office Trunk Circuit
SD 1E344-01	Issue 3B	Dial Transfer Circuit
SD 1E362-01	Issue 1	Universal Interface Circuit
SD 1E349-01	Issue 4B	Dual Console Control Circuit
SD 1E331-01	Issue 5B	C.O. Direct Trunk Termination Circuit

The following Bell System Practices are affected and will be available as noted:

BSP	Issue	Title	Expected General Availability Date
961-680-100	2	General Descriptive Information	3Q72
551-770-200	2	Installation and Connections, Test and Inspections at Time of Installation	"
551-770-201	3	Service Options	"
551-770-301	2	Attendant and Station Equipment - Method of Operation	"
551-770-302	1	Attendant Equipment, Switched Loop Operation - Method of Operation	"
551-770-310	1	Trouble Locating Procedures	2Q73 *
551-770-500	3	Alarms and Power Failure Transfer - Operation Tests	"
551-770-501	2	Common Circuits - Operation Tests	12/72 *
551-770-502	2	Trunk Circuits - Operation Tests	"
551-770-503	2	Attendant Common Circuits - Operation Tests	"
809-830-150	2	Equipment Design Requirements (J58876)	"

* CORRECTION DATED 6-30-72

ORDERING INFORMATION

Ordering information is found in BSP 809-830-150 (J58876), Issue 2 coordinated with 770A PBX Ordering Questionnaire (E-8095) Issue 4 to be available in 3 Q 72. ISSUE 3 AVAILABLE NOW.

AFFECTED EQUIPMENT

TWO-DIGIT TRUNK CODES AND MIXED DIGIT DIALING

J58876	UH	L-6	REGISTER CIRCUIT (L-2, L-3 and L-4 unchanged and still optional)
J58876	UA	L-1, C	MARKER CIRCUIT (L-2 and L-3 unaffected and still optional)
J58876	UD	L-1, B	TRUNK GROUP CIRCUIT

SWITCHED LOOP OPERATION

J58876	UA	L-1, C	MARKER CIRCUIT (L-2 and L-3 unaffected and still optional)
J58876	UH	L-6	REGISTER (L-2, L-3 and L-4 unchanged and still optional)
J58876	UD	L-1, B	TRUNK GROUP CIRCUIT
J58876	UF	L-1, E	POSITION CIRCUIT (L-1, E & 2, F with DSS)
J58876	UG	L-1	SWITCHED LOOP UNIT
J58876	UJ	L-2	ATTENDANT TRUNK
J58876	UL	L-2	TWO-WAY CENTRAL OFFICE TRUNK
J58876	UR	L-1, A	DIAL TRANSFER CIRCUIT
J58876	US	L-1	SWITCHED LOOP CONTROL CIRCUIT
J58876	YA	L-1, B	Dual Console Control Circuit
J58876	YE	L-1, B	C.O. Direct Trunk Termination Circuit

ONE-WAY OUTGOING CENTRAL OFFICE TRUNK

J58876	UM	L-1	(1) One-Way out trunk circuit
J58876	UM	L-1, 2	(2) One-Way out trunk circuits
J58876	UM	L-1,2,3	(3) One-Way out trunk circuits

UNIVERSAL INTERFACE

J58876	YL	L-1	(2) Interface Circuits
J58876	YL	L-1,2	(4) Interface Circuits
J58876	YL	L-3	(1) Interface Circuit for Paging with isolation amplifier

Western Electric advises that the price and availability of the new equipment is as follows:

Equipment Unit			Price	Availability
J58876	UH	L-6	$350.00	
J58876	UA	L-1, C	625.00	
J58876	UD	L-1, B	622.00	Now, for Systems Ordered on an Issue 3 of E8095 Questionnaire and the standard eight week interval applies.
J58876	UF	L-1, E	374.00	
J58876	UF	L-1, E, 2, F	396.30	
J58876	UG	L-1	615.00	
J58876	UJ	L-2	159.00	
J58876	UL	L-2	134.00	
J58876	UR	L-1, A	256.00	
J58876	US	L-1	374.00	
J58876	UM	L-1	62.20	
J58876	UM	L-1, 2	113.40	
J58876	UM	L-1, 2, 3	166.00	
J58876	YL	L-1	59.50	
J58876	YL	L-1, 2	108.60	
J58876	YL	L-3	64.00	
J58876	YA	L-1, B	537.00	
J58876	YE	L-1, B	198.00	

TABLE A

SWITCHED LOOP

Allowable combinations of loops with full access and loops with access to half of the trunks.

TOTAL LOOPS	FULL ACCESS LOOPS	PARTIAL ACCESS LOOPS
10	10	0
11	9	2
12	8	4
13	7	6
14	6	8
15	5	10
16	4	12
17	3	14
18	2	16

TABLE B

ALLOWED DIGIT COMBINATIONS

I. 4-DIGIT SYSTEM

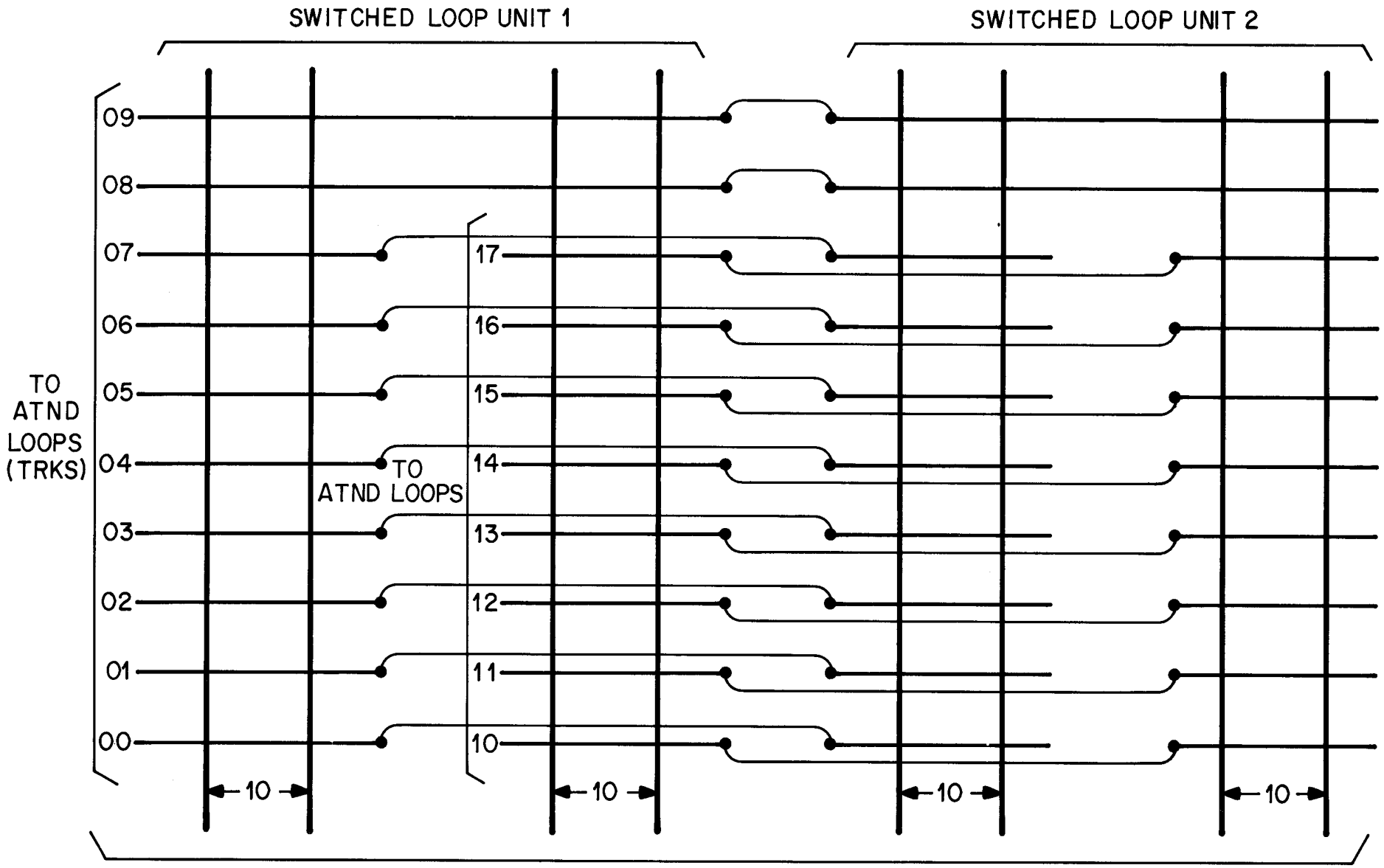
FIRST DIGIT		POSSIBLE COMBINATIONS
1 - 5	OR	4 Digit Station and 3 Digit Station
	OR	4 Digit Station and 2 Digit Station
	OR	4 Digit Station and 1 Digit Station
6 - 9		4 Digit Station and 3 Digit Station
	OR	4 Digit Station and 2 Digit Station
	OR	4 Digit Station and 1 Digit Station
	OR	4 Digit Station and 3 Digit Station and 1 Digit Trunk
	OR	4 Digit Station and 1 Digit Trunk
	OR	2 Digit Trunk

II. 3-DIGIT SYSTEM

FIRST DIGIT		POSSIBLE COMBINATIONS
1 - 5		3 Digit Station and 2 Digit Station
	OR	3 Digit Station and 1 Digit Station
6 - 9		3 Digit Station and 2 Digit Station
	OR	3 Digit Station and 1 Digit Station
	OR	3 Digit Station and 2 Digit Station and 1 Digit Trunk
	OR	3 Digit Station and 1 Digit Trunk
	OR	2 Digit Trunk

FIGURE 1A

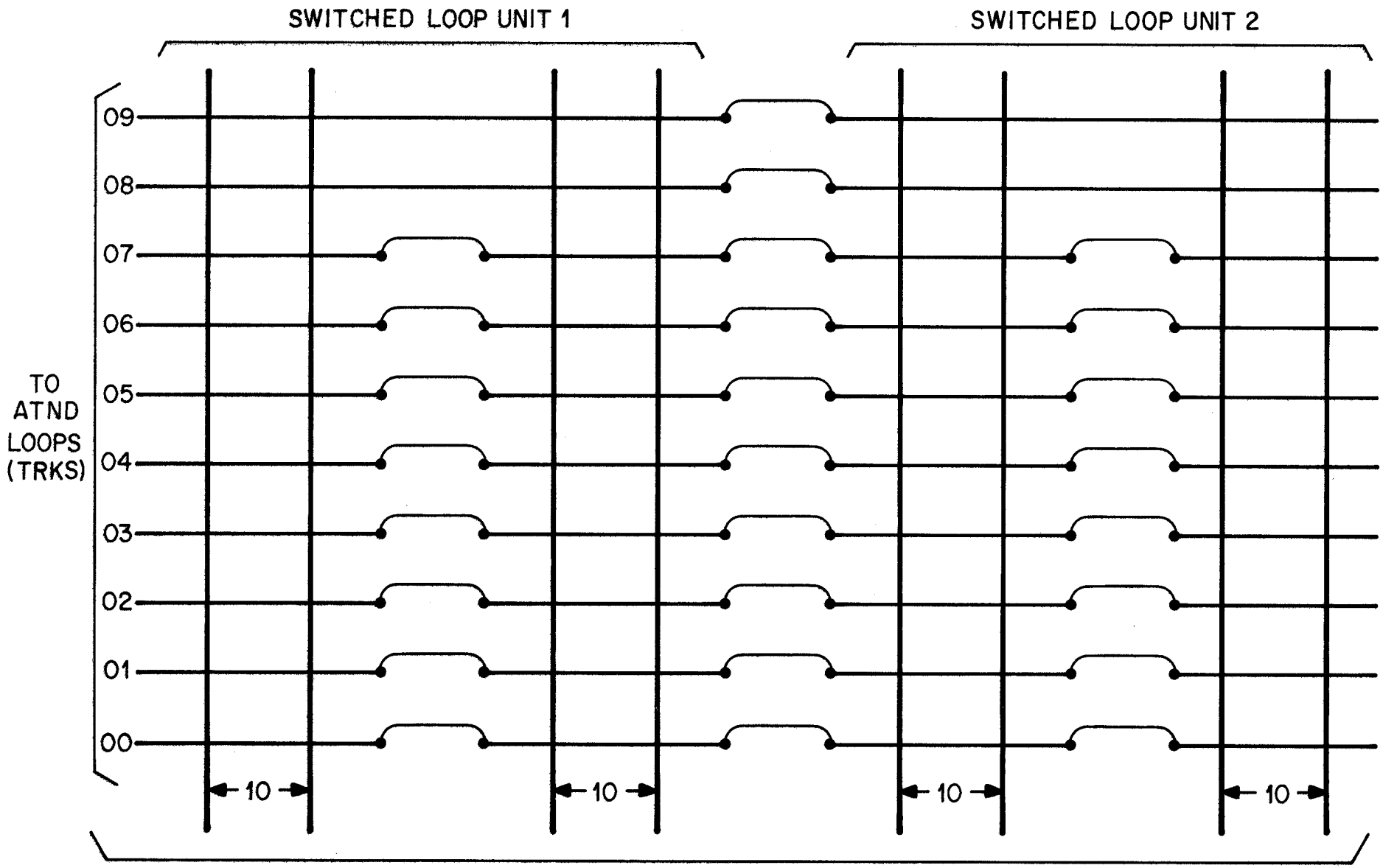
SWITCHED LOOP CONFIGURATION



SWITCHED LOOP ARRANGED FOR 18 LOOPS

Accompanying E.L. 1927

FIGURE 1B

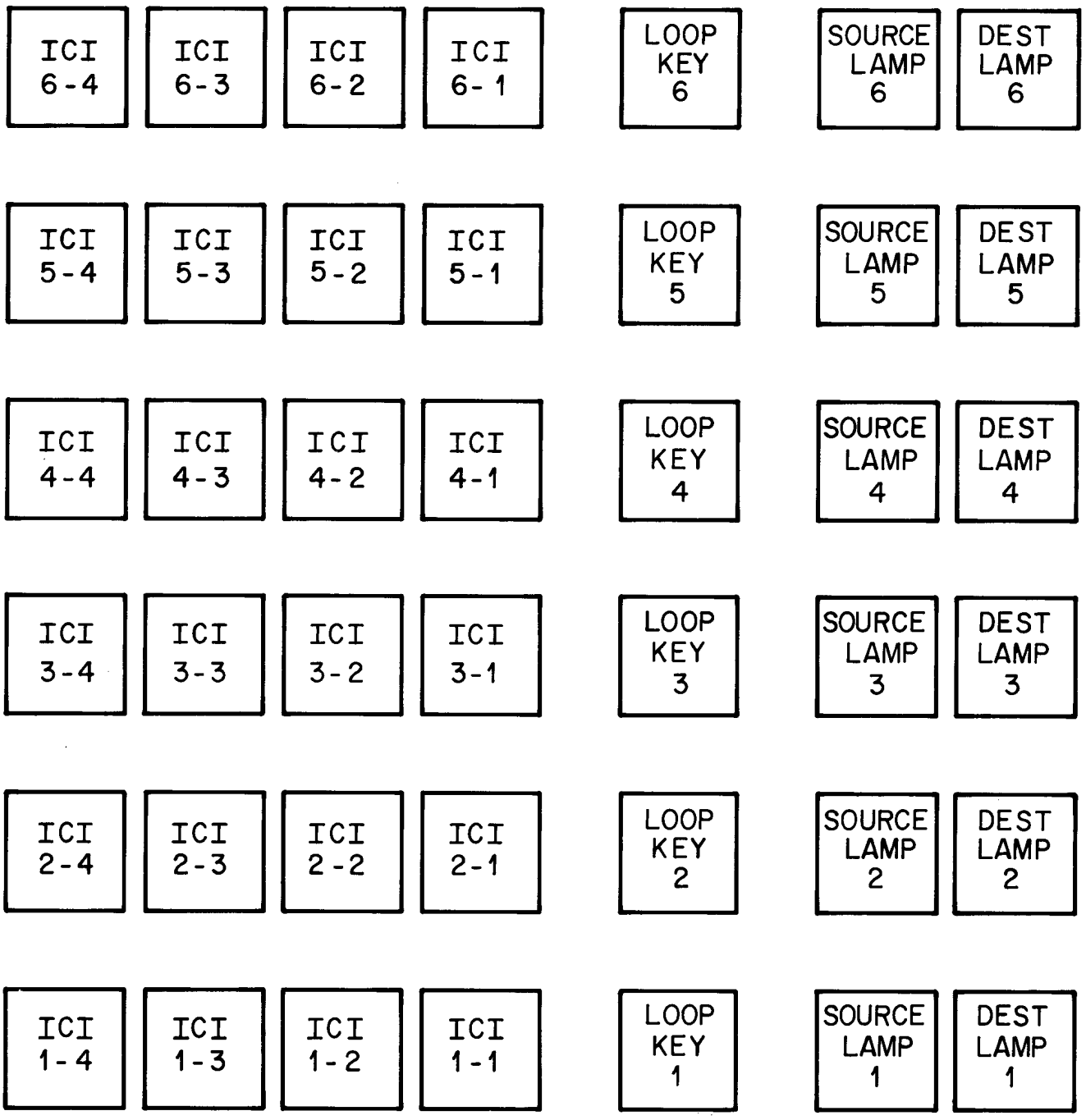


SWITCHED LOOP ARRANGED FOR 10 LOOPS

Accompanying E.L. 1927

FIGURE 2-A

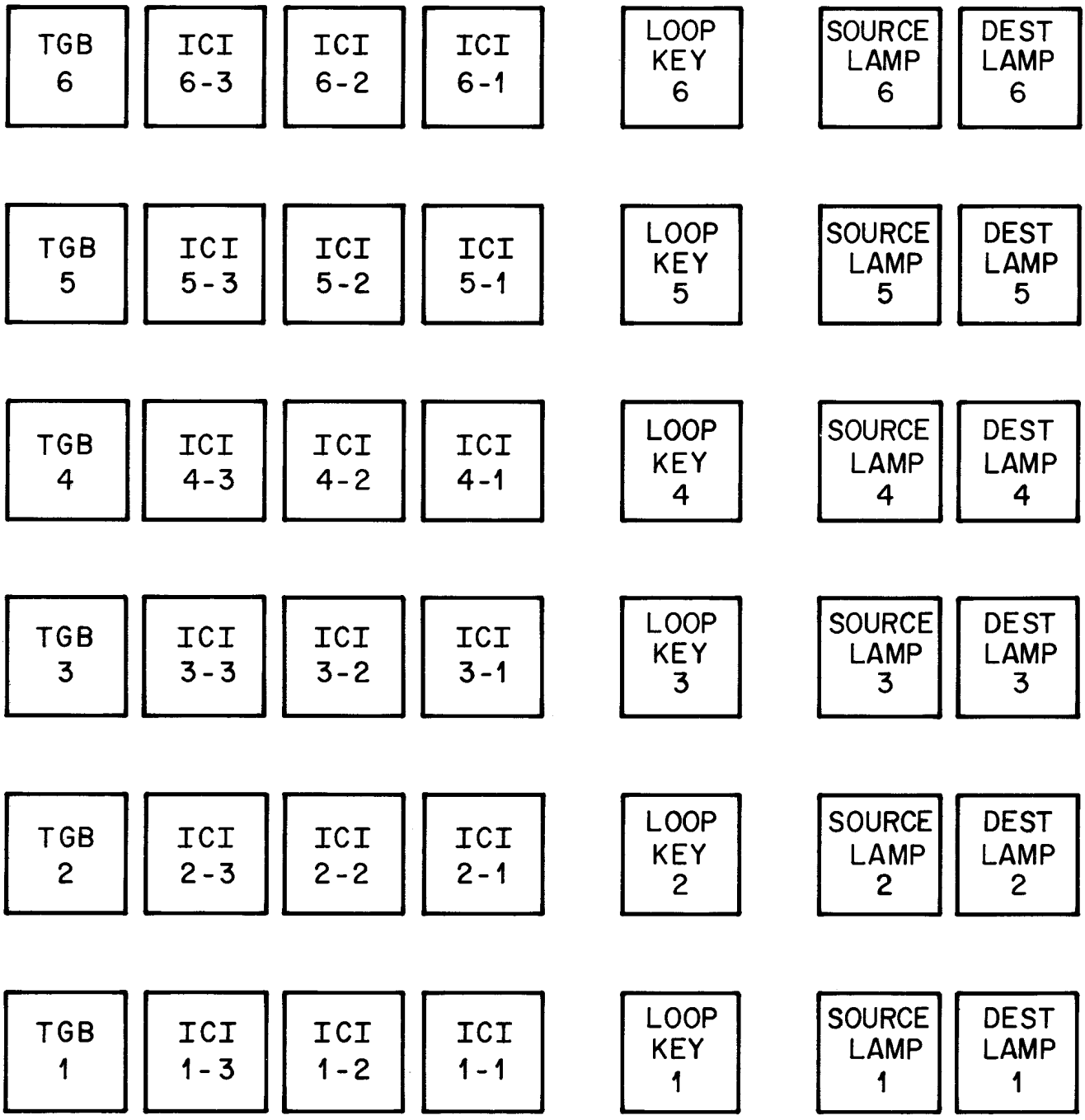
ICI AND TRUNK GROUP BUSY LAMPS



23 TYPE CONSOLE
TYPICAL ARRANGEMENT
OF
ICI AND TRUNK GROUP BUSY
LAMPS

FIGURE 2 - B

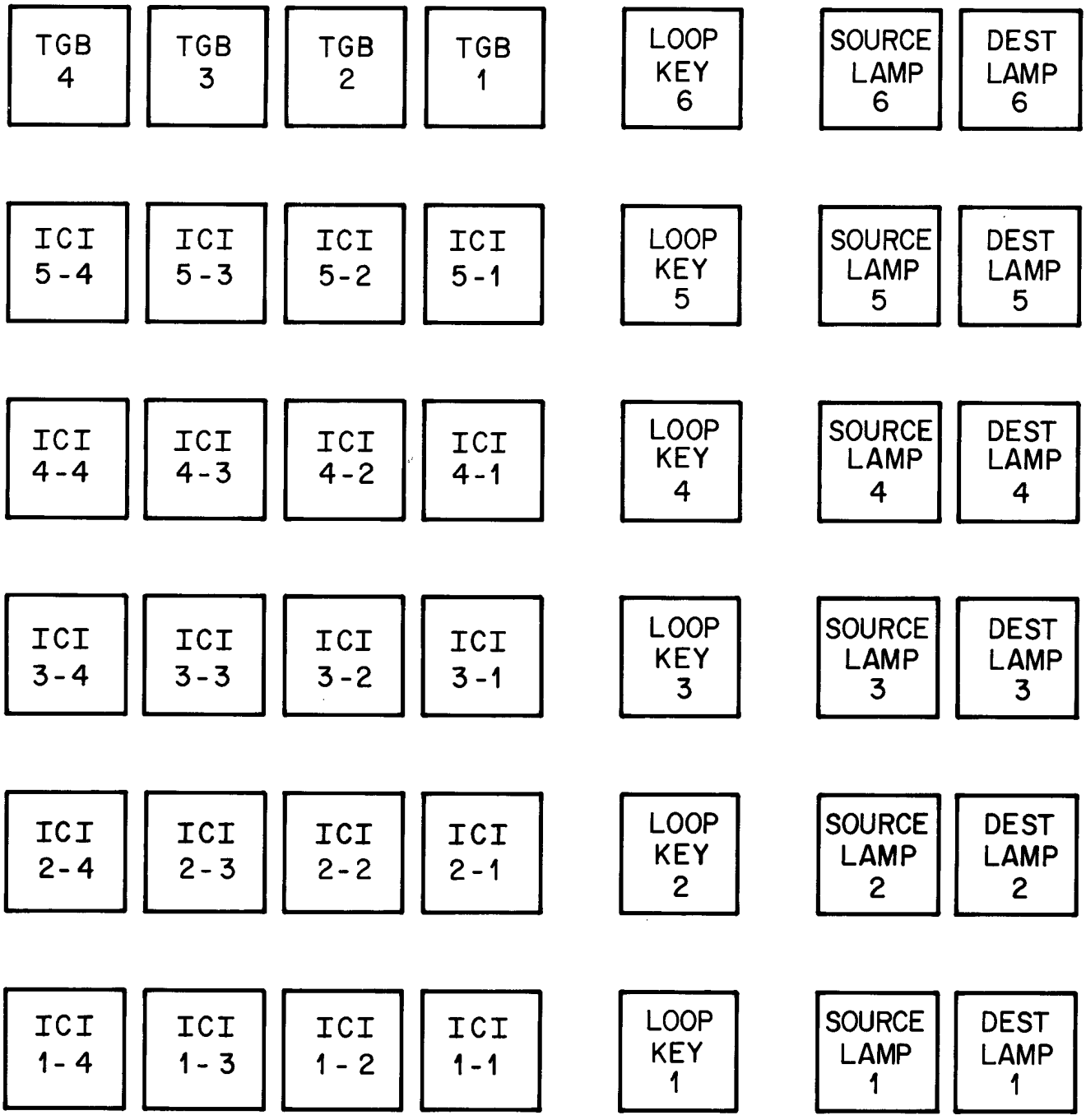
ICI AND TRUNK GROUP BUSY LAMPS



23 TYPE CONSOLE
TYPICAL ARRANGEMENT
OF
ICI AND TRUNK GROUP BUSY
LAMPS

FIGURE 2-C

ICI AND TRUNK GROUP BUSY LAMPS



(5 LOOPS EQUIPPED)

23 TYPE CONSOLE
TYPICAL ARRANGEMENT
OF
ICI AND TRUNK GROUP BUSY
LAMPS