

**NUMBER GROUP FRAME
NONWIRE-SPRING-RELAY TYPE
CROSS-CONNECTIONS AND ASSOCIATED CROSS-CONNECTIONS
AT THE MAIN DISTRIBUTING FRAME
NO. 5 CROSSBAR OFFICES**

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	1. GENERAL	
	1.01 This section describes the method of assigning the number group frame cross-connections and the sleeve lead cross-connections at the main distributing frame (MDF) which are associated with the number group frame. It is intended for use in connection with the initial installation of new lines or for changes in the treatment or routing of calls to existing lines.	
	1.02 The reasons for reissuing this section are listed below. Revision arrows are used to emphasize the more significant changes. Equipment Test Lists are not affected.	

- (a) To revise paragraphs 2.46, 2.52, 3.33, 3.37.
- (b) To revise Tables B, E.
- (c) To revise Fig. 10, 24, 25.
- (d) To make minor changes as required.

1.03 Throughout this section, the terms earlier type and later type are those illustrated by Fig. 1 and 2, respectively. The later-type frame has facilities for cross-connecting more than one hunting group in a tens block, for cross-detection of SC relays when more than one SC relay in a tens block is used, for block select hunting, and for allotted number hunting. No standard method of cross-connections can be provided when the above new features are to be used on the earlier-type frames, since spare terminals on terminal strips A through E must be utilized according to job specifications.

1.04 A number group frame has a capacity of 1000 numbers and is treated as a circuit unit by the marker. A lockout preference feature is provided so that only one marker may work into a number group at one time. With the exception of allotted numbers, the thousands digit determines the number group frame on which a called number is located.

1.05 Each number group has its own individual cross-connection field and terminal strips. The cross-connections of a number group are independent of other number groups with the exception of those groups which handle tandem and toll tandem trunks working through this office. These trunks are assigned identical numbers in two number groups.

1.06 All cross-connections are confined to the number group frame, main distributing frame, and to the allotted number, block-select, and tens block busy test apparatus on the relay rack. No cross-connections are required on the associated number group connector frame on which the connector and preference circuits of the number group are mounted.

1.07 Where a number on the number group frame is associated with a group of terminal hunting numbers, with equipment which requires an exchange of busy with the No. 5 crossbar equipment, or with tens block busy test on block select or allotted

number hunting, sleeve lead cross-connection will be required at the main distributing frame. These connections are covered in this section.

1.08 The number group frame connects the sleeves of lines in a terminal hunting group to sleeve test leads in the marker for selection of an idle line in groups of a maximum of ten lines at a time. A sleeve connector (SC) relay is required for each hunting group or for each group of ten or fewer lines in a tens block in the hunting group. If a hunting group exceeds ten lines, either block hunt (A) relays or tens block selecting (SA) relays may be used to extend the hunting to additional groups of ten lines. When block hunt (A) relays are used, they advance the hunting sequentially in groups of ten lines, the marker testing each group until an idle line is found or until the last line in the group is reached and a busy signal is returned to the calling customer. In this case, the marker holding time is the sum of the times required to test each group of ten lines separately. When block select hunting is used, the marker, upon finding all lines in the first tens block busy, proceeds directly to the tens block in which an idle line appears, thereby reducing its holding time. In order to use this method, an additional relay is used for each tens block and a subgroup idle indication must be obtained from each line in the hunting group. This indication may be obtained from auxiliary line units by cross-connections being made at the MDF or with a number group sleeve busy relay circuit for each line. When allotted hunting is provided, the marker is informed without hunting through the first tens block if all lines of the hunting group in the number group selected are busy and then proceeds immediately to another number group which has lines in the allotted group. Busy indication for the first tens block is provided by the ABT relay. For succeeding tens blocks and for the individual lines, it is obtained in the same manner as for block select hunting.

1.09 Allotted block test (ABT) relays are mounted on a separate unit on a relay rack frame. One relay is required for the first tens block in each number group in which the allotted group appears.

1.10 A separate unit is provided for the block select hunting circuit. This unit is mounted on a relay rack and provides relays for 4 tens blocks providing for a maximum of 40 lines including the initial group of 10. When more than 40 lines

are required in the same hunting group, additional units may be provided and are interconnected by means of unit terminal strips. The sleeve connector relay for the initial group is provided on each unit but is not connected on added units. The SC relays on the number group frame are stamped with 2-digit numbers beginning with 00, while those on relay rack units are numbered from 100 up to avoid confusion. Leads from these units are cabled to the number group frame for cross-connecting when required.

1.11 An auxiliary tens block relay (TBA) may be provided when it is desired to have more than one hunting group in a tens block. Each line in the tens block may be associated with a different sleeve connector relay. With the block select method of hunting, however, no provision is made for having more than one hunting group in any tens block except the first.

1.12 Information covering methods of running cross-connections are covered in the 069 series.

1.13 The arbitrary physical number, theoretical number, extra theoretical number, and physical theoretical number designations apply only to numbers in offices which have been using these designations in the past. New offices will use the PN, TN, EN and PTN arbitrary number designations.

2. CROSS-CONNECTION FACILITIES

A. General

2.01 The number group must be able to perform its functions for each of the various types of translations and it must also be flexible so that the translation can be changed at any time. Flexibility is obtained by having the windings and contacts of relays and the translator resistors connected to punchings which are arranged in convenient fields or terminal strips where they may be interconnected. A general description of the various connecting points follows.

2.02 A general view of the earlier-type number group frame is shown in Fig. 1. The upper part of the number group frame is arranged to mount the hundreds, tens, units, and miscellaneous relays which are part of the number group circuit. Terminal strips A through E, designated from the top down, are mounted in this part of the frame.

Some of the miscellaneous cross-connections required for number group translations are made at these terminal strips. The lower part of the frame provides three cross-connection fields for translating the directory number into the line equipment location and ringing combination.

2.03 A general view of the later-type number group frame is shown in Fig. 2. The upper part of the number group frame is arranged to mount the hundreds, tens, units, and miscellaneous relays which are part of the number group circuit. Terminal strips D through H and S are mounted in this part of the frame. Some of the miscellaneous cross-connections required for number group translations are made at these terminal strips. The lower part of the frame provides three cross-connection fields for translating the directory number into the line equipment location and ringing combination.

2.04 The three cross-connection fields are equipped with terminal strips designated G, VHG, G, F, RF, F, L, LL, and L, reading from the top down. Each of the 1000 numbers in a number group has associated with it the cross-connection field punchings on terminal strips G, F, and L which in turn are cross-connected to the punchings on terminal strips VHG, RF, and LL as a means of translating the number to the line equipment location. A typical terminal strip layout of the cross-connection fields on the lower part of the frame is shown in Fig. 3 and 4.

2.05 The translator resistors connected to the VHG, RF, and LL punchings are mounted on the rear of the frame behind their respective fields.

2.06 Table A for the earlier-type frame and Table B for the later-type frame provide a list of cross-connections together with cross-references to facilitate the location of subject matter associated with the various punchings.

B. Cross-Connection Fields

2.07 *G, F, and L Punchings:* There are 1000 individual G punchings on a number group frame. These punchings appear on two terminal strips which are designated G on the left and right vertical mounting bars. The lower one of the two terminal strips accommodates punching numbers from 000 through 499 and the upper one accommodates numbers from 500 through 999. The

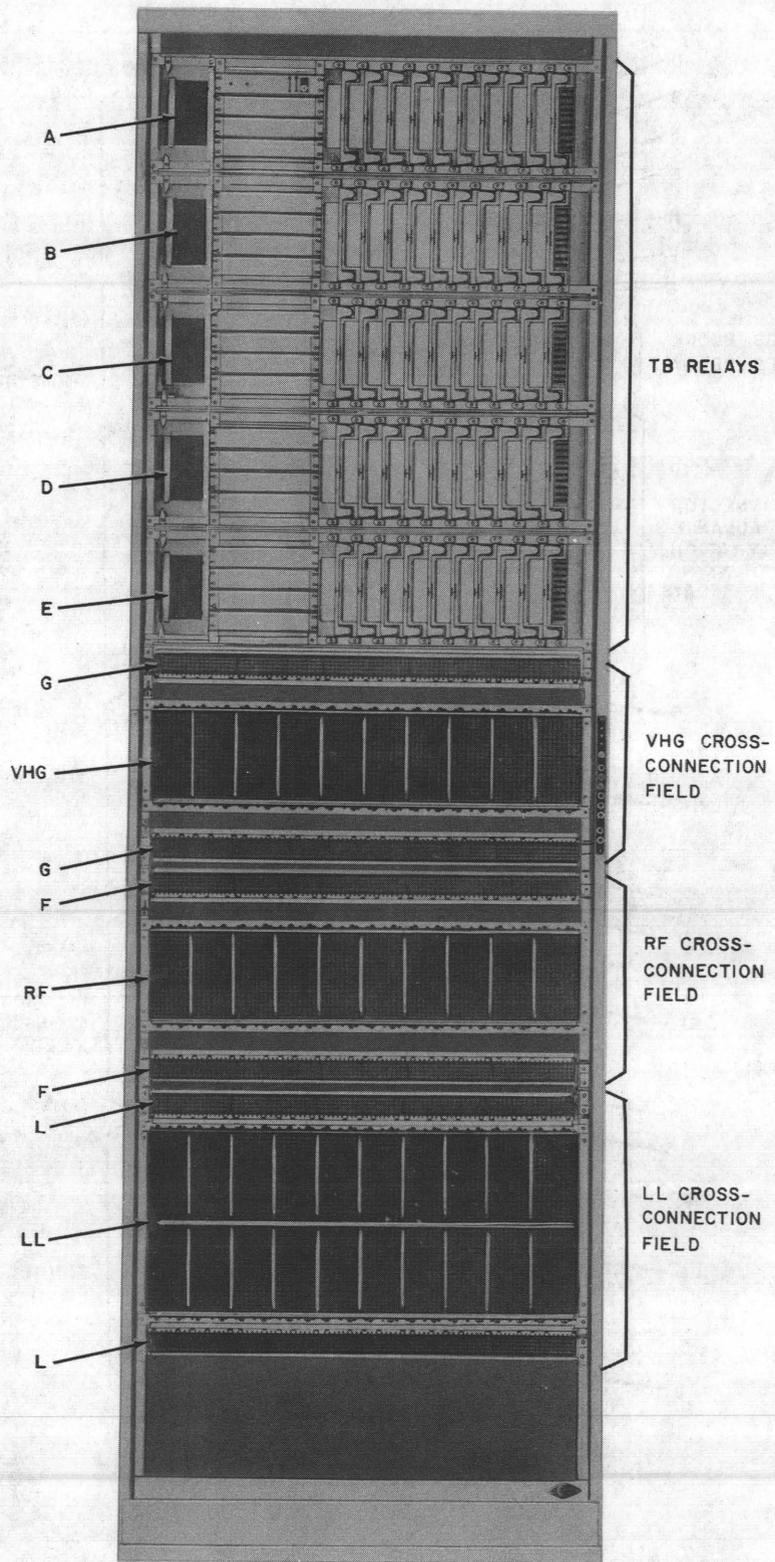


Fig. 1—Earlier-Type Number Group Frame

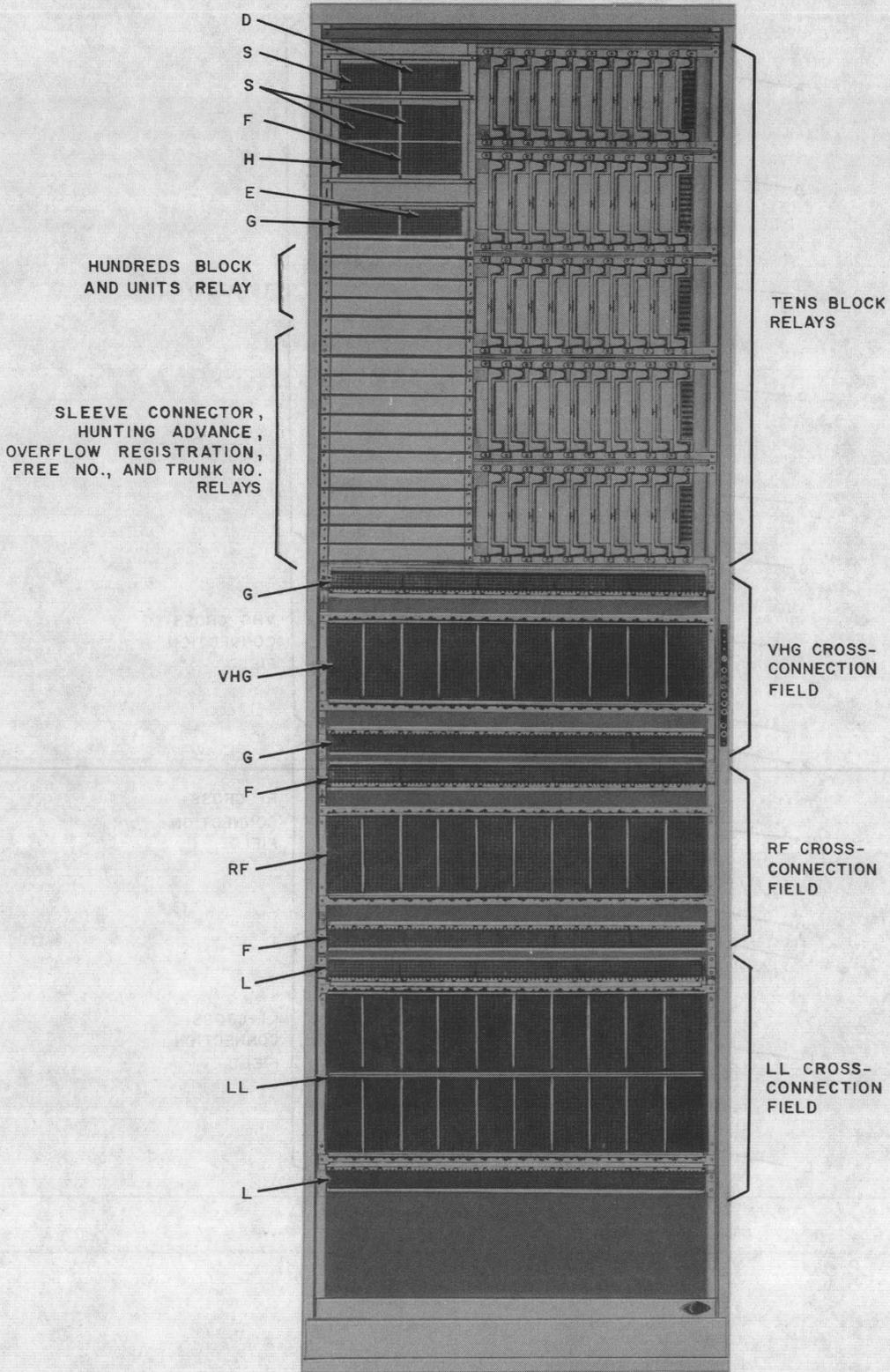


Fig. 2—Later-Type Number Group Frame

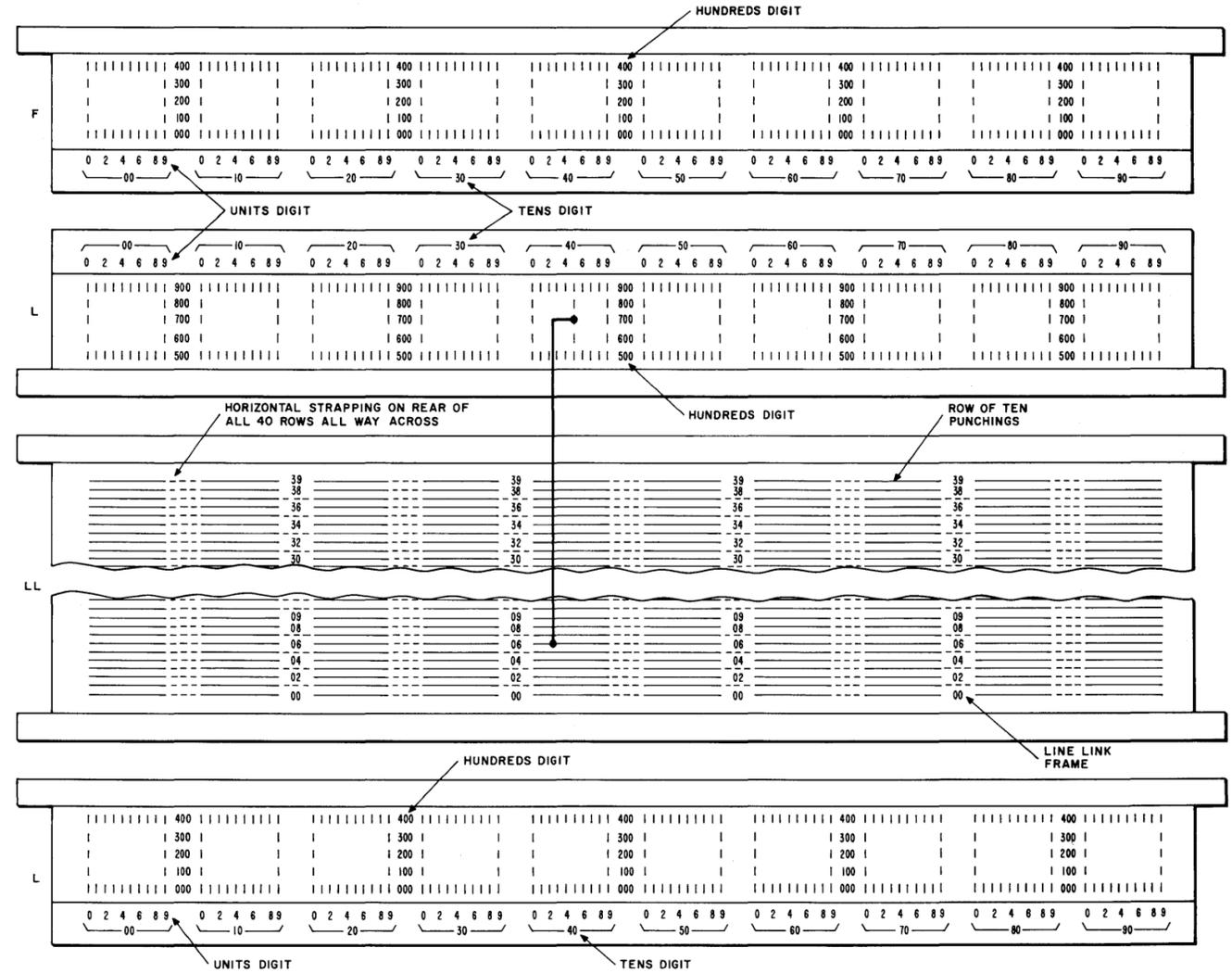
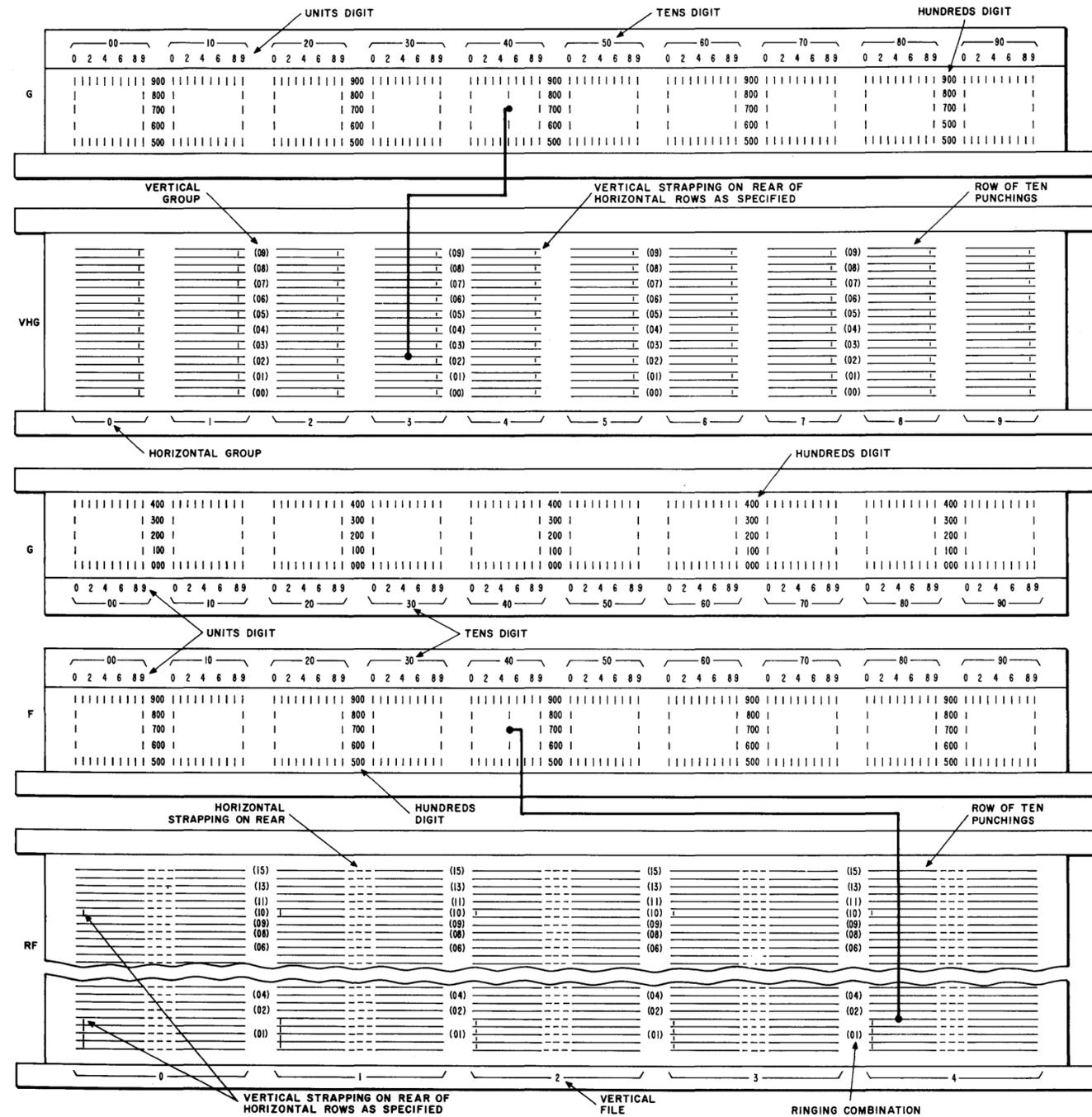
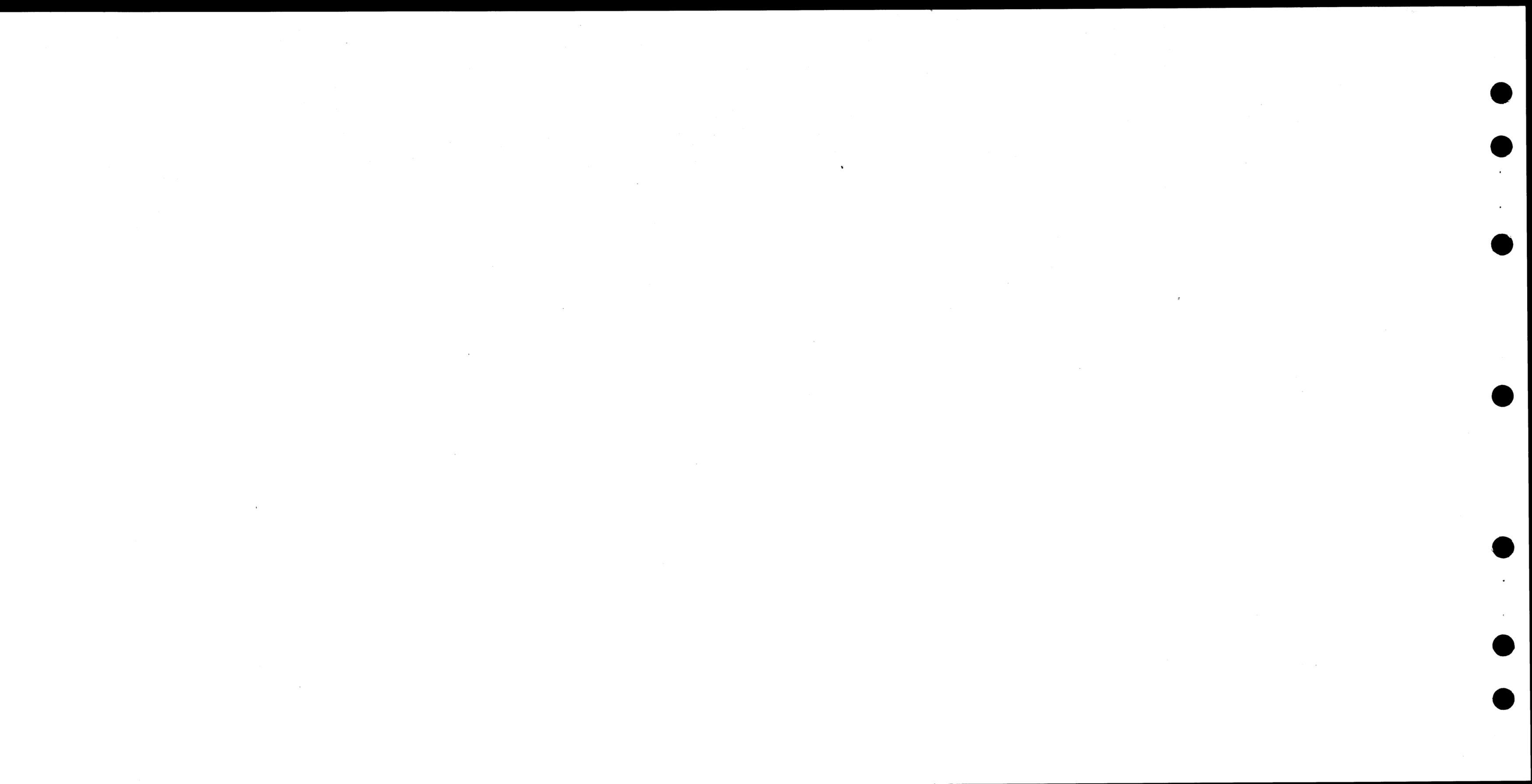


Fig. 3—Typical Layout of VHG, RF (Earlier-Type Offices), and LL Fields With Cross-Connections



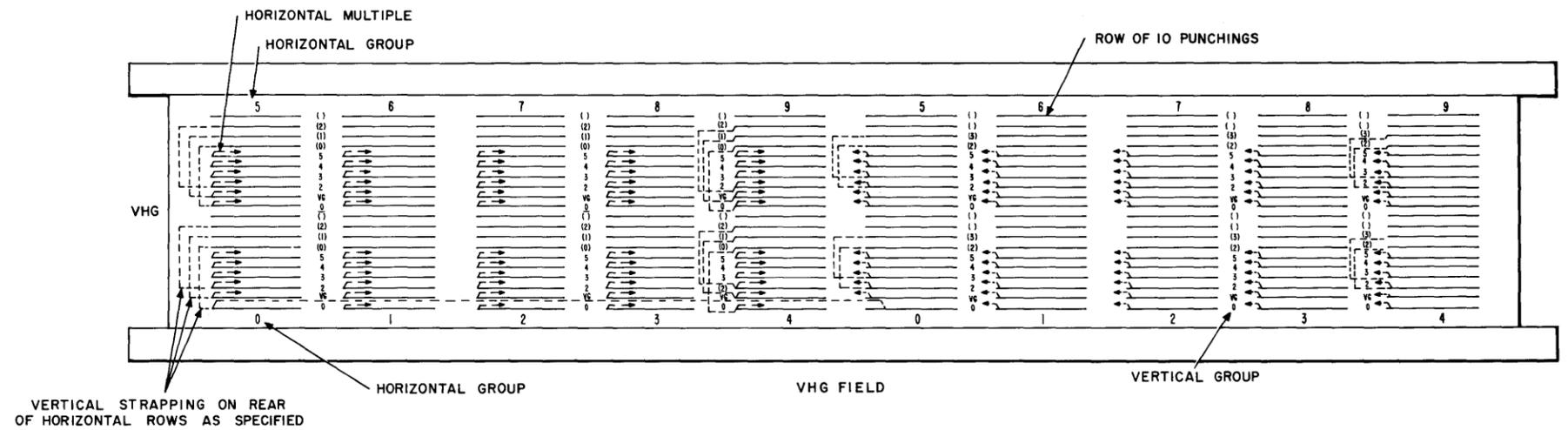
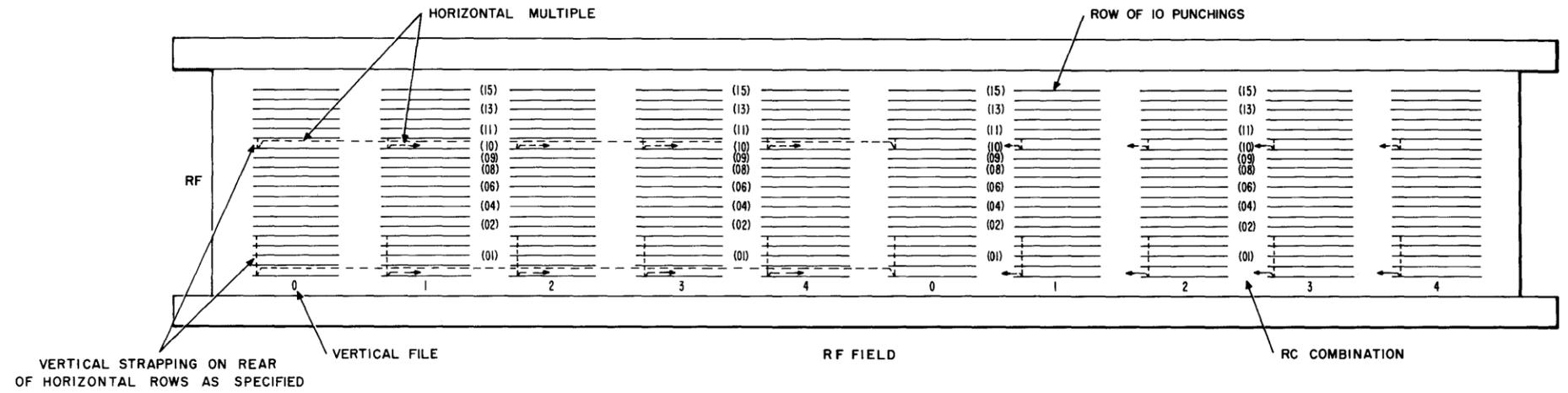


Fig. 4—Typical Layout of RF Field in Later-Type Offices and of VHG Field in Either Earlier- or Later-Type Offices Which Have an Ultimate of Ten or Fewer Line Link Vertical Groups



TABLE A

EARLIER-TYPE FRAME — INDEX OF PUNCHINGS, CROSS-CONNECTIONS,
AND CONDITIONS UNDER WHICH EACH IS REQUIRED

Punching	Connecting Relay	Name	Terminal Strip	Punching No. †	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No.	Initial Paragraph	Illustrations	Conditions
A	SC	Sleeve Connector	E or A†	00-13 or Spare (2.17) (2.23)	EG	MCC*	E	18	3.24	22,23, 24,25	End of terminal hunting group
					A	A	E	20-29	3.29	23	Terminal hunting group advance
					A	POF	E	40-41	3.26	22	End of terminal hunting group with overflow registration
A	POF	Overflow	E	40-41 (2.25)	A	SC	E or A	00-13 or Spare	3.26	22	End of terminal hunting group with overflow registration
A	A	Advance	E	20-29 (2.24)	A	SC	E or A	00-13 or Spare	3.29	23	Terminal hunting group advance
BNK	MCA*	Blank Number Check	E	60-69 (2.31)	PT	HB	E	180-189	3.44		Blank hundreds blocks
EG	MCC*	End of Group	E	18-19 (2.26)	A	SC	E or A	00-13 or Spare	3.24	22,23, 24,25	End of terminal hunting group
F1	See Note 3.	File	RF	F1 (3.11)	F	TB	F	000-999	3.02		First detected number for calling line identification
F2	See Note 3.	File	RF	F2 (3.11)	F	TB	F	000-999	3.02		Second detected number for calling line identification
F	TB	File	F	000-999 (2.07)	RF	See Note 1.	RF	See Note 2.	3.02	3,4	Ring combination and vertical file translation
					F	FN	A	00-09, 36,37	3.04	20	Free number
					PBN	MCC*	E	78	3.05		Permanent busy number
					PMO	MCC*	E	79	3.06		Permanent overflow number
F	FN	File	A	00-09 36,37 (2.16)	F	TB	F	000-999	3.04	20	Free number
FNA	MCC*	Free Number	A	30 (2.16)	FNK	FN	A	20-29, 34,35	3.04	20	Free number. Code 1 ringing
FNB	MCC*	Free Number	A	31 (2.16)	FNK	FN	A	20-29, 34,35	3.04	20	Free number. Code 2 ringing
FNK	FN	Free Number Check	A	20-29, 34,35 (2.16)	FNA	MCC*	A	30	3.04	20	Free number. Code 1 ringing
					FNB	MCC*	A	31	3.04		Free number. Code 2 ringing
G	TB	Group	G	000-999 (2.07) (2.27)	VHG	See Note 1.	VHG	See Note 2.	3.02	3,4	Vertical and horizontal group translation
					G	OF	E	70-71	3.03	19	Overflow registration for nonhunting numbers

TABLE A
EARLIER-TYPE FRAME — INDEX OF PUNCHINGS, CROSS-CONNECTIONS,
AND CONDITIONS UNDER WHICH EACH IS REQUIRED (Cont)

Punching	Connecting Relay	Name	Terminal Strip	Punching No. †	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No.	Initial Paragraph	Illustrations	Conditions
G	OF	Group	E	70-71 (2.27)	G	TB	G	000-999	3.03	19	Overflow registration for nonhunting numbers
HB	HB	Hundreds Block	E	80-89 (2.28)	HBA	A	E	90-99	3.31	24	Hundreds block group advance
HBA	A	Hundreds Block Advance	E	90-99 (2.29)	HB	HB	E	80-89	3.31	23,24	Hundreds block group advance
L	TB	Link	L	000-999 (2.07)	LL	See Note 1.	LL	See Note 2.	3.02	3	Line link frame number translation
LL	See Note 1.	Line Link	LL	See Note 2. (2.14)	L	TB	L	000-999	3.02	3	Line link frame number translation
PBN	MCC*	Permanent Busy Number	E	78 (2.30)	F	TB	F	000-999	3.05		Permanent busy number
PMO	MCC*	Permanent Overflow	E	79 (2.30)	F	TB	F	000-999	3.06		Permanent overflow number
PN	MCA*	Physical Number	E	110-119 (2.31)	PT	HB	E	130-139	3.46		Hundreds block of physical numbers
PT	HB	Physical Theoretical	E	130-139 (2.31)	PN	MCA*	E	110-119	3.46		Hundreds block of physical numbers
					PTN	MCA*	E	120-129	3.46		Hundreds block of nondiscriminating numbers
					TN	MCA*	E	100-109	3.46		Hundreds block of theoretical numbers
					BNK	MCA*	E	60-69	3.44		Blank hundreds blocks
PTN	MCA*	Physical Theoretical Number	E	120-129 (2.31)	PT	HB	E	130-139	3.46		Hundreds block of nondiscriminating numbers
RF	See Note 1.	Ringing & File	RF	See Note 2. (2.10) (2.12)	F	TB	F	000-999	3.02	3,4	Ringing combination and vertical file translation
					RF	FN	E	10-19, 38,39	3.04	20	Ringing combination and vertical file translation for free numbers
RF	FN	Ringing & File	A	10-19, 38,39 (2.16)	RF	See Note 1.	RF	See Note 2.	3.04	20	Ringing combination and vertical file translation for free numbers
RF1	See Note 3.	Ringing & File	RF	RF1 (2.11) (2.13)	RF		RF		3.11		First detected number for calling line identification
RF2	See Note 3.	Ringing & File	RF	RF2 (2.11) (2.13)	RF		RF		3.11		Second detected number for calling line identification

TABLE A
EARLIER-TYPE FRAME—INDEX OF PUNCHINGS CROSS-CONNECTIONS
AND CONDITIONS UNDER WHICH EACH IS REQUIRED (Contd)

Punching	Connecting Relay	Name	Terminal Strip	Punching No ‡	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No	Initial Paragraph	Illustrations	Conditions
RFTN	See Note 1	Ringling & File Trunk Numbers	RF	0-4 (2.11) (2.13)	F	TB	F	000-999	(3.19)		Automatic intercept trunk number indicator
TB	TB	Tens Block	C	00-99 (2.20)	TB	SC	C or A	100-113 or Spare	3.24	22,23 24	Sleeve connector for terminal hunting of tens block
					TB	TN	C	130-139	3.19	21	Tens block of trunk numbers
TB	SC	Tens Block	C or A†	100-113 or Spare (2.17) (2.21)	TB	TB	C	00-99	3.24	22,23 24	Sleeve connector for terminal hunting of tens block
					TB	A	E	30-39	3.29	23,24	Succeeding tens block terminal hunting group advance
TB	A	Tens Block	E	30-39 (2.32)	TB	SC	C or A	100-113 or Spare	3.29	23,24	Succeeding tens block terminal hunting group advance
TB	TN	Tens Block	C	130-139 (2.22)	TB	TB	C	00-99	3.19	21	Tens block of trunk numbers
TBN	MCB	Tens Block Screening	Adj to MCBrlly	0-3 (2.78)	4 (A-Grd)	—	—	54.57	2.78	—	Tens block screening
TN	MCA*	Theoretical Number	E	100-109 (2.31)	PT	HB	E	130-139	3.51		Hundreds block of theoretical numbers
VHG	See Note 1	Vertical Horizontal Group	VHG	See Note 2 (2.08) (2.09)	G	TB	G	000-999	3.02	34	Vertical and horizontal group translation
					VHG	OF	E	72-73	3.03	19	Vertical and horizontal group translation for nonhunting numbers with overflow registration
VHG	OF	Vertical Horizontal Group	E	72-73 (2.27)	VHG	See Note 1	VHG	See Note 2	3.03	19	Vertical and horizontal group translation for nonhunting numbers with overflow registration

* MCA and MCC relays are mounted on the number group connector frame and the leads requiring cross connections are cabled to terminal strip punchings at the number group frame for cross connection purposes.

† A and TB leads for relays SC14 and up are assigned to spare punchings on terminal strip A.

‡ For the C and E terminal strip punching numbering refer to 2.13. For the description of cross-connection facilities, refer to the paragraph shown in parentheses under the punching numbers.

NOTES:

1. Associated with number group translator resistors instead of a relay.
2. These punchings are in the cross-connection field. Their numbering and arrangement depend upon local conditions. The stamping on the field will identify punchings.
3. Associated with RF1 and RF2 diodes instead of a relay.

TABLE B
LATER-TYPE FRAME — INDEX OF PUNCHINGS, CROSS-CONNECTIONS,
AND CONDITIONS UNDER WHICH EACH IS REQUIRED

Punching	Connecting Relay	Name	Terminal Strip	Punching No. *	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No.	Initial Paragraph	Illustrations	Conditions
A	SC	Sleeve Connector	H	A 00-49 (2.53)	AA	ABT	H	AA 0-9	2.54	14	Allotted number. Check operation of ABT relay
					EG	MCC	G	EG 0-9 Strapped	3.29, 3.38	23,24	End of terminal hunting group
					AD	A	G	AD 00-14	3.29, 3.37	23,24	Terminal hunting group advance
					AF	POF	H	AF0, AF1	3.26	22,23, 24,25	End of terminal hunting group with overflow registration
A	SC on Relay Rack	Sleeve Connector	B on Block Select Unit	1 (2.65)	AS	SA & TBT	B on Block Select Unit	6-8	2.63, 2.64	13,14	Block select hunting. Terminal hunting group advance
					AA	ABT	A or B on Allotted Number Hunting Unit	17-20	2.75	14,16	Allotted number. Check operation of ABT relay.
AA	ABT	ABT Relay Check	A or B on allotted Number Hunting Unit	17-20 (2.75)	A	SC 100, 101, etc.	B on Block Select Unit	1	2.74	13,14	Allotted number. Check operation of ABT relay.
			H	AA 0-9 (2.54)	A	SC 00-49	H	A 00-49	2.53	14	
AB		Battery Supply	A or B on allotted Number Hunting Unit	13-16 (2.77)	BB	B	Tens Block Busy Test Unit	5-8, 13-16, 21-22	2.63, 2.64	14	Allotted number. Busy indication obtained from B relay. First tens blocks only
			HMDF	AB 0-3	BS	Auxiliary Line Circuit			2.83	14	Allotted number. Busy indication obtained from auxiliary line circuits. First tens block only
ABT	ABT	Busy Test	A or B on Allotted Number Hunting Unit	9-12 (2.77)	TT	B	Tens Block Busy Test Unit	1-4, 9-12, 17,18	2.77	14,16	Battery for ABT relay. Busy indication obtained from B relays
			HMDF	ABT 0-3	TBT	Auxiliary Line Ckt			2.83	14,16	Battery for ABT relay. Busy indication obtained from auxiliary line circuits

TABLE B

LATER-TYPE FRAME — INDEX OF PUNCHINGS, CROSS-CONNECTIONS,
AND CONDITIONS UNDER WHICH EACH IS REQUIRED (Cont)

Punching	Connecting Relay	Name	Terminal Strip	Punching No. *	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No.	Initial Paragraph	Illustrations	Conditions
AD	A	Advance	G	AD, 00-14 (2.48)	A	SC	H	A 00-49	3.37, 3.29	21,23	Block select hunting. Terminal hunting group advance
AE	SC & TBT	Advance End	B on Block Select Unit	2-4 (2.68)	EG	MCC	A on Block Select Unit	31	2.62, 2.65	13,15	End of block select hunting
AF	POF	Overflow	H	AF0,AF1 (2.55)	A	SC on Number Group	H	A 00-49	3.26	20,21, 22,23	End of terminal hunting group with overflow registration
AF			A on Block Select Unit	28	AT	TBT	B on Block Select Unit	18-20	2.62, 2.65	13,14	End of block select hunting with overflow registration
AN	Marker PBX Allotter Circuit	Allotted Number	A or B on Allotted Number Hunting Unit	1-4	D	TBT	B on Block Select Unit	30-32	2.66	14	Allotted number. Number group busy indication. More than one tens block in hunting group
					H	ABT	A or B on Allotted Number Hunting Unit	5-8	2.76	16	Allotted number. Number group busy indication. Only one tens block in hunting group
AS	SA & TBT	Advance	B on Block Select Unit	6-8 (2.65)	A	SC on Relay Rack	B on Block Select Unit	1	2.63, 2.64	13,14	Block select hunting. Terminal hunting group advance
					BA	SA	B on Block Select Unit	9-11			
					SA	ABT	A or B on Allotted Number Hunting Unit	21-24	2.75	14	Allotted number. Select tens block with idle line if group contains more than one tens block.

TABLE B

LATER-TYPE FRAME — INDEX OF PUNCHINGS, CROSS-CONNECTIONS,
AND CONDITIONS UNDER WHICH EACH IS REQUIRED (Cont)

Punching	Connecting Relay	Name	Terminal Strip	Punching No. *	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No.	Initial Paragraph	Illustrations	Conditions
AT	SA & TBT	A Lead Transfer	B on Block Select Unit	18-20 (2.65)	AF	POF	H	AF0,AF1	2.63, 2.64	13,14	Block select hunting. End of terminal hunting group with overflow registration
					T	TBT	B on Block Select Unit	21-23	2.63, 2.64	13,14	Block select hunting. Terminal hunting group advance
					EG	MCC	A on Block Select Unit	31	2.63, 2.64, 2.65	13,14	Block select hunting. End of terminal hunting group advance
B	SA		B on Block Select Unit	15-17 (2.67)	LSA	SA	B on Block Select Unit	12-14	2.63, 2.64	13,14	Block select hunting marker. Check that SA relay operated.
BA	SA	Advance	B on Block Select Unit	9-11 (2.65)	AS	SA & TBT	B on Block Select Unit	6-8	2.63, 2.64	13,14	Block select hunting. Terminal hunting group advance
					T	TBT	B on Block Select Unit	21-23			
BB	B	Battery	Tens Block Busy Test Unit	5-8, 13-16, 21-22	AB		A or B on Allotted Number Hunting Unit	13-16	2.75	14	Allotted number. Busy indication obtained from B relay. First tens block only
					BS	BS Resistor					Block select hunting. Battery for TBT relay
					TT	B	Tens Block Busy Test Unit	1-4, 9-12, 17-18	2.63, 2.64	13,14	Block select hunting. Tens block busy test. Not used on hunting lines in first tens block
BNK	MCA	Blank Number Check	F	BNK 0-4 Strapped (2.43)	PT	HB	E	0-9	3.44, 3.46		Block hundreds blocks
BS	BS Resistor				BB	B	Tens Block Busy Test Unit	5-8, 13-16, 21-22			

TABLE B

LATER-TYPE FRAME — INDEX OF PUNCHINGS, CROSS-CONNECTIONS,
AND CONDITIONS UNDER WHICH EACH IS REQUIRED (Cont)

Punching	Connecting Relay	Name	Terminal Strip	Punching No. *	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No.	Initial Paragraph	Illustrations	Conditions
BS		Battery Supply	H MDF	BS 101-103	BS	Auxiliary Line Circuit			2.63, 2.64	13,14	Block select hunting. Tens block busy test. Not used on hunting lines in first tens block
C	TBT	Busy Test	B on Block Select Unit	27-29 (2.66)	D	TBT	B on Block Select Unit	30-32	2.66	13,14	Allotted number. Number group busy indication. More than one tens block in an allotted hunting group
					H	ABT	A or B on Allotted Number Hunting Unit	5-8	2.76	14,16	
CA	A	Advance	E	CA 00-14 (2.36)	TB	SC	F	TB-SC 00-49	3.29, 3.37	23,24	Block hunt advance
D	TBT	Busy Test	B on Block Select Unit	30-32 (2.66)	C	TBT	B on Block Select Unit	27-29	2.66	13,14	Allotted number. Number group busy indication. More than one tens block in group
					AN	Marker PBX Allotter Circuit	A or B on Allotted Number Hunting Unit	1-4	2.76	14,16	
EG		End of Group	A or B on Allotted Number Hunting Unit	32	SA	ABT	A or B on Allotted Number Hunting Unit	21-24	2.75	14,16	Allotted number. End of terminal hunting group
EG	MCC	End of Group	G	EG 0-9 Strapped (2.49)	A	SC	H	A 00-49	3.29, 3.38	23,24	Block select hunting. End of terminal hunting group
EG		End of Group	A on Block Select Unit	31	AE	SC & TBT on Relay Rack	B on Block Select Unit	1-3	2.63, 2.64	13,14	End of block select hunting
					AT	SC & TBT on Relay Rack	B on Block Select Unit	18-20			Block select hunting. End of terminal hunting group

TABLE B

LATER-TYPE FRAME — INDEX OF PUNCHINGS, CROSS-CONNECTIONS,
AND CONDITIONS UNDER WHICH EACH IS REQUIRED (Cont)

Punching	Connecting Relay	Name	Terminal Strip	Punching No. *	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No.	Initial Paragraph	Illustrations	Conditions
EN	MCB	Extra Theoretical Number	F	EN (2.43)	PT	HB	E	0-9	2.38, 3.44, 3.45		Hundreds block of extra theoretical numbers. Regular number series
EN1	MCB	Physical Number	F	EN1 (2.44)	PT	HB	E	0-9	2.33, 3.44, 3.45		Hundreds block of extra theoretical numbers. Added number series
F1	See Note 2.	File	RF Translator Field	F1 (3.11)	F	TB	F Translator Field	000-999	3.02		First detected number for calling line identification
F1	See Note 2.	File	RF Translator Field	F2 (3.11)	F	TB	F Translator Field	000-999	3.02		Second detected number for calling identification
F	TB	File	F Translator Field	000-999 (2.07)	RF		RF Translator Field		3.02	3,4	Ringling combination and vertical file translation
					F	FN	H	F 0-4	3.04	18	Free number
					PBN	MCC	H	PBN	3.05		Permanent busy number
					PMO	MCC	H	PMO	3.06		Permanent overflow number
F	FN	Free Number	H	0-4 (2.56)	F	TB	F Translator Field	000-999	3.04	20	Free number
FNA	MCC	Free Number	H	FNA (2.56)	FNK	FN	H	FNK 0-4	3.04	20	Free number. Code 1 ringling
FNB	MCC	Free Number	H	FNB (2.56)	FNK	FN	H	FNK 0-4	3.04	20	Free number. Code 2 ringling
FNK	FN	Free Number Check	H	FNK 0-4 (2.56)	FNA	MCC	H	FNA	3.04	20	Free number. Code 1 ringling
					FNB	MCC	H	FNB	3.04	20	Free number. Code 2 ringling
G	TB	Group	G Translator Field	000-999 (2.07)	VHG		VHG		3.02	3,4	Vertical and horizontal group translation
					G	OF	H	G0, G1	3.03	19	Overflow registration for nonhunting numbers
G	OF	Group	H	G0, G1 (2.58)	G	TB	G	000-999			

TABLE B

LATER-TYPE FRAME — INDEX OF PUNCHINGS, CROSS-CONNECTIONS,
AND CONDITIONS UNDER WHICH EACH IS REQUIRED (Cont)

Punching	Connecting Relay	Name	Terminal Strip	Punching No. *	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No.	Initial Paragraph	Illustrations	Conditions
Grd		Ground	E	Ground 0-9 Strapped (2.37)	XC	SC	F	XC 0-49	3.24, 3.28	22,23	One hunting group in a TB relay
H	ABT	Busy Test	A or B on Allotted Number Hunting Unit	5-8	AN	Marker PBX Allotter Circuit	A or B on Allotted Number Hunting Unit	1-4			Allotted number. Number group busy indication. Only one tens block in group
					C	TBT	B on Block Select Unit	27-29		Allotted number. Number group busy indication. More than one tens block in hunting group	
HB	HB	Hundreds Block	H	HB 0-9 (2.59)	HBA	A	G	HBA 00-14	3.31, 3.37	23,24	Block select hunting. Operate HB relay for trouble record.
					HBS	SA	G	HBS 100-119	2.63, 2.64	13,14	Block select hunting. Operate HB relay for trouble record.
HBA	A	Hundreds Block	G	HBA 00-14 (2.50)	HB	HB	H	HB 0-9	3.31, 3.37	23,24	Block select hunting. Operate HB relay for trouble record.
HBS	SA	Hundreds Block	G	HBS 100-119 (2.51)	HB	HB	H	HB 0-9	2.63, 2.64	13,14	Block select hunting. Operate HB relay for trouble record.
HS		Hunt Sleeve	HS VMDF	000-009	NS	B	NS VMDF	000-399	2.63, 2.64	13,14	Block select hunting. Line busy test
L	TB	Link	L Translator Field	000-999	LL		LL Translator Field	00-39	3.02	3	Line link frame number translation
LA	MCC	Lock A	A on Block Select Unit	32 (2.67)	LSA	SA	B on Block Select Unit	12-14	2.63, 2.64	13,14	Lock A or SA relay.
LL		Line Link	LL Translator Field	00-39 (2.14)	L	TB	L Translator Field	000-999	3.02	3	Line link frame number translation

TABLE B

LATER-TYPE FRAME — INDEX OF PUNCHINGS, CROSS-CONNECTIONS,
AND CONDITIONS UNDER WHICH EACH IS REQUIRED (Cont)

Punching	Connecting Relay	Name	Terminal Strip	Punching No. *	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No.	Initial Paragraph	Illustrations	Conditions
LSA	SA	Lock SA	B on Block Select Unit	12-14 (2.67)	B	SA	B on Block Select Unit	15-17	2.63, 2.64	13,14	Lock SA relay.
					LA	MCC	A on Block Select Unit	32			
OAN	AN	Allotted Number	F	OAN 0-3 (2.42)	TB	TB	E	TB 00-99	2.40	14	Allotted number check. Required only for directory number tens block
PBN	MCC	Permanent Busy Number	H	PBN (2.60)	F	TB	F Translator Field	000-999	3.05		Permanent busy number
PMO	MCC	Permanent Overflow	H	PMO (2.60)	F	TB	F Translator Field	000-999	3.06		Permanent overflow number
PN	MCA	Physical Number	F	PN 5-9 Strapped (2.43)	PT	HB	E	PT 0-9	3.44, 3.46, 3.47		Hundreds block of physical numbers. Regular number series
PN1	MCA	Physical Number	F	PN1 (2.44)	PT	HB	E	0-9	2.38, 3.44, 3.45		Hundreds block of physical numbers. Added number series
PT	HB	Physical Theoretical Number	E	PT 0-9 (2.38)	PN	MCA	F	PN 5-9 Strapped	3.44, 3.46, 3.47		Hundreds block of physical numbers. Regular number series
					PTN	MCA	F	PTN 0-4 Strapped	3.44, 3.46, 3.47		Hundreds block of nondiscriminating numbers. Regular number series
					TN	MCA	F	TN 5-9 Strapped	3.44, 3.46, 3.47		Hundreds block of theoretical numbers. Regular number series
					BNK	MCA	F	BNK 0-4 Strapped	3.44, 3.46, 3.47		Hundreds block of blank numbers
					EN	MCB	F	EN	2.43		Hundreds block of extra theoretical numbers. Regular number series

TABLE B

LATER-TYPE FRAME — INDEX OF PUNCHINGS, CROSS-CONNECTIONS,
AND CONDITIONS UNDER WHICH EACH IS REQUIRED (Cont)

Punching	Connecting Relay	Name	Terminal Strip	Punching No. *	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No.	Initial Paragraph	Illustrations	Conditions
PT (Cont)					EN1	MCB	F	EN1	2.44		Hundreds block of extra theoretical numbers. Added number series
					PN1	MCA	F	PN1	2.44		Hundreds block of physical numbers. Added number series
					PTN1	MCA	F	PTN1	2.44		Hundreds block of nondiscriminating numbers. Added number series
					TN1	MCA	F	TN1	2.44		Hundreds block of theoretical numbers. Added number series
PTN	MCA	Physical Theoretical Number	F	PTN 0-4 Strapped (2.43)	PT	HB	E	PT 0-9	3.44, 3.46, 3.47		Hundreds block of nondiscriminating numbers. Regular number series
PTN1	MCA	Physical Theoretical Number	F	PTN1 (2.44)	PT	HB	E	0-9	2.38, 3.44, 3.45		Hundreds block of nondiscriminating numbers. Added number series
RF		Ringing & File	RF Translator Field	(2.10), (2.12)	F	TB	F Translator Field	000-999	3.02	3,4	Ringing combination and vertical file translation
	RF				FN	H	RF 0-4	3.04	20	Ringing combination and vertical file translation for free numbers	
RF	FN	Ringing & File	H	0-4 (2.56)	RF		RF Translator Field				
RF1	See Note 2.	Ringing & File	RF Translator Field	RF1 (3.11)	RF		RF Translator Field		3.04		First detected number for calling line identification
RF2	See Note 2.	Ringing & File	RF Translator Field	RF2 (3.11)	RF		RF Translator Field		3.04		Second detected number for calling line identification
RFTN	See Note 1.	Ringing & File Trunk Numbers	RF Translator Field	0-4 (3.19)	F	TB	F Translator Field	000-999	3.02		Automatic intercept trunk number indication

TABLE B

LATER-TYPE FRAME — INDEX OF PUNCHINGS, CROSS-CONNECTIONS,
AND CONDITIONS UNDER WHICH EACH IS REQUIRED (Cont)

Punching	Connecting Relay	Name	Terminal Strip	Punching No. *	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No.	Initial Paragraph	Illustrations	Conditions	
SA	ABT	Advance	A or B on Allotted Number Hunting Unit	21-24	AS	SA & TBT	B on Unit	6-8		14	Allotted number. More than one tens block in group	
					EG	MCC	G	EG 0-9 Strapped		14	Allotted number. End of group	
SU	TBA		G	SU 00-99 (2.52)					3.33	24, 25	More than one hunting group in TB relay. Strap together the SU terminals of each hunting group and cross-connect to TB-SC punching of each associated SC relay.	
					TB-SC	SC	F	TB-SC 00-49				
T	TBT	Transfer	B on Block Select Unit	21-23 (2.65)	BA	SA	B on Block Select Unit	9-11	2.63	13,14	Second, intermediate, and last TB relay. Block select hunting. Terminal hunting group advance	
					AT	TBT	B on Block Select Unit	18-20	2.64			
TA	A	Advance	E	TA 0-14 (2.39)	TBA	TBA	F	TBA 0-9	3.37	23	More than one hunting group in TB relay advanced to	
TB	TB	Tens Block	E	TB 00-99 (2.40)	OAN	AN	F	OAN 0-3	2.42	14	Allotted number check. Required only for directory number tens block	
					TB	SC on Number Group	F	TB-SC 00-49	3.24, 3.28	22,23	One hunting group per TB relay. Numbers in one or more TB relays	
					TB	SC on Relay Rack	H	TB 100-119	2.63, 2.64	13,14	Block select hunting. One hunting group per TB relay in other than first TB relay	
					TBA	TBA	F	TBA 0-9	3.33	24	More than one hunting group in TB relay. All numbers in one TB relay or numbers in more than one TB relay	
					TB	TN	H	TN 0-9 R & F	3.18, 3.19	21	Tens block of trunk numbers	
TB	SC on Number Group Frame	Sleeve Connector	F	TB-SC 00-49 (2.46)	CA	A	E	CA 00-14	3.37	24	Numbers in more than one TB relay	More than one hunting group in TB relay. Numbers in more than one TB relay
					SU	TBA	G	SU 00-99			More than one hunting group in TB relay	
					TB	TB	E	TB 00-99	3.24, 3.28	22,23	One hunting group per TB relay. Numbers in one or more TB relays	

TABLE B

**LATER-TYPE FRAME—INDEX OF PUNCHINGS CROSS-CONNECTIONS
AND CONDITIONS UNDER WHICH EACH IS REQUIRED (Cont)**

Punching	Connecting Relay	Name	Terminal Strip	Punching No *	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No	Initial Paragraph	Illustrations	Conditions
TB	SC on Relay Tack	Sleeve Connector	H	TB 100-119 (2.61)	TB	TB	E	TB 00-99	2.63 2.64	13,14	Block select hunting. One hunting group per TB relay other than first
TB	TN	Trunk Numbers	H	TN 0-9 R & F (2.57)	TB	TB	E	TB 00-99	3.18 3.19	21	Tens block of trunk numbers
TBA	TBA		F	TBA 0-9 (2.45)	TB	TB	E	TB 00-99	3.33	25	More than one hunting group in TB relay. All numbers in one TB relay or numbers in more than one TB relay
					TA	A	E	TA 00-14	3.37	24	More than one hunting group in TB relay advanced to
TBN	MCB	Tens Block Screening	Adj to MCBrlly	0-3 (2.78)	4 (A-Grd)	—	—	54-57	2.78	—	Tens Block Screening
TBT	TBT	Busy Test	B on Block Select Unit	24-26 (2.69)	TT	B	Tens Block Busy Test Unit	1-4 9-12 17-18	2.63 2.64	13,14	Block select hunting. Tens block busy test
TN	MCA	Theoretical Number	F	TN 5-9 Strapped (2.43)	PT	HB	E	PT 0-9	3.44 3.46		Hundreds block of theoretical numbers
TN1	MCA	Theoretical Number	F	TN1 (2.44)	PT	HB	E	0-9	2.38 3.44 3.45		Hundreds block of theoretical numbers. Added number series
TT	B	Busy	Tens Block Busy Test Unit	1-4 9-12 17-18 (2.65)	ABT	ABT	A or B on Allotted Number Hunting Unit	9-12	2.74	14,16	Allotted number. Busy indication obtained from line-busy B relays. First tens block only
					BB	B	Tens Block Busy Test Unit	5-8 13-16 21-22	2.63 2.64	13,14	Block select hunting. Tens block busy test
					TBT	TBT	B on Block Select Unit	24-26			

TABLE B

**LATER-TYPE FRAME — INDEX OF PUNCHINGS, CROSS-CONNECTIONS,
AND CONDITIONS UNDER WHICH EACH IS REQUIRED (Cont)**

Punching	Connecting Relay	Name	Terminal Strip	Punching No. *	Cross-connect to Punching	Connecting Relay	Terminal Strip	Punching No.	Initial Paragraph	Illustrations	Conditions
VHG		Vertical Horizontal Group	VHG Translator Terminal Strip	000-199 (2.08), (2.09)	G	TB	G Translator Terminal Strip	000-999	3.02	3,4	Vertical and horizontal group translation
					VHG	OF	H	VHG0, VHG1	3.03	19	Overflow registration for nonhunting numbers
XC	SC		F	XC 0-49 (2.47)	Grd		E	Ground 0-9 Strapped	3.24, 3.28	22,23	One hunting group in a TB relay
					XSC	XSC	E	XSC 0-9 Strapped	3.34, 3.39	24,25	More than one hunting group per TB relay
XSC	XSC	Crossed SC Relay	E	XSC 0-9 Strapped (2.41)	XC	SC	F	X 0-49			
XC	SC on Relay Rack		B on Block Select Unit	5 (2.70), (2.73)	Grd		A on Block Select Unit	30	2.63, 2.64	13,14	Block select hunting. One hunting group in first TB relay
					XSC	XSC	A on Block Select Unit	29	2.63, 2.64	13,14	Block select hunting. More than one hunting group in first TB relay
XSC	XSC	Crossed SC Relay	A on Block Select Unit	29 (2.73)	XC	SC on Relay Rack	B on Block Select Unit	5			

* For the description of cross-connection facilities, refer to the paragraph shown in parentheses under the punching numbers.

Notes:

1. Associated with number group translator resistors instead of a relay.
2. Associated with RF1 and RF2 diodes instead of a relay.

punchings are arranged in horizontal rows of 100 terminals in groups of ten. The units and tens designations appear above or below the punchings, depending upon whether the terminal strip is the upper or lower one, respectively. Horizontal rows are numbered by hundreds from the bottom up, extending through the two terminal strips and are stamped between the horizontal groups of ten terminals. This same arrangement is provided for the F and L punchings. The G, F, and L punchings connect to the contacts of the 100 tens (TB) block relays. The hundreds and tens digit numerical designation of a group of ten punchings agrees with the numerical designation of the TB relay. For example, punchings 720 through 729 of each of the terminal strips G, F, and L are connected to the contact springs of TB72 relay. Fig. 3 shows the arrangement and numbering of these punchings.

2.08 VHG Punching Terminal Strip Arranged for Twelve Vertical Groups: The terminal strip for these punchings is located near the middle of the frame and between the two G terminal strips as shown in Fig. 3. The terminal strip is divided into ten groups of punchings which represent the ten line link frame horizontal groups HG0 through HG9 and are so designated from left to right at the bottom of this terminal strip. Each of the ten groups HG0 through HG9 consists of 20 horizontal rows of 10 punchings each and these rows represent the line link frame vertical groups (VG). The vertical group designations are stamped between the horizontal groups of punchings. The ten punchings of each horizontal row are a single unit. A multiple is provided on the rear of the terminal strip between horizontal rows of punchings, depending upon the number of vertical groups for which the office is arranged. Three typical arrangements which may be used are as follows:

NO. OF VERTICAL GROUPS	MULTIPLES
6	Each three rows strapped together, leaving two rows unused
8 or 10	Each two rows strapped together, leaving four or fewer rows unused
12	At least one row of terminals per vertical group, leaving the remaining rows unused

The strapping of rows is arranged to give the maximum number of punchings per vertical group for the sizes of line link frames used in the office. The strapping between rows representing vertical groups may be determined by the numbering shown between horizontal groups. The VHG punchings connect to their respective number group translator resistors mounted behind terminal strip VHG. With the typical arrangement of 10 horizontal groups and 10 vertical groups, as shown in Fig. 3, the cross-connection field provides 20 punchings for each of 100 line groups. Any group of VHG punchings, such as 039, are therefore located by the horizontal group HG9 and the vertical group VG03 stamping on this cross-connection field.

2.09 VHG Punching—Optional Arrangement of Terminal Strip for an Ultimate of Ten or Fewer Vertical Groups: The optional arrangement of the VHG terminal strip is for use in offices with an ultimate of ten or fewer vertical groups and is shown in Fig. 4. The terminal strip is divided into left and right halves. Each half has horizontal group designations HG0 through HG4 at the bottom and horizontal group designations HG5 through HG9 at the top. Each horizontal group consists of ten horizontal rows of ten punchings each. These horizontal rows represent the line link frame vertical groups (VG). Each horizontal row of ten punchings is a single unit, and a multiple is provided between like-designated rows of ten punchings in each half of the terminal strip. For example, the row of punchings designated HG0 VG0 in the left half is multiplied to the row designated HG0 VG0 in the right half. This division of the VHG field permits shorter cross-connections to the G terminal strips. When fewer than ten vertical groups are provided on the line link frame, a multiple is provided on the rear of the terminal strip between horizontal rows in the manner described in paragraph 2.07.

2.10 RF Punching—Earlier-Type Offices: This terminal strip is similar to terminal strip VHG described in paragraph 2.08 and is located at the center of the cross-connection fields between the two F terminal strips. (See Fig. 3.) The terminal strip is divided into 5 horizontal groups of punchings of 20 punchings per row. These five groups are designated 0 through 4 at the bottom of the terminal strip and represent the vertical files (VF) of line groups. The 20 punchings are attained by strapping two units of 10 punchings. There are 20 horizontal rows in

each of the 5 horizontal groups of punchings. Vertical strapping is provided on the rear between these horizontal groups of punchings as required, in order to provide the necessary number of punchings for the RC (ringing combination) numbers as required for the particular office. The ringing combination numbers are stamped between the groups of vertical file punchings. These punchings connect to their respective number group translator resistors mounted behind the RF terminal strip. With this arrangement, the RF cross-connection field provides 20 or more punchings for each of the 75 different combinations of vertical files (VF) and ringing combinations (RC). The RF punching arrangement shown in Fig. 3 is a typical one with the first five rows vertically strapped for RC number 01 and two rows provided for RC number 10. When one ringing combination occupies a large portion of the RF field, it may be found that this RC number has appearances at both the top and bottom of the cross-connection field to provide equal access from the top and bottom F terminal strips. A typical example of this is shown in Fig. 5. The arrangement of the field may be determined from the stamping. For example as shown in Fig. 3, a group of RF punchings, such as 062, is located by the vertical file (VF)2 and the ringing combination (RC)06 stampings on this cross-connection field.

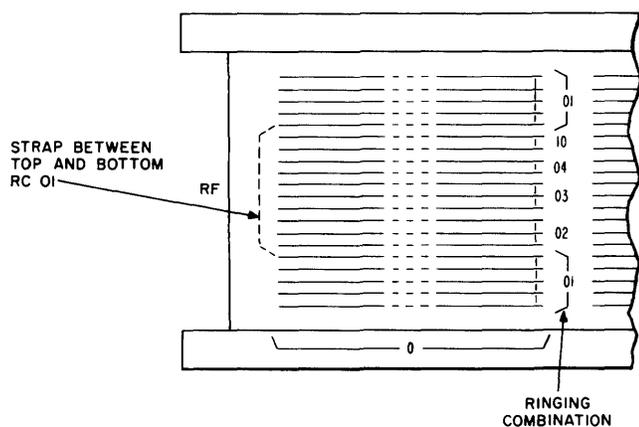


Fig. 5—RF Terminal Strip Showing Same RC Number on Top and Bottom of Field

2.11 On a job basis some of the unused punchings on the RF terminal strip are redesignated RF1, RF2, F1, F2, and RFTN (0 through 4) to provide additional features.

2.12 RF Punching—Later-Type Offices:

This terminal strip is similar to the RF terminal strip described in paragraph 2.10 except that it is divided into a left and right half as shown in Fig. 4. The terminal strip is divided into ten horizontal groups of ten punchings, each numbered 0 through 4 from left to right on the left and right halves of the terminal strip. A multiple is provided between like-designated rows of ten punchings in each half of the terminal strip. For example, the row of punchings designated VF0 RC01 in the left half are multiplied to the row designated VF0 RC01 in the right half. This division of the RF field permits shorter cross-connections to the F terminal strips. The 20 horizontal rows for ringing combination are strapped together vertically as required in the manner described in paragraph 2.10.

2.13 On a job basis some of the unused punchings on the RF terminal strip are redesignated RF1, RF2, F1, F2, and RFTN (0 through 4) to provide additional features.

2.14 LL Punching: This terminal strip is similar to the VHG terminal strip described in paragraph 2.08 and is located on the lower part of the frame between the two L terminal strips. It is shown in Fig. 3. This terminal strip is arranged in 10 groups of 10 punchings horizontally and 40 horizontal rows in each group. Each horizontal row of 10 punchings is a single unit and horizontal rows are strapped together at the rear of the terminal strip, forming a row of 100 punchings. Vertical strapping of horizontal rows is provided, depending upon the ultimate size of the office. (See Fig. 6.) There are three typical arrangements: 40, 20, and 10 line link frame ultimates. In the case of a 40-frame ultimate, a single row of 100 punchings is assigned for each frame. The numbering is from the bottom up, 00 through 39, and the stamping is between vertical groups of rows as shown in Fig. 3. Where a 10-frame ultimate is arranged for, horizontal rows are divided into four groups of ten each and the rows of each group are 00 through 09. The like-numbered rows are strapped together. Where a 20-frame ultimate is arranged for initially, the rows are divided into a lower and upper group of 20 each and each designated 00 through 19. Vertical strapping is provided between rows of a line number. For example, in the case of a 20-frame ultimate, LL punchings associated with line link

frame 16 are located in the row designated 16 in the lower group and also in the upper group. The LL punchings connect to their respective number group translator resistors mounted behind the LL terminal strip.

Note: The line link frame LL punching numbers agree with and are the same as the line link frame (FR) numbers specified on the assignment sheets or service orders.

C. Terminal Strips A Through E on Earlier-Type Frames

Numbering of Terminal Strips A Through E

2.15 Each of these terminal strips has 140 punchings. These punchings are designated

at the bottom and at the top to indicate the tens digit and at the right to indicate the units digit. Fig. 7 shows the numbering arrangement for these terminal strips. For example, to find punching 46, locate the tens row at the bottom designated 4 and up to the horizontal row designated 6 at the right. Similarly, to find a punching above 69, such as 125, locate the tens row 12 at the top and units row 5 at the right in the upper 0 through 9 group.

Punchings on Terminal Strip A

2.16 F, RF, and FNK Punchings for FN-Relays and FNA and FNB Punchings:

FN-relays are furnished as a means of providing free line service. For each of these relays there is an F, RF, and FNK punching. The FNA and FNB punchings connect to the MCC relay contacts

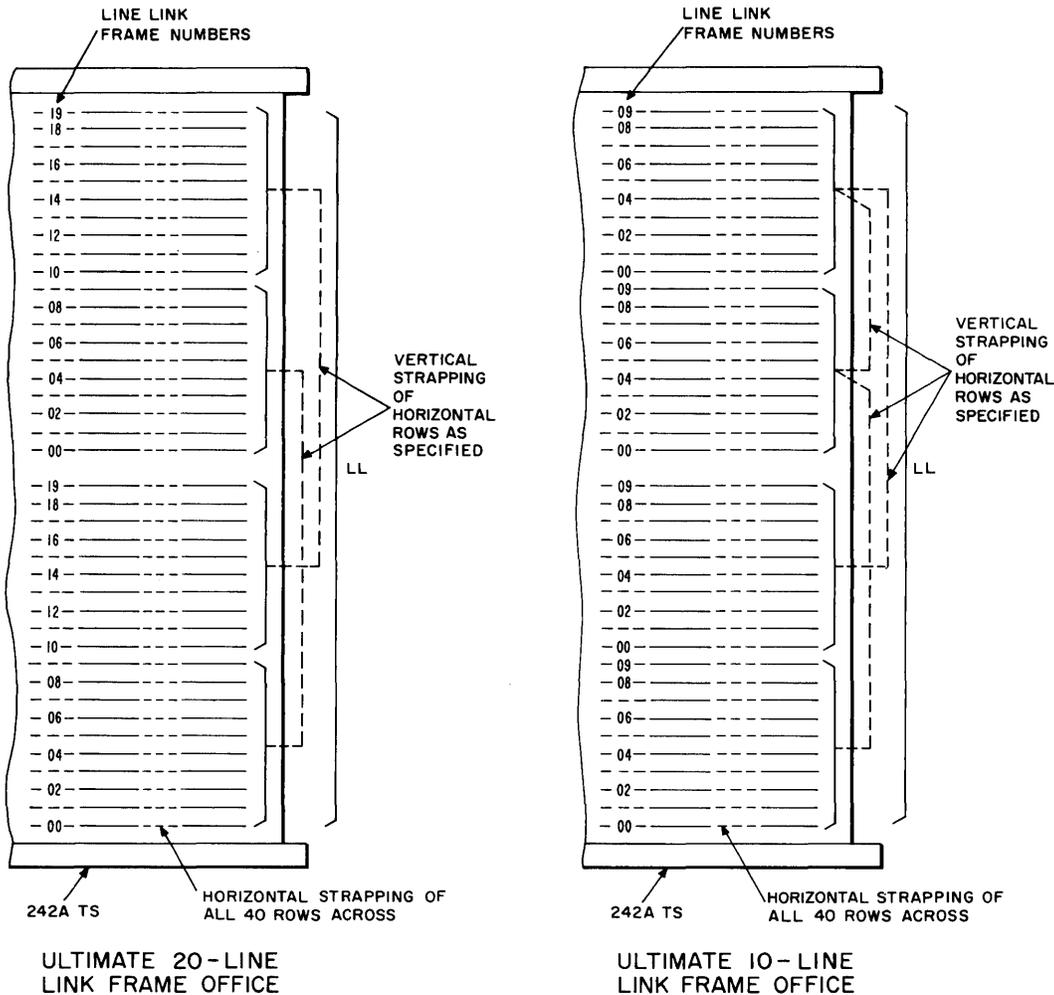


Fig. 6—Vertical Strapping Arrangement for Ultimate 20-Line Link Frame Office and 10-Line Link Frame Office

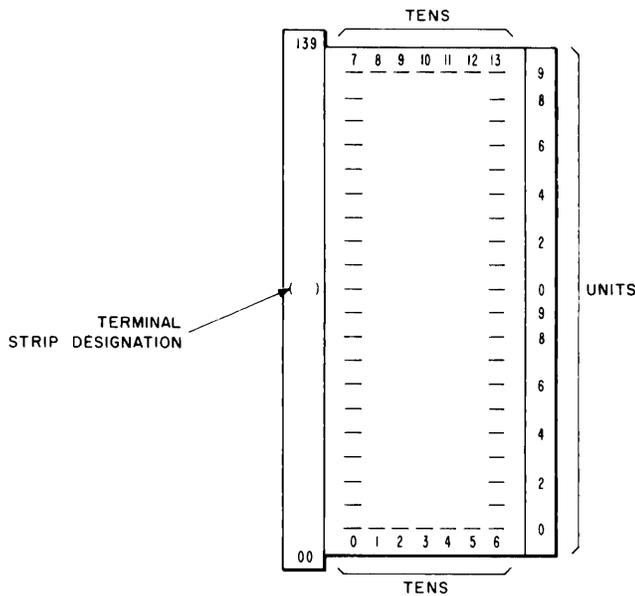


Fig. 7—Numbering of Punchings on Terminal Strips A Through E of Earlier-Type Frames

through which the marker receives its signal that free number service is required. The punchings are numbered as follows:

RELAY	F	RF	FNK	FNA	FNB
FN0	00	10	20		
FN1	01	11	21		
FN2	02	12	22		
FN3	03	13	23		
FN4	04	14	24		
FN5	05	15	25		
FN6	06	16	26		
FN7	07	17	27		
FN8	08	18	28		
FN9	09	19	29		
FN10	36	38	34		
FN11	37	39	35		
MCC				30	31

The F and RF punchings are introduced between like-designated punchings in the F and RF cross-connection field in order to operate the FN-relay and then pass on the RF lead signal. The FNK punching cross-connection depends upon the type of line receiving the free line service treatment

and is cross-connected to either the FNA or the FNB punching. The FNA punching is used when the ringing combination number indicated by the RF cross-connection is satisfactory. The FNB punching is used when the ringing combination indication should be superseded by a code 2 ringing. This change in code is required by some information, repair service, or official PBX circuits. For example, if the FNO relay is used, punchings 00 and 10 would be cross-connected to the F and RF fields, respectively, and punching 20 to punching 30 for a line with an unchanged ringing code.

2.17 A and TB Punchings for SC Relays:

The A and TB punchings for SC00 through SC13 relays are located on terminal strips E and C, respectively. When more than 14 SC relays are provided, the additional A and TB punchings are assigned to spare punchings on terminal strip A on a job basis.

Punchings on Terminal Strips B and D

2.18 These terminal strips are used for cabling between frames and do not enter into cross-connections described herein.

2.19 S0 Through S9 Punchings:

These punchings are located on terminal strip B. Ten punchings for each SC relay are provided for 10 S0 through S9 leads and provision is made for 14 SC relays which utilize all the punchings on this terminal strip. Punchings 00 through 09 are associated with relay SC00 and punchings 10 through 19 are associated with relay SC01. In like manner, relays SC02 through SC13 are connected to punchings 20 through 139. For example, the tens punching on the B terminal strip represents the SC relay and the units punching represents the SC relay lead (0 through 9). These punchings connect to ten make contacts of the SC relays. Through these contacts the marker gains access to the sleeves of the ten numbers of a tens block on which terminal hunting is required. This is accomplished by connecting in multiple an SC relay with the TB relay. When operated, the relay connections are extended through the B terminal strip via a cable to the distributing frame where jumpers are provided to cross-connect the S0 through S9 leads to the particular line link frame sleeve leads of equipment which require terminal hunting. When more than 14 SC relays are provided, the additional S0 through S9 leads are cabled directly from the SC relay springs to the

distributing frame. Therefore, no cross-connections are made at the number group frame for these leads or punchings. The cross-connection facilities at the distribution frame for these leads are covered in the description of the distributing frame punchings.

TB Punchings on Terminal Strip C

2.20 TB Relay Windings: These punchings are numbered 00 through 99 and connect to windings of the correspondingly numbered 100 TB relays. They are used where required to cross-connect the winding of a TN_ or SC_ relay in parallel with the winding of the TB_ relay. For example, punching 25 is connected to the TB25 relay.

2.21 SC Relay Windings: These punchings are numbered 100 through 113 and connect to windings of the 14 SC00 through SC13 relays, respectively. They are used to cross-connect these relays to the windings of TB_ relays which have terminal hunting numbers assigned within their tens block or to the TB leads from the A_ relays if the TB-SC relay combination is other than the first one of a terminal hunting group which spreads over more than one tens block. For example, punching 110 is connected to the SC10 relay. Where more than 14 SC_ relays are provided, additional TB leads are assigned to spare punchings on terminal strip A.

2.22 TN Relay Windings: These punchings are numbered 130 through 139 and connect to the windings of the TN0 through TN4 relays as follows. The primary of TN0 relay connects to punching 130 and the secondary to punching 131; the primary of TN1 relay connects to punching 132 and the secondary to punching 133. The other relays and punchings follow in like order. These punchings are used to connect TN_ relays in parallel with those TN_ relays which serve tandem trunk numbers. For example, if TB45 relay is a tens block assigned to trunk numbers, punching 45 would be cross-connected to the primary of TN0 relay or punchings 130. Other TB_ relays serving trunk numbers would be assigned to the remainder of the TN punchings, one for each TB_ relay.

Punchings on Terminal Strip E

2.23 A Punchings for SC_ relays: These punchings are numbered 00 through 13 and connect to the 11B contacts of SC00 through SC13 relays, respectively. The cross-connections to these

punchings are used either to control the A_ relay (group advance) where more than one tens block relay is required for a terminal hunting group, to control the overflow registration of a terminal hunting group, or to send a signal to the marker that the end of a terminal hunting group has been reached. Punching 09, for example, is connected to the SC9 relay. Where more than 14 SC_ relays are provided, additional A leads are assigned to spare punchings on terminal strip A.

2.24 A Punchings For A_ Relays: These punchings are numbered 20 through 29 and connect to the windings of the A0 through A9 relays, respectively. The cross-connections to these punchings are used where it is required to advance the testing of line sleeves of a terminal hunting group when the lines are located on more than one tens block relay. This relay is operated over the A lead from the SC_ relay. Punching 22, for example, is connected to the A2 relay.

2.25 A Punchings for POF_ Relays: These punchings are numbered 40 and 41 and connect to the windings of the POF0 and POF1 relays, respectively. The cross-connections to these punchings are used to signal the marker that overflow registration is required on the terminal hunting group and that the end of the group has been reached. This cross-connection would be to the A punching for the last SC_ relay of the hunting group. Since only two POF_ relays are normally provided, only two terminal hunting groups in a number group can be given this treatment. If additional relays are provided, cross-connections will be required at terminal strip A.

2.26 EG Punchings: The two EG punchings, 18 and 19, are strapped together and connect to the MCC relay contacts to signal the marker that the end of a terminal hunting group has been reached. These punchings are used with the A punchings of the SC_ relays.

2.27 G and VHG Punchings for OF_ Relays:

These punchings are used in connection with overflow registration for nonhunting number. Cross-connection punchings are provided for a maximum of two OF_ relays. For each of these relays there are G and VHG punchings which are numbered as follows and connect to the winding of the OF_ relay and 1B contact, respectively.

RELAY	G	VHG
OF0	70	72
OF1	71	73

The G and VHG punchings are introduced between like-designated punchings in the G and VHG cross-connection field in order to operate the OF_ relay and then pass on the VHG lead signal. For example, if the OF0 relay is used, punchings 70 and 72 would be connected to the G and VHG fields, respectively.

2.28 HB Punchings for HB_ Relays: These punchings are numbered 80 through 89 and connect to the windings of the HB0 through HB9 relays, respectively. The cross-connections to these punchings are made so that the advance (A_) relay will reoperate the HB_ relay where the hunting group spreads over more than one tens block. Punching 83, for example, is connected to the HB3 relay.

2.29 HBA Punchings for A_ Relays: These punchings are numbered 90 through 99 and connect to the 3B contact of the A0 through A9 relays, respectively. The cross-connections to these punchings are made in order to operate the HB_ relay where the hunting group spreads over more than one tens block. Punching 93, for example, is connected to the A3 relay.

2.30 PBN and PMO Punchings: These punchings are numbered 78 and 79 and connect to the MCC relay contacts, the PBN punching 78 provides facilities for making lines permanently busy and this punching is cross-connected to the F punching of such lines. Its primary use is for test circuit calls or instruction purposes. The PMO punching 79 is also used for test purposes and provides an overflow condition for trunks. The line assigned for this purpose has its F punching connected to the PMO punching.

2.31 PN, PT, PTN, TN, and BNK Punchings: The PT punchings numbered 130 through 139 connect to the 12T contact of the HB0 through HB9 relays, respectively. These punchings are associated with the TN, PN, PTN, or BNK punchings as a means of informing the marker hundreds blocks of physical, theoretical, and nondiscriminating numbers and blank hundreds blocks. There are ten TN, PN, PTN, and BNK punchings multiplied

as shown in the following list. These punchings are wired to the MCA relay contacts.

TYPE OF NUMBERS	LEAD	PUNCHINGS MULTIPLIED FROM
Theoretical	TN	100 thru 109
Physical	PN	110 thru 119
Nondiscriminating	PTN	120 thru 129
Blank hundreds blocks	BNK	60 thru 69

For example, punching 135, which is connected to HB5 relay, is cross-connected to one of the 110 through 119 punchings for a physical number indication.

2.32 TB Punchings for A_ Relays: These punchings are numbered 30 through 39 and connect to the 1B contact of the A0 through A9 relays, respectively. The cross-connections to these punchings are used to operate the succeeding SC_ relay and its tens block TB_ relay where there are lines of a terminal hunting group in more than one tens block group. Punching 31, for example, is associated with the A1 relay.

D. Terminal Strips D, S, and E Through H on Later-Type Frames

Note: When fewer than the following quantities of relays are furnished, terminal strips E through H will be stamped in accordance with the following descriptions:

- 50 SC relays
- 15 A relays
- 10 TBA relays
- 5 FN relays
- 10 TN relays
- 2 OF relays
- 2 POF relays

When a greater quantity of any one type is provided, these figures shall be considered typical and job stamping information shall be provided.

Punchings on Terminal Strips D and S

2.33 These terminal strips are mounted on the top of the frame, are used for cabling, and do not enter into cross-connections described herein.

2.34 The D terminal strip has 160 punchings. The punchings are designated at the left and right to indicate tens digits or hundreds and tens digits and at the top to indicate units digits.

2.35 The three S terminal strips are arranged for 400 punchings. The punchings are designated at the left and right to indicate hundreds and tens digits and at the top to indicate units digits. Ten punchings for each SC₁ relay are provided for 10 S₀ through S₉ leads and provision is made for 40 SC relays. The hundreds and tens punching represents the SC₁ relay, the units punching the SC₁ relay 0 through 9 leads. These punchings connect to 10 make contacts of the SC relays. Through these contacts, the marker gains access to the sleeves of the 10 numbers of a tens block on which terminal hunting is required. When the SC relay operates, the connections are extended through terminal strip S via a cable to the distributing frame NS punchings where cross-connections are provided to connect the S₀ through S₉ leads to the particular line link frame sleeve leads (LS) of equipment which requires terminal hunting. Where more than 40 SC relays are provided, the additional S₀ through S₉ leads are cabled directly from the SC relay springs to the distributing frame. The cross-connection facilities at the distributing frame for these leads are covered in the description of distributing frame punchings.

Punchings on Terminal Strip E (Fig. 8)

2.36 CA Punchings: These punchings are numbered 00 through 14 and connect to the 6T contacts of the A0 through A14 relays, respectively. The cross-connections to these punchings are used to operate the succeeding SC relay and its tens block TB relay in block hunting where there are lines of a terminal hunting group in more than one tens block group. Punching A6, for example, is associated with the A6 relay.

2.37 GRD Punchings: There are ten GRD punchings strapped common and connected to a ground bar. These punchings are connected to XC punchings when the tens block relay contains

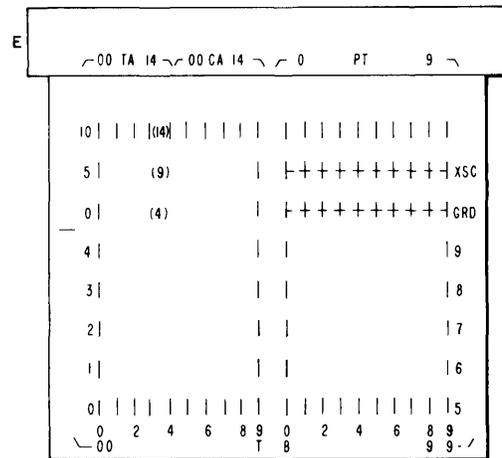


Fig. 8—Numbering of Terminals on Terminal Strip E of Later-Type Frames

only one hunting group and cross-detection is not required on all SC relays.

2.38 PT Punchings: The PT punchings, numbered 0 through 9, connect to the 12T contact of the HB0 through HB9 relays, respectively. These punchings are cross-connected to the TN, PN, EN, PTN, or BNK punching. For example, punching PT5, which is connected to HB5 relay, is cross-connected to punching PN for a physical number indication on the 500 block. Under certain conditions, it is desired to place two 1000 series in one number group. The PN1, TN1, EN1, and PTN1 punchings have been added to provide for intercepting calls to the respective number series if the incorrect thousands digit is dialed. If the service is restricted in this manner, the PT punching for the added thousands series will be cross-connected to a PN1, TN1, EN1, or PTN1 punching.

2.39 TA Punchings: These punchings are numbered 00 through 14 and are connected to the 4T contacts of the A0 through A14 relays, respectively. The cross-connections to these punchings are used to operate the associated TBA and TB relays when advanced to more than one hunting group in the tens block.

2.40 TB Punchings: These punchings are numbered 00 through 99 and are connected to windings of the correspondingly numbered 100 TB relays. They are used where required to cross-connect the winding of a TN, SC, AN, or

hunting group has been reached. The terminal strips are designated at the left to indicate the hundreds digit and at the bottom to indicate the units digit of the SC relay.

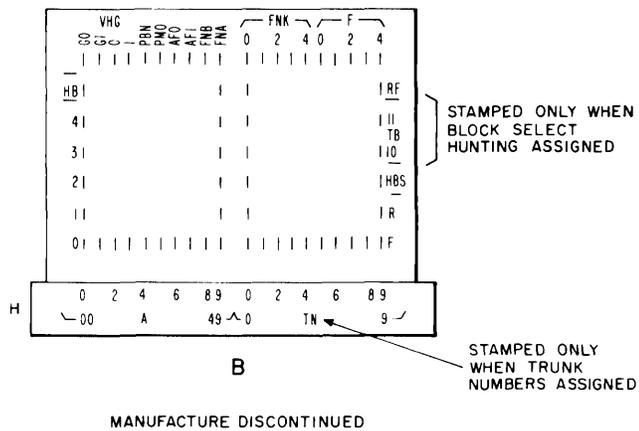
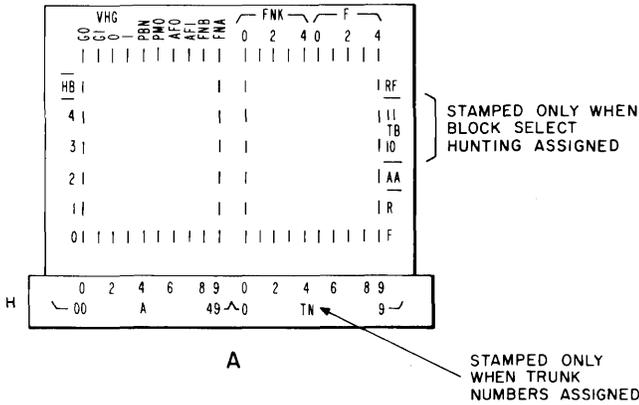


Fig. 11—Numbering of Terminals on Terminal Strip H

2.54 AA Punchings: These punchings are numbered 0 through 9 and connect to the 4B contacts of the allotted block test (ABT) relay through punchings on the allotted number hunting unit. The EG signal to the marker is carried through these contacts to check that the ABT relay has operated.

2.55 AF0 and AF1 Punchings: These punchings connect to the windings of the POF0 and POF1 relays, respectively. The cross-connection to this punching is used to signal

the marker that overflow registration is required on the terminal hunting group and that the end of the group has been reached. This cross-connection would be to the A punching of the last SC relay in the hunting group or to the last AT punching in block select hunting.

2.56 Upper F, RF, and FNK Punchings for FN Relays and FNA and FNB Punchings:

FN relays are furnished as a means of providing free line service. The F, RF, and FNK punchings are numbered 0 through 4 and connect, respectively, to the winding 3T and 2T contacts of the correspondingly numbered FN relay. The FNA and FNB punchings connect to the MCC relay contacts through which the marker receives its signal that free number service is required. The F and RF punchings are introduced between like-designated punchings in the F and RF cross-connection field in order to operate the FN relay and then pass on the RF lead signal. The FNK punching cross-connection depends upon the type of line receiving the free line service treatment and is cross-connected to either the FNA or FNB punchings. The FNA punching is used when the ringing combination number indicated by the RF cross-connection is satisfactory. The FNB punching is used when the ringing combination indication should be superseded by a code 2 ringing. This change in code is required by some information, repair service, or official PBX circuits.

2.57 TNF and TNR Punchings: If trunk numbers are assigned to a number group, 20 punchings will be designated for this purpose although more may be ordered. These punchings will be designated TNF0 through TNF9 and TNR0 through TNR9. Each TN relay has an F and R punching and connects to the windings of the TN0 through TN9 relays as follows. The primary or 5BF winding of the TN0 relay connects to the TNF0 punching and the secondary or 6BR winding connects to the TNR0 punching. The other relays and punchings follow in like order. The punchings are used to connect TN relays in parallel with those TB relays which serve trunk numbers, each TN relay being able to accommodate two TB relays. The TN relays may be equipped on only two number group frames.

2.58 G and VHG Punchings: These punchings are used in connection with overflow for nonhunting numbers. Cross-connection punchings are provided for a maximum of two OF relays.

For each of these relays there are G and VHG punchings which are numbered G0, G1, VHG0, and VHG1 and connect to the winding of the OF relay and 1B contact, respectively. The G and VHG punchings are introduced between like-designated punchings in the G and VHG cross-connection field in order to operate the OF relay and then pass on the VHG lead signal.

2.59 HB and HBS Punchings

(a) **HB Punchings:** These punchings are numbered 0 through 9 and connect to the winding of the HB0 through HB9 relays, respectively. The cross-connection from these punchings to the HBA punchings are made so that, on block hunting, the advance A relay will operate the HB relay advanced to. The cross-connections to the HB punchings from the HBS punchings are made so that, on block select hunting, the advance SA relay will operate the HB relay advanced to.

(b) **HBS Punchings (Manufacture Discontinued) Fig. 11B:** These punchings are numbered 0 through 9 and extend through the A terminal strip of the block select unit on the relay rack to the 4T contact of the SA relay. The cross-connections from the HB punchings to these punchings are made in order to operate the HB relay on block select hunting. This provides proper identification where a trouble record is taken.

2.60 PBN and PMO Punchings: These punchings connect to the MCC relay contacts. The PBN punching provides facilities for making lines permanently busy and this punching is cross-connected to the F punchings of such lines. Its primary use is for test circuit calls or instruction purposes. The PMO punching is also used for test purposes and provides an overflow condition for

trunks. The line assigned for this purpose has its F punching connected to the PMO punching.

2.61 TB Punchings: These punchings are numbered from 100 through 119 and extend through terminal strip A of the block select unit on the relay rack to the windings of the block select SC relays, numbered 100 up, mounted on the relay rack. They are used to cross-connect these relays to the windings of TB relays which are associated with the SC relays of the block select terminal hunting group. The terminal strips are designated at the right to indicate the hundreds and tens digits and at the bottom to indicate the units digit of the SC relay.

E. Block Select Terminal Mounting Units (Fig. 12)

2.62 The relays and terminal strips used for block select terminal hunting are mounted on the relay rack and are numbered from 100 up. The first SC (sleeve connector) relay on each block select hunting unit has no associated SA or TBT relays and is associated with the first (directory number) tens block of the block select terminal hunting group. Beginning with the second tens block in the hunting group, an SC relay, TBT relay, and SA (select advance) relay are required per hunting group per tens block. The first tens block may have more than one hunting group per tens block but succeeding tens blocks can have only one hunting group per tens block.

F. Tens Block Busy Test Terminal Mounting Units

2.63 The relays and terminal strip used for sleeve busy test in block select hunting are mounted on the relay rack. Starting with the second tens block of a block select hunting group, a B relay is associated with each line of a hunting group. When all lines in a tens block are busy, the ten B relays will operate to the busy sleeves of the

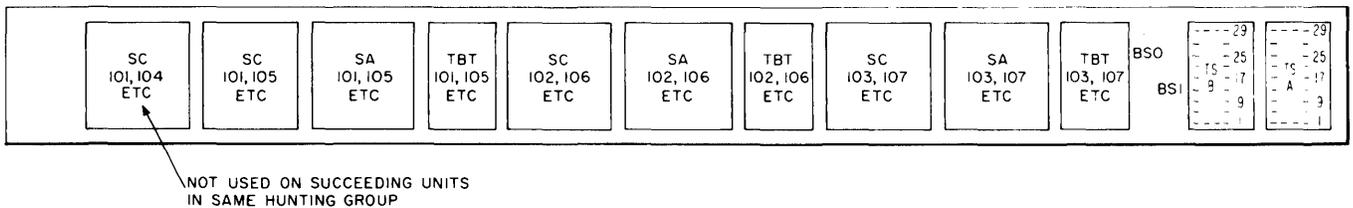


Fig. 12—Block Select Hunting Unit on Relay Rack

lines which in turn will operate the TBT relay of the block select hunting unit and allow the marker to test the next tens block of the hunting group, or if the last tens block hunting group was involved, the marker will receive an end-of-group or overflow indication.

2.64 The following paragraphs describe the purpose of the various punchings used on the block select hunting units and the tens block busy test units mounted on the relay rack. Fig. 12 represents the block select terminal hunting unit equipment. Fig. 13 shows the leads and the correspondingly numbered punchings on the terminal strips and the relay contacts or windings to which they are wired. Fig. 14 shows the schematic layout. By cross-reference between Fig. 13 and 14, the terminals to be cross-connected can be determined.

2.65 A, AS, BA, T, AF, AT, and EG Punchings: Starting at the A punching of the first SC relay, a series chain circuit is extended through the SA and TBT relays of the block select hunting group by means of cross-connecting the A, AS, BA, T, AT, EG, or AF punchings. If all lines in the first tens block are busy, the marker will apply battery to this circuit, thereby operating the lowest-numbered SA relay with an idle line in the tens block, or if all lines in the hunting group are busy, the marker will receive either an end-of-group or overflow indication.

2.66 C and D Punchings: These punchings connect the AN lead to the PBX allotter circuit through a series chain of make contacts on the ABT and TBT relays of an allotted hunting group. If all lines in the group are busy, a circuit is closed through to battery.

2.67 B, LSA, and LA Punchings: The cross-connections of these punchings are used by the marker to lock the SA relay.

2.68 AE Punchings: If all lines become busy after the SA relay has operated and the marker has not progressed to sleeve busy test, the marker obtains an end-of-group indication by means of the AE through EG cross-connections.

2.69 TBT Punchings: These punchings connect to the windings of the TBT relays and cross-connect to the last TT punchings of the tens block busy test units or if auxiliary line circuits are used, cabling extends these punchings to the

TBT punchings on the HMDF which are cross-connected to the auxiliary line circuits for busy test. When all lines in a tens block are busy, the TBT relay, in operating, advances the hunt to the next tens block or if all TBT relays are operated, the marker will receive either an end-of-group or overflow indication.

2.70 XC and GRD Punchings: The XC punching connects to the winding of the first SC relay on the unit and is cross-connected to the GRD punching if there is one hunting group in the first tens block or connects to the XSC punching if there is more than one hunting group in the first tens block. To provide cross-detection on all SC relays, cross-connect the XC punching to the XSC punching. This method will permit the XC wiring to remain in place between service orders.

2.71 TB0 Through TB3 Punchings: These punchings are wired to the windings of the SC relays on the units. Cabling, as required by job specifications, extends these leads to the TB100 through TB119 punchings on terminal strip H on the number group frame which in turn are cross-connected to the assigned TB00 through TB99 punching on terminal strip E of the number group. They are used to connect in parallel the windings of the SC relay and the TB relay of the same tens block.

2.72 HBS0 Through HBS2 Punchings: These punchings are connected to the 4T contact of the SA relays. Cabling, as required by job specifications, extends these leads to the HBS0 through HBS9 punchings on terminal strip H on the number group frame which in turn are cross-connected to the proper HB0 through HB9 punchings on the same terminal strip. This cross-connection is used for operating the HB relay, thus providing proper identification when a trouble record is taken.

2.73 XSC Punching: When there is more than one hunting group in the first tens block of the hunting group or if cross-detection is provided on all SC relays, the winding of the SC relay of the first tens block is connected to the XSC relay of the SC relay cross-detecting circuit by means of a cross-connection between XC and XSC punchings. If the SC leads from the TBA relay contacts to the windings of the SC relays are crossed, a trouble record will be obtained.

G. Allotted Number Hunting Unit Terminals (Fig. 15 and 16)

2.74 The relays and terminal strips for the allotted number hunting unit are mounted on the relay rack frame on which the associated block select and/or sleeve busy relay units are mounted. Allotted hunting groups have lines in two or more number groups and an allotted block test (ABT) relay is provided on the unit for each allotted group in the associated number group for supplying a busy indication for the first tens block to the PBX allotter circuit. This simultaneous busy test of all lines in the first tens block cancels the automatic hunting through the first tens block which is a feature of block select hunting. For subsequent tens blocks, block select hunting is used.

2.75 AA, EG, and SA Punchings: These punchings are used to carry the circuit from the marker to the EG lead through make contacts on the ABT relay to check that this relay operates when all lines in the first tens block are busy. The EG punching is used only when the allotted group consists of only one tens block in the number group.

2.76 AN and H Punchings: These punchings are used to carry a busy signal through contacts of the ABT relay to the PBX allotter circuit when all lines of an allotted group in a number group are busy.

2.77 AB and ABT Punchings: The AB punchings connect battery to a series chain of make contacts on the B relays for the lines in the first tens block of an allotted hunting group. The ABT punchings connect the ABT relay coil to the other end of this chain. When B relays are not used and busy indication is obtained from auxiliary line circuits, the AB and ABT punchings are connected to similarly designated punchings on the horizontal side of the main distributing frame.

H. Tens Block Screening

2.78 TBN 0-3 Punchings: These punchings are numbered 54 through 57 on the terminal strip adjacent to the MCB-0 relay on the initial number group connector frame or MCB-6 relay on the supplemental number group connector frame. If all lines in a number group are assigned to the same group of tens blocks, the required "TBS" lead to the marker is cross-connected to ground.

Tens block screening enables the marker to translate certain ringing combinations to give four different meanings to each ringing combination depending on the marker cross-connection arrangement.

I. Distributing Frame Punchings

2.79 NS Punchings on NG Terminal Strip:

The NS punchings appear on terminal strips designated NG on the front and are located on the distributing frame. New offices have the NG terminal strips mounted on the horizontal of the distributing frame, but local procedures will determine whether they shall be mounted on the horizontal or the vertical. The NG terminal strips described in this section are assumed to be mounted vertically. They connect by means of cables to the B terminal strip on earlier-type frames and to the S terminal strips on later-type number group frames. Provision is usually made at the distributing frame to accommodate the ultimate number of NS punchings on the basis of one group of ten punchings (S0 through S9) for each SC_i relay on each number group frame. The terminal strips on which these punchings are located are numbered to agree with the number group frame numbering. For example, in an office requiring 20,000 or less numbers in a marker group, a terminal strip stamped NGA0 would accommodate the punchings for the number group A0 which represents the 0 thousands digit for office A. If more than 20,000 numbers are required in a marker group, the number group frames are numbered 00 through 39 without office or thousands digit significance. Under the latter conditions, the NG terminal strips are designated NG00 through NG39. The individual punchings on the terminal strips for the earlier-type number group frames are numbered from 000 through 139 (000 through 099 in the first of the earlier-type offices) and connect to punchings on the number group B terminal strip for relays SC0 through SC13 and cable directly for relays SC14 and up. The individual punchings on the terminal strips for the later-type number group frames are numbered from 000 through 399 and connect to correspondingly numbered punchings on the S terminal strips on the number group frame for relays SC0 through SC39 and cable directly to relays SC40 and up. The SC relays on the block select unit mounted on a relay rack are numbered from 100 up and are cabled directly to correspondingly numbered punchings on the main frame. The numbers at the top and bottom of the terminal strip indicate the number of the SC relay of the

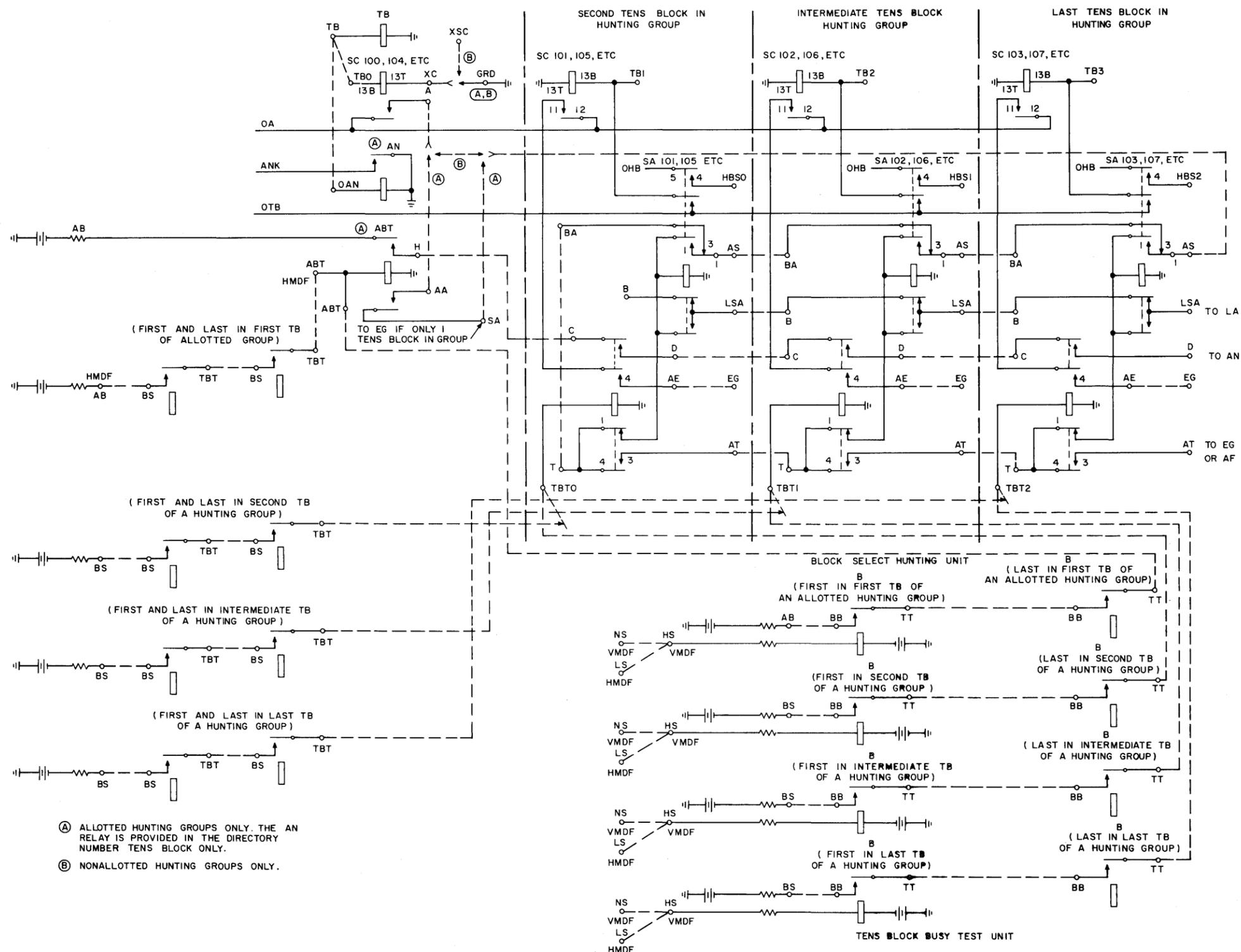


Fig. 14—Cross-Connections Required for Block Select, Tens Block Busy, and Allotted Number Hunting Units



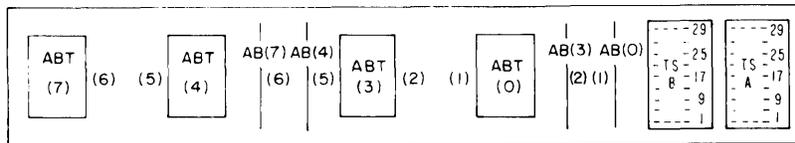


Fig. 15—Allotted Number Hunting Unit on Relay Rack

number group and the numbers at the left, as shown in Fig. 17, indicate the number of the S lead (S0 through S9) on the associated SC relay. In the earlier-type offices where more than 14 (10 in the first of the earlier type) SC relays are provided on the number group frame, a similar arrangement and stamping is provided on adjacent terminal strips, the exact layout depending upon local conditions. The numbers of the punchings on these terminal strips are 140 through 279, 280 through 419, etc (100 through 199, 200 through 299, etc, in the first of the earlier-type offices) and have the same number group frame number as the associated terminal strip. For example, assume that it is required to locate the NS punching for No. 1274. First, determine from office records, the SC-relay associated with this number. Assume that it is the SC00 relay and then determine the terminal strip associated with the number group frame containing the one thousands series, since one is the thousands digit of the number. Then, on the terminal strip, locate the punchings associated with SC00 relay which is the vertical row designated 00. In this vertical row, the punching designated 4 will be used since the units digit 4 of the number must agree with punching S4 of the SC00 relay. Fig. 17 shows the layout of the punching numbering.

2.80 LS Punchings on LL Terminal Strip:

A certain number of line circuit sleeve leads from the line link frame are connected to the LS punchings which appear on terminal strip LL on the front and are located on the horizontal side of the distributing frame. Fig. 18 shows typical layouts of punchings on the LL terminal strips. The terminal strips are numbered to agree with the numbering of line link frames to which the sleeves are connected and the associated line equipment location is stamped on the terminal strip. This consists of the vertical group (VG number, vertical file (VF) number, and horizontal group (HG) number. The vertical group number appears farthest to the rear of the terminal strip and is designated VG00 through VG13. In front

of the vertical group number appears the vertical file number of the sleeves for connections brought from the line link frame, such as VF0. In front of the vertical file designation is the horizontal group designation 4 and 9, and at the front of the terminal strip is the horizontal group designation 0 and 5. Thus, the punchings for any horizontal group read from front to rear 0 through 4, and 5 through 9 for the indicated vertical group and vertical file. On lines other than 2-party message rate using message registers, one LS punching is provided for each line and the HG designations 0, 5, 4, and 9 are stamped in line with the rows of associated punchings. On 2-party lines, arranged for message rate service (using message registers), two LS punchings are provided for each line. These punchings are arranged on two adjacent rows from front to rear with the tip party LS punchings on the left row and ring party LS punchings on the right row. The HG designations 0, 5, 4, and 9 are stamped between the rows of associated punchings. Therefore to locate, for example, the sleeve punching for a line equipment location, such as LL05, VG03, HG7, and VF0, first locate the LS terminal strip for line link frame 05. Then locate the punchings of vertical group 03 and vertical file 0. In this group of punchings, the LS punching for HG7 will be the third punching in from the front in the row stamped 5 at the front and 9 at the rear. If the line is a 2-party message rate line with a message register, the tip party LS punching for HG7 will be the third punching in from the front on the left row stamped 5 at the front and the ring party will be on the adjacent punching to the right.

2.81 HS Punchings:

The HS0 through HS9 punchings on the tens block busy test unit are cabled to an HS terminal strip on the vertical side of the distributing frame. The first tens block busy test unit is designated 000 through 019, the second 010 through 019, etc. These HS punchings are cross-connected to the NS and LS punchings of the associated hunting lines.

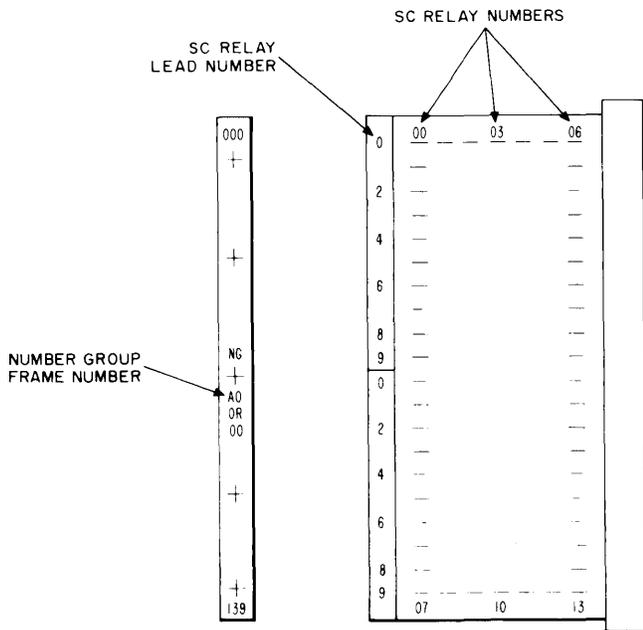


Fig. 17—Typical Numbering of NS Punchings on Terminal Strip NG on Distributing Frame

2.82 TBT Punchings: Cabling extends the 24, 25, and 26 punchings on the block select hunting unit terminal strip B to the horizontal side of the distributing frame for connecting the windings of the TBT- relays to auxiliary line circuits when provided. The numbering of the TBT punchings agrees with the tens and units digits of the TBT relay number on the block select hunting unit.

2.83 BS and TBT Punchings: BS and TBT punchings on the horizontal side of the distributing frame are connected to the contacts of the auxiliary line circuit relays for use in block select hunting when auxiliary line circuits are provided. Battery supply for these punchings is provided by a separate BS punching.

2.84 AB and ABT Punchings: These punchings on the horizontal side of the main distributing frame are connected to the contacts of auxiliary line circuit relays when these relays are used to provide busy indication for the lines in the first tens block of an allotted hunting group.

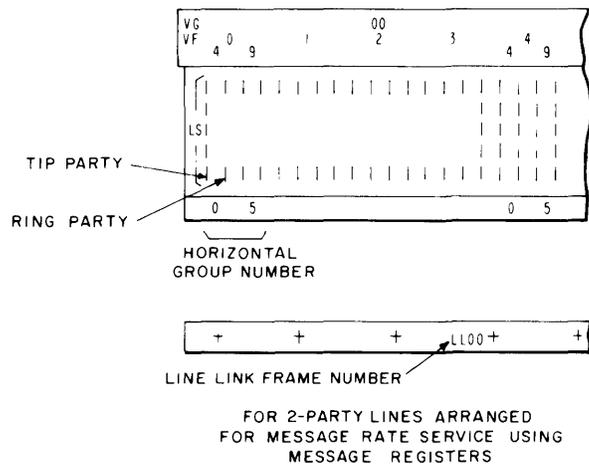
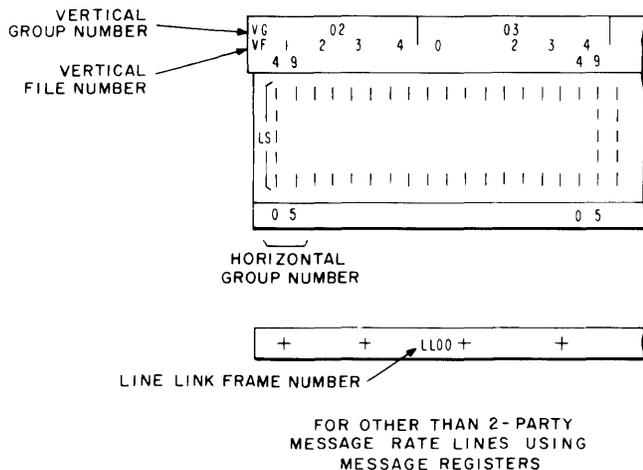


Fig. 18—Typical Numbering of LS Punchings on Terminal Strip LL on Distributing Frame

3. ASSIGNMENTS AND CROSS-CONNECTIONS

A. Assignment Information Required

3.01 The data required for cross-connections when telephone lines, tandem trunks, or toll tandem trunks are added or removed from service are

given on an assignment order as established by local procedure. The assignment information required is shown below with the paragraphs in this part of the section which describe how the cross-connections shall be made and cross-connections required which are covered in Tables C, D, and E.

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ASSIGNMENT INFORMATION	PARAGRAPH
Telephone number	3.02
Ringing combination (RC)	3.02
Line equipment location	3.02
Terminal Hunting Numbers	3.20 thru 3.40
Sleeve control (SC-) relay	3.23 thru 3.40
Advance (A-) relay	3.27 thru 3.40
Overflow Registration	
Nonhunting (OF-) relay	3.03
Terminal hunting (POF-) relay	3.26
Lines used for originating service only	3.41
Free Service Number	
Nonhunting	3.04
Terminal hunting	3.43
Permanent busy number	3.05
Permanent overflow number	3.06
Regular and temporary intercept and no-such-number tone trunk	3.07
Trouble Intercept	
Nonhunting	3.08
Terminal hunting	3.42
Blank numbers	3.09
Exchange of busy	3.10
Trunk Numbers	3.12 thru 3.18
Second number group frame	3.14 thru 3.16
Second equipment location	3.15
Trunk (TN) relay	3.17
Night numbers	3.40
Physical-theoretical numbers and blank hundreds blocks	3.44 thru 3.48
Distributing frame	3.49 thru 3.52

Note: The numerals, 06-02-34-01, refer to the line equipment location and ringing combination as follows:

FR VG HG VF RC
06 02 3 4 01

On the office records and assignment information the line link frame number is normally referred to by the letters FR, while the equipment is designated LL. Also, the punchings and terminal strip on the number group frame which represent line link frame numbers are known as LL punchings and LL terminal strip.

Since each number group handles 1000 consecutive numbers and this number is in the 2000 series, the cross-connection field affected will be the number group handling the numbers from 2000 through 2999. The last three digits of the number correspond to the punching number on the G, F, and L terminal strips on the number group frame. The VHG, RF, and LL punchings representing the assigned vertical group (VG), horizontal group (HG), ringing combination (RC), vertical file (VF), and the tens and units digits of the line link (LL) frame number for 2745 are VHG 023, RF 014, and LL 06. Since it is necessary to indicate to the marker the line equipment location for this particular number, it will be necessary to cross-connect the G punching 745 to the VHG punching 023 which represents vertical group (VG) 02 and horizontal group (HG) 3 on the VHG terminal strip. Also, it will be necessary to cross-connect the F punching 745 to the RF punching 014 which represents ringing combination (RC) 01 and vertical file (VF) 4 on the RF terminal strip and the L punching 745 to the LL punching 06 on the LL terminal strip which represents the line link (LL) frame number. Fig. 3 and 4 show the cross-connection fields with these cross-connections. When the VHG or RF terminal strips are arranged with a left-half and right-half numbering arrangement, cross-connections are made to the half immediately above or below the G or F punching being cross-connected. The connections at the L and LL terminal strips can usually be made with a straight run, since frame punchings are multiplied all the way across the LL terminal strips.

B. Cross-Connections for Numbers Other Than Terminal Hunting or Tandem Trunk Numbers

3.02 General Treatment of Numbers: With data such as given in paragraph 3.01, it is possible to make the proper cross-connections at the number group frame. For example, assume that telephone number 2745 in office A is to be cut in and that the line equipment location is line link frame (LL) 06, vertical group (VG) 02, horizontal group (HG) 3, vertical file (VF) 4, and ringing combination (RC) 01 (normally shown as 06-02-34-01).

3.03 Number With Overflow Registration (Fig. 19): Where it is desired to obtain an overflow registration on a particular number, it is necessary to inform the marker of this treatment.

TABLE C

**VHG, RF, AND LL CROSS-CONNECTION FIELDS AND ASSOCIATED JUMPERS
ON EARLIER- AND LATER-TYPE FRAMES**

Field	Number Used For	Cross-Connection Extends*		See Notes	
		From Punching	To Punching		
VHG	Line or Trunk	G Tel No.	VHG	1, 5, 6, 7	
	Nonhunting Number With Overflow Registration	G Tel No.	G(OF-)		
		VHG(OF-)	VHG		
RF	Line or Trunk	F Tel No.	RF	2, 3, 4, 5, 6, 7	
	Free Line Service Terminal Hunting or Nonhunting	F Tel No.	F(FN-)		3
		RF(FN-)	RF		
		FNK(FN-)	FNA or FNB		
	Permanent Busy	F Tel No.	PBN		
Permanent Overflow	F Tel No.	PMO			
LL	Line or Trunk	L Tel No.	LL	2, 5, 6, 8	

*The designation enclosed in parentheses is the relay associated with the punching on the miscellaneous terminal strip.

Notes:

1. This jumper is not required for nonhunting numbers with overflow registration. See separate listing in VHG field for cross-connections required.
2. Regular intercept for nonhunting numbers requires a cross-connection only at the VHG field and none in the RF and LL fields.
3. The RF punching selected depends upon the ringing combination (RC) for the number, and this in turn is dependent upon the type of ringing, the code to be used, and the side of the line to which the ringing is to be applied. Tandem trunk numbers and terminal hunting numbers require ringing combination RC 10. Tandem trunks also require a jumper at terminal strip C from TB punching for the TB- relay to TB punching for the assigned TN- relay. Additional jumpers required for terminal hunting numbers are covered in Table D.
4. This cross-connection is not made for free lines. See separate listing in RF field for cross-connections required.
5. Permanent busy and permanent overflow numbers require a jumper only at the RF field and none in the VHG and LL fields. See separate listings in RF field for cross-connections required.
6. Blank numbers require no cross-connections in VHG, RF, and LL fields except blank numbers in equipped hundreds blocks when routing is different from that for changed or discontinued numbers, in which case the connection is made in the VHG field.
7. Trouble intercept for terminal hunting numbers requires a cross-connection only at the LL field and none in the VHG and RF fields.
8. Cross-connection at the LL field is omitted for temporary intercept.

This is accomplished by the operation of an OF relay in the number group which by its operation gives this information. Assume that 2745 (the same example used in paragraph 3.02) is to have overflow registration. The F and L punchings are then cross-connected to the RF and LL punchings, respectively, in the same manner as covered in paragraph 3.02. On the earlier-type frame, the G punching 745 is cross-connected to punching 70 of the E terminal strip and the VHG punching 023

is cross-connected to punching 72 of the E terminal strip if OF0 relay is used. If the OF1 relay is used, connect to punchings 71 and 73, respectively, at the E terminal strip. On the later-type frame, the G punching 745 is cross-connected to the G0 punching and VHG punching is cross-connected to VHG0 punching on terminal strip H. If the OF1 relay is used, connect to G1 and VHG1 at terminal strip H. Fig. 19 shows how the G and VHG punchings connect the OF relay into the circuit in

TABLE D

**TERMINAL HUNTING GROUP CROSS-CONNECTIONS AT TERMINAL STRIPS
C AND E ON EARLIER-TYPE FRAME**

Numbers of Terminal Hunting Group	Hunting Conditions	Cross-Connection Extends [§]				Remarks
		From		To		
		Terminal Strip	Punching	Terminal Strip	Punching	
All on One Tens Block TB- Relay*		C	TB(TB-)	C or A	TB(SC-)	
		E or A	A(SC-)	E	EG	No overflow registration required
				E	A(POF-)	Overflow registration required
	First Tens Block TB- and SC- Relays	C	TB(TB-)	C or A	TB(SC-)	
		E or A	A(SC-)	E	A(A-)†	†Same relay listed under intermediate tens block
Extended Through More Than One Tens Block TB- Relay*	Intermediate Tens Block TB- and SC- Relays	C	TB(TB-)	C or A	TB(SC-)	Two leads on TB(SC-) punching. †Same relay listed under first tens block. (See Note.)
		E	TB(A-)†	C or A	TB(SC-)	
		E	HBA(A-)†	E	HB-(HB-)	
		E or A	A(SC-)	E	A(A-)‡	‡Same relay listed under last tens block. (See Note.)
	Last Tens Block TB- and SC- Relays	C	TB(TB-)	C or A	TB(SC-)	Two leads on TB(SC-) punching. †Same relay listed under intermediate tens block
		E	TB(A-)‡	C or A	TB(SC-)	
		E	HBA(A-)‡	E	HB-(HB-)	
		E or A	A(SC-)	E	EG	No overflow registration required
				E	A(POF-)	Overflow registration required

*Where number checking is not required and a group of terminal hunting numbers are used for original service, treat these numbers as a separate terminal group.

† ‡ See Note.

§The designation enclosed in parentheses is the relay associated with the punching on terminal strips C and E. Refer to Table C for cross-connection at the VH, RF, and LL fields.

Note: When more than one intermediate group is cross-connected, the (A-)† and (A-)‡ relays are associated, respectively, with the previous and next tens block.

order to provide for overflow registration. The F and L punching cross-connections are the same as in Fig. 3. With this arrangement, when the marker finds the line busy, it causes the operation of a traffic register through the contacts of the OF relay. When an overflow registration on a particular In-Wats line is desired, the OF lead is extended through contacts of the OF₁ relay and cross-connected to the auxiliary line circuit. If the marker finds the line busy, the traffic register associated with the auxiliary line circuit operates.

3.04 Free Service Numbers: When any 6-wire ringing selection switches are used

in an office, no special cross-connections are required in the number group for individual free lines. For free hunting groups in these offices and for both free lines and free hunting groups in offices using only 4-wire ringing selection switches, the number group must inform the marker of the free treatment. This is accomplished by associating an FN relay with the line or with the first trunk or line in the hunting group. Assume that the FN0 relay is the one to be used and 2745 (the same example used in paragraph 3.02) is to be given free line service. The G and L punchings are then cross-connected to the VH and LL punchings, respectively, in the same manner as covered in

paragraph 3.02. On the earlier-type frame, the F punching 745 is cross-connected to punching 00 of terminal strip A and the RF punching 014 is cross-connected to punching 10 of terminal strip A. Punching 20, which is the FNK punching associated with the FNO relay, is connected to the FNA punching 30 of terminal strip A. On the later-type frame, the F punching 745 is cross-connected to the F0 punching, the RF punching 014 is cross-connected to RF0 punching, and the FNK punching is cross-connected to the FNA punching on terminal strip H if only 4-wire ringing selection switches are used in the office. If any 6-wire switches are used in the office, the FN relay is not required for individual free lines. It is assumed in this example that the ringing combination (RC) translation is correct. However if code 2 ringing is required and is not attained by the RF punching cross-connection because a terminal hunting connection requires RC 10 (code 1 ringing), punching 20 would be cross-connected to FNB punching 31 on terminal strip A on the earlier-type frame. On the later-type frame, the FNK punching would be connected to the FNB punching on terminal strip H. If the FN relays are to be cross-connected to a line or first trunk of a terminal hunting group, connect the F, RF, and FNK punchings of these relays in the same manner. The punching numbers for these relays are listed in paragraph 2.16. Fig. 20 shows the F-RF cross-connections for the example used in this paragraph, and the G and L punching cross-connections are the same as in Fig. 3.

3.05 Permanent Busy Number: Where a number is to be made permanently busy for test or training purposes, it is necessary to inform the marker of this condition. This is accomplished by making a cross-connection to the PBN punching instead of making the cross-connection normally made at the G, F, and L punchings covered in paragraph 3.02. This will cause the marker to return line busy signal on calls to the number. For example, assume that 2986 is to be given the permanent busy condition treatment. On the number group frame which handles numbers 2000 through 2999, the G and L punchings associated with 986 are not cross-connected but are left open. On the earlier-type frame, a cross-connection is run from F punching 986 to PBN punching 78 of terminal strip E. On the later-type frame, a cross-connection is run from F punching 986 to PBN punching on terminal strip H. Where more than one number in a number group is to be made permanently busy, strap the F punchings on each

F terminal strip together with sleeved strap wire and run a jumper to the PBN punching from each F terminal strip.

3.06 Permanent Overflow Number: Where a number is to be connected to give a permanent overflow, it is necessary to inform the marker of this condition. A cross-connection is made to the PMO punching instead of the cross-connections normally made at the G, L, and F punchings as covered in paragraph 3.02. This will cause the marker to return overflow signal on calls to the number. For example, assume that when the 2987 is called, it is to indicate that the overflow signal be returned. On the number group frame which handles numbers 2000 through 2999, the G and L punchings associated with 987 are not cross-connected but are left open. On the earlier-type frame, a cross-connection is run from F punching 987 of the line to PMO punching 79 of terminal strip E. On the later-type frames, a cross-connection is run from F punching 987 to PMO punching of terminal strip H.

3.07 Regular and Temporary Intercept and No-Such-Number Trunk or Announcement Machine: Regular intercept is provided on lines with changed, discontinued, or unassigned (blank) numbers. The cross-connection between the F and RF punchings and between the L and LL punchings is disconnected or omitted. Calls on these lines will be routed to regular intercepting or to no-such-number trunk or announcement machine, depending upon optional cross-connections in the marker circuit. The cross-connection of the G to VHG punchings at the number group frame is made as follows:

- (a) On unassigned numbers in equipped hundreds blocks, the cross-connection between the G and VHG punchings is omitted.
- (b) On changed or discontinued numbers that are to be routed the same as unassigned numbers in equipped hundreds blocks, the cross-connection between the G and VHG punchings is omitted.
- (c) On changed or discontinued numbers that are not to be routed the same as unassigned numbers in equipped hundreds blocks, the cross-connection between the G and VHG punchings is connected as covered in paragraph 3.02.

TABLE E

TERMINAL HUNTING GROUP CROSS-CONNECTIONS AT TERMINAL STRIPS E, F, G, AND H ON LATER-TYPE FRAME

Numbers of Terminal Hunting Group	Hunting Conditions	Cross-Connection Extends				Remarks
		From		To		
		Term. Strip	Punching	Term. Strip	Punching	
One Hunting Group in TB Relay— All Numbers in One TB Relay (Fig. 22)		E	TB(TB-)	F	TB-SC(TB-)	
		H	A(SC-)	G	EG	No overflow registration required
		F	XC(XC-)	H	AF(POF-)	Overflow registration
More Than One Hunting Group in TB Relay— All Numbers in One TB Relay (Fig. 25)		E	TB(TB-)	F	TBA(TBA-)	SC relay cross-detection not required
		G	SU(TBA-)	F	TB-SC(SC-)	Strap together the SU punchings of each hunting group.
		F	XC(SC-)	E	XSC(XSC)	SC relay cross-detection required
		H	A(SC-)	G	EG	No overflow registration required
One Hunting Group in TB Relay— Numbers in More Than One TB Relay (Fig. 23)	First Tens Block	E	TB(TB-)	F	TB-SC(SC-)	Overflow registration required
		E	TB(TB-)	H	TB(SC-)*	Sleeve test required
			A(SC-)*		AS(SA-)	Block select hunting required. *SC100, SC104, etc, relay mounted on relay rack. (See Fig. 14.) SC relay cross-detection not required
			XC(SC-)*		Grd	
	Intermediate Tens Block	F	XC(SC-)	E	Grd	SC relay cross-detection not required
		H	A(SC-)	G	AD(A-)†	†Same A- relay. Advance to next tens block on block hunting.
		E	CA(A-)†	F	TB-SC(SC-)	
		E	TB(TB-)	F	TB-SC(SC-)	Two leads on TB punching of SC relay
	Last Tens Block	F	XC(SC-)	E	Grd	SC relay cross-detection not required
		G	HBA(A-)†	H	HB-(HB-)	HB relay advanced to
		H	A(SC-)	G	AD(A-)‡	‡Same relay listed under last tens block
		E	CA(A-)‡	F	TB-SC(SC-)	‡Same relay listed under intermediate tens block
		E	TB(TB-)	F	TB-SC(SC-)	Two leads on TB punching of SC relay
		F	XC(SC-)	E	Grd	SC relay cross-detection not required
		G	HBA(A-)	H	HB-(HB-)	HB relay advanced to
		H	A(SC-)	G	EG	No overflow registration required
More Than One Hunting Group in TB Relay— Numbers in More Than One TB Relay (Fig. 24)	First Tens Block	H	AF(POF-)			Overflow registration required
		E	TB(TB-)	G	TBA(TBA-)	
		G	SU(TBA-)	F	TB-SC(SC-)	Sleeve test required
		G	SC(TBA-)		TB(SC-)*	Block select hunting required. *SC100, SC104, etc, relay mounted on relay rack. (See Fig. 14.) SC relay cross-detection required
	Intermediate Tens Block		A(SC-)*		AS(SA-)	
			XC(SC-)*		XSC(XSC)	SC relay cross-detection required
		F	XC(SC-)	E	XSC(XSC)	SC relay cross-detection required
		H	A(SC-)	G	AD(A-)†	†Same A- relay. Advance to next tens block on block hunting.
		E	CA(A-)†	F	TB-SC(SC-)	
		G	SU(TBA-)	F	TB-SC(SC-)	Strap together the SU punchings of each hunting group.
		F	XC(SC-)	E	XSC(XSC)	SC relay cross-detection required
		E	TA(A-)†	F	TBA(TBA-)	†Same A- relay. Advance to next tens block on block hunting.
	Last Tens Block	F	TBA(TBA-)	E	TB(TB-)	
		H	A(SC-)	G	AD(A-)‡	‡Same relay listed under last tens block
		G	HBA(A-)‡	H	HB-(HB-)	HB relay advanced to. ‡Same A relay listed under intermediate tens block
		E	CA(A-)‡	F	TB-SC(SC-)	
G		SU(TBA-)	F	TB-SC(SC-)	Strap together the SU punchings of each hunting group.	
F		XC(SC-)	E	XSC(XSC)	SC relay cross-detection required	
H		A(SC-)	G	EG	No overflow registration required	
			H	AF(POF-)	Overflow registration required	
Allotted (Fig 18)	First Tens Block	E	TB(TB-)	F	OAN(AN)	Directory number tens block only
		H	A(SC-)	H	AA(ABT)	Check operation of ABT relay.
		G	EG		SA	Only one tens block in allotted group. No overflow provided

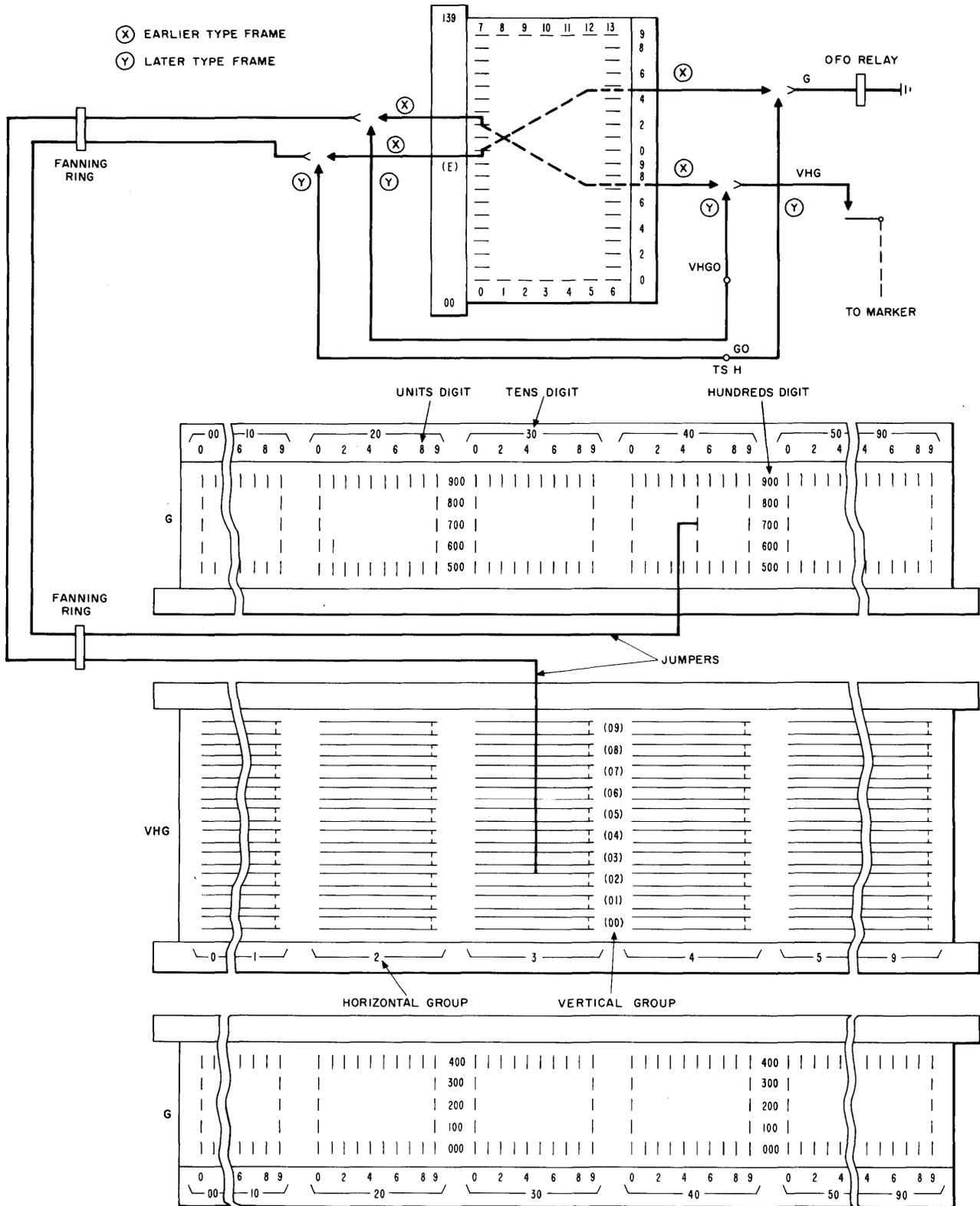


Fig. 19—Typical Overflow Registration—Terminal Strips G and VHG Cross-Connections for Nonhunting Numbers

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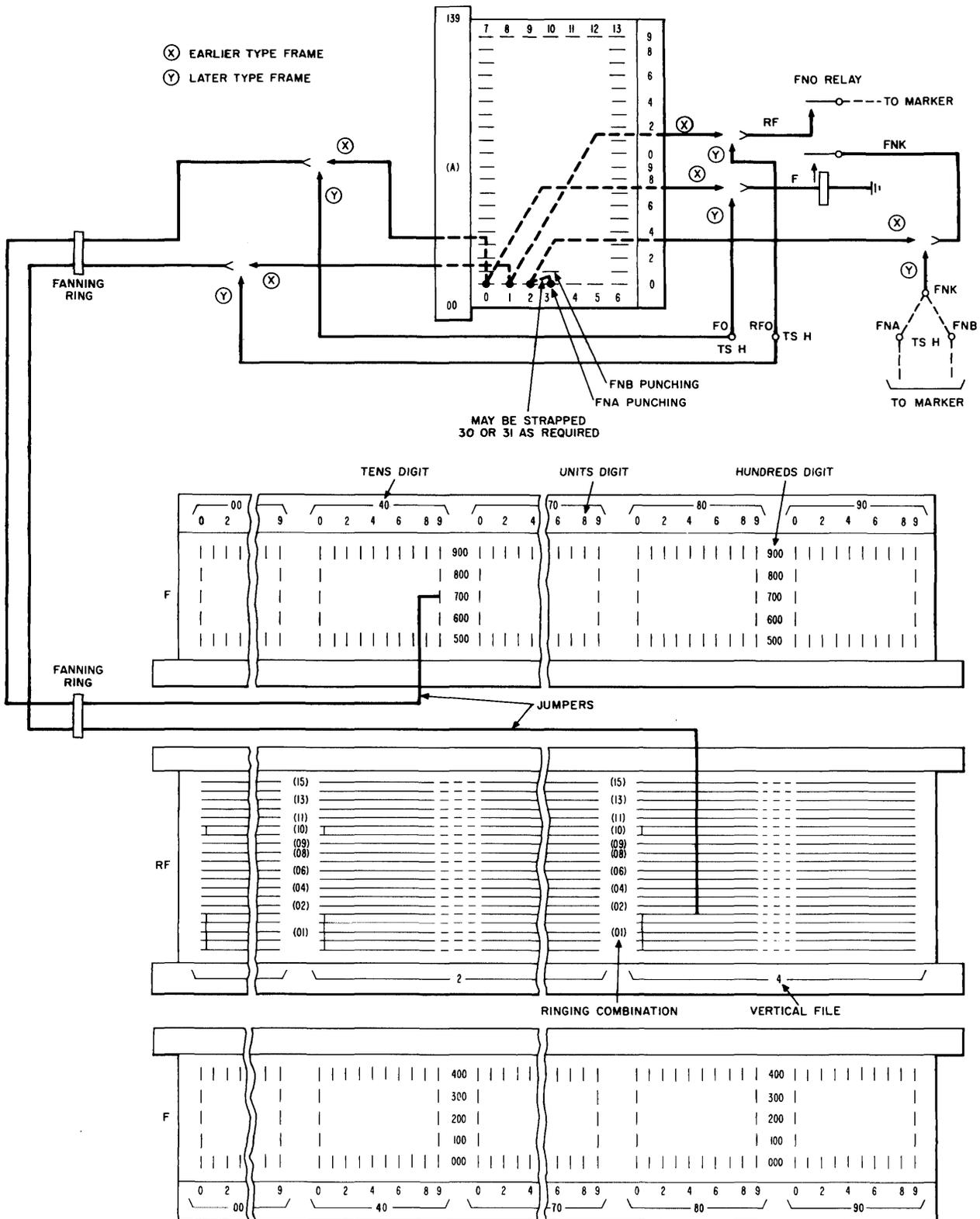


Fig. 20—Typical Free Number—Terminal Strips F and RF Cross-Connections for All Numbers

(d) On numbers appearing in a blank hundreds block where all numbers are unassigned, the cross-connection between the G and VHG punchings is omitted. The cross-connection between the PT and BNK punchings is made as covered in paragraphs 3.44 and 3.46.

When temporary intercept is desired, the cross-connection between the L and LL punchings is omitted while the cross-connection between the F and RF punchings and between the G and VHG punchings is connected as covered in paragraph 3.02.

3.08 *Trouble Intercept:* Trouble intercepting on individual or party lines requires no work at the number group frame since it is done by plugging up the line at the distributing frame. If more lines are in trouble than there are plugging-up circuits available, the extra lines should be provided for in accordance with local procedures.

3.09 *Blank Numbers:* The F, G, and L punchings of unused or blank numbers and the PT punchings of blank hundreds blocks are connected at the cross-connection fields as covered in paragraphs 3.07, 3.44, and 3.46.

3.10 *Line or Trunk With Exchange of Busy With No. 5 Crossbar Equipment:* The F, G, and L punchings are cross-connected in the same manner as covered in paragraph 3.02. In addition, each line or trunk requires an associated SC_ relay to be connected with the tens block TB_ relay serving the number. Use TBA relay and one SC relay for each number or group of numbers if it is desired to place more than one in a TB relay. Ten individual numbers may be placed in one TB relay by using one TBA and ten SC relays.

3.11 *Detection of Called Numbers for Calling Line Identification:* A method is provided for taking a trouble record of calls to a maximum of two selected numbers in a number group. To provide this feature, the cross-connection between the F and RF punching of the number to be detected is removed and cross-connections from the F to F1 and the RF to RF1 punchings are added. If a second number is to be detected, cross-connections from the F to F2 and the RF to RF2 punchings are added.

C. Cross-Connections for Trunk Numbers

3.12 Trunks that are arranged for tandem service through a No. 5 crossbar office have one or two line link appearances as well as the trunk link frame appearance. In setting up a tandem or through call through such a trunk, it is necessary for the marker to know the line link frame appearance of this trunk. This is accomplished through the number group in a manner similar to that of individual lines. Each trunk arranged for tandem service is given a 3-digit trunk number assignment. These numbers are part of the 1000 numbers of a number group frame. No thousands digit is necessary since trunk numbers are assigned to two particular number groups which are alternately selected by the markers.

3.13 The G, F, and L punchings for these numbers are cross-connected in the same manner as numbers covered in paragraph 3.02 with the F punching cross-connected to an RF punching which gives an RC 10 for the ringing code. In addition, in number groups which contain both regular numbers and trunk numbers, the TB_ relays which serve trunk tens block numbers must be connected to TN_ relays and certain limitations must be observed as covered in the following paragraphs. TN relays are not required in number groups which contain only trunk numbers.

3.14 Where the same trunk number appears in two number group frames and has only one line equipment location, any change in trunk number or line link equipment location requires similar cross-connection changes at both number group frames.

3.15 Where two line link equipments are assigned to a trunk as in the case of an intertoll trunk, the same trunk number is assigned at the two number group frames. The cross-connection translation at the first number group frame, however, gives one line equipment location, while the second number group frame gives the other line equipment location in the same manner as covered in paragraph 3.02. Therefore, any change in line equipment location assignments will have to be coordinated with its associated number group frame and any change in trunk number would affect both number group frame cross-connections.

3.16 The two number group frames which are used for trunk numbers may also serve

customer lines. However, tens block groups which serve trunk numbers can serve no other numbers. Furthermore, the same numerical designation of the tens block relay on one number group frame is used on the other number group frame since this number is part of the number originally obtained from the incoming register circuit by the marker. For this reason, a change in trunk number must be coordinated with the cross-connections at the register frame.

3.17 The TN relays are double-wound, with each winding connected to a punching. Provision is made on the earlier-type number group frame for a maximum of five TN relays and on the later-type frame for a maximum of ten TN relays. The winding of each tens block TB relay serving trunk numbers has a winding of a TN relay cross-connected in parallel with it. The TB punchings 00 through 99 on the C terminal strip for earlier-type frames and on the E terminal strip for later-type frames which are assigned to trunk numbers are cross-connected to TB punchings 130 through 139 on terminal strip C for the earlier-type frames and to TN punchings F0 through F9 and R0 through R9 on terminal strip H for the later-type frames for the windings of the TN relays on the basis of one TN relay winding for each TB relay serving trunk numbers.

3.18 For example, if 780 is to be used as a local tandem trunk number, on the two number group frames assigned for trunk numbers, such as 2 and 3, the TB78 relay is cross-connected to a TN relay winding which is not connected to any other TB relay. In this case, assume that the primary winding of the TNO relay is to be used in both frames. On the earlier-type frame, cross-connect at terminal strip C, TB punching 78 to punching 130 which is the primary winding of the TNO relay. On the later-type frame, cross-connect TB punching 78 on the terminal strip E to TN F0 punching on terminal strip H which goes to 5BF winding terminal connecting to the primary winding of the TNO relay. This cross-connection is to be made at both number group frames used for trunk numbers (Fig. 21). Cross-connect the G, F, and L punchings for 780 to VH, RF, and LL punchings, respectively, as covered in paragraph 3.02 at each of the two trunk number group frames. Being a tandem trunk, the RC 10 is used for the ringing combination. The cross-connections are identical on the two number group frames since a single line equipment location is assigned to a local tandem

trunk. When two line equipment locations are assigned, as in the case of intertoll trunks, cross-connect the G, F, and L punchings on one frame to agree with one line equipment location and on the other frame to agree with the second line equipment location. For example, number group frame 2 has the cross-connections associated with one line equipment location and number group frame 3 has the other one.

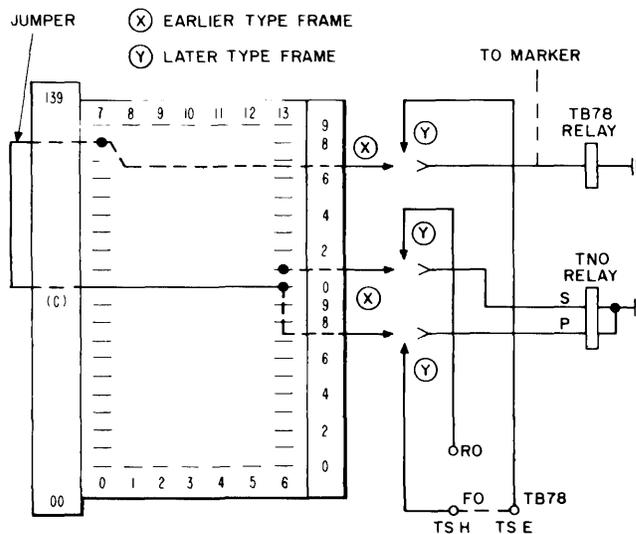


Fig. 21—Typical TN-Relay Cross-Connections

3.19 Automatic Intercept Trunk Number Indication: The G and L punchings for trunk numbers are cross-connected in the same manner as numbers covered in paragraph 3.02. The F punching is cross-connected to one of the RFTN (0 through 4) punchings associated with the vertical file location of the trunk.

D. Cross-Connections for Terminal Hunting Numbers

General

3.20 Terminal hunting groups are assigned on the basis of either one or more than one hunting group appearing in a tens block. Numbers not part of the hunting group may be used for nonhunting numbers.

3.21 A terminal hunting group may spread over more than one tens block group although it need not completely fill any tens block group. Also,

the tens block groups which make up a hunting group need not be numbered consecutively.

3.22 The S leads of line equipment from the line link frames (hold-magnet windings) of terminal hunting numbers are cross-connected at the distributing frame to the S0 through S9 leads associated with SC relays. In each tens block group, the individual S0 through S9 leads are cross-connected to agree with the last digit of the telephone numbers assigned to the terminal hunting group. For example, if the numbers of a hunting group are 1274 through 1276, the S4 through S6 leads of the SC relay associated with the TB27 relay are cross-connected to the line equipment sleeves of these lines, connecting S4 to 1274, S5 to 1275, and S6 to 1276, the units digit agreeing with the S punching number. The S4 through S6 leads are located on the number group frame containing the one thousands series.

One Hunting Group in TB Relay and all Numbers in One TB Relay

3.23 Each number of the terminal hunting group will have its G, F, and L punchings cross-connected as covered in paragraph 3.02. Cross-connection of RF punchings to the F punching will be required to give the RC 10 ringing combination.

3.24 The assigned SC relay is cross-connected to the TB relay serving these lines. A typical SC relay cross-connection is shown in Fig. 22. Assume that the SC00 relay is to be used and that the hunting group is 1274 to 1276 (the same one used for the example in paragraph 3.22). The connections to be made are the following: on the earlier-type frames, terminal strip C, TP punching 27 for the TB27 relay is cross-connected to TB punching 100 for the SC00 relay. On the later-type frame, TB punching 27 on terminal strip E is cross-connected to TB punching of SC00 relay on F terminal strip for the SC00 relay. This connects the windings of TB27 and SC00 relays in parallel. Cross-connect the XC00 punching of the SC00 relay to one of the GRD punchings on the later-type frame. On the earlier-type frames, on terminal strip E the A punching 00 for the SC00 relay is cross-connected to EG punching 18. On the later-type frames, punching A00 on terminal strip H is cross-connected to any spare EG punchings on terminal strip G to indicate to the marker that the end of this hunting group occurs on the SC00 relay.

Note: On the earlier-type frames, all A leads of SC relays, punchings 00 through 13, which require cross-connection to EG punching 18 are first strapped together and then a single jumper run to punching 18. The A leads of relays SC14 and up are assigned to spare punchings on terminal strip A, are similarly strapped together, and a single jumper run to punching 18 on terminal strip E.

3.25 The individual S0 through S9 punchings of the SC relays at the B terminal strip on the earlier-type frames and at the S terminal strips of the later-type frames require no cross-connections at the number group frame because these terminal strips are cabled directly to the vertical side of the distributing frame. When more than 14 SC relays on earlier-type frames or more than 40 SC relays are required on later-type frames, or when block select SC relays are required, the S0 through S9 leads are cabled directly from the SC relay springs to the distributing frame. The cross-connections for these leads are covered in the description of sleeve cross-connections at the distributing frame.

Overflow Registration Required

3.26 Overflow registration can be made on any hunting arrangement by cross-connecting the A punching of the SC relay in the last tens block in the hunting group, or in the case of block select hunting, by cross-connecting the AT punching of the last tens block in the hunting group to the winding of a POF relay instead of to an EG punching in order to inform the marker that overflow registration is required if all numbers of a hunting group are busy. Fig. 22, 23, 24, and 25 illustrate the cross-connections to be made for various arrangements. When the marker finds all the lines of the terminal hunting group busy, it causes the operation of a traffic register through the contact of the operated POF relay. When an overflow registration is desired on an IN-Wats hunting arrangement, the OF lead is extended through contacts of the POF relay and cross-connected to the auxiliary line circuit. If the marker finds all lines busy, the traffic register associated with the auxiliary line circuit operates. On the earlier-type frames, punchings 40 and 41 on terminal strip E and on the later-type frames, punchings AF0 and AF1 on terminal strip H connect, respectively, to the windings of the POF0 and POF1 relays.

One Hunting Group in TB Relay and Numbers in More Than One TB Relay

3.27 Each line of the terminal hunting group will have its G, F, and L punchings cross-connected as covered in paragraph 3.02.

3.28 Each tens block TB relay which includes numbers of the hunting group has an SC relay associated with it. Each of these is cross-connected at the miscellaneous terminal strip as covered in paragraph 3.24 to connect the TB and SC relay windings in parallel and to connect the SC relay winding to ground if on a later-type frame.

3.29 In order to advance from one tens block to another, A relays are cross-connected to SC relays as follows. The A punching of the SC relay associated with the TB relay which includes the listed directory number is cross-connected to the A punching of an A relay on the earlier-type frames or to the AD punching on the later-type frames. Assume that SC00 and A0 relays are being used. On the earlier-type frames, punching 00 which is the A punching for the SC00 relay and punching 20 which is the A punching for the A0 relay are located on terminal strip E and should be cross-connected. On the later-type frames, punching A00 on terminal strip H should be cross-connected to punching AD00 on terminal strip G. On the earlier-type frame, the TB punching of the A0 relay (punching 30 on terminal strip E) or on the later-type frame, the CA punching of the A0 relay (punching CA00 on terminal strip E) is connected to the winding of the second TB and SC relays in the sequence of numbers in the group. For this condition, assume that the hunting group extends to include 1296 and 1297 and that SC02 relay has been assigned to this tens block. The windings of TB29 and SC2 relays are cross-connected as covered in paragraph 3.24. Punching 29 is cross-connected to punching 102 on terminal strip C and TB punching 30 of the A0 relay on terminal strip E is cross-connected to TB punching 102 of SC02 relay on terminal strip C on the earlier-type frame. TB punching 29 on terminal strip E is cross-connected to TB punching of SC02 relay and punching CA00 on terminal strip C is cross-connected to the TB punching of the SC02 relay on the later-type frame. It should be noted that the next tens block cross-connected to does not necessarily have to be the next in numerical sequence of tens blocks in the hunting group. If the second TB

and SC relay combination is the end of the hunting group, the A punching of the second SC relay is strapped either to the EG punching or to the AF punching of the POF relay if overflow registration is required, as previously covered in paragraphs 3.24 and 3.26. If not the end of a group, the preceding pattern of cross-connections between the SC, A, and a succeeding SC relay is repeated in sequence for as many TB relays as the hunting group is spread over. The A punching of the last SC relay is connected either to the EG punching or A or AF punching of the POF relay as previously covered. Fig. 23 covers the cross-connection used in the preceding example.

3.30 Reference should be made to Fig. 22 and to the description of sleeve cross-connections at the distributing frame for sleeve lead (S0 through S9) connections at the distributing frame.

3.31 The HBA punching of each A relay used is cross-connected to the HB punching of the HB relay which is the hundreds block for the associated tens block that the A relay cuts in. Using the example where 1296 and 1297 are in the succeeding tens block, the A0 relay cuts in succeeding TB29 relay. The hundreds block in which the TB29 relay is located is the HB2 relay. On the earlier-type frame, punching 90 on terminal strip E, which is the HBA punching for the A0 relay, must be cross-connected to punching 82 on terminal strip E of the HB2 relay. On the later-type frame, the HBA00 punching on terminal strip G is cross-connected to the HB2 punching on terminal strip H. Where more than one A relay HBA punching is to be connected to an HB punching, first cross-connect the HBA punchings and then cross-connect to the HB punching. This will limit to two leads on HBA punchings and to one lead on the HB punching. These cross-connections are shown in Fig. 23 and 24.

More Than One Hunting Group in TB Relay and All Numbers in One TB Relay On Later-Type Frames

3.32 On the earlier-type frame, no standard method of cross-connections can be provided, since spare terminals on terminal strips A through E will have to be utilized.

3.33 An auxiliary TBA relay is connected in parallel with each TB relay which contains numbers in more than one hunting group. An SC relay is required for each hunting group in each

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NOTE:

FOR THIS ILLUSTRATION ASSUME THAT SC00 RELAY AND TB27 RELAY ARE ASSIGNED FOR NUMBERS IN FIRST TB RELAY AND SC02 RELAY AND TB29 RELAY ARE ASSIGNED FOR NUMBERS IN SECOND TB RELAY.

- (X) EARLIER TYPE FRAMES
- (Y) LATER TYPE FRAMES

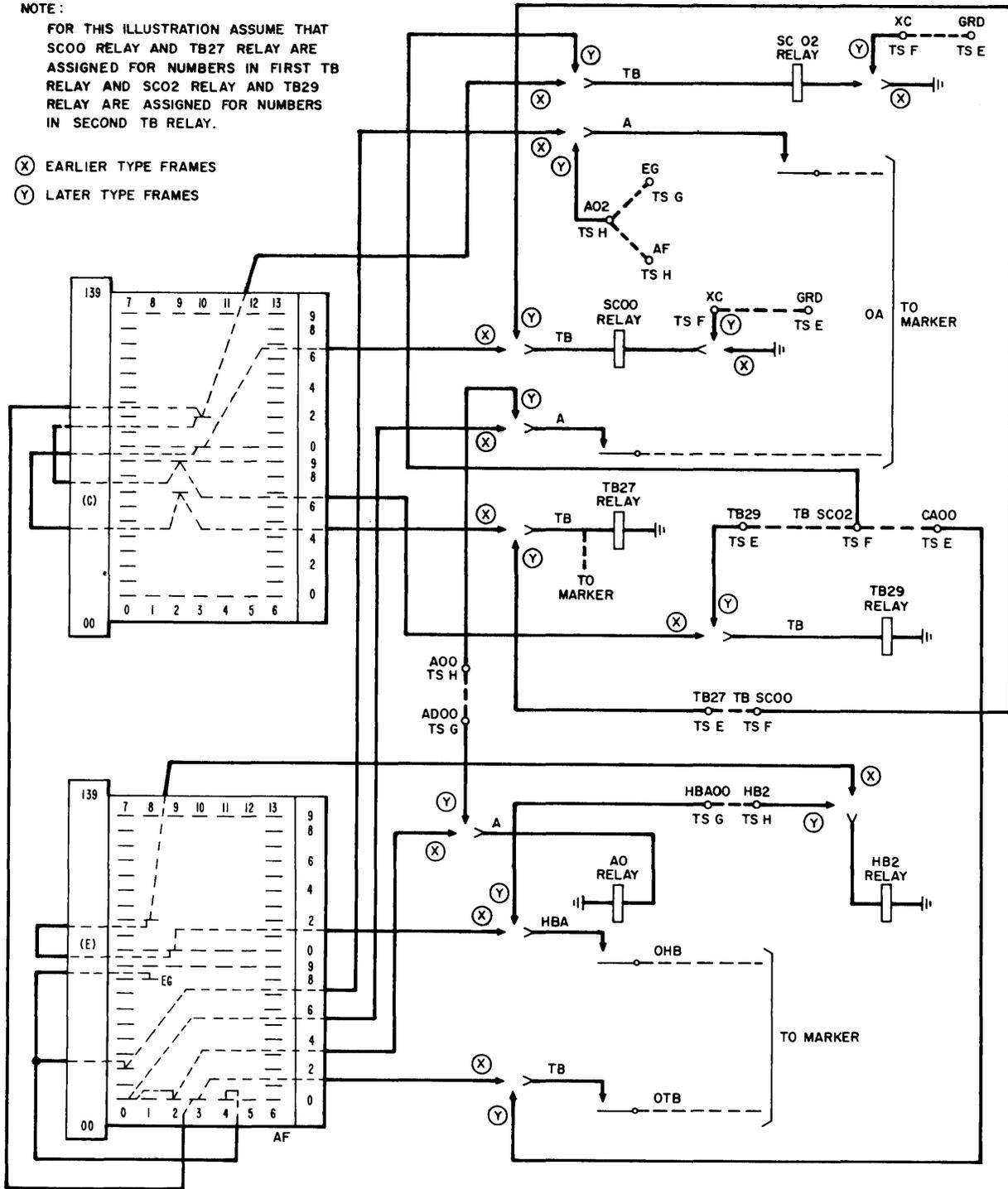


Fig. 23—Typical A, SC, and TB Relay Cross-Connections With Only One Hunting Group in TB Relay and Numbers in More Than One TB Relay

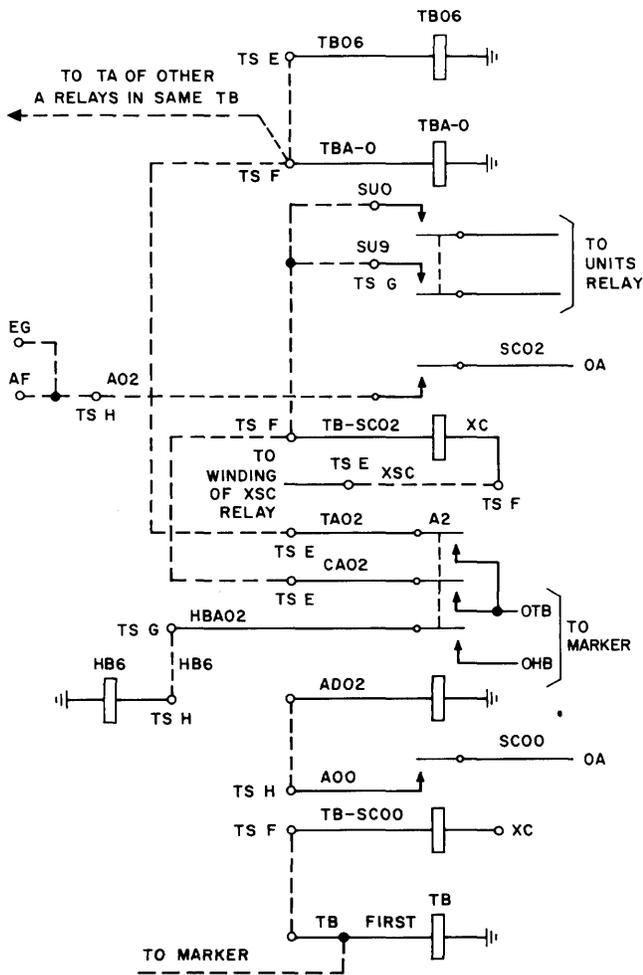


Fig. 24—Typical TBA, SC, TB, and A Relay Cross-Connections With More Than One Hunting Group in TB Relay and Numbers in More Than One TB Relay

TB relay. The \blacklozenge SU \blacklozenge terminal numbers on the TBA relay correspond to the units digit numbers on the associated TB relay. The \blacklozenge SU \blacklozenge terminals corresponding to the line numbers in each individual group are strapped together and then cross-connected to an SC relay. This is illustrated in Fig. 25, where connections are shown for a tens block having two hunting groups with one group assigned to the SC00 relay and the other group to the SC02 relay. TBA0 and TB6 relays are also assigned as illustrated. One group includes lines 0, 1, and 4 and the other group, lines 5, 8, and 9. \blacklozenge SU \blacklozenge punchings 0, 1, and 4 of the TBA0 relay are strapped together and connected to SC00 relay, and \blacklozenge SU \blacklozenge punchings 5, 8, and 9 of the TBA0 relay are strapped together and connected to SC02 relay.

3.34 All tens blocks containing more than one hunting group will have the XC terminals of the SC relays cross-connected to the XSC terminal of the XSC relay instead of the GRD terminal, so that if more than one SC relay operates, the XSC relay will operate causing the marker to bring in the trouble recorder.

3.35 At the distributing frame, the S0, S1, S4, S5, S8, and S9 leads are cross-connected as covered in the description of sleeve cross-connections at the distributing frames and illustrated in Fig. 22. Terminals not in the hunting group are not connected.

More Than One Hunting Group in TB Relay and Numbers in More Than One TB Relay on Later-Type Frames

3.36 For earlier-type frames, refer to paragraph 3.32.

3.37 Fig. 24 illustrates the cross-connections necessary for this arrangement. The assumption is that the hunting lines in the first TB relay are associated with the SC00 relay and the remainder of the hunting lines in the same hunting group are associated with SC02, TBA0, and TB6 relays. Other hunting groups in the same tens block would also use TBA0 and TB6 relays using other SC relays. The A00 punching of the SC00 relay is cross-connected to ADO2 punching of the A2 relay so that if all lines in the first TB relay are busy the marker will operate the A2 relay. The CA02 punching is cross-connected to the TBSC02 punching of the SC02 relay which has lines 0 and 9 of the hunting group associated with it (Refer to paragraph 3.33.) The \blacklozenge SU0 and \blacklozenge SU9 \blacklozenge punchings of the TBA0 relay are strapped together and cross-connected to the TBSC02 punching of the SC02 relay. The TA02 punching of the A2 relay and the TB6 punching of the TB6 relay are cross-connected to the TBA0 punching of the TBA0 relay. The HBA02 punching of the A2 relay is cross-connected to the HB6 punching.

3.38 As the hunting group is contained in two tens blocks in this assumption, the A02 punching of the SC02 relay is wired to an EG punching for end-of-group or AF punching where overflow registration is required.

3.39 For cross-connecting XC punching of the SC02 relay, refer to paragraph 3.34. The S leads of the SC00 relay and the S0 and S9 leads

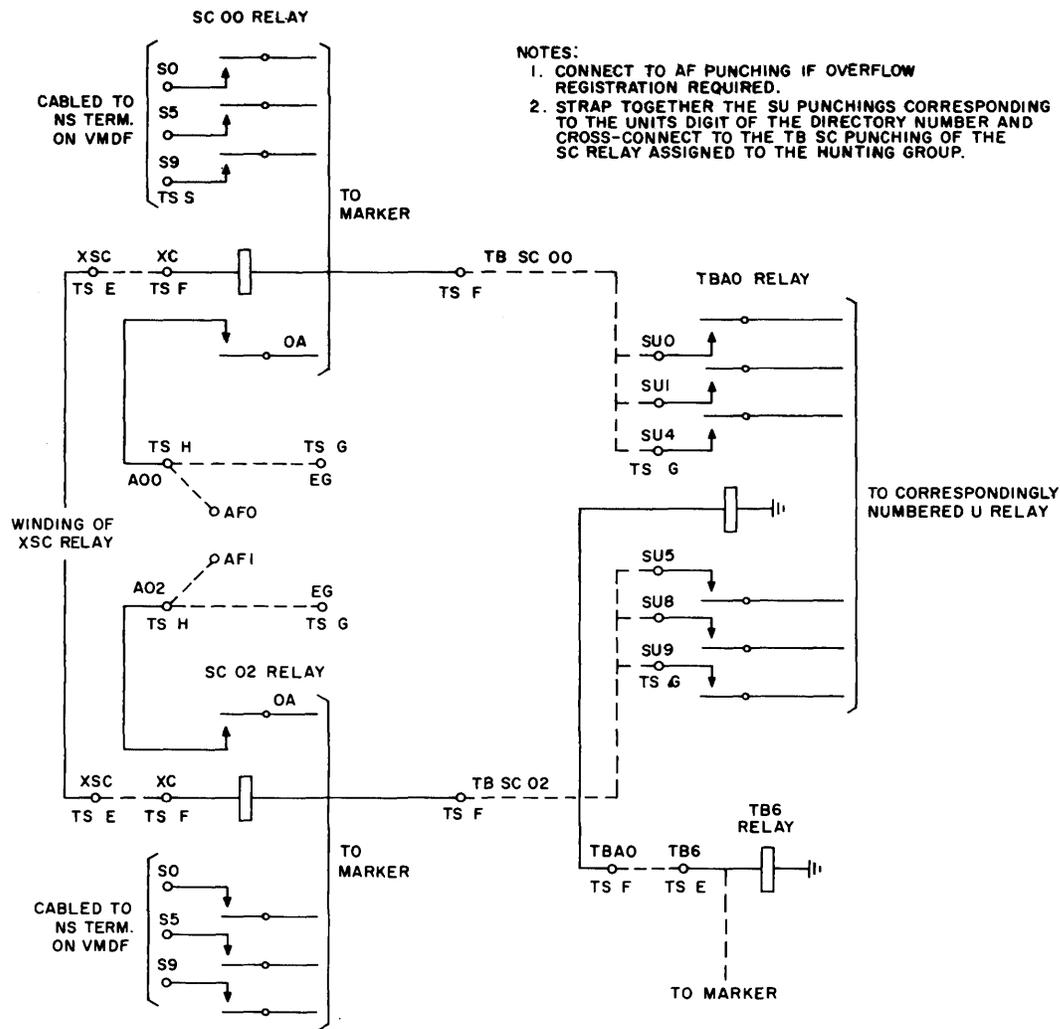


Fig. 25—Typical TBA, SC, and TB Relay Cross-Connections With More Than One Hunting Group in TB Relay and All Numbers in One TB Relay

of the SC02 relay are cross-connected at the distributing frame as covered in the description of the sleeve cross-connections at the distributing frames and illustrated in Fig. 22.

Night Numbers

3.40 Night numbers associated with a PBX hunting group may be handled in several ways as follows:

- (a) Have individual directory listings outside the hunting group and be associated with the same line appearances as numbers within the hunting group.

- (b) Be within the hunting group and cross-connected for RC 10. In this case, an incoming call to any night number in the group will hunt through succeeding numbers if the called line is busy.

- (c) Be within the hunting group and cross-connected for RC 1. In this case, an incoming call to one of the night numbers would not hunt if the called number was busy.

Lines Used for Originating Service Only

3.41 All lines of this type, both individual and group, that are in one tens block are treated

as one hunting group. Each originating service-only line will have its G, F, and L punchings cross-connected as covered in paragraph 3.02. The RF punchings cross-connected to the F punching will be required to give the RC 10 ringing combination. The assigned SC relay is cross-connected to the TB relay serving these lines. These lines may appear in a tens block having one or more hunting groups. In this case, use TBA relay and one SC relay for all lines with originating service only. Also, use one SC relay for each hunting group. The SC relay is assigned so that access to the lines for testing may be obtained but no sleeves will be connected at the distributing frame so that the lines will always test busy on regular terminating calls. The A punching of the SC relay should be connected to the EG punching for all such groups.

Trouble Intercept

3.42 When a number of a terminal hunting group is in trouble, it is made busy in the approved manner. If all numbers of a terminal hunting group are in trouble, all numbers except the listed directory number are made busy. For the directory number, disconnect the cross-connection field jumpers between the G and VHG and the F and RF punchings. The L and LL cross-connection is left in as covered in paragraph 3.02. Also disconnect any night numbers in the hunting group in the same manner as the directory number.

Free Service Numbers

3.43 When free line service is required on a hunting group, it is necessary to inform the marker of this condition. This is accomplished by associating an FN_ relay with the first number of a terminal hunting group. Where it is desired to avoid charging a customer if an intermediate or last number of a group is dialed by the customer, FN_ relays are required to be cross-connected for each number of the hunting group. The cross-connections required are the same as those for a nonhunting number covered in paragraph 3.04.

E. Cross-Connections for Physical and Theoretical Numbers and Blank Hundreds Blocks

3.44 Where lines are in an office which requires restricted service in accordance with the origin of the call, identifying cross-connections on the basis of hundreds blocks are provided to indicate to the marker whether or not a group of 100

numbers are physical, theoretical, extra theoretical, or nondiscriminating numbers. By means of these cross-connections, all lines in a hundreds block are restricted in the same manner. This is accomplished by cross-connecting the PT punching associated with the HB_ relay to the PN (physical), TN (theoretical), EN1 (extra theoretical), or PTN (nondiscriminating) punchings. When all numbers of a hundreds block are unassigned, the PT punching of the associated HB_ relay is cross-connected to the BNK punching.

3.45 Under certain conditions it is desired to place two 1000 series in one number group. The PN1, TN1, EN1, and PTN1 punchings have been added to provide for intercepting calls to the respective number series if the incorrect thousands digit is dialed. If service is restricted in this manner, the PT punching will be cross-connected to a PN1, TN1, EN1, or PTN1 punching.

3.46 To make the cross-connections, cross-connect each PT punching associated with a hundreds block that is part of the physical numbers to a PN or PN1 punching. On the earlier-type frame, these punchings are all on terminal strip E. There are ten PN punchings arranged vertically and are strapped together. The PT punchings are likewise arranged vertically in an adjacent vertical row, and therefore, horizontal sleeved strap wire from the PT to the PN punchings is used. Similar cross-connections are made between PT punchings for theoretical hundreds block numbers and the TN or TN1 punchings and between the PT punchings for extra theoretical hundreds block numbers and the EN or EN1 punchings. Those PT punchings associated with hundreds blocks that do not require discrimination are connected to the PTN or PTN1 punchings. In offices where no segregation is required, strap all PT punchings horizontally to PN punchings. Cross-connect each PT punching associated with a hundreds block in which all numbers are unassigned to a BNK punching. The ten BNK punchings are strapped together and are arranged vertically in the same vertical row with the PT punchings. On the later-type frame, the PT punching is cross-connected as required to one of the PT, PTN, TN, or BNK punchings on the F terminal strip.

3.47 One limitation occurs in connection with assignments of terminal hunting numbers. A hunting group which is spread over several TB relays must be in hundreds blocks which give the same number indication of physical, theoretical,

extra theoretical, or nondiscriminating. This is done so that if a number of an intermediate line is dialed, the same group signal is given as supplied by the first line of the group.

3.48 Trunks may be assigned to any hundreds block as this limitation does not apply.

F. Sleeve Cross-Connections at Distributing Frames

3.49 Each terminal hunting number group and any number on which busy is exchanged with No. 5 crossbar equipment requires cross-connections at the distributing frame to connect from the LS punchings on the horizontal side to the NS (S0 through S9) punchings. This connects the sleeves of line equipment locations to the SC₁ relay contacts at the number group frame so that the marker can check for an idle number in a tens block.

3.50 Each terminal hunting group using block select hunting requires special cross-connections for the lines located in the second, intermediate, and last tens block. When the tens block busy test unit is used, the NS and LS punchings of these lines are cross-connected to the HS punchings of the busy test unit, thus connecting the sleeves of the line equipment locations to the windings of the BB relays of the busy test unit as shown in Fig. 16. When auxiliary line circuits are used, the BS and TBT punchings of the auxiliary line circuits and the TBT punchings of the block select unit are cross-connected as shown in Fig. 16. When all the lines of a hunting group in a tens block test busy, except the lines in the first tens block which are hunted over as in block hunting, the marker proceeds directly to a tens block in which an idle line appears, thereby reducing marker holding time.

3.51 From the assignment information, locate at the distributing frame, the sleeve of the line equipment location. If the line is arranged for 2-party message rate (using a message register), but is being used as a single line or PBX line, locate the tip party sleeve which is used for cross-connection to the NS punching on the vertical

side. For example, on the horizontal side, locate the block which has the sleeves for the line link frame such as LL00. Next, locate on this block the vertical group, such as VG03 and the vertical file such as VF0. If the sleeve for HG7 is the one required, this is the third punching in from the front in the row stamped 5 at the front of the block. If the line is 2-party message rate using message registers, the tip party sleeve for HG7 is the third punching in from the front in the left row stamped 5 at the front of the block. See Fig. 18 for the layout of these punchings. This punching is cross-connected by means of a jumper to the number group block on the vertical side.

Note: The line link frame (LL) numbering agrees with and is the same as the line link frame (FR) numbers specified on the assignment sheets or service orders.

3.52 Determine from office records the number group frame terminal strip on the vertical side of the distributing frame associated with the assigned telephone number. Assume the numbers of the hunting group are 7-2126 through 7-2128. To locate the required sleeve punching on this strip, information as to which SC₁ relay is assigned to the tens block TB12 relay is required. Assume SC00 was assigned. The ten sleeve punchings, S0 through S9, associated with this relay are then located. These are the ten vertical punchings in the first row at the top of the block stamped 00. See Fig. 17 for layout of these punchings. Assume the vertical unit used in paragraph 3.50 is to be used with 7-2126. Since the units digit in this number is 6, the sleeve punching of SC00 relay used with this number is S6 or the 006 punching on this block. The jumper from the horizontal side is cross-connected to this punching. In like manner, 7-2127 and 7-2128 in this hunting group would be associated with punchings of the SC00 relay which agree in the unit number, S7 and S8, and they in turn would be cross-connected to sleeve punchings on the horizontal side of their respective assigned line link equipment locations. The units digit number always agrees with the SC₁ relay S₁ lead number.