

**LIMITING RESISTANCE OF LEADS
BETWEEN FRAMES AND UNITS
EQUIPMENT DESIGN REQUIREMENTS
NO. 1 CROSSBAR SYSTEM**

1. GENERAL

SCOPE

1.01 This specification covers the maximum allowable resistance for certain leads between No. 1 crossbar frames and units.

1.02 This section is reissued:

- (a) To add maximum resistance values for specific leads in a number of switchboard cable runs.

DESCRIPTION

1.03 The No. 1 Crossbar System employs equipment of the common control type which may involve long multiples of leads resulting in appreciable resistance of the cable paths. In order to assure adequate operating margins, it is necessary to limit the conductor resistance of certain leads between frames and units. The maximum resistance values which may be allowed for these leads are shown in Table A in 4.05.

2. SUPPLEMENTARY INFORMATION

Floor Plan Data Sheets—Section 9

3. DRAWINGS

Keysheet

SD-25000-01—Crossbar System No. 1

4. MAXIMUM RESISTANCE OF LEADS

4.01 When adding new cables or changing existing cables in an office, conductor resistance should be kept within the limitations shown in Table A. Therefore, on orders that call for the addition of frames and units, an effort should be made to keep cable runs short enough so that

conductor resistance will not become excessive. For this reason, care should be taken in planning the location of frames, units, cable racks, and cable wells. However, on some jobs unusually long cable runs might be unavoidable. In such cases if the selection and use of standard switchboard cables would result in excessive conductor resistance, action should be taken to reduce resistance to the levels specified in Table A by using one or both of the methods outlined in 4.02. Where conductor resistance cannot be sufficiently reduced to meet the limitations shown, the problem should be referred to Bell Telephone Laboratories, Incorporated for recommendations.

4.02 When it is necessary to reduce conductor resistance, the following methods may be utilized:

- (a) A heavier gauge of wire may be used in one or more of the cables comprising the cable run. Where comparatively few leads out of the total number are critical, it may be preferable to use the heavier wire only for the critical leads.
- (b) When a number of frames are multiplied together without slip multiples being used (ie, when the multiple does not go through circuit components such as relay contacts), the multiple may be split and separate leads may be run from the common point.

It should be kept in mind that the use of the above procedures results in nonstandard arrangements which are not desirable from an overall standpoint and should be used only when normal procedures will not suffice.

4.03 In the case of conductors connecting to crosspoints of crossbar switches or to multicontact relays which have thin terminals, wire heavier than 22 gauge should not be used.

Twenty-gauge or heavier wire may be connected to equipment having heavier terminals such as terminal strips. When using a larger size of wire, the individual frames should be analyzed to determine whether sufficient cable space is available.

4.04 When it is necessary to compute the resistance of leads, the entire length of each switchboard cable including strippers must be considered. However, the length of unit surface wiring, intraframe local cables, and local cables between adjacent frames may be disregarded. The following resistance values shall be used in calculating conductor resistance:

GAUGE OF WIRE	RES. PER 100 FT (OHMS)
24	2.86
22	1.78
20	1.08
19	0.85
16	0.45

4.05 Table A covers the maximum resistance which may be allowed for various leads. Some of the leads are shown in runs involving a single cable between two frames. Other leads are shown in runs involving a number of cables between three or more frames. The number of cables in a run depends on the requirements of circuit functions with which the leads are associated. Maximum lengths are shown for leads when the entire run is made up of 24-gauge wire. If more than one gauge of wire is used in a run, then each gauge must be considered when calculating overall resistance.

TABLE A

ITEM	CABLE			MAX RES IN OHMS	MAX LENGTH IN FEET (FOR 24 GA)	FOR LEADS
	FROM	THROUGH	TO			
RUNS FROM LINK FRAMES (ORIGINATING)						
1	LL	DJGF	DJ or ADJ	10.0	350	S
1A	MDF (SUB)	LL,DJGF	DJ or ADJ	27.2	952	T,R
1B	MR	LDF,LL, DJGF, DJ, or ADJ	RC	22.9	800	(M1,MR)*, (M2,MR)* (See 6.04)
2	DJ or ADJ	DL, OJGF, OL	OE	4.3	150	S, BAT. (See 4.04)
2A	DJ or ADJ	DL, OJGF, OL, OE	MDF (TRK)	13.7	480	T,R (See 6.03)
2B	OL or OE		MDF (TRK)	10.0	350	S,S1 (See 6.03)
2C	OL		OE	2.9	100	ALL
3	SSL or ASSL	SSL & ASSL MULT	S	11.4	400	S,SL,DC
				36.6	1280	FT,FR
				45.8	1600	GS,RL,ON,F0-F9,F00, F10,T,R

TABLE A (Cont)

ITEM	CABLE			MAX RES IN OHMS	MAX LENGTH IN FEET (FOR 24 GA)	FOR LEADS
	FROM	THROUGH	TO			
3A	OM	DL MULT, DJ, or ADJ SSL & ASSL MULT	S	45.8	1600	(TR,TRL)* (See 4.04)
3B	LL	DJGF, SSL & ASSL MULT	S	57.0	1990	CS-,VF-,SW-,CU-,CT-, CH-
3C	RDC	DJ or ADJ, SSL & ASSL MULT	S	45.8	1600	(LR,HD)*
4	OL	MDF (TRK)	DSA SWBD	17.2	600	ALL
5	OL		INC TRK TST CONN	2.9	100	ALL
6	LL		NO TEST CONN	4.3	150	ALL
RUNS FROM LINK FRAMES (TERMINATING)						
10	LL	LJGF,IE, IL	IT	7.2	252	S
10A	MDF (SUB)	LL,LJGF, IE,IL,IT	MDF (TRK)	45.6	1595	T,R
10B	IE		IL	2.9	100	B-
				9.6	336	RT or LB,RB or LT
11	TSL or ATSL	TSL & ATSL MULT, TS MULT	TS	11.4	400	S,SL,F0-F9
				37.0	1295	AO,OB,OC,GS,TR,RL, EF,F00,F10,NS0,NS1
11A	IT	TSL & ATSL MULT	TS	26.0	910	T,R,D
				37.0	1295	CO
11B	IT	TSL & ATSL MULT,TS, TMC MULT	TM	26.0	910	FC

TABLE A (Cont)

ITEM	CABLE			MAX RES IN OHMS	MAX LENGTH IN FEET (FOR 24 GA)	FOR LEADS
	FROM	THROUGH	TO			
RUNS FROM ORIGINATING MARKER						
15	OM	OMC MULT	S	24.0	840	ODN
				100.0	3500	ALL REMAINING LEADS EXCEPT LEADS DC & AID
15A	DL	DL MULT, OM,OMC MULT,S, SSL & ASSL MULT	DJ or ADJ	34.0	1190	(DK,DC)* (See 4.04)
16	OM	DL MULT	DL	11.4	400	AK,SL,LS-,S-
				25.5	890	JC-,DK,CB
				40.0	1400	MR,MR1,ST,PC,B, SSA,SSB,ZK
				81.0	2830	REMAINING LEADS EXCEPT LEADS IN ITEMS 16A-16C
16A	OM	DL MULT, DJ or ADJ, SSL & ASSL MULT	S	45.8	1600	(TR,TRL)* (See 4.04)
16B	OM	DL MULT	DJ or ADJ	10.5	365	(FC,AK)*
16C	DJ or ADJ	SSL & ASSL MULT,S, OMC MULT, OM,DL MULT	DL	34.0	1190	(DK,DC)*
17	OM	OL MULT	OL	7.4	258	S-,S1-,LS-
				24.8	865	REMAINING LEADS

TABLE A (Cont)

ITEM	CABLE			MAX RES IN OHMS	MAX LENGTH IN FEET (FOR 24 GA)	FOR LEADS
	FROM	THROUGH	TO			
RUNS FROM TERMINATING MARKER						
20	TM	TMC MULT	TS	30.0	1050	CK-,F-,F10,U-,T-,H-, TH-,OAB,RO,RL,TRL
20A	TM	TMC MULT	TMC	30.0	1050	DB,CKG,TM,TR2
20B	TMC		TS	30.0	1050	MB-,SPL,ST,HLD
20C	TM APPLQ	TMC MULT	TS	30.0	1050	NS-
20D	TM	TMC MULT, TS, TSL & ATSL MULT	IT	26.0	910	FC
21	TM	IL MULT	IL	8.6	300	AK,B,SL,0L-9L,0R-9R
				29.0	1010	REMAINING LEADS EXCEPT LEADS IN ITEM 21A
21A	TM	IL MULT	IT	35.0	1220	RC,RV,RP,TC
22	TM	LCC MULT	LJC	15.2	532	JA-,JB-
				21.1	738	(CC-,CR-)*,(CC-,CE-)*
				27.2	950	CN
22A	TM		LCC	15.2	532	CK
				27.2	950	TMB,ST
22B	TM	LCC MULT, LJC	LL	11.4	400	LL-,LJ-,(EH-,HM-)*, (OH-,HM-)*, (TK,BK)*, NT, (AK,CK)*
22C	TM	LCC MULT	LL	27.2	950	LR-,LE-,LO-, (HG-,H-)*, SM-
22D	TM	LCC MULT, LJC,TR	TR CAB	27.2	950	PC,PL,OF
22E	LJC		LL	14.4	504	PL
23	TM	NGC MULT, BR MULT, LDF	LL	20.0	700	(NS-,S-)* (See 6.02)
23A	LDF		RR	5.0	175	ANS, ALS

TABLE A (Cont)

ITEM	CABLE			MAX RES IN OHMS	MAX LENGTH IN FEET (FOR 24 GA)	FOR LEADS
	FROM	THROUGH	TO			
23B	TM	NGC MULT	BR	27.0	945	TB- (See 6.02)
				36.0	1260	HB-,NF-,NC-,HG-,TF-, RF-,HF-,JC-,JF-,OFT, CN,PN,PTN,TN,OPR, CLI,XG
23C	TM	NGC MULT	NGC	27.0	945	ST-
				36.0	1260	CK,TMB-
23D	TM	NGC MULT	TR	36.0	1260	SOF
23E	TM	NGC MULT, TRRR	TR CAB	48.0	1680	MR,NP
24	TM		RR	2.9	100	
25	TM		135~ SUP	17.2	600	
RUNS FROM SENDERS						
29	S					(See items 3.3A-3C.15, 15A,16A,16C,36,41A, 63)
30	TS					(See items 11,11A,11B, 20,20B-20D,38)
RUNS FROM CONNECTOR FRAMES						
31	NGC					(See items 23,23B-23E, 55,55A)
32	LJC					(See items 22,22B,22D, 22E)
33	LCC					(See items 22,22A-22D)
34	OMC					(See items 15,15A)
35	TMC					(See items 20,20A- 20D)
RUNS FROM SENDER SELECTOR UNITS						
36	S SEL		S	45.8	1600	AS,BS,SB,SC
37	S SEL		SSL	6.0	210	OH,GH
				15.0	525	REMAINING LEADS

TABLE A (Cont)

ITEM	CABLE			MAX RES IN OHMS	MAX LENGTH IN FEET (FOR 24 GA)	FOR LEADS
	FROM	THROUGH	TO			
38	TS SEL		TS	13.0	455	SC
				30.0	1050	SB,BS
RUNS TO EMERGENCY CONTROLLERS						
40	LL		MATE FR or EM CONT	4.9	170	ALL
41	SSL	SSL MULT	MATE FR or EM CONT	10.0	350	EL,A,B
				12.0	420	SL,PA,CA,CB,SEL,A-,SH-,OC-,RES
				30.0	1050	REMAINING LEADS
41A	S	SSL MULT	MATE FR or EM CONT	45.8	1600	GS
42	TSL		MATE FR or EM CONT	2.9	100	ALL
RUNS ASSOCIATED WITH KEYPULSING EQUIPMENT (See 5.01)						
44	DJ		KSL	4.3	150	ALL
45	IT		KSL	4.3	150	ALL
46	KS	KSL MULT	KSL	5.7	200	ALL
47	KS	OMC MULT	OM	5.7	200	ALL
48	OGT		KSL	4.3	150	ALL
49	MDF		RR	5.7	200	ALL
50	FUSE BAY		KS	—		(MAX 125 FEET of 20-GAUGE WIRE)
51	DSA		RR or MISC FR	17.2	600	ALL
52	KS		KS SEL	3.7	130	ALL
RUNS FROM TEST AND OTHER MAINTENANCE FRAMES						
54	TTI	TMC MULT	TM	30.0	1050	(CNG,CN)* (FRG,FR)*, (SNG,SN)*

TABLE A (Cont)

ITEM	CABLE			MAX RES IN OHMS	MAX LENGTH IN FEET (FOR 24 GA)	FOR LEADS
	FROM	THROUGH	TO			
55	TTI	NGC MULT	TM	36.0	1260	NGC
55A	TTI		NGC	15.0	525	NGF
56	TTI		LCC	15.0	525	LCF
57	CTI		SSL or ASSL	15.0	525	C,CIA,DL,RA,TIS, SLF,CTI,TI,EM,TIB
57A	CTI	SSL & ASSL MULT	SSL or ASSL	15.0	525	RM,TIA
				57.0	1990	REMAINING LEADS
58	CTI	S SEL MULT	S SEL	15.0	525	TIB,SGP
				57.0	1990	S0-S9
59	CTI		LL	15.0	525	LL.AL
60	DJT		SSL	11.4	400	D-G-,RL,TRL,ST,BT
61	OTI		OM	40.0	1400	ALL
62	OTI	DL MULT	DL	11.4	400	DF
				15.0	525	LC0-11,M0-9
63	OST		S	50.0	1750	ALL
64	OST		S SEL	15.0	525	CG
				50.0	1750	REMAINING LEADS
65	LIT		LL	12.0	420	VS-
66	SMB		LL	15.0	525	TR.AL,TL
RUNS FROM MISCELLANEOUS FRAMES						
69	IT		TR	4.0	140	ALL
70	IT		NO TEST CONN	3.4	120	ALL
71	IT		TOLL RR ("BT" GRD BAR)	0.5	—	(180 FT 14 GA)
72	INT CHK CKT		DJ or ADJ	5.7	200	ALL
73	NO. CHKG SDR		FUSE BAY	4.3		ALL
74	INC TRK TST CONN		MDF	17.2	600	ALL

TABLE A (Cont)

ITEM	CABLE			MAX RES IN OHMS	MAX LENGTH IN FEET (FOR 24 GA)	FOR LEADS
	FROM	THROUGH	TO			
75	TR	MDF	LDF	11.4	400	ALL
RUNS INVOLVING COIN CONTROL AND ZONE REGISTRATION CIRCUITS						
79	DJ	CSL MULT	C SR UNIT	23.2	810	T,R,FT,FR
				53.0	1850	S
				100.0	3500	REMAINING LEADS
80	DJ		RC	14.5	505	ST
				48.6	1700	HM,DH,HD,BC
						MR (See item 86)
81	DL		RDC	4.3	150	ALL
82	RC		RDC	2.0	70	ALL
83	RC		RT UNIT	2.0	70	ALL
84	RDC		RT UNIT	2.0	70	ALL
85	RT UNIT		REG TEST	5.7	200	ALL
86	RC	DJ or ADJ, DJGF,LL, LDF	MR	22.9	800	(M1,MR)*, (M2,MR)* (See 6.04)
RUNS AMONG AMA FRAMES						
89	LL		DG CONN	7.1	250	ALL
90	DG CONN		SDR SGRP CONN	7.1	250	ALL
91	LL	DG CONN	SDR SGRP CONN	11.4	400	ALL
92	SSL		SDR SGRP CONN	8.6	300	ALL
93	CLR		SDR SGRP CONN	2.1	75	ALL
94	CLR		S	8.6	300	ALL
95	CLR		OST	6.4	225	ALL

TABLE A (Cont)

ITEM	CABLE			MAX RES IN OHMS	MAX LENGTH IN FEET (FOR 24 GA)	FOR LEADS
	FROM	THROUGH	TO			
96	CLR		TVC	2.1	75	(See PERF MAG LEAD REG)
97	TVC		TV	2.1	75	
98	TVC		S	8.6	300	
99	TV		OST	6.4	225	ALL
100	M TMG		RCD	4.6	160	RL,RNT
101	M TMG	RCD	PERF CAB	8.6	300	PA MAGNET LEAD
102	MTCE RCD		PERF CAB	8.6	300	PA MAGNET LEAD
103	PERF CAB	RCD	TV	8.6	300	PA MAGNET LEAD
104	PERF CAB	RCD,TVC	CLR or S	25.7	900	PERF MAGNET LEAD
105	DJ	DIST IDENT	RCD	17.2	600	RC
106	RCD		DIST IDENT			BT ↑
106A	DIST IDENT		DJ			DJ ↑
106B	DJ		DIST IDENT			CH ↑
106C	DIST IDENT		RCD			GRD ↓
* An asterisk indicates a lead with two designations. One designation or the other is used as the lead passes through one frame to another.						

5. DC KEYPULSING REQUIREMENTS

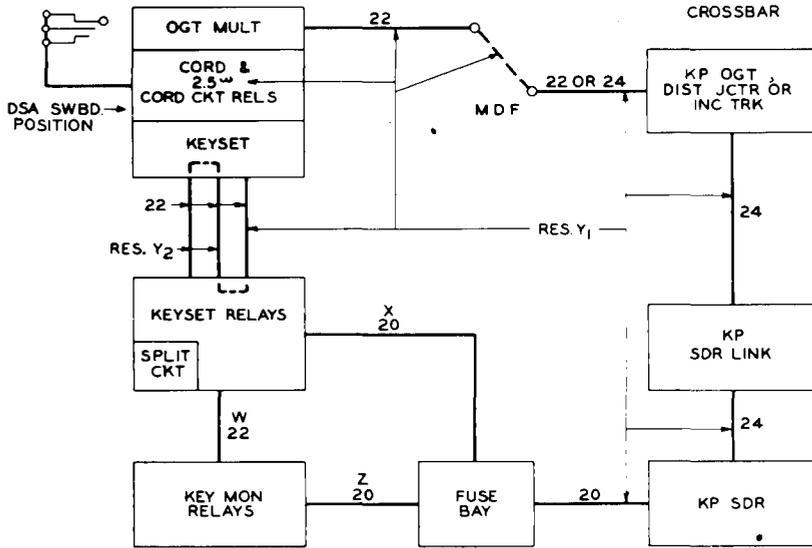
5.01 Keypulsing senders are required in crossbar offices to receive dc keypulsing signals from DSA switchboards equipped to send out such signals. The dc keypulsing circuit operation involves various combinations of high- and low-resistance 48-volt battery and ground applied at the keyset in the switchboard to the tip and ring lead into the sender and into the key monitoring circuit. In the sender and key monitor, each of the tip and ring leads is connected through a sensitive, polarized, and marginal relay in series to 24-volt battery. Therefore, definite resistance limits for the conductors connecting the keyset and the sender must be observed to insure satisfactory circuit operation.

5.02 Recent improvements have been made in dc keypulsing equipment to extend the operating margins and to improve the reliability. These improvements involve the position keyset equipment, the key monitor, the keypulsing senders, and the sender test frame and are covered in detail in 5.09 to 5.12.

Limiting Factors Involved in Keypulsing

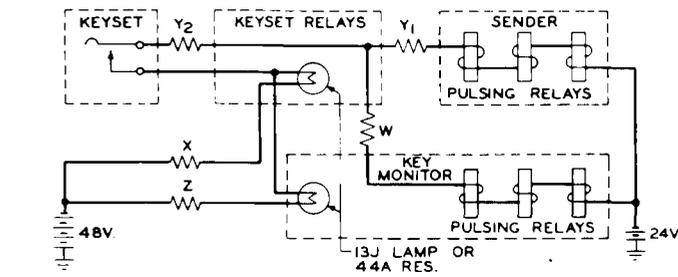
5.03 Figures 1, 2, and 3 show the cabling schematic, resistance network, and capability curves for the worst dc keypulsing circuit condition, ie, application of low-resistance battery by the keyset to the tip or ring leads into the sender. In setting up the maximum conductor resistance

requirements for satisfactory dc keypulsing, several assumptions must be made. These assumptions include values of relay resistances, relay adjustments, battery voltage, and length of key closure. In order to arrive at a satisfactory standard for maximum allowable conductor resistances, values were assumed for all variables except resistances Y1 and Y2 in Fig. 3, as these resistances vary most widely from office to office, and the curves in Fig. 3, calculated for three combinations of the improvements. The conditions for which these curves were figured are listed under the diagram in Fig. 3 and include nominal values for resistances W, X, and Z of Fig. 2, a minimum 0.050-second key closure, extreme adverse relay resistances and adjustments, 22-volt difference between the 24- and 48-volt battery, and key monitor attached. Although the probability of having extreme adverse relay resistances and adjustments is small, key closures shorter than 0.050 second may be experienced. Therefore, the curves in Fig. 3 are a fair criterion of satisfactory circuit operation. Curve 1 outlines the values of resistances Y1 and Y2, when none of the associated equipment has the improvements outlined in 5.09 to 5.12. Curve 2 outlines the maximum values of resistances Y1 and Y2 for satisfactory circuit operation when improvements have been made in the keyset equipment and key monitor equipment as covered in 5.09 and 5.10. Curve 3 outlines the maximum allowable resistance values of Y1 and Y2 when the improvements outlined in 5.09 to 5.12 have been applied to all associated equipment.



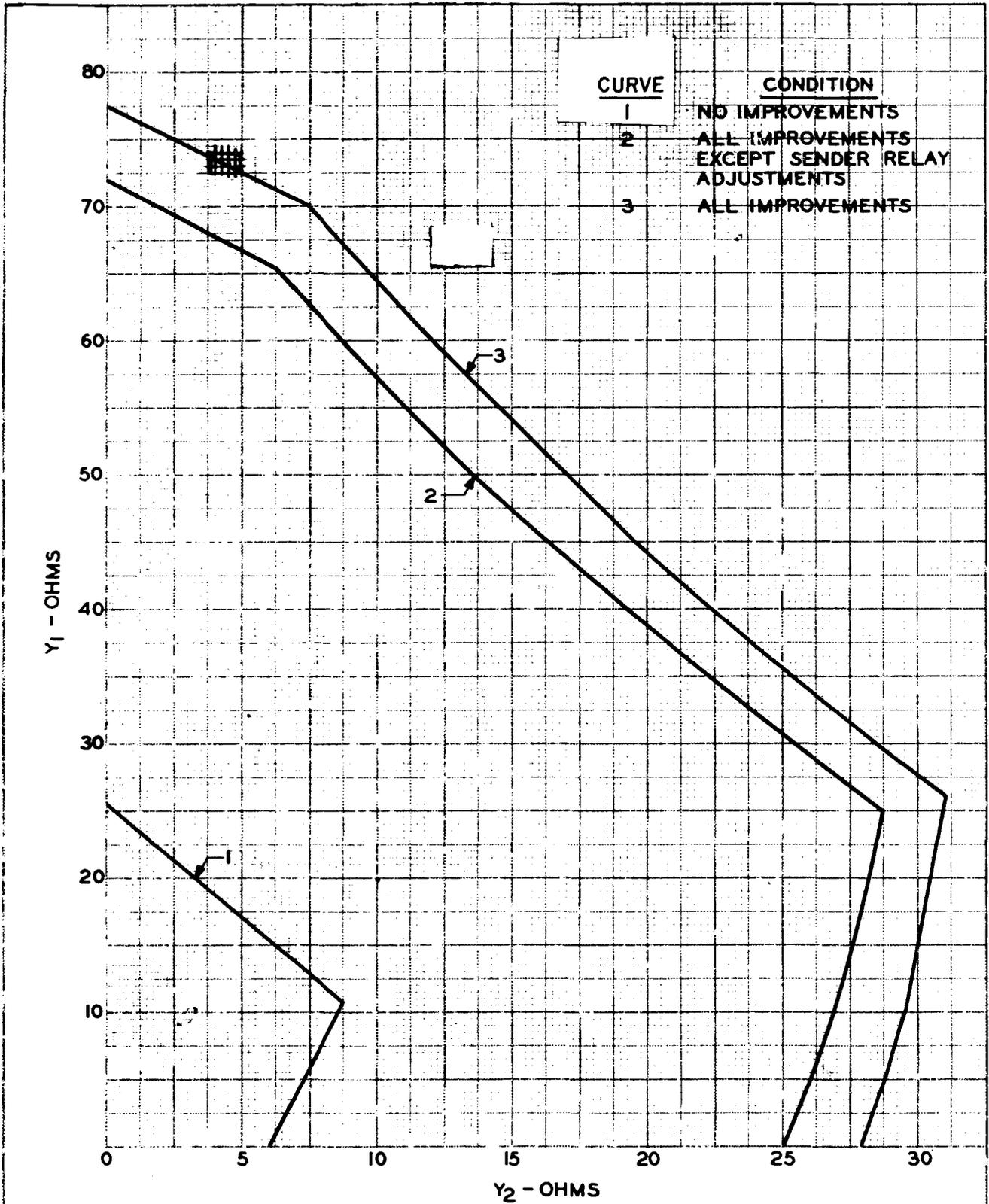
- NOTES:
 1. THE RES. Y₁ AND Y₂ CONSIST OF THE OHMAGES OF THE INDICATED RUNS IN SERIES (FOR USE IN FIG. 2)
 2. NUMERALS INDICATE GAUGES OF WIRE.

Fig. 1—Cabling Schematic



- NOTES:
 1. Y₁ AND Y₂ RES. ARE THE COORDINATES IN FIG. 3

Fig. 2—Resistance Network



IF THE VALUES OF Y_1 AND Y_2 FROM FIG.2 ARE TO THE LEFT OF AND BELOW THE CURVE, SATISFACTORY OPERATION IS REALIZED WITH (1) KEY MONITOR ATTACHED, (2) A DIFFERENCE OF 22V. BETWEEN THE 48V. AND 24V. BATTERIES, (3) A MINIMUM KEY CLOSURE OF .050 SECONDS, (4) MAXIMUM VALUES OF $X=2.23$ OHMS, $Z=1.57$ OHMS AND $W=3.3$ OHMS, AND (5) EXTREME ADVERSE RELAY RESISTANCES AND ADJUSTMENTS.

Fig. 3—Capability Curve

New Installations

5.04 For new crossbar offices, any value of resistances Y1 and Y2 below and to the left of curve 3 will give satisfactory circuit operation. This curve applies as all new equipment will have the improvements outlined in 5.09 to 5.12.

Existing Installations

5.05 It is probable that the lead resistances of some existing crossbar installations may exceed the values of curve 1 in Fig. 3. When this condition occurs, the existing equipment should not be modified unless the Telephone Company feels that the resultant improvement in service justifies the expense of modification. It should be recognized that if Y1 and Y2 lie outside of the capability curve of Fig. 3, it does not indicate complete circuit failure but only that the probability of incorrect registration is increased.

Additions

5.06 *New Positions Only:* If new positions only are added and the value of Y1 and Y2 for the addition falls below and to the left of curve 2 in Fig. 3, the new positions will operate satisfactorily with the sender relays adjusted for the old keyset equipment in the existing switchboard. The key monitor should be modified as outlined below. If the value of Y1 and Y2 falls between curve 2 and curve 3, it may be desirable to modify existing positions and sender test frame and to readjust the sender relays to provide increased operating margin if the Telephone Company agrees.

5.07 *New Senders Only:* If senders only are to be added and the value of Y1 and Y2 falls below and to the left of curve 1 in Fig. 3, the TM and RM relays in the added senders should be adjusted to work with the older keyset equipment and no other changes need be made. However, if the point determined by Y1 and Y2 falls outside of curve 1, but inside curve 2, it may be desirable to modify the existing keyset equipment and modify the key monitor in order to extend the range of the keypulsing equipment. By readjusting the TM and RM relays in all senders and modifying the sender test frame, the full range as indicated by curve 3 could be realized at only a slightly additional cost over the change required to bring the keypulsing range up to curve 2. If modification is indicated by a comparison with the capability curve 1, that

is if the value of Y1 and Y2 fall to the left of curve 1, the Telephone Company should be consulted for their decision on whether the improved operation justifies the additional expense. As pointed out above, when the value of Y1 and Y2 lies outside of any of the three capability curves it does not indicate circuit failure but only that the probability of incorrect registration is increased.

5.08 *New Positions and New Senders:* When both positions and senders are added to an existing office, the key monitor should be modified as covered in 5.10. It will not be necessary to modify existing positions unless the values of Y1 and Y2 for the cable runs between the old positions and the added senders lie outside of curve 1 and the Telephone Company agrees that the improved operation justifies the expense of modification. If the existing positions are modified, the TM and RM relays in the sender shall be readjusted and the sender test frame changed accordingly. Curve 2 in Fig. 3 applies to the pulsing capabilities between the new positions and the old and new senders if the TM and RM relays are not readjusted. Curve 3 applies between all positions and all senders if existing positions are modified, the relays in all senders readjusted, and the sender test frame modified.

5.09 Improvements in Keyset Equipment:

Changes in keyset equipment included substitution of a resistance lamp for the 52.5-ohm Ward-Leonard resistance, removal of one resistance, and a change in value of another resistance. With these changes, the contacts of the 10-button keyset will break a heavier current, thereby affecting the life of the contacts of older keysets having No. 1 contact metal. New keysets having No. 2 contact metal may be installed when these modifications are made, if desired. These changes are covered in detail on the keyset circuits.

5.10 Improvements in the Key Monitor:

Whenever old key monitoring equipment is to be used with keyset equipment having the improvements per 5.09, the key monitor equipment must be modified so that it will operate with the new or changed keyset equipment. This modification consists of the substitution of a resistance lamp for the 52.5-ohm Ward-Leonard resistance, removal of one resistance, change in value of one resistance, addition of two resistances, and the addition of two condenser-resistance networks. The adjustment of the register relays must also be changed. These

modifications improve the operation of the key monitor with older keyset equipment not having the improvements covered in 5.09. Detailed information on this change is covered on the key monitor circuit.

5.11 *Improvements in the Key pulsing Senders:*

The changes in the sender corresponding to modifications in the keyset circuit consist only of readjustment of the TM and RM relays. When the sender must work with both old and new keyset equipment, the relays should be adjusted to work with the older positions. When all of the positions have the improvements covered in 5.09, the sender relays shall be adjusted accordingly. The Circuit Requirement Table on the sender circuit shows these optional adjustments for the TM and RM relays.

5.12 *Improvements in the Sender Test Frame:*

As the sender test frame is provided with a feature to check the operation of the TM and RM relays in the sender, it must be equipped to test the sender according to the relay adjustment used. The extent of the change in the test frame will vary depending on the issue of the circuit installed. The maximum modification will consist of replacing a key and two resistances, adding two resistances, and minor wiring changes.

6. GENERAL NOTES

6.01 This specification does not supersede any working limits covered on the circuit drawings.

Bell Telephone Laboratories, Incorporated

Dept. 5245

Lead resistance should be checked not only against the limits in this specification but also against circuit requirements.

6.02 When calculating the resistance of the cable run from the terminating marker through the number group connector, block relay, and line distributing frames to line link frames, it should be kept in mind that leads NS-, TB-, NF-, NC- and CN may be multiplied to two or more block relay frames serving the same number group. In this case, the block relay frame multiple must be included in the overall length of the cable run. If it is necessary to reduce conductor resistance in this run, 22-gauge wire may be specified for any of the cables in the overall run except for the cable between the BR frame and the LDF. The latter cable consisting of 24-gauge wire is shipped with the BR frame and preformed with its local cable.

6.03 When trunks are used in common with Panel equipment, the run from the MDF to the office or district selectors shall not exceed 300 feet of 24-gauge cable (8.6 ohms).

6.04 Lengths for the message register leads M1, M2, and MR shall not be less than 200 feet of 24-gauge cable (5.7 ohms).