

196 TYPE RELAYS

1. GENERAL

- 1.01 This section covers 196 Type Relays and replaces specification X-70072-01, Issue 1. position sufficiently to break the contact, that has been made, and make the contact reliably that has been broken.
- 1.02 Reference shall be made to Section 400.001 covering General Requirements and Definitions for additional information necessary for the proper application of the requirements listed herein.
- 1.03 Part 1, "General" and Part 2, "Requirements" form a part of Western Electric Co., Inc. Installation Department Handbook.
- 1.04 Operate (DC) means that when the specified operate current is applied, the armature shall move sufficiently to break the back contact and make the front contact reliably.
- 1.05 Release (DC) means that when the current is reduced from the operate value to the release value, the armature shall move from the operated
- 1.06 Operate (AC) means that when the operate current is applied for one second the armature shall move sufficiently to cause the associated relay or relays to function.
- 1.07 Non-operate (AC) means that when the non-operate current is applied for one second, the armature shall not move sufficiently to cause the associated relay or relays to function.
- 1.08 Figs. B, F and FB These figures, formerly referred to on circuit requirements tables, are covered by the requirements on pages 1 and 2.
- 1.09 Fig. 3 The requirements formerly covered in this figure are now covered on pages 3 to 10 inclusive.

2. REQUIREMENTS

- 2.01 Relay Mounting Relays shall be fastened securely to the mounting plate. This shall be checked for by applying a vertical and a horizontal pressure to the relay and not by attempting to turn the relay. Gauge by feel.
- 2.02 Cover Spring Pressure The cover springs shall have sufficient pressure against the cover to hold the cover securely in place. Gauge by feel.
- 2.03 Contact Alignment Contacts shall line up so that the point of contact falls wholly within the circumference of the opposing contact disc. Gauge by eye.

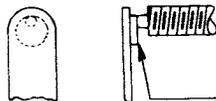


Fig. 1

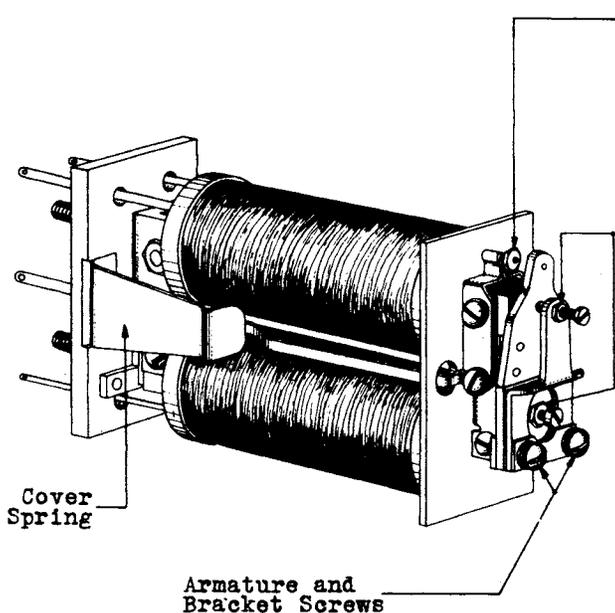


Fig. 2

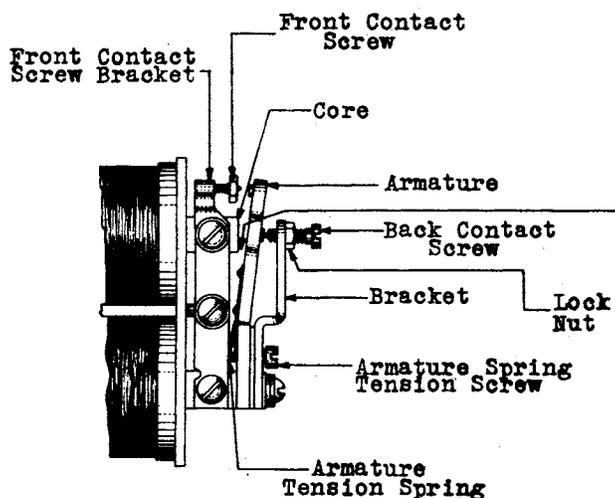


Fig. 3

2.04 Tightness of Front Contact Screw The front contact (or stop) screw shall be sufficiently tight in the front contact screw bracket to hold any adjusted position. Gauge by feel.

2.05 Tightness of Lock Nuts Lock nuts shall be sufficiently tight to hold the screws in their adjusted position. Gauge by feel.

2.06 Unoperated Armature Air-Gap There shall be a gap between the core of the upper coil and the armature measured at the nearest point when the back contact (or stop) screw is touching the armature, of:  
 Min. .007"  
 Max. .009"  
 Use the No. 74-D gauge.

2.07 Armature Travel There shall be a separation between the back contact (or stop) screw and the armature when the front contact (or stop) screw is touching the armature of:  
 Min. .003"  
 Max. .005"  
 Use the No. 74-D gauge.

2.08 Electrical Requirements A relay shall meet the electrical requirements specified on the circuit requirement table. When the circuit requirement table specifies the electrical test and readjust requirements to be in accordance with the B.S.M.P., R.A.P. or X specification, the requirements given on pages 3 to 10 shall apply. The particular requirements that are to be applied shall be determined by the item number or the type of testing and adjusting equipment, the code of the relay, type of switchboard and circuit, connection of windings, type of adjustment and ringing frequency and voltage involved.

2.09 Cleaning Contacts and other parts shall be cleaned when necessary in accordance with Section 460.005 covering cleaning of relay contacts and parts.

CONNECTION OF WINDINGS	TYPE OF ADJUSTMENT	AC TEST AND READJUST CURRENT FLOW REQUIREMENTS	FREQUENCY IN CYCLES	VOLTAGE AT BUS-BAR	EQUIVALENT AC N.I. RESISTANCE REQUIREMENTS				ITEM NO.				
					TEST		READJ.						
					8-C or 6-B LAMP	W-L RES.	W-L RES.						
							R	K		L			
Windings in Series	Standard	Test Opr. - .0012 Amp. Readj. Opr. - .0011 Amp. Readj. N.O. - .00085 Amp.	16 2/3	75-80	595	690	185	390	1.01				
				80-85	555	630	170	370	1.02				
				85-90	515	590	160	350	1.03				
				90-95	485	560	145	330	1.04				
				95-100	460	530	132	310	1.05				
				100-105	435	500	128	287	1.06				
				105-110	410	470	125	270	1.07				
				110-115	390	450	120	255	1.08				
				115-120	370	430	110	245	1.09				
				75-80	850	930	235	540	1.10				
				80-85	765	880	225	510	1.11				
				85-90	715	810	205	480	1.12				
			90-95	670	740	187	450	1.13					
			95-100	625	700	170	420	1.14					
			100-105	590	660	158	392	1.15					
			105-110	555	620	150	370	1.16					
			110-115	530	590	142	350	1.17					
			115-120	505	560	135	330	1.18					
			Special	Test Opr. - .0007 Amp. Readj. Opr. - .0006 Amp. Readj. N.O. - .0004 Amp.	16 2/3	75-80	280	340	132	143	1.19		
						80-85	260	310	120	135	1.20		
						85-90	245	290	111	126	1.21		
						90-95	235	270	105	120	1.22		
						95-100	220	255	98	112	1.23		
						100-105	210	240	93	107	1.24		
	105-110	200				220	88	102	1.25				
	110-115	190				210	83	97	1.26				
	115-120	180				200	78	92	1.27				
	20	75-80				375	400	140	170	1.28			
		80-85				345	360	132	158	1.29			
		85-90				325	330	123	147	1.30			
		90-95			305	300	118	137	1.31				
		95-100			285	280	110	130	1.32				
		100-105			270	260	100	125	1.33				
		105-110			260	240	97	118	1.34				
		110-115			250	230	93	112	1.35				
		115-120			240	220	90	105	1.36				
		Windings in Parallel			Standard	Test Opr. - .0025 Amp. Readj. Opr. - .0022 Amp. Readj. N.O. - .0017 Amp.	16 2/3	75-80	530	670	170	380	1.37
								80-85	490	610	150	350	1.38
								85-90	455	570	150	320	1.39
	90-95							430	530	140	300	1.40	
	95-100							400	500	130	280	1.41	
	100-105							380	470	120	270	1.42	
	105-110		360	440				110	260	1.43			
	110-115		340	420				100	250	1.44			
	115-120		325	400				100	240	1.45			
	20		75-80	600				780	180	420	1.46		
			80-85	560				710	170	390	1.47		
			85-90	515				650	160	360	1.48		
90-95			485	600			150	330	1.49				
95-100			455	560			150	300	1.50				
100-105			430	530			135	285	1.51				
105-110			410	500			130	270	1.52				
110-115			390	480			120	260	1.53				
115-120			370	460			110	250	1.54				
Special			Test Opr. - .0014 Amp. Readj. Opr. - .0012 Amp. Readj. N.O. - .0008 Amp.	16 2/3			75-80	240	310	90	150	1.55	
							80-85	225	295	80	140	1.56	
							85-90	212	270	75	130	1.57	
	90-95						200	255	70	120	1.58		
	95-100						190	240	70	110	1.59		
	100-105						180	230	70	100	1.60		
	105-110				170	215	70	90	1.61				
	110-115				162	205	70	80	1.62				
	115-120				155	195	70	70	1.63				
	20				75-80	280	350	90	160	1.64			
					80-85	265	320	80	150	1.65			
					85-90	245	290	80	140	1.66			
				90-95	230	270	80	130	1.67				
				95-100	220	260	80	120	1.68				
				100-105	210	250	80	110	1.69				
				105-110	200	240	80	100	1.70				
				110-115	190	230	80	90	1.71				
				115-120	180	220	80	80	1.72				

Notes 1, 2, 6, 9, 14 and 15 on Pages 8 and 9 apply to the above table.  
Standard Adjustment was formerly Average Adjustment.  
Special Adjustment was formerly Minimum Adjustment.

ELECTRICAL REQUIREMENTS FOR 196-A AND 196-B RELAYS  
IN THRU TOLL CORD CIRCUITS - TOLL SWITCHBOARD NO. 1 AND REPEATER CORD CIRCUITS  
WHEN RESISTANCE NETWORK METHOD OF TESTING AND ADJUSTING IS USED

Page 3  
Issue 1-D  
Standard

CONNECTION OF WINDING	TYPE OF ADJUSTMENT	AC TEST AND READJUST CURRENT FLOW REQUIREMENTS	FREQUENCY IN CYCLES	VOLTAGE AT BUS-BAR	EQUIVALENT AC N.I. RESISTANCE REQUIREMENTS				ITEM NO.	
					TEST		READJ.			
					θ-C OR 6-B LAMP	W-L RES.	W-L RES.			
							R	K		L
Windings in Series	Standard	Test Opr. - .0012 Amp. Readj. Opr. - .0011 Amp. Readj. N.O. - .00085 Amp.	16 2/3	75-80	2160	2560	750	1140	2.01	
				80-85	1920	2170	640	1020	2.02	
				85-90	1710	1910	550	930	2.03	
				90-95	1540	1710	470	860	2.04	
				95-100	1380	1550	420	790	2.05	
				100-105	1250	1400	380	740	2.06	
				105-110	1140	1290	340	690	2.07	
				110-115	1050	1200	320	640	2.08	
				115-120	980	1110	300	600	2.09	
			20	75-80	3080	4000	990	1700	2.10	
				80-85	2710	3340	780	1500	2.11	
				85-90	2400	2850	650	1350	2.12	
				90-95	2120	2460	560	1220	2.13	
				95-100	1880	2180	510	1110	2.14	
				100-105	1660	1960	450	1020	2.15	
				105-110	1500	1780	410	930	2.16	
				110-115	1380	1620	370	870	2.17	
				115-120	1280	1500	330	820	2.18	
	Special	Test Opr. - .0007 Amp. Readj. Opr. - .0006 Amp. Readj. N.O. - .0004 Amp.	16 2/3	75-80	720	1000	330	360	2.19	
				80-85	725	900	305	325	2.20	
				85-90	670	810	280	300	2.21	
				90-95	620	750	260	280	2.22	
				95-100	580	690	235	265	2.23	
				100-105	545	640	220	250	2.24	
				105-110	510	600	205	235	2.25	
				110-115	480	560	185	225	2.26	
				115-120	450	530	175	215	2.27	
			20	75-80	1000	1110	410	440	2.28	
				80-85	910	1000	375	405	2.29	
				85-90	835	920	340	375	2.30	
				90-95	775	840	310	350	2.31	
				95-100	720	780	285	325	2.32	
				100-105	670	720	260	305	2.33	
				105-110	625	670	240	290	2.34	
				110-115	585	630	225	275	2.35	
				115-120	555	590	210	260	2.36	
	Windings in Parallel	Standard	Test Opr. - .0025 Amp. Readj. Opr. - .0022 Amp. Readj. N.O. - .0017 Amp.	16 2/3	75-80	1100	1440	330	700	2.37
					80-85	975	1270	290	640	2.38
					85-90	875	1150	270	580	2.39
					90-95	780	1050	240	540	2.40
					95-100	710	970	210	500	2.41
					100-105	650	900	190	470	2.42
					105-110	605	830	170	440	2.43
					110-115	570	770	170	410	2.44
					115-120	545	720	160	390	2.45
				20	75-80	1340	1990	550	900	2.46
					80-85	1200	1720	470	790	2.47
					85-90	1090	1530	400	730	2.48
90-95					1000	1370	340	680	2.49	
95-100					920	1250	310	630	2.50	
100-105					850	1150	280	590	2.51	
105-110					790	1060	260	550	2.52	
110-115					745	980	240	520	2.53	
115-120					700	910	230	490	2.54	
Special		Test Opr. - .0014 Amp. Readj. Opr. - .0012 Amp. Readj. N.O. - .0008 Amp.	16 2/3	75-80	435	550	205	190	2.55	
				80-85	400	510	180	175	2.56	
				85-90	375	475	165	160	2.57	
				90-95	347	445	155	150	2.58	
				95-100	323	420	150	140	2.59	
				100-105	302	395	140	135	2.60	
				105-110	285	370	130	130	2.61	
				110-115	270	350	120	125	2.62	
				115-120	260	330	110	120	2.63	
			20	75-80	540	690	230	250	2.64	
				80-85	495	630	210	230	2.65	
				85-90	460	585	195	210	2.66	
				90-95	430	540	180	200	2.67	
				95-100	410	500	165	190	2.68	
				100-105	390	470	155	180	2.69	
				105-110	370	440	145	170	2.70	
				110-115	350	415	140	160	2.71	
				115-120	330	395	135	150	2.72	

Notes 1, 2, 10, 14 and 15 on Pages 8 and 9 apply to the above table.  
 Standard Adjustment was formerly Average Adjustment.  
 Special Adjustment was formerly Minimum Adjustment.

Page 4  
 Issue 1-D  
 Standard

ELECTRICAL REQUIREMENTS FOR  
 196-A AND 196-B RELAYS  
 IN TERMINATING OR THRU AND TERMINATING CORD CIRCUITS - TOLL SWITCHBOARD NO. 1  
 WHEN RESISTANCE NETWORK METHOD OF TESTING AND ADJUSTING IS USED

CONNECTION OF WINDING	TYPE OF ADJUSTMENT	AC TEST AND READJUST CURRENT FLOW REQUIREMENTS	FREQUENCY IN CYCLES	VOLTAGE AT BUS-BAR	EQUIVALENT AC N.I. RESISTANCE REQUIREMENTS				ITEM NO.
					TEST		READJ.		
					8-C or 6-B LAMP	W-L RES.	W-L RES.		
		R	F	K	L				
Windings in Series	Standard	Test Opr. - .0012 Amp. Readj. Opr. - .0011 Amp. Readj. N.O. - .00085 Amp.	16 2/3	75-80	850	1105	285	590	3.01
				80-85	785	1000	255	540	3.02
				85-90	725	920	235	500	3.03
				90-95	665	845	220	460	3.04
				95-100	625	780	200	430	3.05
				100-105	585	725	195	400	3.06
				105-110	550	675	175	380	3.07
				110-115	520	635	160	365	3.08
				115-120	495	600	145	350	3.09
			20	75-80	1885	2775	830	1040	3.10
				80-85	1640	2360	680	950	3.11
				85-90	1470	2070	590	870	3.12
				90-95	1330	1820	525	790	3.13
				95-100	1220	1630	470	730	3.14
				100-105	1120	1480	420	680	3.15
				105-110	1040	1360	370	640	3.16
				110-115	960	1260	340	600	3.17
				115-120	910	1160	320	560	3.18
	Special	Test Opr. - .0007 Amp. Readj. Opr. - .0006 Amp. Readj. N.O. - .0004 Amp.	16 2/3	75-80	365	460	150	185	3.19
				80-85	340	425	140	170	3.20
				85-90	320	395	130	160	3.21
				90-95	300	370	125	150	3.22
				95-100	285	350	120	140	3.23
				100-105	270	330	110	135	3.24
				105-110	255	310	100	130	3.25
				110-115	240	290	95	120	3.26
				115-120	230	275	90	115	3.27
			20	75-80	565	705	270	250	3.28
				80-85	520	645	235	235	3.29
				85-90	485	595	215	225	3.30
				90-95	450	550	200	210	3.31
				95-100	425	515	190	195	3.32
				100-105	400	480	180	185	3.33
				105-110	375	450	170	175	3.34
				110-115	355	430	160	165	3.35
				115-120	340	410	150	160	3.36
Windings in Parallel	Standard	Test Opr. - .0025 Amp. Readj. Opr. - .0022 Amp. Readj. N.O. - .0017 Amp.	16 2/3	75-80	485	615	140	380	3.37
				80-85	450	560	120	350	3.38
				85-90	420	520	110	325	3.39
				90-95	394	485	105	305	3.40
				95-100	370	455	100	285	3.41
				100-105	350	430	90	270	3.42
				105-110	334	400	85	255	3.43
				110-115	318	380	80	240	3.44
				115-120	304	360	75	230	3.45
			20	75-80	554	690	155	395	3.46
				80-85	512	635	140	365	3.47
				85-90	477	590	130	340	3.48
				90-95	447	550	115	320	3.49
				95-100	420	510	110	300	3.50
				100-105	396	475	100	285	3.51
				105-110	375	450	90	270	3.52
				110-115	356	425	85	255	3.53
				115-120	340	405	85	240	3.54
	Special	Test Opr. - .0014 Amp. Readj. Opr. - .0012 Amp. Readj. N.O. - .0008 Amp.	16 2/3	75-80	245	300	85	165	3.55
				80-85	230	280	85	150	3.56
				85-90	215	265	80	140	3.57
				90-95	200	250	75	130	3.58
				95-100	190	235	70	125	3.59
				100-105	180	220	65	120	3.60
				105-110	170	205	60	115	3.61
				110-115	165	195	55	110	3.62
				115-120	160	185	50	105	3.63
			20	75-80	260	325	105	145	3.64
				80-85	245	300	95	135	3.65
				85-90	230	280	90	125	3.66
				90-95	215	260	85	115	3.67
				95-100	205	245	80	110	3.68
				100-105	195	230	75	105	3.69
				105-110	185	220	70	100	3.70
				110-115	175	210	65	95	3.71
				115-120	170	200	65	90	3.72

Notes 1, 2, 11, 14 and 15 on Pages 8 and 9 apply to the above table.  
Standard Adjustment was formerly Average Adjustment.  
Special Adjustment was formerly Minimum Adjustment.

ELECTRICAL REQUIREMENTS FOR  
196-A AND 196-B RELAYS  
IN TOLL CORD CIRCUITS - SWITCHBOARDS NO. 1-D, No. 2, AND NO. 11  
WHEN RESISTANCE NETWORK METHOD OF TESTING AND ADJUSTING IS USED

196-A AND 196-B RELAYS IN TOLL SWITCHBOARD NO. 3 WINDINGS IN PARALLEL							
TYPE OF ADJUST- MENT	AC TEST AND READJUST CURRENT FLOW REQUIREMENTS	FREQUENCY IN CYCLES	VOLTAGE AT BUS-BAR	EQUIVALENT AC N.I. RESISTANCE REQUIREMENTS			ITEM NO.
				A	B	C	
Standard	Test Opr. - .0025 Amp. Readj. Opr. - .0022 Amp. Readj. N.O. - .0017 Amp.	20	75-80	1170	690	760	4.01
			80-85	1060	570	620	4.02
			85-90	960	490	520	4.03
			90-95	870	440	430	4.04
			95-100	810	380	370	4.05
			100-105	750	350	320	4.06
			105-110	700	310	290	4.07
			110-115	655	285	250	4.08
			115-120	615	255	230	4.09
			Special	Test Opr. - .0014 Amp. Readj. Opr. - .0012 Amp. Readj. N.O. - .0008 Amp.	20	75-80	405
80-85	375	265				195	4.11
85-90	345	245				170	4.12
90-95	325	220				155	4.13
95-100	305	205				140	4.14
100-105	285	190				130	4.15
105-110	270	175				125	4.16
110-115	255	165				115	4.17
115-120	240	160				100	4.18

**Notes** 1, 5 and 16 on Pages 8 and 9 apply to the above table.  
Standard Adjustment was formerly Average Adjustment.  
Special Adjustment was formerly Minimum Adjustment.

196-E RELAY							
TYPE OF ADJUST- MENT	AC TEST AND READJUST CURRENT FLOW REQUIREMENTS	FREQUENCY IN CYCLES	VOLTAGE AT BUS-BAR	EQUIVALENT AC N.I. RESISTANCE REQUIREMENTS			ITEM NO.
				A	B	C	
Standard	Test Opr. - .0025 Amp. Readj. Opr. - .0022 Amp. Readj. N.O. - .0017 Amp.	16 2/3 or 20	75-80	1530	360	1055	5.01
			80-85	1740	377	1122	5.02
			85-90	1940	405	1188	5.03
			90-95	2150	422	1255	5.04
			95-100	2360	439	1322	5.05
			100-105	2570	456	1388	5.06
			105-110	2780	474	1455	5.07
			110-115	2990	491	1522	5.08
			115-120	3190	518	1588	5.09
			Special	Test Opr. - .0017 Amp. Readj. Opr. - .0015 Amp. Readj. N.O. - .0012 Amp.	16 2/3 or 20	75-80	3240
80-85	3560	520				1181	5.11
85-90	3880	545				1252	5.12
90-95	4180	590				1323	5.13
95-100	4500	615				1394	5.14
100-105	4810	640				1465	5.15
105-110	5130	665				1536	5.16
110-115	5450	690				1607	5.17
115-120	5760	725				1678	5.18

**Notes** 1, 7 and 17 on Pages 8 and 9 apply to the above table.  
Standard Adjustment was formerly Average Adjustment.  
Special Adjustment was formerly Minimum Adjustment.

ELECTRICAL REQUIREMENTS FOR  
196-A AND 196-B RELAYS IN TOLL SWITCHBOARD NO. 3  
AND  
196-E RELAY IN INTERMEDIATE COMPOSITE RINGERS  
WHEN RESISTANCE NETWORK METHOD OR TESTING AND ADJUSTING IS USED

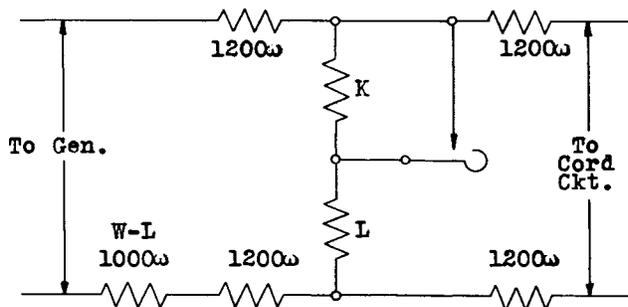
RELAY CODE	TYPE OF SWITCH-BOARD	TYPE OF CIRCUIT	CONNECTION OF WINDING	TYPE OF ADJUSTMENT	FREQUENCY IN CYCLES	AC TEST AND READJUST CURRENT FLOW REQUIREMENTS						NOTES	ITEM NO.	
						CURRENT IN RELAY AMPERES			METER SETTING AMPERES					SHUNT RESISTANCE
						Test Oper.	Readj.		Test Oper.	Readj.				
							Oper.	N.O.		Oper.	Oper.			
196-A AND 196-B	NO. 1 TOLL	CORD	Series	Standard	16 2/3	.0012	.0011	.00085	.108	.096	.062	125 $\omega$	1,4,12,19	6.01
				Special	20	.0007	.0006	.0004	.142	.126	.088	60 $\omega$		6.02
				Standard	16 2/3	.0025	.0022	.0017	.094	.078	.048	80 $\omega$		6.03
			Parallel	Standard	20	.0014	.0012	.0008	.134	.114	.070	125 $\omega$		6.04
				Special	20	.0014	.0012	.0008	.074	.062	.044	30 $\omega$		6.05
				Standard	16 2/3	.0025	.0022	.0017	.068	.060	.040	60 $\omega$		6.06
	LINE	Parallel No Series Condenser	Standard	20	.0014	.0012	.0008	.086	.068	.040	125 $\omega$	1,4,8,19	6.07	
			Special	20	.0014	.0012	.0008	.122	.098	.056	30 $\omega$		6.08	
			Standard	16 2/3	.0025	.0022	.0017	.112	.098	.072	90 $\omega$		6.09	
		Parallel	Standard	20	.0014	.0012	.0008	.130	.116	.084	60 $\omega$		6.10	
			Special	20	.0014	.0012	.0008	.088	.070	.040	60 $\omega$		6.11	
			Standard	16 2/3	.0025	.0022	.0017	.102	.086	.048	60 $\omega$		6.12	
	NO. 1-D AND NO. 2 TOLL	CORD	Series	Standard	16 2/3	.0012	.0011	.00085	.106	.096	.068	100 $\omega$	1,4,11,19	7.01
				Special	20	.0007	.0006	.0004	.096	.086	.064	150 $\omega$		7.02
				Standard	16 2/3	.0025	.0022	.0017	.106	.090	.050	50 $\omega$		7.03
			Parallel	Standard	20	.0014	.0012	.0008	.126	.104	.060	60 $\omega$		7.04
				Special	20	.0014	.0012	.0008	.076	.066	.050	60 $\omega$		7.05
				Standard	16 2/3	.0025	.0022	.0017	.092	.078	.058	75 $\omega$		7.06
NO. 11	CORD AND POSITION	Series	Standard	16 2/3	.0012	.0011	.00085	.106	.096	.068	100 $\omega$	1,4,13,19	8.01	
			Special	20	.0007	.0006	.0004	.096	.086	.064	150 $\omega$		8.02	
			Standard	16 2/3	.0025	.0022	.0017	.106	.090	.050	50 $\omega$		8.03	
		Parallel	Standard	20	.0014	.0012	.0008	.126	.104	.060	60 $\omega$		8.04	
			Special	20	.0014	.0012	.0008	.076	.066	.050	60 $\omega$		8.05	
			Standard	16 2/3	.0025	.0022	.0017	.092	.078	.058	75 $\omega$		8.06	
NO. 11	LINE	Parallel	Standard	20	.0025	.0022	.0017	.082	.068	.044	30 $\omega$	1,4,8,18	8.07	
			Special	20	.0014	.0012	.0008	.112	.090	.056	60.5 $\omega$		8.08	
NO. 3 TOLL	LINE	Parallel	Standard	20	.0025	.0022	.0017	.122	.100	.075	28.5 $\omega$	1,4,8,18	8.09	
			Special	20	.0014	.0012	.0008	.112	.082	.050	60.5 $\omega$		8.10	
196-E	INTERMEDIATE RINGER	Parallel	Standard	16 2/3	.0025	.0022	.0017	.025	.022	.017	903 $\omega$	1,3,20	10.01	
				or 20	.0014	.0012	.0008	.014	.012	.008	10.02			
			Special	16 2/3	.0025	.0022	.0017	.025	.022	.017	1330 $\omega$		11.01	
				or 20	.0017	.0015	.0012	.017	.015	.012			11.02	

See Pages 8, 9 & 10 for the Notes referred to on the above table.  
Standard Adjustment was formerly Average Adjustment.  
Special Adjustment was formerly Minimum Adjustment.

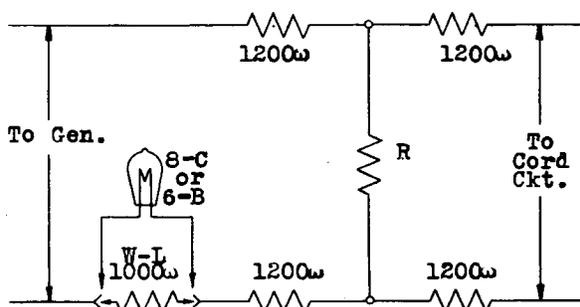
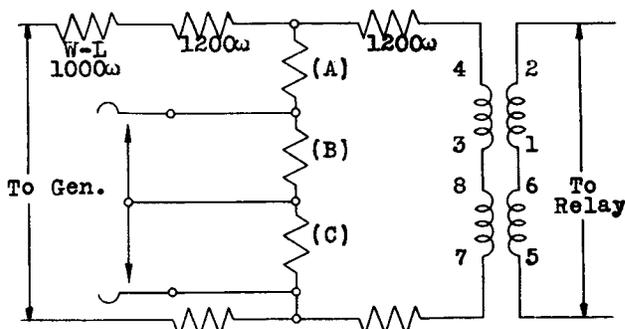
ELECTRICAL REQUIREMENTS FOR 196-A, 196-B AND 196-E RELAYS  
WHEN LOW SHUNT METHOD OF TESTING AND ADJUSTING IS USED

NOTES

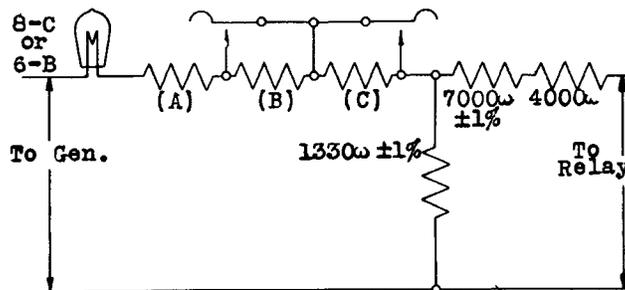
1. Testing and readjusting shall be done with the standard testing and adjusting circuits, networks or AC milliammeter circuits, if installed; if not, the current or the resistance values or meter settings specified in the tables on pages 3, 4, 5, 6 and 7, shall be used in connection with the testing and adjusting circuits shown in Notes 14 to 21.
2. Readjusting shall be done only when a 1000 ohm Ward-Leonard resistance is in the ringing lead.
3. Testing and readjusting shall be done only when a 500 ohm Ward-Leonard resistance is in the ringing lead.
4. Testing and readjusting shall be done only when a 300 ohm Ward-Leonard resistance is in the ringing lead.
5. Testing and readjusting shall be done when the relay is isolated from the toll line. The line circuit relay equipment shall be left in the circuit, that is, disconnect the toll line at the drop jack.
6. In repeater cord circuits, testing and readjusting shall be done with the relay isolated from its circuit.
7. Testing and readjusting shall be done when the relay is isolated from the toll line.
8. Testing and readjusting may be done when the relay is either connected to or isolated from the toll line.
9. With the tip and ring of either cord connected to the testing circuit and the sleeve of this cord connected to ground through 60 ohms the cord circuit is prepared for testing and readjusting the relay. Where repeater cord circuits of the through and terminating type are involved the sleeve of the TRK & TOLL cord shall be connected to ground through 60 ohms.
10. With the tip and ring of the TOLL cord connected to the testing circuit and the sleeve of that cord connected to ground through 60 ohms the cord circuit is prepared for testing and readjusting the relay.
11. The cord circuit is prepared for testing and readjusting the relay under the following conditions:  
Cord circuits arranged to leave the repeating coil in on all connections shall have the sleeve of the TOLL & SUBS or CALL cord connected to ground through 500 ohms when testing the relay in this cord and of the TOLL or ANS cord connected to ground through 500 ohms when testing the relay in this cord.  
Cord circuits arranged to cut the repeating coil out on through magneto connections shall have the sleeve of the TOLL & SUBS or CALL cord connected to ground through 34 ohms with the tip and ring open and the testing or adjusting circuit connected to the tip and ring of the TOLL or ANS cord with the sleeve connected to ground through 500 ohms.
12. With the tip and ring of either cord, in the case of through toll cord circuits, connected to the testing circuit and the sleeve of that cord connected to ground through 60 ohms, or with the tip and ring of the TOLL cord, in the case of terminating or through and terminating toll cord circuits, connected to the testing circuit and the sleeve of that cord connected to ground through 60 ohms, the cord circuit is prepared for testing and readjusting the relay.
13. The cord circuit is prepared for testing and readjusting the relay in the cord circuit under the following conditions:  
Cord circuits arranged to leave the repeating coil in on all connections shall have the sleeve of the TOLL & SUBS or CALL cord connected to ground through 500 ohms when testing the relay in this cord and of the TOLL or ANS cord connected to ground through 500 ohms when testing the relay in this cord.  
Cord circuits arranged to cut the repeating coil out on through magneto connections shall have the sleeve of the TOLL & SUBS or CALL cord connected to ground through 34 ohms with the tip and ring open and the testing or adjusting circuit connected to the tip and ring of the TOLL or ANS cord with the sleeve connected to ground through 500 ohms.  
The cord and position circuits are prepared for testing and readjusting the relay in the position circuit under the following conditions:  
The testing or adjusting circuit shall be connected to the tip and ring of the TOLL or ANS cord of any cord in the position with the sleeve connected to ground through 500 ohms, the cord circuit talking key operated and the position circuit splitting key operated to talk on the TOLL & SUBS end of the cord.

14. Adjusting Network

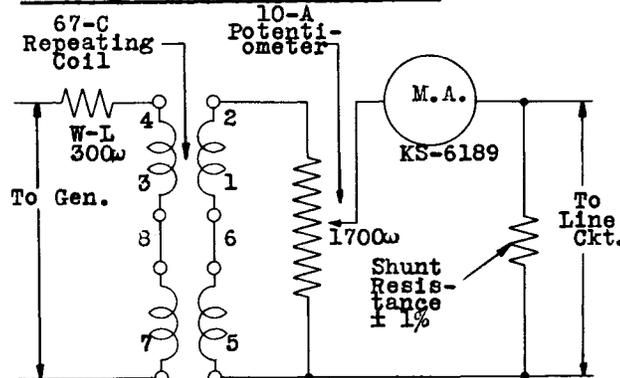
For readjust operate, the key which short circuits resistance K shall be normal so that resistances K and L are in the circuit.  
For readjust non-operate, the key which short circuits resistance K shall be operated.

15. Testing Network16. Testing and Adjusting Network

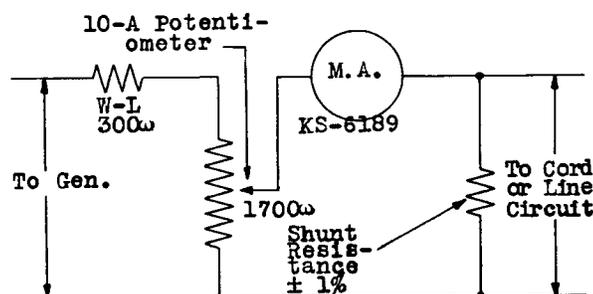
For test operate, the keys shall be normal so that resistances "A", "B" and "C" are in the circuit.  
For readjust operate, the key which short circuits resistance "C" shall be operated.  
For readjust non-operate, the keys which short circuit resistances "B" and "C" respectively shall be operated.

17. Testing and Adjusting Network

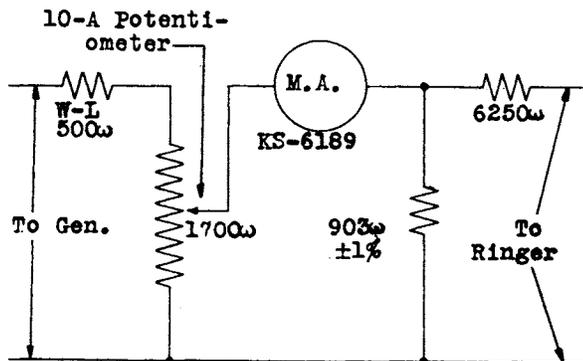
For test operate, the keys which short circuit resistances "B" and "C" respectively shall be operated.  
For readjust operate, the key which short circuits resistance "C" shall be operated.  
For readjust non-operate, the keys shall be normal so that resistances "A", "B" and "C" are in the circuit.

18. Testing and Adjusting Network

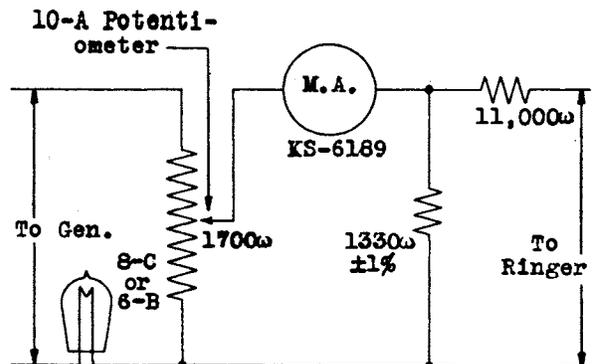
Vary the potentiometer arm to get specified meter setting. This shall be done before the testing and adjusting circuit is connected to the circuit under test.

19. Testing and Adjusting Network

Vary the potentiometer arm to get specified meter setting. This shall be done before the testing and adjusting circuit is connected to the circuit under test.

20. Testing and Adjusting Network

Vary the potentiometer arm to get specified meter setting. This shall be done before the testing and adjusting circuit is connected to the circuit under test.

21. Testing and Adjusting Network

Vary the potentiometer arm to get specified meter setting. This shall be done before the testing and adjusting circuit is connected to the circuit under test.

REASON FOR ISSUE COVERING CHANGES IN REQUIREMENTS

1. To add electrical requirements for testing and adjusting by means of the Low Shunt Method. (2.08) (Previously covered in specification X-70329-01, Issue 2, Provisional).
2. To change the armature air-gap requirement from an operated to an unoperated gap. (Information for W. E. Company covered by CO-110656) (2.06).
3. To add a maximum limit to the armature travel requirement (Information for W. E. Company covered by CO-110656) (2.07).
4. To specify Standard and Special Adjustments in place of Average and Minimum Adjustments respectively.
5. To specify electrical requirements for testing and adjusting by means of low shunt for 196A and B relays in No. 1 toll line circuits.

3. ADJUSTING PROCEDURESTOOLS

<u>Code No.</u>	<u>Description</u>
35	Screw-Driver - 3 1/2" (Part of No. 221 Combination Tool)
46	Wrench - 3/8" Hex. Socket
220	Wrench - 3/16" Hex. Socket (Part of No. 221 Combination Tool)
388-A	Wrench - 3/16" and 1/4" Hex. Open-end Offset
-	Bell System P-Long Nose Pliers - 6 1/2" per A.T.& T. Co. Drawing - 46-X-56
-	Bell System Cabinet Screw-Driver - 3 1/2" per A.T.& T. Co. Drawing - 46-X-40

GAUGES

74-D	Nest of Thickness Gauges
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TEST APPARATUS

35-C	Test Set for Applying Direct Current Flow Requirements
-	Testing and Adjusting Circuits, in Offices so equipped, for Applying AC Requirements

3.01 RELAY MOUNTING (Rq.2.01)

M-1 To tighten loose mounting nuts use the No. 46 wrench.

3.02 COVER SPRING PRESSURE (Rq.2.02)

M-1 If the cover springs do not have sufficient tension against the cover, increase the tension by adjusting the springs away from the coil, applying a lateral pressure against the springs with the 3-1/2" cabinet screw-driver inserted between the spring and coils.

M-2 If the cover springs have excessive tension, decrease the tension by adjusting the spring toward the coil, applying a lateral pressure against the spring with the 3-1/2" cabinet screw-driver inserted outside the spring.

M-3 Care should be taken not to injure the protective serving on the coils.

3.03 CONTACT ALIGNMENT (Rq.2.03)

M-1 To align the contacts loosen the armature and bracket screws with the No. 35 screw-driver and shift the armature and bracket as required.

3.04 TIGHTNESS OF FRONT CONTACT SCREW (Rq.2.04)

M-1 If the front contact (or stop) screw is not sufficiently tight in its bracket to hold its adjusted position proceed as follows:

M-2 Remove the left armature and bracket screw and loosen the right armature and bracket screw using the No. 35 screw-driver. Then push the armature to the right with the No. 220 wrench until the wrench can be applied to the front contact (or stop) screw and remove the screw.

M-3 Force the threaded portion of the front contact screw bracket closer together with the long nose pliers as shown in Fig. 4.

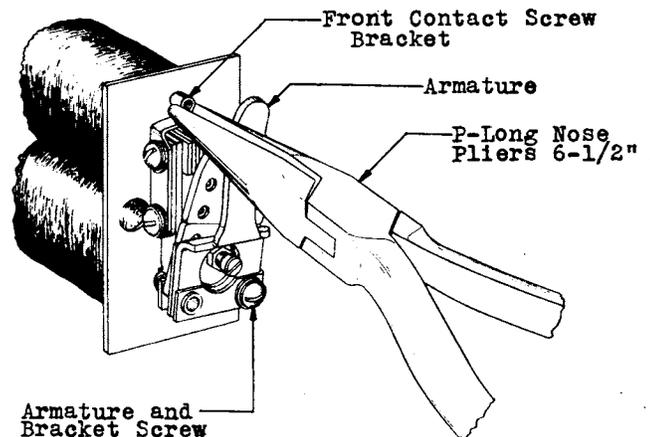


Fig. 4 - Method of Adjusting the Front Contact Screw Bracket

M-4 Replace the front contact (or stop) screw in the front contact screw bracket with the No. 220 wrench and reassemble the armature and bracket by replacing the left armature and bracket screw and tightening the right armature and bracket screw. At the same time align the contacts in accordance with procedure 3.03.

3.05 TIGHTNESS OF LOCK NUTS (Rq.2.05)

M-1 To tighten loose lock nuts use the No. 220 wrench in combination with the No. 35 screw-driver exercising care that the position of the screws is not changed.

3.06 UNOPERATED ARMATURE AIR GAP (Rq.2.06)  
 3.07 ARMATURE TRAVEL (Rq.2.07)

M-1 Unoperated Armature Air-Gap To adjust for the unoperated armature air-gap proceed as follows: Loosen the lock nut on the back contact (or stop) screw with the No. 220 wrench and turn this screw in a counter-clockwise direction with the No. 35 screw-driver until the .008" blade of the No. 74-D gauge can be inserted between the armature and the core of the upper coil at the nearest point. Then while holding the gauge against the core of the upper coil turn the back contact (or stop) screw in a clockwise direction until the armature just touches the gauge. If necessary turn the front contact (or stop) screw in a clockwise direction using the No. 388-A wrench. Tighten the lock nut securely and remove the gauge.

M-2 Armature Travel To adjust for the armature travel proceed as follows: Turn the front contact (or stop) screw in a clockwise direction with the No. 388-A wrench until the .004" blade of the No. 74-D gauge can be inserted between the armature and the back contact (or stop) screw. Then while holding the gauge against the back contact (or stop) screw turn the front contact (or stop) screw in a counter-clockwise direction until the front contact (or stop) screw just touches the armature and the armature touches the gauge. Remove the gauge.

3.08 ELECTRICAL REQUIREMENTS (Rq.2.08)

M-1 General Information The presence of defects which may cause the armature to remain in an operated position after the flow of current through the relay has stopped may be detected by pushing the top of the armature lightly forward against the front contact (or stop) screw. If the relay has been re-adjusted as outlined below and the armature remains in an operated position, this may be due to the front contact (or stop) screw being dirty. If dirty, clean in accordance with procedure 3.09. If the relay fails to meet the non-operate requirement the trouble is probably due to a defective armature tension spring.

M-2 The methods covered under M-7 to M-12 inclusive are for use where testing and adjusting circuits or test panels are installed, the other methods are for general use.

M-3 After the relay has been adjusted to meet its electrical requirements replace the cover and apply the electrical requirements again to see that the relay still operates, non-operates and releases satisfactorily.

DC ADJUSTMENT

(To be used only where DC requirements are specified)

M-4 Operate Failure of the relay to meet the operate requirement is probably due to the tension of the armature tension spring being too great. To decrease this tension, loosen the lock nut on the armature spring tension screw with the No. 220 wrench and turn the screw in a counter-clockwise direction with the No. 35 screw-driver until the relay just meets the operate requirement. Tighten the lock nut securely.

M-5 Release Failure of the relay to meet the release requirement is probably due to the tension of the armature tension spring being insufficient. To increase this tension, loosen the lock nut on the armature spring tension screw with the No. 220 wrench and turn the screw in a clockwise direction with the No. 35 screw-driver until the relay meets the release requirement. Tighten the lock nut securely. Failure to meet the release requirement may also be due to the front contact (or stop) being dirty. If dirty, clean in accordance with procedure 3.09.

M-6 In general the armature tension should be as great as possible, consistent with meeting the operate requirement reliably.

AC ADJUSTMENT

M-7 The following methods are to be employed in conjunction with the milliammeter, low shunt or network adjusting circuit.

M-8 With the relay adjusted mechanically in accordance with procedures 3.01 to 3.07 inclusive, connect the relay circuit to the adjusting circuit and adjust to meet the electrical requirements as follows:

3.08 (Continued)

M-9 Operate Loosen the lock nut on the armature spring tension screw with the No. 220 wrench and while intermittently applying the operate current, slowly turn the screw in a clockwise direction with the No. 35 screwdriver, thus increasing the tension on the spring until the relay just fails to operate. Then reduce the tension of the spring by slowly turning the screw in a counter-clockwise direction until the relay just operates satisfactorily and then decrease the tension slightly by turning the screw in a counter-clockwise direction approximately 1/16 of a turn. Tighten the lock nut securely.

M-10 If the relay operates satisfactorily but the relays associated with the relay under adjustment do not, check to see if they are in adjustment and if they are not, readjust them.

M-11 Non-operate Now apply the non-operate current and if the relay does not operate the relay may be considered in proper adjustment. If, however, the relay operates, increase the tension of the armature tension spring.

To do this, loosen the lock nut on the armature spring tension screw with the No. 220 wrench and turn the screw in a clockwise direction slowly with the No. 35 screw-driver until the relay does not operate. Check that the relay and the associated apparatus functions when the operate current is applied for approximately one second.

M-12 Replace the relay cover and again check to see that the relay operates, non-operates and releases satisfactorily as indicated by the operation of the associated apparatus. Although no release requirement is specified for these relays when adjusted on AC, they should release on open circuit after the current has been disconnected. Failure to do this may be due to the front contact (or stop) screw being dirty. If dirty, correct in accordance with procedure 3.09.

3.09 CLEANING (Rq.2.09)

M-1 Clean the contacts and other parts in accordance with Section 460.005 covering cleaning of relay contacts and parts.

REASON FOR ISSUE COVERING CHANGES IN ADJUSTING PROCEDURES

- |                                                      |                                        |
|------------------------------------------------------|----------------------------------------|
| 1. To change the following procedures:               | 3.06, M-1 and Unoperated Armature Air- |
| 3.04, M-2 Removing front contact screw from bracket. | 3.07, M-2 Gap - Use of 74-D gauge.     |

## APPROVED:

Bell Telephone Laboratories, Inc.	FAC 6-28-29
Department of Development and Research	SPS 8-1-29