

BSM# 840B

**RELAYS — TIMING REQUIREMENTS
FOR APPLICATION WHERE CIRCUIT REQUIREMENT
TABLES DO NOT SHOW TIMING REQUIREMENTS**

1. GENERAL

1.01 This section covers timing requirements for various step-by-step slow-release relays, and the 162B relay in No. 1 toll cord circuits, where the circuit requirement tables do not show timing requirements. This section supplements Sections 040-219-701 and 040-236-701.

1.02 This section is reissued to cover timing requirements for slow-release relays in AEC_o circuits of 35-E-97 type offices.

1.03 Table A covers timing requirements for slow-release step-by-step relays identified by code or resistance of relay coil and by circuit designation.

1.04 Table B covers timing requirements for slow-release step-by-step relays used in AEC_o circuits of 35-E-97 type offices. These relays are identified by circuit designation only.

1.05 When the timing requirements covered in this section are applied, residual and electrical requirements specified in Part 2 of this section supersede the residual and electrical requirements specified on the circuit requirement tables or the residual requirement specified in Section 040-236-711.

1.06 Reference shall be made to Section 020-010-711 covering general requirements and definitions for additional information necessary for the proper application of the requirements listed herein.

1.07 Where existing 221- and 222-type and corresponding AEC_o relays have been modified to employ a 1:1 ratio armature, such relays for the purpose of this section shall be regarded as 247- and 248-type relays, respectively.

1.08 Operate: A relay is said to operate if, when current is connected to its winding the armature or the residual screw (if a residual

airgap is specified) moves all the way up to the core, and all normally closed contacts break and all normally open contacts make.

1.09 Nonoperate: A relay is said to nonoperate if, when current is connected to its winding, the armature does not move sufficiently to close any normally open contacts or to reduce the contact pressure on normally closed contacts enough to cause an unreliable contact.

1.10 Hold: A relay is said to hold if, after it has operated and the current is reduced abruptly from the soak or operate to the hold value, or is interrupted momentarily, the armature does not move sufficiently from its operated position to cause normally open contacts to become unreliable, or to cause normally closed contacts to make.

1.11 Release: A relay is said to release if the armature moves from its operated position sufficiently to cause normally open contacts to break and normally closed contacts to make reliably.

1.12 Residual airgap is the gap between the face of the relay core and the nearest point on the armature with the relay electrically operated and the residual screw touching the core.

2. REQUIREMENTS

2.01 Timing Requirements: The relays shall meet the timing requirements specified in Table A or B. These requirements may be met with the cover on or off, except that in the case of C position relays the test requirement shall be met with the cover on.

SECTION 040-013-711

Use the J94713A timing test set where requirements are specified in terms of time intervals. Use the J34717A pulsing test set (with or without the J64722A pulse repeating test set as required) or other locally approved test apparatus for making pulsing tests, where requirements are specified in terms of loop or leak conditions.

Check the requirements as covered in (a) and (b).

→ (a) Using the proper test set, make connections in accordance with the information specified in Table A or B and the associated notes. Unless otherwise specified in the notes, the test jack of the circuit under test is patched to the V-M (variable make) or V-BR (variable break) jack of the timing test set when the timing requirements are specified in terms of time intervals. Where the notes specify that the requirements apply directly at the relay under test, the relay winding or the nearest test point in the circuit to the relay winding, shall be patched directly to the V-M or V-BR jack of the timing test set. Where requirements are specified in terms of loop or leak, see Section 100-232-101 covering the pulsing test set.

(b) Also refer to the proper section covering the methods of making timing and pulsing tests for the particular relay. These sec-

tions primarily cover methods of checking test requirements. However, they can be used for checking readjust requirements wherever the test and readjust requirements are both pulsing requirements or both timing requirements.

→ **2.02 Electrical Requirements:** When timing requirements specified in Table A are applied, the relays shall meet the electrical nonoperate requirements specified under "Elec Req" in Table A in place of the electrical requirements specified on the circuit requirement tables. → When timing requirements specified in Table B are applied, the relays shall meet the electrical nonoperate requirements specified on the AECO → AH sheets as stated in Table B. Before applying the nonoperate requirement, the soak current shall be applied by passing through the winding or windings under test the maximum current (not to exceed 0.700 ampere) obtainable with minimum resistance in the relay test set.

Use the 35-type test set.

→ **2.03 Residual Airgap:** When the timing requirements specified in Table A or Table B are applied, the relays shall meet the residual requirements specified under "Resid Airgap" in the table.

This requirement shall be checked in accordance with the methods covered in Section 040-236-701.

Table A — Timing Requirements — Relays Identified By Code Or Resistance of Relay Coil, and By Circuit Designation

CIRCUIT	RELAY		TIMING REQUIREMENTS						ELEC REQ		RESID AIR GAP (see 2.03)
	CKT DESIG	TYPE OR RES	TIME INTERVAL				TIMING TEST SET JACK (see 2.01)	SEE NOTES PAGE 5	NON OPR CURRENT M.A. (see 2.02)		
			HOLD SEC (see 2.01)		RELEASE SEC (see 2.01)				Test	Readj	
			Test	Readj	Test	Readj					
Pri Line Sw	A	Copper Color Slug	.155	.155	.200	.200	V-BR	1,6	16.5	18.5	S-2
Step-by-Step Sel (except toll trans sel)	B	222		.300	.750	.500	V-BR	2a	6.9	7.3	SL
		222 Mod			.750	.500	V-BR	2c,10	7.7	8.2	Min. 1.5
		248		.333	.750	.500	V-BR	2c	8.5	9.0	Min. 1.5
	C	8 _ω		.100	.155	.140	V-M	2b	62.0	69.0	S-4
		4 _ω		.100	.155	.140	V-M	2b	85.0	95.0	S-4
		335 _ω	.100	.111	.175	.155	V-BR	6	9.7	10.6	S-2
Toll and AB Toll Trans Sel ES-30052-01 ES-30053-01 ES-30202-01 ES-30203-01 ES-30183-01 SD-31214-01 SD-31365-01 SD-31646-01 SD-31702-01 ES-360041 ES-241614	B	222	.300	.300	.750	.500	V-BR		6.9	7.3	SL
		222 Mod	.450	.450	.750	.500	V-BR		7.7	8.2	Min. 1.5
		248	.300	.333	.750	.500	V-BR		8.5	9.0	Min. 1.5
	C	8 _ω	.100	.100	.155	.140	V-M		62.0	69.0	S-4
		4 _ω	.100	.100	.155	.140	V-M		85.0	95.0	S-4
	K	222	.300	.300	.750	.500	V-BR	14	6.9	7.3	S-2
Step-by-Step Conn (for toll rot. conn E relays and other connector relays not listed here, see special connector listings below)	B	222		.300	.750	.500	V-BR	2a,7,8	6.9	7.3	SL
		222 Mod			.750	.500	V-BR	2c,7,10	7.7	8.2	Min. 1.5
		248		.333	.750	.500	V-BR	2c,7	8.5	9.0	Min. 1.5
	C	8 _ω		.100	.155	.140	V-M	2b,7	62.0	69.0	S-4
		4 _ω		.100	.155	.140	V-M	2b,7	85.0	95.0	S-4
		375 _ω		.111	.300	.275	V-M	2b,3,7	10.6	11.2	S-2
	E	375 _ω		.111	.300	.275	V-M	2b,3,7	10.6	11.2	S-2
		335 _ω		.140	.225	.200	V-M	2b,7	9.7	10.6	S-2
		8 _ω		.111	.175	.155	V-M	2b,7,12	62.0	69.0	S-4
		4 _ω		.111	.175	.155	V-M	2b,7	85.0	95.0	S-4
Level Htg Conn ES-30360-01, SD-31093-01, (for B relays, see connector listings above)	C	335 _ω	.100	.111	.175	.155	V-BR	6,7	10.0	10.6	S-2

Table A (cont)

CIRCUIT	RELAY		TIMING REQUIREMENTS						ELEC REQ		RESID AIR GAP (see 2.03)
	CKT DESIG	TYPE OR RES	TIME INTERVAL				TIMING TEST SET JACK (see 2.01)	SEE NOTES PAGE 5	NON OPR CURRENT M.A. (see 2.02)		
			HOLD SEC (see 2.01)		RELEASE SEC (see 2.01)				Test	Read	
			Test	Read	Test	Read					
10-Party Conn SD-31373-01 (for C and E re- lays, see conn listings above)	G	221		.300	.750	.500	V-BR	2a,7	6.9	7.3	SL
		221 Mod			.750	.500	V-BR	2c,7,10	7.7	8.2	Min. 1.5
		247		.333	.750	.500	V-BR	2c,7	8.5	9.0	Min. 1.5
Toll Rotary Conn (for B and C relays, see conn list- ings above)	E	8 ω		.111	.200	.175	V-M	2b,7,12	62.0	69.0	S-4
		4 ω		.111	.200	.175	V-M	2b,7	85.0	95.0	S-4
Step-by-Step Outgoing Interoffice Rep and Trk Ckts	B	222		.300	.750	.500	V-BR	2a,13	6.9	7.3	SL
		222 Mod			.750	.500	V-BR	13	7.7	8.2	Min. 1.5
		248		.333	.750	.500	V-BR	13	8.5	9.0	Min. 1.5
	C	335 ω		.125	.200	.175	V-M	2b,4	10.9	12.0	S-2
				.100	.155	.140	V-M	2b,5	10.9	12.0	S-2
Pulse Corr Rep and Trk Ckts SD-31453-01	J Fig. B		.300	.300	.750	.500	V-BR	6	6.9	7.3	S-2
Inc Rep and Pulse Corr Rep and Trk Ckts ES-30027-01 ES-30484-01 ES-30527-01 ES-30537-01 ES-31319-01 SD-31358-01 SD-31358-02	B	221 or 222	.300	.300	.750	.500	V-BR	6	6.9	7.3	SL
Test Distrib ES-30193-01 ES-359323 ES-360029	B	222	.300	.300	.750	.500	V-BR		6.9	7.3	SL
		222 Mod	.450	.450	.750	.500	V-BR		7.7	8.2	Min. 1.5
		248	.300	.333	.750	.500	V-BR		8.5	9.0	Min. 1.5
	C	8 ω	.100	.100	.155	.140	V-M		62.0	69.0	S-4
		4 ω	.100	.100	.155	.140	V-M		85.0	95.0	S-4
	F	222KE	.100	.111	.200	.175	V-BR	6	10.0	10.6	S-2
	J	375 ω	.111	.111	.300	.275	V-M	9	10.6	11.2	S-2
		335 ω	.125	.140	.225	.200	V-M	9	10.0	10.6	S-2
Toll Swbd No. 1 Cord	RL	162B	.200	.225	.300	.300	V-BR	11	-	-	-

Notes:

1. These requirements do not apply where a line switch test tool (test pencil) having a resistance greater than 1100 ohms is used to test the line switch in accordance with the section on operation tests primary line switch relays. On relays having gray-coated slugs, a hold time interval of 0.125 second shall be applied and the residual shall be 0.
2. As a test hold requirement, the relay shall meet one of the following tests applied with the J34717A pulsing test set.
 - (a) 1200-ohm loop
 - (b) Leak A
 - (c) 1200-ohm loop pulsing test where the balance of the office is maintained to a 1200-ohm loop pulsing test, and 1400-ohm loop pulsing test where the balance of the office is maintained to a 1400-ohm loop pulsing test.
3. On the 221EL relay shown on SD-66378-01 and SD-31297-01, the readjust hold requirement shall be 0.100 second.
4. These requirements apply only in outgoing interoffice repeater circuits for use with trunk loops of 1200 ohms or less and having a condenser and resistance wired across contacts 4 and 5 of the A position relay. Where the C position relay has a preliminary make contact, the following electrical requirements for this contact shall also be met.

	TEST (MA)	READJ (MA)
Opr.	11.7	10.7
N.O.	8.6	9.5

5. These requirements apply only to relays in outgoing interoffice repeaters and trunk circuits where trunk loops are 3000 ohms or less and where the A position relay does not have a condenser and resistance wired across contacts 4 and 5.

6. Requirements to be applied directly at the relay using the current flow obtained with the normal office voltage with no external resistance in series.
7. Ground the sleeve wiper when applying timing requirements.
8. The timing requirements do not apply to the B position relays of toll connector circuits nor to the 10-party connector circuit SD-31373-01.
9. These requirements apply only for that circuit condition where the rotary magnet is in parallel with the relay under test.
10. The readjust hold requirement shall be 0.450 second where the office is maintained to a 1400-ohm loop pulsing test and 0.375 second where the office is maintained to a 1200-ohm loop pulsing test.
11. Test requirements to be applied directly at the relay using the current flow obtained with the normal office voltage with no external resistance in series. Readjust requirements to be applied with 0.015 ma current flow.
12. Where an 8-ohm E relay is used in the same circuit as a 375-ohm C relay, the requirements for the C relay shall be used for checking the E relay.
13. When the relay is not required to hold over pulsing, it shall meet a hold test and hold readjust timing requirement of 0.333 second. When the relay is required to hold over pulsing, it shall meet hold test and hold readjust requirements covered in notes 2c and 10 respectively.
14. These requirements apply only to the K relays of toll transmission selectors arranged for reringing.

Table B — Timing Requirements — Relays in AEC0 Circuits of 35-E-97 Offices

CIRCUIT	RELAY CKT DESIG	TIMING REQUIREMENTS						ELEC REQ NON-OPR CURRENT (see 2.02)	RESID AIR GAP (see 2.03)
		TIME INTERVAL				TIMING TEST SET JACK (see 2.01)	SEE NOTES		
		HOLD SEC. (see 2.01)		RELEASE SEC. (see 2.01)					
Test	Read	Test	Read						
Selectors	(B)	.225	.750	.500		V-BR	1	1.5-4	
	(C)	.111	.200	.175		V-M	2	1.5-5	
Connectors	(B)	.225	.750	.500		V-BR	1,4	1.5-4	
	(C)	.125	.275	.250		V-M	2,4	1.5-5	
	(E)	.125	.275	.250		V-M	2,3,4	1.5-5	
Rev Call Selectors	(B)	.225	.750	.500		V-BR	1	1.5-4	
	(C)	.125	.275	.250		V-M	2	1.5-5	
Repeater H-61074	(B)	.225	.750	.500		V-BR	1	1.5-4	
Repeater H-61183	(B)	.225	.750	.550		V-BR	1	1.5-4	
	(C)	.111	.200	.175		V-M	2	1.5-5	
Repeaters H-61249 H-61375	(B)	.225	.225	.750	.500	V-BR	5	1.5-4	
	(C)	.100	.111	.200	.175	V-M	5	1.5-5	
Repeaters H-61257 H-61379	(B)	.225	.225	.750	.500	V-BR	6	1.5-4	
	(C)	.100	.111	.200	.175	V-M	6	1.5-5	
Repeaters H-61412 H-61434	(B)	.225	.750	.500		V-BR	1	1.5-4	
	(C)	.125	.300	.275		V-M	2	1.5-5	
Repeater H-61423	(B)	.225	.750	.500		V-BR	1	1.5-4	
	(C)	.080	.155	.140		V-M	2	S-1.5	

Notes:

- As a test hold requirement, the relay shall meet the 1400-ohm loop requirement of the J34717A pulsing test set.
- As a test hold requirement, the relay shall meet the Leak A requirement of the J34717A pulsing test set.
- When checking the test hold requirement on E position relays of connectors, ground the sleeve wiper cord terminal.
- Ground the sleeve wiper cord terminal at the test jack assembly when applying timing requirements on connectors.
- Connect the output jack of the timing test set to switch jack spring 6 and ground.
- Connect the output jack of the timing test set to switch jack springs 1t and 16.

3. ADJUSTING PROCEDURES

- 3.01 *Timing Requirements* (Reqt 2.01)
- 3.02 *Electrical Requirements* (Reqt 2.02)
- 3.03 *Residual Airgap* (Reqt 2.03)

(1) If the relay fails to meet the requirements covered herein, readjust the relay as covered in Section 040-236-701 for step-by-step relays and Section 040-219-701 for the 162B relay.

REASONS FOR REISSUE

1. To add general information covering Table A (1.03).
2. To add general information covering Table B (1.04).
3. To revise the definition for hold (1.10).
4. To revise the information covering the timing requirements (2.01).
5. To revise the information covering the electrical requirements (2.02).
6. To revise the information covering the residual airgap requirements (2.03).
7. To add Table B and notes 1 through 6 under Table B.