

RINGING MACHINES

KS-15804, KS-15905, AND KS-15985 TYPES

REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the KS-15804 L1 through L6, KS-15905 L1 through L3, and KS-15985 L1 through L3 ringing machines.

1.02 This section is reissued to add information relative to the KS-15985 L3 ringing machine, add Fig. 12, add subparagraph 2.14(c), and add additional material to paragraph 3.001. This issue does affect the Equipment Test List (ETL).

1.03 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.

1.04 **Asterisk(*)**: Requirements marked with an asterisk necessitate dismantling of the apparatus to check the requirement. Perform the check when the apparatus or part is made accessible for other reasons. If a check marked with an asterisk is included in the ETL, the interval between checks must not exceed the interval given in the ETL.

1.05 The KS-15804 L1 (Fig. 1 and 2) and L3 ringing machines consist of a 48-volt dc motor; a 65- to 90-volt, 20-Hz alternator with a rated output of 0.25-ampere ringing current; a tone alternator providing two low-tone channels (600 Hz modulated by 120 Hz); and an interrupter to provide various ringing and signaling interruptions. The KS-15804 L1 ringing machine is rated "Manufacture Discontinued" and replaced by KS-15804 L3. The KS-15804 L2 ringing machine is similar to the KS-15804 L1 and L3 except that the L2 machine is not provided with a tone alternator. The KS-15804 L4, manufactured by the Holtzer-Cabot Corp and the Commercial Electric Products Corp, is a new design ringing machine primarily intended for use in the 812A PBX. The KS-15804 L4 ringing

machine is similar to the KS-15804 L3 ringing machine except that the L4 machine is equipped with a 115-volt, single phase, 60-Hz ac motor. The KS-15804 L5 and L6 ringing machines provide stutter dial tone for the 812A PBX System per J58877DA. The Lists 5 and 6 machines are identical to the Lists 3 and 4, respectively, with the following exceptions. A 300 IPM timing pulse is provided in place of the 120 IPM timing pulse which was obtained in the 2a position on Lists 3 and 4. Both the 2a and 2b contacts are used to provide the 300 IPM rate. The closure of the 2a and 2b contacts will bear no relation to zero reference which is the closure of the 5a contact.

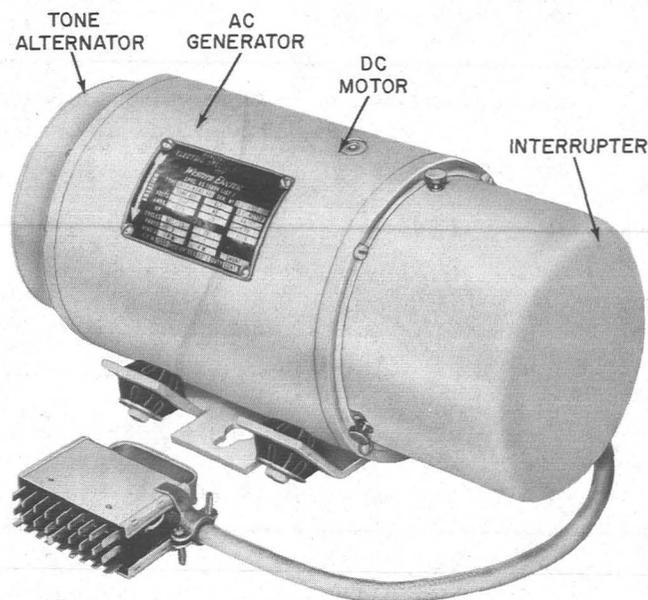


Fig. 1—KS-15804 L1 Ringing Machine—Electronic Specialty Co—External View Showing Location of Main Components

NOTICE

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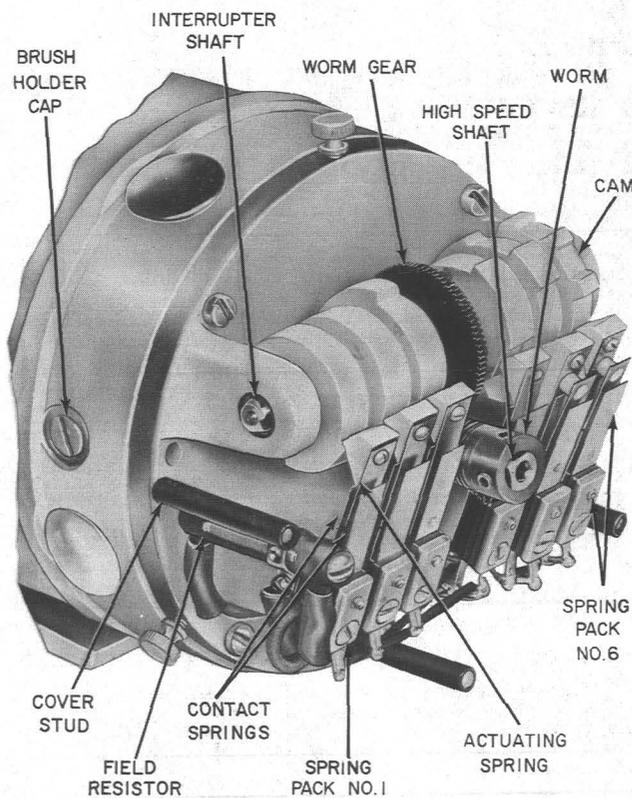


Fig. 2—KS-15804 L1 Ringing Machine—Holtzer-Cabot Corp—Interrupter End Shown With Cover Removed

1.06 The KS-15905 L1 through L3 ringing machines consist of a 115-volt, single-phase, 60-Hz ac motor; a 65- to 90-volt, 20-Hz alternator with a rated output of 0.25-ampere ringing current; and an interrupter to provide various ringing and signaling interruptions.

1.07 The KS-15985 L1 ringing machine consists of a 115-volt, single-phase, 60-Hz ac motor; a 65-volt, 20-Hz alternator with a rated output of 0.25-ampere ringing current; a tone alternator providing two low-tone channels (600 Hz modulated by 120 Hz); and an interrupter to provide various ringing and signaling interruptions. The KS-15985 L2 and L3 ringing machines are similar to the KS-15985 L1 except that they are provided with a 48-volt dc motor. Early models of the Holtzer-Cabot Corp. KS-15985 ringing machine were equipped with plastic worm gears. The plastic worm gears have experienced excessive worm gear wear which results in misalignment and stripping of the plastic worm gear teeth. The plastic worm gear on the Holtzer-Cabot Corp KS-15985 ringing machine may

be replaced with a bronze worm gear by using a repair kit—Part Number F7074—obtained from the Commercial Electric Co. The KS-15985 ringing machines, presently being manufactured, are equipped with bronze worm gears.

Note: The Electric Specialty Co, Electronic Specialty Co, and Radiation International Inc, are all past names given to the present Tech Systems Corp. Parts for the Holtzer-Cabot Corp units should be ordered from Commercial Electric Products Corp.

2. REQUIREMENTS

General Requirements

***2.01 Condition of Motor Commutator (KS-15804 L1 Through L3 and L5 and KS-15985 L2 and L3):** The commutator shall meet the applicable requirements covered in Section 171-110-701.

***2.02 Condition of Motor Brushes (KS-15804 L1 Through L3 and L5 and KS-15985 L2 and L3):** The brushes shall meet the applicable requirements covered in Section 171-110-701.

2.03 Motor Brush Length (KS-15804 L1 Through L3 and L5 and KS-15985 L2 and L3): The overall length of the brushes shall be a minimum of 3/8 inch.

Use the R-8550 steel scale.

2.04 Freedom of Rotating Parts

Warning 1: These ringing machines are automatically controlled equipment. Care should be exercised to prevent automatic transfer to the machine on which maintenance is to be done. Prior to performing maintenance, prevent automatic transfer of machine by removing fuses, blocking relays, opening switches, etc. as necessary. When maintenance work has been completed, make sure that the circuit has been restored to normal.

Warning 2: Personnel working around power equipment should remove watches, rings, key chains, etc. When working on or around rotating machinery, long

shirt sleeves should be rolled up, and flowing neckties should be removed.

(a) Motor Shaft and Interrupter Shaft:

The motor shaft and the interrupter shaft shall rotate without bind. All units should be checked for perceptible backlash between the worm and worm gear and perceptible end play of the interrupter shaft.

Gauge by eye and feel.

To check this requirement, insert the proper size Allen wrench in the interrupter end of the motor shaft and rotate the shaft through several revolutions. The intermittent magnetic drag on the rotor during each revolution should not be mistaken for binding of the shaft.

(b) Alignment and Mesh of Gears: The worm gear shall be centered over the longitudinal axis of the worm and shall have only perceptible backlash.

Gauge by eye and feel.

This requirement shall be checked at the time of installation and every six months thereafter.

2.05 Operating Noise and Vibration: The noise and vibration of the machine, while operating under normal conditions, shall not be excessive.

Gauge by sound and feel.

2.06 Motor Speed: The motor speed under all conditions of load and input voltage, as specified on the nameplate, shall be as follows:

	MIN (rpm)	MAX (rpm)
KS-15804 L1, L2, L3, L5	1020	1380
KS-15804 L4, L6	1020	1200
KS-15905 L1, L2 & L3	1020	1200
KS-15985 L1	1080	1200
KS-15985 L2, L3	1020	1380

Use Boulin Instrument Corp tachometer, type A.

***2.07 Alternator Output Voltage:** With the input voltage within the limits specified on the nameplate and under all conditions of load,

the output voltage of the alternator shall be as follows:

- Minimum—65 volts ac
- Maximum—90 volts ac.

Use the KS-14510 volt-ohm-milliammeter.

To check this requirement, connect the volt-ohm-milliammeter leads across terminals 4 and 23 (KS-15804 and KS-15905) or terminals 27 and 28 (KS-15985) of the socket into which the ringing machine plug is inserted.

***2.08 Tone Alternator Output Voltage (KS-15804 L1, L3 through L6, and KS-15985 L1 through L3):** With the input voltage within the limits specified on the nameplate, the output voltage of the tone alternator shall be as follows:

	OUTPUT VOLTS AC (FULL LOAD)	OUTPUT VOLTS AC (NO LOAD)
Phase 1	Min 2.0	Max 3.3
Phase 2	Min 0.7	Max 1.1

Use the KS-14510 volt-ohm-milliammeter.

To check this requirement, connect the volt-ohm-milliammeter leads across the socket terminals into which the ringing machine plug is inserted. Measure the output voltages on the following terminals:

	TERMINALS (phase 1)	TERMINALS (phase 2)
KS-15804 L1, and L3 through L6	18 and 21	24 and 27
KS-15985 L1, L2, and L3	15 and 29	15 and 30

2.09 Motor Frame Temperature: The temperature of the motor frame shall not exceed 90°C (194°F).

Use the R-1032, Detail 1, thermometer.

To check this requirement, hold the bulb of the thermometer against the motor frame. Cover the

portion of the bulb not in contact with the motor frame with the asbestos pad. Observe the maximum temperature reading.

Interrupter Requirements

***2.10 Tightness of Spring Pack Mounting Screws:** The spring packs shall be securely mounted.

Gauge by feel.

***2.11 Cleaning of Contacts:** The contacts shall be cleaned when necessary.

Gauge by eye.

***2.12 Contact Follow:** There shall be visible follow of all contact springs after closure of the contacts.

Gauge by eye.

***2.13 Timing Requirements:** The contacts of each spring pack shall close in accordance with the applicable timing chart shown in Fig. 3 through 12 and the tolerances covered in (a) and (b).

(a) **Transfer Period Tolerances:** The interval between the opening of one pair of contacts and closure of the associated pair of contacts shall be within the tolerances specified in Table A.

(b) **Sequence of Contact Closure Tolerances (Spring Packs Having Two or More Make or Break Contacts):** The outer contacts shall close after closure of the inner contacts in accordance with the tolerances specified in Table B. For ringing machines not covered in Table B, closure of all outer contacts shall occur within ± 1 revolution of the motor shaft of the closure of the inner contacts (contacts adjacent to cam).

Gauge by eye.

To check the requirement, insert the proper size Allen wrench in the interrupter end of the motor shaft. Using the wrench, slowly rotate the shaft and count the number of shaft revolutions between opening and closure of the contacts. In checking the requirements, begin counting shaft rotations

when the REFERENCE contacts on each timing chart just close.

(c) **Cam Follower Bottoming:** There shall be no bottoming of the cam followers in the low dwell portions of the cams after all other interrupter and timing requirements have been met.

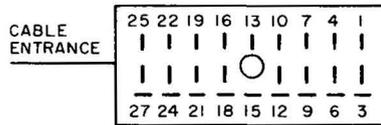
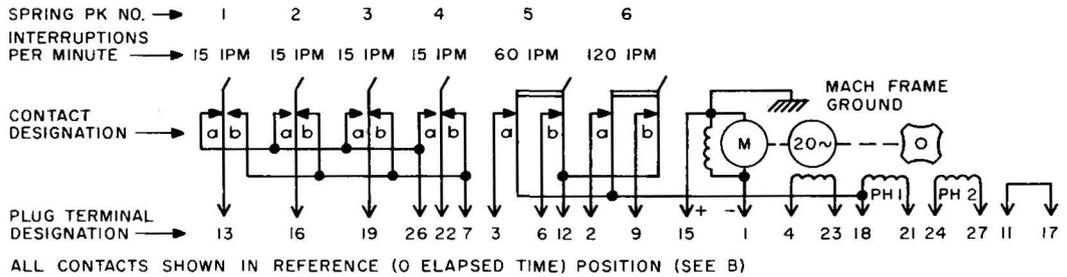
Gauge by eye.

2.14 Lubrication: The ringing machines generally require no lubrication.

(a) The KS-15985 Holtzer-Cabot Corp ringing machine may be equipped with a worm gear repair kit which replaces the plastic worm gear assembly with a bronze worm gear and a steel worm. If the KS-15985 ringing machine is a new machine, it is equipped with a bronze worm gear and a steel worm. If the KS-15985 ringing machine is equipped with the worm gear repair kit, lubricate the worm and worm gear with Lubriplate No. 930AA lubricant. Lubricate at the time of installation and every three months thereafter. Avoid excess lubricant which could get on spring contacts or cams and cam followers.

(b) All list numbers of the KS-15804 ringing machine, equipped with a bronze worm gear and a steel worm, shall be lubricated with Lubriplate No. 930AA lubricant. Lubricate the worm and worm gear at the time of installation and every three months thereafter. Avoid excess lubricant which could get on spring contacts or cams and cam followers.

(c) The KS-15804 L1, L2, and L3 Tech Systems Corporation ringing machine interrupter cam shaft bearings are impregnated at the time of manufacture with lubricating oil. During operation of the machine, the bearings slowly and continuously release this oil to lubricate the interrupter shaft. Eventually this oil will break down, leaving an accumulation of residue on the shaft that can cause the interrupter shaft to bind and strip the worm gear. Every 6 months the shaft and bearings should be wiped clean with a KS-14666 cleaning cloth, and 2 drops of Anderol 465 oil should be applied to the shaft adjacent to each bearing. To prevent damaging the interrupter cams and contacts, avoid applying excess oil. If this condition has been allowed to exist to the point that the worm gear requires replacement, it is recommended that the shaft bearings be replaced also.♦



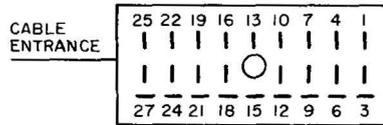
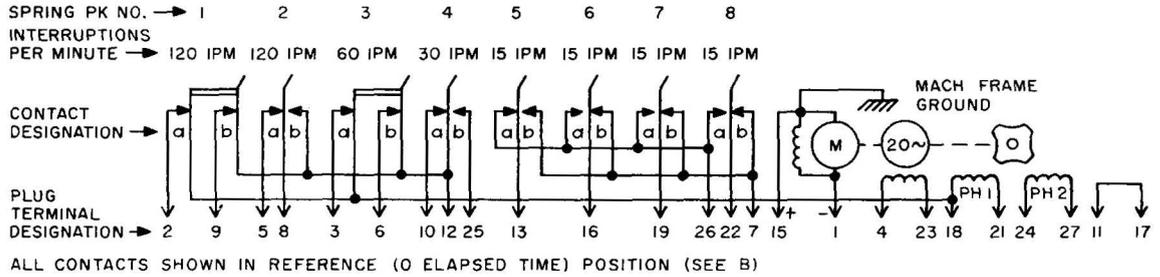
A - RINGING MACHINE SCHEMATIC AND PLUG TERMINAL ARRANGEMENT

SPRING PK NO. AND CONTACT DESIGNATION	CONTACT CLOSURE CHART NOMINAL VALUES SPRING PK 1a CONTACTS CLOSE AT 0				ALLOWABLE VARIATIONS FROM VALUES INDICATED ON CHART			INTERRUPTIONS PER MINUTE
					POINT OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)	LENGTH OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)		
						MIN	MAX.	
1a 1b	[Timing chart for 1a, 1b]				REFERENCE	16	18	15 IPM
2a 2b	[Timing chart for 2a, 2b]				±1 *	16	18	15 IPM
3a 3b	[Timing chart for 3a, 3b]				±1 *	16	18	15 IPM
4a 4b	[Timing chart for 4a, 4b]				±1 *	16	18	15 IPM
5a 5b	[Timing chart for 5a, 5b]				—	9	11	60 IPM
6a 6b	[Timing chart for 6a, 6b]				—	4	6	120 IPM
0 20 40 60 80 ← REV OF HIGH SPEED SHAFT 0 1 2 3 4 ← ELAPSED TIME (SEC) ← ONE REVOLUTION OF CAM →								

* TRANSFER PERIOD - SEE REQ T 2.13 (a).

B - INTERRUPTER TIMING CHART

Fig. 3—KS-15804 L1 Ringing Machine



A-RINGING MACHINE SCHEMATIC AND PLUG TERMINAL ARRANGEMENT

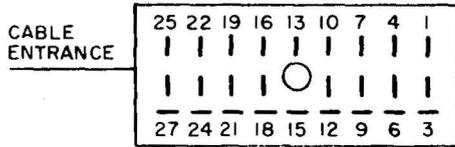
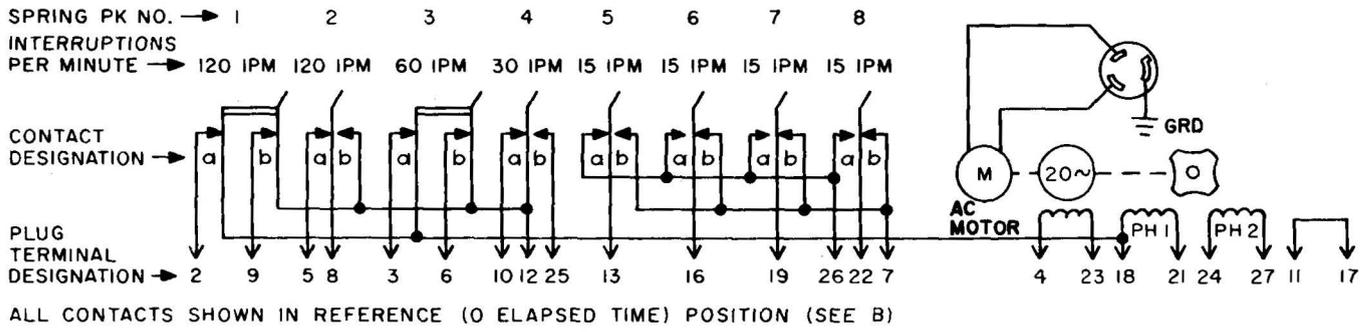
SPRING PK NO. AND CONTACT DESIGNATION	CONTACT CLOSURE CHART NOMINAL VALUES SPRING PK 5a CONTACTS CLOSE AT 0				ALLOWABLE VARIATIONS FROM VALUES INDICATED ON CHART		INTERRUPTIONS PER MINUTE	
					POINT OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)	LENGTH OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)		
			MIN	MAX.				
1a	[Timing chart for 1a]				±1	4	6	120 IPM
1b	[Timing chart for 1b]				±1	4	6	
2a	[Timing chart for 2a]				±1	4	6	120 IPM
2b	[Timing chart for 2b]				*			
3a	[Timing chart for 3a]				±1	9	11	60 IPM
3b	[Timing chart for 3b]				±1	9	11	
4a	[Timing chart for 4a]				±1	4	6	30 IPM
4b	[Timing chart for 4b]				*			
5a	[Timing chart for 5a]				REFERENCE	16	18	15 IPM
5b	[Timing chart for 5b]				*			
6a	[Timing chart for 6a]				±1	16	18	15 IPM
6b	[Timing chart for 6b]				*			
7a	[Timing chart for 7a]				±1	16	18	15 IPM
7b	[Timing chart for 7b]				*			
8a	[Timing chart for 8a]				±1	16	18	15 IPM
8b	[Timing chart for 8b]				*			
0 20 40 60 80 ← REV OF HIGH SPEED SHAFT 0 1 2 3 4 ← ELAPSED TIME (SEC)					← ONE REVOLUTION OF CAM →			

* TRANSFER PERIOD - SEE REQ T 2.13 (a).

B - INTERRUPTER TIMING CHART

Fig. 5—KS-15804 L3 Ringing Machine

SECTION 163-530-701



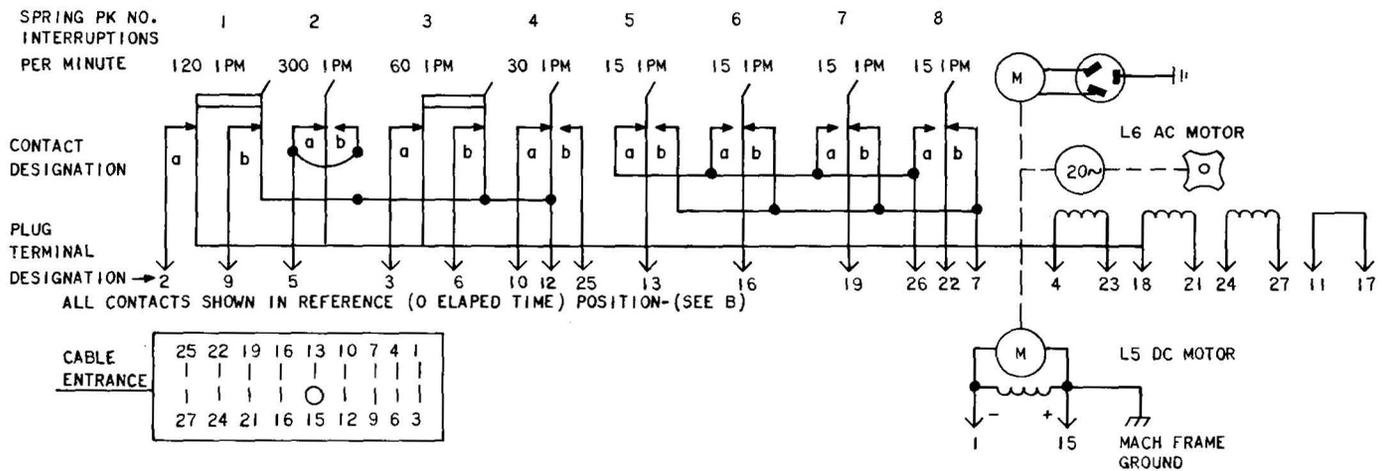
A-RINGING MACHINE SCHEMATIC AND PLUG TERMINAL ARRANGEMENT

SPRING PK NO. AND CONTACT DESIGNATION	CONTACT CLOSURE CHART NOMINAL VALUES SPRING PK 5a CONTACTS CLOSE AT 0	ALLOWABLE VARIATIONS FROM VALUES INDICATED ON CHART			INTERRUPTIONS PER MINUTE
		POINT OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)	LENGTH OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)		
			MIN	MAX.	
1a	[Timing chart for 1a]	±1	4	6	120 IPM
1b		±1	4	6	
2a	[Timing chart for 2a]	±1	4	6	120 IPM
2b		*			
3a	[Timing chart for 3a]	±1	9	11	60 IPM
3b		±1	9	11	
4a	[Timing chart for 4a]	±1	4	6	30 IPM
4b		*			
5a	[Timing chart for 5a]	REFERENCE	16	18	15 IPM
5b		*			
6a	[Timing chart for 6a]	±1	16	18	15 IPM
6b		*			
7a	[Timing chart for 7a]	±1	16	18	15 IPM
7b		*			
8a	[Timing chart for 8a]	±1	16	18	15 IPM
8b		*			
0 20 40 60 80 ← REV OF HIGH SPEED SHAFT 0 1 2 3 4 ← ELAPSED TIME (SEC)		← ONE REVOLUTION OF CAM →			

* TRANSFER PERIOD - SEE REQT 2.13 (a).

B - INTERRUPTER TIMING CHART

Fig. 6—KS-15804 L4 Ringing Machine



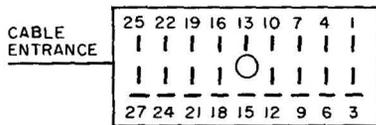
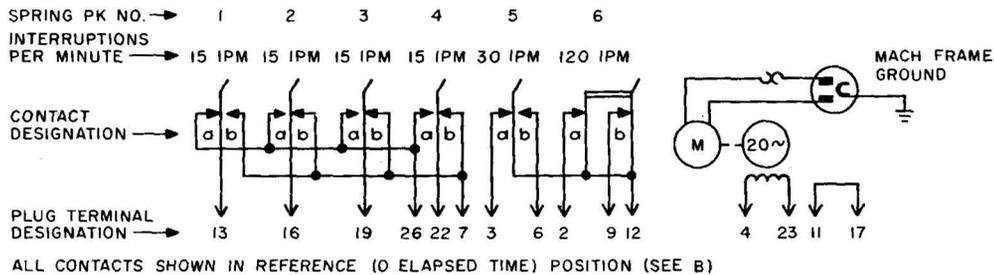
A RINGING MACHINE SCHEMATIC AND PLUG TERMINAL ARRANGEMENT

SPRING PK NO. AND CONTACT DESIGNATION	CONTACT CLOSURE CHART NOMINAL VALUES				ALLOWABLE VARIATION FROM VALUES INDICATED ON CHART			INTERRUPTIONS PER MINUTE
					POINT OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)	LENGTH OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)		
	SPRING PK 5a CONTACTS CLOSE AT 0						MIN	
1a	—	—	—	—	±1	4	6	120 IPM
1b	—	—	—	—	±1	4	6	
2a,b	—	—	—	—		2	3.75	300 IPM
3a	—	—	—	—	±1	9	11	60 IPM
3b	—	—	—	—	±1	9	11	
4a	—	—	—	—	±1	4	6	30 IPM
4b	—	—	—	—	*			
5a	—	—	—	—	REFERENCE	16	18	15 IPM
5b	—	—	—	—	*			
6a	—	—	—	—	±1	16	18	15 IPM
6b	—	—	—	—	*			
7a	—	—	—	—	±1	16	18	15 IPM
7b	—	—	—	—	*			
8a	—	—	—	—	±1	16	18	15 IPM
8b	—	—	—	—	*			

* TRANSFER PERIOD - SEE REOT 213 (A)

B INTERRUPTER TIMING CHART

Fig. 7—KS-15804 L5 & L6 Ringing Machines



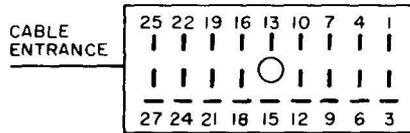
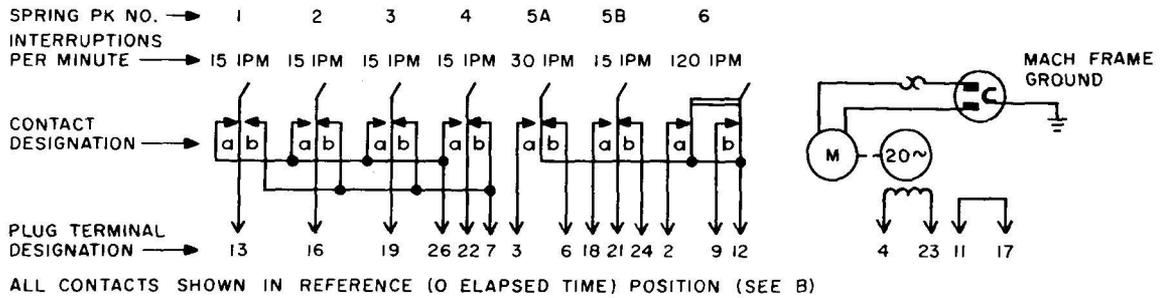
A - RINGING MACHINE SCHEMATIC AND PLUG TERMINAL ARRANGEMENT

SPRING PK NO. AND CONTACT DESIGNATION	CONTACT CLOSURE CHART NOMINAL VALUES SPRING PK 1a CONTACTS CLOSE AT 0	ALLOWABLE VARIATIONS FROM VALUES INDICATED ON CHART		INTERRUPTIONS PER MINUTE	
		POINT OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)	LENGTH OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)		
			MIN		MAX.
1a	[Timing chart for 1a]	REFERENCE	16	18	15 IPM
1b		*			
2a	[Timing chart for 2a]	±1	16	18	15 IPM
2b		*			
3a	[Timing chart for 3a]	±1	16	18	15 IPM
3b		*			
4a	[Timing chart for 4a]	±1	16	18	15 IPM
4b		*			
5a	[Timing chart for 5a]	±1	4	6	30 IPM
5b		*			
6a	[Timing chart for 6a]	±1	4	6	120 IPM
6b		±1	4	6	
0 20 40 60 80		← REV OF HIGH SPEED SHAFT			
0 1 2 3 4		← ELAPSED TIME (SEC)			
← ONE REVOLUTION OF CAM →					

* TRANSFER PERIOD - SEE REQT 2.13 (a).

B - INTERRUPTER TIMING CHART

Fig. 8—KS-15905 L1 Ringing Machine



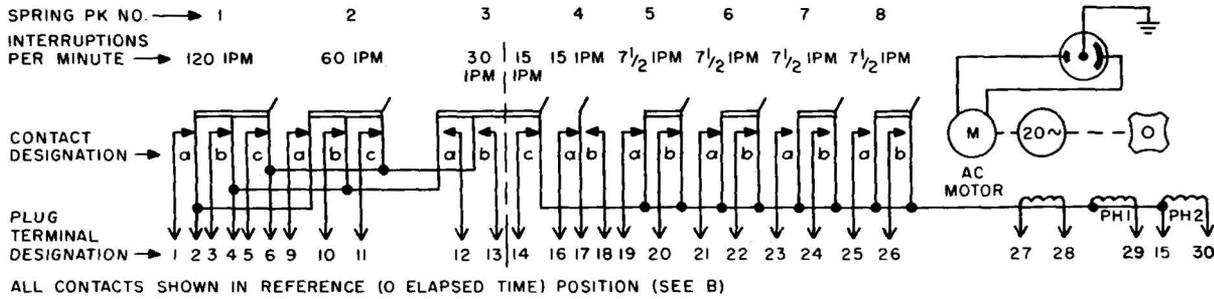
A - RINGING MACHINE SCHEMATIC AND PLUG TERMINAL ARRANGEMENT

SPRING PK NO. AND CONTACT DESIGNATION	CONTACT CLOSURE CHART NOMINAL VALUES SPRING PK 1a CONTACTS CLOSE AT 0	ALLOWABLE VARIATIONS FROM VALUES INDICATED ON CHART		INTERRUPTIONS PER MINUTE	
		POINT OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)	LENGTH OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)		
			MIN		MAX
1a 1b	[Timing chart for 1a, 1b]	REFERENCE *	16	18	15 IPM
2a 2b	[Timing chart for 2a, 2b]	±1 *	16	18	15 IPM
3a 3b	[Timing chart for 3a, 3b]	±1 *	16	18	15 IPM
4a 4b	[Timing chart for 4a, 4b]	±1 *	16	18	15 IPM
5Aa 5Ab	[Timing chart for 5Aa, 5Ab]	±1 *	4	6	30 IPM
5Ba 5Bb	[Timing chart for 5Ba, 5Bb]	— *	4	6	15 IPM
6a 6b	[Timing chart for 6a, 6b]	—	4 4	6 6	120 IPM
		0 20 40 60 80 ← REV OF HIGH SPEED SHAFT			
		0 1 2 3 4 ← ELAPSED TIME (SEC)			
		← ONE REVOLUTION OF CAM →			

* TRANSFER PERIOD - SEE REQT 2.13 (a).

B - INTERRUPTER TIMING CHART

Fig. 9—KS-15905 L2 & L3 Ringing Machine



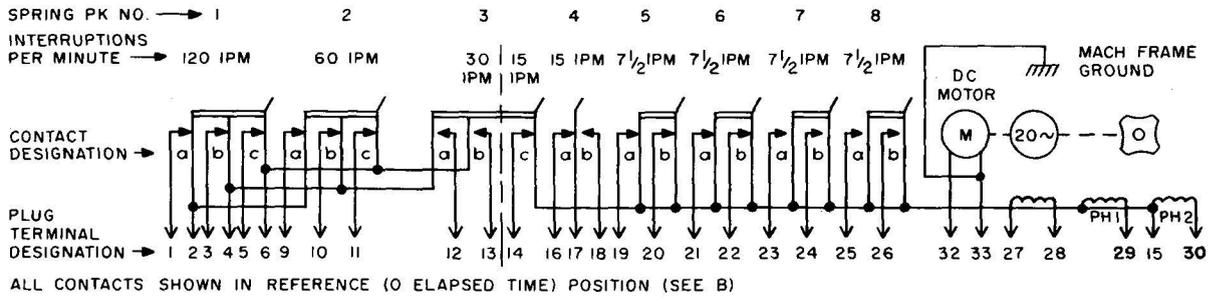
A-RINGING MACHINE SCHEMATIC AND PLUG TERMINAL ARRANGEMENT

SPRING PK NO AND CONTACT DESIGNATION	CONTACT CLOSURE CHART NOMINAL VALUES SPRING PK 4a CONTACTS CLOSE AT O							ALLOWABLE VARIATIONS FROM VALUES INDICATED ON CHART			INTERRUPTIONS PER MINUTE
								POINT OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)	LENGTH OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)		
									MIN	MAX	
1a	0-160	±1	4	6	120 IPM						
1b	0-160	±1	4	6							
1c	0-160	±1	4	6							
2a	0-160	±1	9	11	60 IPM						
2b	0-160	±1	9	11							
2c	0-160	±1	9	11							
3a	0-160	±1	34	35	30 IPM						
3b	0-160	±1	34	35							
3c	0-160	±1	4	6							
4a	0-160	REFERENCE	19	21	15 IPM						
4b	0-160	*									
5a	0-160	±1	4	6	7 1/2 IPM						
5b	0-160	±1	4	6							
6a	0-160	±1	4	6	7 1/2 IPM						
6b	0-160	±1	4	6							
7a	0-160	±1	4	6	7 1/2 IPM						
7b	0-160	±1	4	6							
8a	0-160	±1	4	6	7 1/2 IPM						
8b	0-160	±1	4	6							
0 20 40 60 80 100 120 140 160 0 1 2 3 4 5 6 7 8 ← REV OF HIGH SPEED SHAFT ← ELAPSED TIME (SEC)											
← REVOLUTION OF CAM →											

* TRANSFER PERIOD - SEE REQT 2.13 (a).

B - INTERRUPTER TIMING CHART

Fig. 10—KS-15985 L1 Ringing Machine



A-RINGING MACHINE SCHEMATIC AND PLUG TERMINAL ARRANGEMENT

SPRING PK NO AND CONTACT DESIGNATION	CONTACT CLOSURE CHART NOMINAL VALUES								ALLOWABLE VARIATIONS FROM VALUES INDICATED ON CHART			INTERRUPTIONS PER MINUTE
	SPRING PK 4a CONTACTS CLOSE AT 0								POINT OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)	LENGTH OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)		
										MIN	MAX	
1a	1	2	3	4	5	6	7	8	±1	4	6	120 IPM
1b	2	3	4	5	6	7	8	±1	4	6		
1c	3	4	5	6	7	8	±1	4	6			
2a									±1	9	11	60 IPM
2b								±1	9	11		
2c								±1	9	11		
3a									±1	34	35	30 IPM
3b								±1	34	35		
3c									±1	4	6	15 IPM
4a									REFERENCE	19	21	15 IPM
4b									*			
5a									±1	4	6	7 1/2 IPM
5b								±1	4	6		
6a									±1	4	6	7 1/2 IPM
6b								±1	4	6		
7a									±1	4	6	7 1/2 IPM
7b								±1	4	6		
8a									±1	4	6	7 1/2 IPM
8b								±1	4	6		
	0	20	40	60	80	100	120	140	160	← REV OF HIGH SPEED SHAFT		
	0	1	2	3	4	5	6	7	8	← ELAPSED TIME (SEC)		
	← ONE REVOLUTION OF CAM →											

* TRANSFER PERIOD - SEE REQ'T 2.13 (a).

B - INTERRUPTER TIMING CHART

Fig. 11—KS-15985 L2 Ringing Machine

TABLE A
TRANSFER PERIOD TOLERANCES

RINGING MACHINE	SPRING PACK NO.	ALLOWABLE VARIATIONS (REVOLUTIONS OF HIGH-SPEED SHAFT)	
		MIN	MAX
KS-15804 L1	1 through 4	1/2	2
KS-15804 L2	1 through 5B	1/2	1-1/2
KS-15804 L3 and L4	2, 4, 5, 6, 7 and 8	1/2	1-1/2
KS-15804 L5 and L6	4, 5, 6, 7 and 8	1/2	1-1/2
KS-15905 L1 through L3	1 through 5	1/2	2
KS-15985 L1 & L2	4	1/2	1-1/2
◆KS-15985 L3	5	1/2	1-1/2 ◆

TABLE B

SEQUENCE OF CONTACT CLOSURE TOLERANCES

RINGING MACHINE	SPRING PACK NO.	ALLOWABLE VARIATIONS (revolutions of high-speed shaft)
KS-15804 L1	5 and 6	1/4
KS-15804 L2	6	1/4
KS-15905 L1	6	1/4

3. GENERAL PROCEDURES

3.001 *List of Tools, Gauges, and Materials*

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
373D	Contact Burnisher Holder

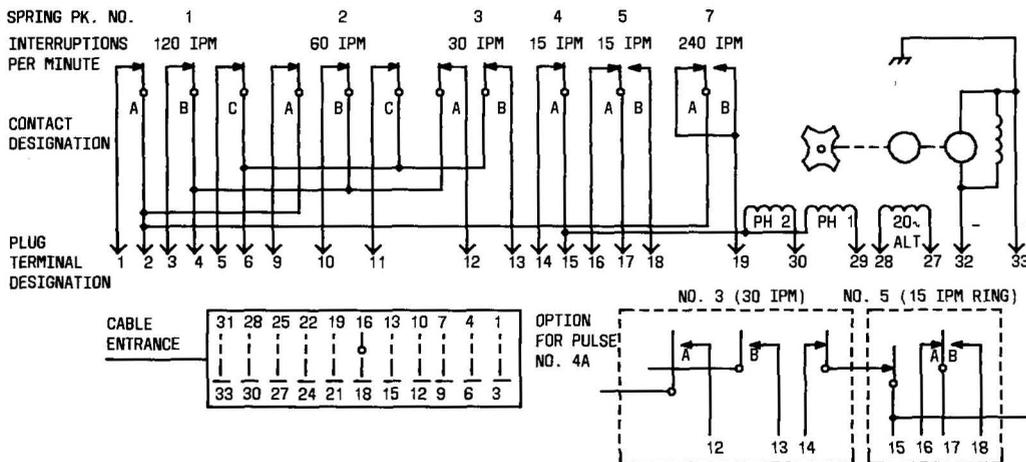
TOOLS

374A	Burnisher
374B	Burnisher
534G	Spring Adjuster
KS-14164	Brush
—	4-Inch E Screwdriver
—	1/2 Ampere Fuse
KS-14796	Oiler
GAUGES	
KS-14510	Volt-Ohm-Milliammeter
R-1032	Thermometer
R-8550	6-Inch Steel Scale
—	Tachometer, Type A, Boulin Instrument Corp

MATERIALS

KS-6948	Battery, 45 Volts (2 reqd)
KS-7860	Petroleum Spirits
KS-14666	Cleaning Cloth
—	Asbestos Pad
—	Bar Stock (approximately 3 inches long, 1/16 inch thick, and 1/2 inch wide) (2 reqd)
KS-16326 L1	Oil
—	Grease-Fiske Lubriplate (930AA is the same as 300-300P)
—	◆Anderol 465 Lubricating Oil (Available from William F. Nye Co. Inc., New Bedford, Mass.)◆

3.002 In many cases, it will be necessary to dismount the ringing machine and place it on a bench for checking requirements and making adjustments. To dismount the machine, disconnect the machine from the circuit by removing the plug from the socket; then lift and remove the machine from its mounting bolts.



A - RINGING MACHINE SCHEMATIC AND PLUG TERMINAL ARRANGEMENT

SPRING PK NO AND CONTACT DESIGNATION	CONTACT CLOSURE CHART NOMINAL VALUES SPRING PACK 4A CONTACTS CLOSE AT 0								ALLOWABLE VARIATIONS FROM VALUES INDICATED ON CHART		INTERRUPTIONS PER MINUTE	
									POINT OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)	LENGTH OF CONTACT CLOSURE (REV OF HIGH SPEED SHAFT)		
	MIN	MAX										
1A									±1	4	6	120 IPM
1B									±1	4	6	
1C									±1	4	6	
2A									±1	9	11	60 IPM
2B									±1	9	11	
2C									±1	9	11	
3A									±1	34	35	30 IPM
3B									±1	34	35	
4A									±1	4	6	15 IPM
5A									REFERENCE	19	21	15 IPM RING
5B									*			
7A									±1	2	3	240 IPM
7B									±1	2	3	
0 20 40 60 80 100 120 140 160								← REV OF HIGH SPEED SHAFT				
0 1 2 3 4 5 6 7 8								← ELAPSED TIME (SEC)				
← ONE REVOLUTION OF CAM												

* TRANSFER PERIOD - SEE REQ 2.13(a)

B - INTERRUPTER TIMING CHART

Fig. 12—KS-15985 L3 Ringing Machine

3.003 Caution: Care should be exercised when using petroleum spirits in power rooms where there are dc machines, since commutation may be adversely affected by softening of commutator film by the fumes. To avoid the need for burnishing the commutators of dc machines after doing any cleaning called for in this section, provide adequate ventilation; use the absolute minimum amount of petroleum spirits required for the cleaning operation; and keep the container closed when not in use.

Warning: Care should be exercised when using petroleum spirits in power rooms to avoid producing sparks which could ignite fumes. Provide adequate ventilation to prevent asphyxiation or other ill effects to personnel.

General Requirements

3.01 Condition of Motor Commutator (KS-15804 L1 Through L3 and L5

and KS-15985 L2 and L3) (Reqt 2.01): Section 171-110-701 covers procedures for maintaining the commutator.

3.02 Condition of Motor Brushes (KS-15804 L1 Through L3 and L5 and KS-15985 L2 and L3) (Reqt 2.02): Section 171-110-701 covers procedures for maintaining the brushes.

3.03 Motor Brush Length (KS-15804 L1 Through L3 and L5 and KS-15985 L2 and L3) (Reqt 2.03): If the requirement is not met, replace the brushes as covered in Section 163-530-801.

3.04 Freedom of Rotating Parts (Reqt 2.04)

- (a) Failure to meet this requirement may be due to binding between the worm and worm gear or worn motor shaft bearings.
- (b) If the motor shaft bearings are worn, replace them as covered in Section 163-530-801.
- (c) If the worm and worm gear bind, correct the condition on Holtzer-Cabot Corp machine as covered in (d), on Electronic Specialty Co machines as covered in (e), and on General Electric Co machines as covered in (f).

(d) **Holtzer-Cabot Corp**

Note: If the KS-15985 ringing machine is equipped with plastic worm gears which bind or show wear, replace the plastic worm gear. A worm gear repair kit is available from the Commercial Electric Co (Part Number F7074) to replace the faulty plastic worm gear. The repair kit includes a bronze worm gear, a steel worm, and a replacement interrupter shaft. All parts in the kit should be installed at the time of replacement.

If the worm and worm gear bind, reposition them in accordance with (3) through (6) after first verifying that there is perceptible end play in the interrupter shaft. If there is more than perceptible end play, perform (1) and (2).

- (1) Loosen the outer cam setscrews using the proper size Allen wrench.

- (2) With the inner cams centered on their associated cam followers, position each outer cam against its associated bearing flange to obtain only perceptible end play of the interrupter shaft and then securely tighten the outer cam setscrews in the V groove of the shaft.

- (3) Loosen the worm gear setscrew using the proper size Allen wrench.

- (4) Hold the No. 1 cam (see Fig. 2) against the bearing flange while positioning the worm gear so that it is centered on the worm. Securely tighten the worm gear setscrew in the V groove.

- (5) Loosen the worm setscrews using the proper size Allen wrench.

- (6) Shift the tapered worm longitudinally along the shaft until there is no backlash. Back off the tapered worm to the point where first perceptible backlash is obtained between the worm and worm gear. Securely tighten the worm setscrews on the flats of the shaft.

(e) **Electronic Specialty Co (Fig. 13)**

- (1) Initially, these machines were provided with a tapered worm similar to the worm used on Holtzer-Cabot Corp machines. To correct for binding on these machines, reposition the worm as covered in (d).

- (2) On later machines, the interrupter shaft on which the worm gear is mounted has bearings in which the bearing holes are slightly eccentric with respect to the periphery of the bearing. Rotating these bearings in their housings increases or decreases the distance between the worm and worm gear shafts, thus changing the backlash between the worm and worm gear. To facilitate making this adjustment, each bearing has an indicator line which is associated with radial graduations on the bearing housing. To eliminate binding between the worm and worm gear, increase the backlash as covered in (3) and (4).

- (3) Using the 3-inch C screwdriver, slightly loosen the bearing bracket mounting screws on both ends of the interrupter shaft.

- (4) Place the two pieces of bar stock edgewise in the bearing slots as shown in Fig. 13. To increase the backlash, simultaneously rotate each bearing the same amount counterclockwise as viewed from the end of the interrupter shaft shown in Fig. 13. Use the graduations on the bearing housing to make sure that both bearings are rotated equally. Securely tighten the bearing bracket mounting screws.

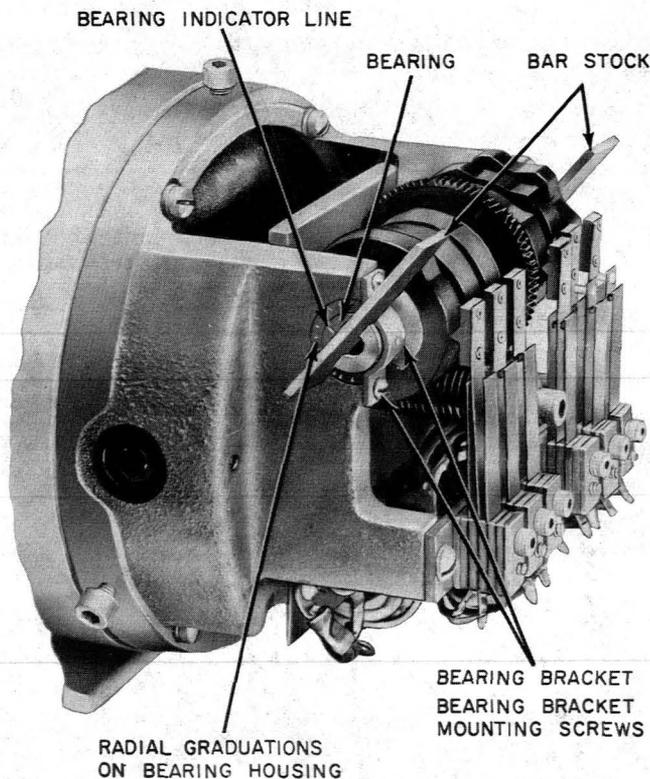


Fig. 13—KS-15804 L2 Electronic Specialty Co—Method of Adjusting Clearance Between Worm and Worm Gear

- (f) **General Electric Corp:** Binding between the worm and worm gear on these machines may be due to foreign matter on the teeth of the worm and worm gear or on the compression spring which holds the worm gear against the worm. Examine these parts and, if necessary, clean them with the KS-14164 brush moistened with KS-7860 petroleum spirits. After cleaning, remove excess petroleum spirits with a clean, dry, KS-14666 cloth. Check for perceptible backlash between the worm and worm gear. If

the backlash is insufficient or excessive, loosen the retaining screws of the bearing caps on both ends. (If the white Teflon washers are present, remove and discard these washers.) Align the outboard ends of each bearing flush with the exterior of the cast surface of the bearing support. Securely tighten the bearing cap mounting screws. Check the backlash. To adjust the backlash, loosen the retaining screws of the bearing cap opposite the worm gear face to allow free movement of the bearing. Slide the bearing toward or away from the gear face to increase or decrease backlash. Once the backlash is adjusted to the desired range, maintain the bearing at the adjusted position and tighten the retaining screws evenly to clamp the bearing in place. If the requirement is still not met after cleaning and adjusting for backlash, replace the worm, worm gear, and, if necessary, the compression spring as covered in Section 163-530-801. The backlash adjustment procedure should be performed after the components are replaced.

3.05 Operating Noise and Vibration (Req 2.05):

If the requirement is not met, check for tightness of all bolts and screws. While the mounting bolts should be tight in the panel, there should be clearance between the bolt heads and the ringing machine mounting bracket when the machine is pushed against the panel. This clearance permits the removal and mounting of the machine without disturbing the bolts. Tighten bolts and screws if necessary. If the interrupter shaft bearings are noisy, place 2 drops of KS-16326 L1 oil using the KS-14796 oiler on the bearing surfaces to flush any dirt away. If this does not correct the trouble, the bearings may require replacement. Replace the bearing if necessary as covered in Section 163-530-801.

3.06 Motor Speed (Req 2.06)

(a) KS-15804 L1 Through L3 and L5 and KS-15985 L2 and L3 Ringing Machines

- (1) If the requirement is not met, check requirements 2.01 through 2.05 and 2.09. If these requirements are met and the speed is still outside the limits, adjust the field resistor of the Holzter-Cabot Corp machine as covered in (2) and that of the Electronic

Specialty Co and General Electric Co machines as covered in (3).

(2) **Holtzer-Cabot Corp and Commercial Electric Products Corp** : To increase the speed of the motor, loosen the screw of the adjustable slider on the field resistor, using the 3-inch C screwdriver, and move the slider towards the outer end of the resistor. To decrease the speed, move the slider in the other direction. After making the adjustments, securely tighten the slider screw.

(3) **Electronic Specialty Co and General Electric Co**: To increase the speed of the motor, loosen the screw of the adjustable slider on the field resistor using the 3-inch C screwdriver and move the slider toward the right end of the resistor. To decrease the speed, move the slider in the other direction. After making the adjustment, securely tighten the slider screw.

(b) **KS-15804 L4 and L6; KS-15905 L1, L2, and L3; and KS-15985 L1 Ringing Machines**: If the requirement is not met, check requirements 2.04, 2.05, and 2.09. If these requirements are met and the speed is outside the specified limits, refer the matter to the supervisor.

3.07 Alternator Output Voltage (Req't 2.07)

(a) **KS-15804 Ringing Machines**: If the requirement is not met, check requirement 2.06. If requirement 2.06 is met, the trouble is due to demagnetization of the alternator rotor caused by an accidental application of a dc potential directly to the alternator stator winding. To correct this condition, remagnetize the rotor as covered in (1) through (3).

(1) Connect two KS-6948 45-volt batteries in series aiding to obtain a 90-volt battery supply.

(2) To remagnetize the rotor, unplug the ringing machine from the plant. Connect the 90-volt battery to terminals 4 and 23 of the ringing machine plug for approximately 2 seconds.

Note: The battery may be connected in either polarity when remagnetizing the rotor.

(3) Reinsert the plug and recheck the alternator output voltage. If the requirement is still not met, unplug the ringing machine and repeat steps (1), (2), and (3).

Note: If the voltage is over 90 volts, proceed in accordance with (4) to reduce the voltage level.

(4) **Warning**: Use suitable insulated leads to connect the fuse at the connector socket. Remove lead quickly from the alternator output terminal when the fuse blows.

Connect a 1/2 ampere fuse with suitable leads between the alternator output (terminal 4 or 23) and ground. The fuse should blow instantly. Recheck the output voltage.

(b) **KS-15905 and KS-15985 Ringing Machines**: If the requirement is not met, check requirement 2.06. If this requirement is met, refer the matter to the supervisor.

3.08 Tone Alternator Output Voltage (KS-15804 L1 and L3 Through L6 and KS-15985 L1 Through L3) (Req't 2.08):

If the requirement is not met, check requirement 2.06. If this requirement is met, refer the matter to the supervisor.

3.09 Motor Frame Temperature (Req't 2.09):

If the temperature exceeds the specified limits, check requirements 2.01 through 2.06. If these requirements are met, refer the matter to the supervisor.

Interrupter Procedures

3.10 Tightness of Spring Pack Mounting Screws (Req't 2.10):

Securely tighten the spring pack mounting screws using the 3-inch C screwdriver. Check requirements 2.12 and 2.13 after tightening the screws.

3.11 Cleaning of Contacts (Req't 2.11):

Clean the contacts in accordance with Section 069-306-801. After cleaning, check that requirements 2.12 and 2.13 are met.

3.12 Contact Follow (Reqt 2.12)

- (a) If these requirements are not met, adjust the contact springs using the 534G spring adjuster as covered in (b).
- (b) Place the slotted portion of the spring adjuster at an angle against the edge of the spring. Roll the adjuster over the spring so that the spring engages the bottom of the slot. Then slide the adjuster to the base of the spring. Bend the spring in or out as required, taking care not to disturb adjacent springs.

3.13 Timing Requirements (Reqt 2.13):
Same as 3.12.

Note: The cam followers shall not bottom in the low dwell portions of the cams after all other interrupter and timing requirements have been met.

3.14 Lubrication (Reqt 2.14) Bronze Worm Gear and Steel Worm on the KS-15804 and KS-15985 Ringing Machine: Clean the worm gear and worm if the surfaces appear gummy or excessively dirty. If necessary, clean them with the KS-14164 brush moistened with KS-7860 petroleum spirits. After cleaning, remove excessive petroleum spirits with a clean, dry KS-14666 cloth. Apply the 930AA lubriplate grease to the entire circumference of the worm gear. Rotate the worm gear electrically or manually to obtain unobstructed access to all teeth of the worm gear and worm. After the grease has expanded fully, stop the machine and remove excess grease from the sides of the worm gear and the bottom of the worm with a clean KS-14666 cloth.

Note: When cleaning and lubricating the worm gear and worm, do not permit grease or dirt to fall on associated apparatus.