

TIMERS
KS-16329, L1 AND L2
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the KS-16329, L1 and L2 timers.

1.02 This section is reissued to add information for the KS-16329, L2 timer, to revise the requirement and procedure for release of timer, and to add the requirement and procedure for electrical requirements. Detailed reasons for reissue will be found at the end of the section.

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.

2. REQUIREMENTS

2.01 *Lubrication:* The gear teeth and bearings shall be checked annually for lubrication. If lubrication is necessary, a film of KS-14774, L2G lubricating grease shall be distributed evenly over the periphery of the gears and around the edge of each bearing.

2.02 *Contact Spring Roller Position:* The contact spring rollers shall be aligned with respect to their associated cams so that the width of the cam lies entirely within the width of the roller.

Gauge by eye.

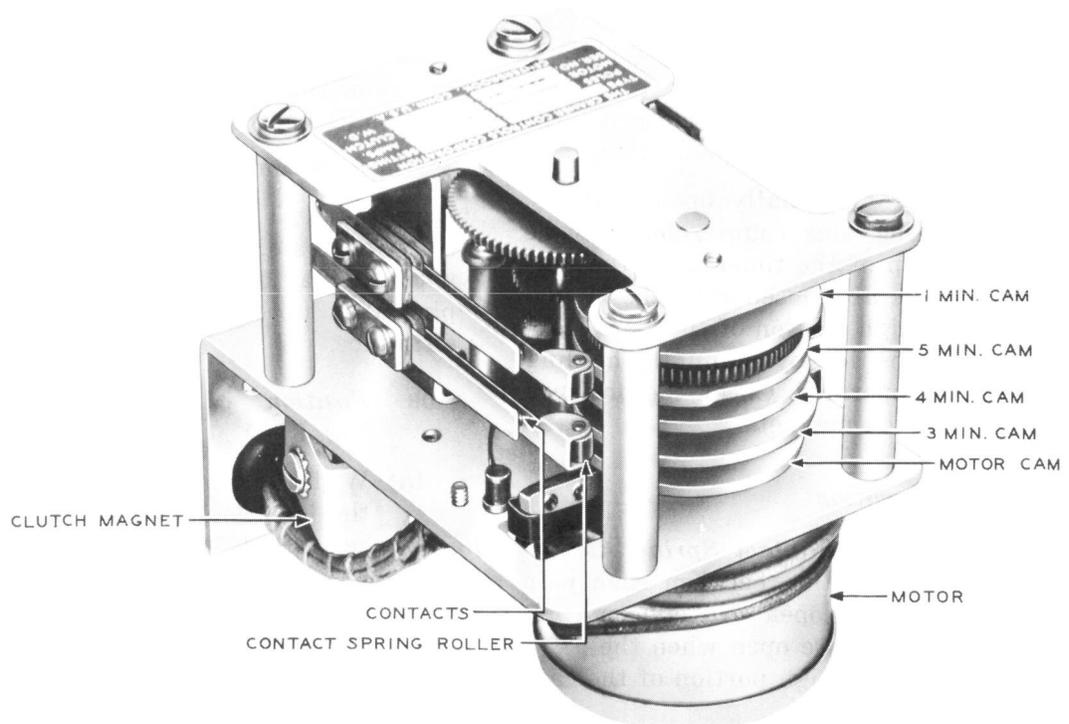


Fig. 1 – KS-16329 Timer — Cover Removed (L1 timer shown)

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2.03 Contact Alignment: Fig. 2 (A) — Contacts shall not be out of alignment more than 40 per cent of their base diameter.

Gauge by eye.



Fig. 2 — Maximum Permissible Contact Misalignment

2.04 Freedom of Movement of Contact Spring Rollers: The rollers of the contact springs shall rotate freely.

Gauge by eye and feel.

To check this requirement, use the KS-6320 orange stick to lift the contact spring on which the roller is mounted so that the roller just clears the cam. Check freedom of movement of the roller with another orange stick.

2.05 Contact Pressure: The pressure between mating contacts shall be

Min 25 grams

Use the 68B gauge applied as close to the contact as possible.

To check pressure of normally open contacts, manually rotate the cams counterclockwise as viewed from the top of the timer until the normally open contacts are closed with the associated roller on the high portion of the cam. Hold the cams in this position by manually holding the clutch magnet operated. Check the pressure and release the clutch magnet.

2.06 Contact Separation

(a) **Except Transfer Contact Spring Assemblies:** The separation between each pair of contacts normally open or between each pair of contacts that are open when the associated roller is on the high portion of the cam shall be

Min 0.008 inch

Gauge by eye.

(b) **Transfer Contact Spring Assembly:** The contact separation shall be as follows.

(1) **Normally open contacts**

Min 0.006 inch

Max 0.010 inch

Use the 92A and 92U gauges.

(2) **Normally closed contacts**

Min 0.008 inch

Max 0.015 inch

Use the 92E and 92W gauges.

Measure the contact separation of normally closed contacts as covered in (c).

(c) To check the contact separation of normally closed contacts, manually rotate the cams in a counterclockwise direction as viewed from the top until the roller of the associated spring is over the low portion of the cam. Hold the cams in this position by manually holding the clutch magnet operated. Check the contact separation and release the clutch magnet.

2.07 Clearance Between Contact Spring Roller and Cam: On spring assemblies having normally closed contacts with the contacts closed and the roller over the low portion of the cam, the clearance between the roller and cam shall be

Min 0.005 inch

Use the 92T gauge inserted between the roller and cam. The requirement may be checked with the play between the roller and its bearing pin taken up in the direction to increase the clearance.

2.08 Position of Clutch Magnet Detent: Fig. 3(A)

(a) With the clutch magnet armature against the back stop, the detent shall clear the notched wheel.

Gauge by eye.

(b) With the armature held electrically against a 0.010-inch gauge inserted between the center of the core and the armature, the detent shall fully engage the notched wheel.

Gauge by feel using the KS-6320 orange stick.

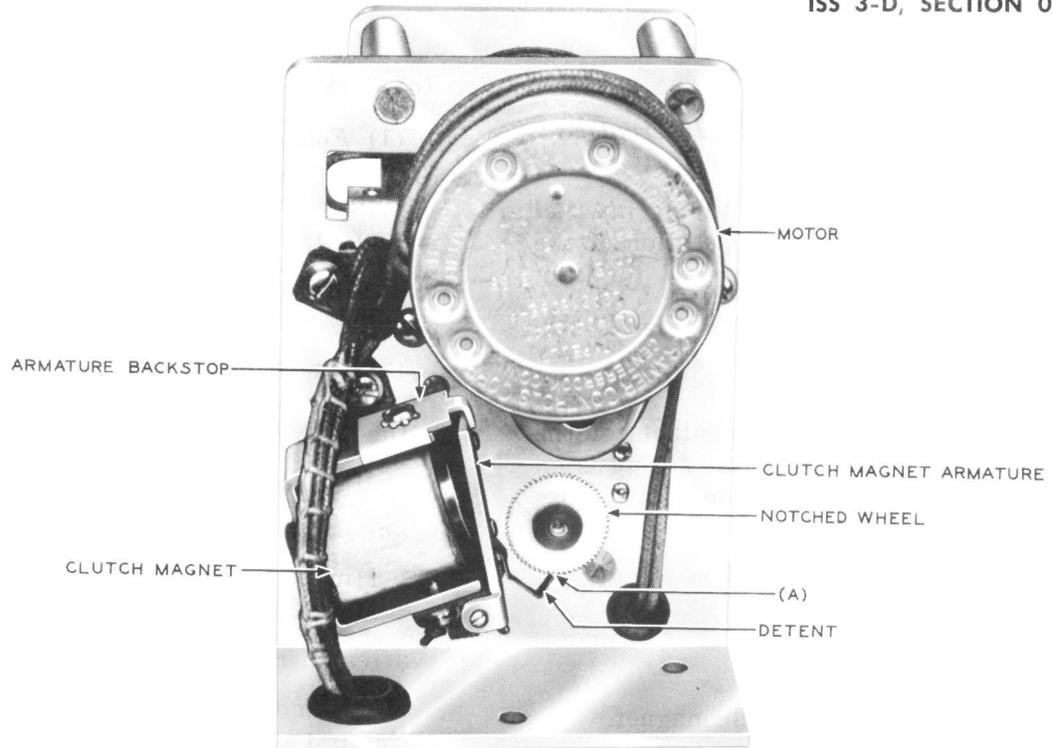


Fig. 3 — KS-16329 Timer — Bottom View (L1 timer shown)

To check this requirement, insert the 92A gauge between the armature and core at the center of the core and operate the armature against the gauge by connecting ground to terminal 15, 16, 17, or 18 of the A terminal strip for timer 1, 2, 3, or 4, respectively. Use a 1W13A cord equipped with a 365 tool at each end for making this connection.

2.09 Release of Timer: The timer shall return to normal from any operated position without hesitation when the clutch magnet is released.

To check the requirement, electrically operate the T relay by connecting ground to terminal 55, 56, 57, or 58 on the A terminal strip for timer 1, 2, 3, or 4, respectively. Operate the clutch magnet by connecting ground to terminal 15, 16, 17, or 18 of the A terminal strip for timer 1, 2, 3, or 4, respectively. Use two 1W13A cords equipped at each end with 365 tools for making these connections. Hold the clutch magnet operated

for a few seconds and then release it by removing the ground connection to the clutch magnet.

2.10 Motor Operation: The motor shall drive the 1-minute cam five revolutions in 5 minutes $\pm 3/5$ second.

Use the KS-3008 stop watch.

To check the requirement, make a pencil mark on the edge of the 1-minute cam. Electrically operate the T relay by connecting ground to terminal 55, 56, 57, or 58 on the A terminal strip for timer 1, 2, 3, or 4, respectively. Operate the clutch magnet by connecting ground to terminal 15, 16, 17, or 18 of the A terminal strip for timer 1, 2, 3, or 4, respectively. Use 1W13A cords equipped at each end with 365 tools for making these connections. Time the interval from the time the clutch magnet operates to the time that the 1-minute cam has made five revolutions as indicated by the pencil mark on the edge of the cam. Disconnect the cords from the terminals.

2.11 *Timing Requirements*

Γ (a) *Timer Used for 2-Minute Interval*
(L2 timer only)

(1) *Two-Minute Cam:* The timing interval as measured from the operation of the clutch magnet to the closure of the cam contacts shall be

Min 1 minute, 52 seconds
Max 1 minute, 56 seconds

(2) *One-Minute Cam:* The contacts of the cam which make when the spring is on the high portion of the cam shall close

Max 1 minute, 49 seconds
and shall open

Min 2 minutes, 11 seconds
Max 2 minutes, 13 seconds

after operation of the clutch magnet.

Make and break of these contacts during the first revolution of this cam shall be disregarded for this requirement.

Use the KS-3008 stop watch.

L Check as covered in (e).

(b) *Timer Used for 3-Minute Interval*

(1) *Three-Minute Cam:* The timing interval as measured from the operation of the clutch magnet to the closure of the cam contacts shall be

Min 2 minutes, 52 seconds
Max 2 minutes, 56 seconds

(2) *One-Minute Cam:* The contacts of the cam which make when the spring is on the high portion of the cam shall close

Max 2 minutes, 49 seconds
and shall open

Min 3 minutes, 11 seconds
Max 3 minutes, 13 seconds

after operation of the clutch magnet.

Make and break of these contacts during the first two revolutions of this cam shall be disregarded for this requirement.

Use the KS-3008 stop watch.

Check as covered in (e).

(c) *Timer Used for 4-Minute Interval*

(1) *Four-Minute Cam:* The timing interval as measured from the operation of the clutch magnet to the closure of the cam contacts shall be

Min 3 minutes, 52 seconds
Max 3 minutes, 56 seconds

(2) *One-Minute Cam:* The contacts of the cam which make when the spring is on the high portion of the cam shall close

Max 3 minutes, 49 seconds
and shall open

Min 4 minutes, 11 seconds
Max 4 minutes, 13 seconds

after operation of the clutch magnet.

Make and break of these contacts during the first three revolutions of this cam shall be disregarded for this requirement.

Use the KS-3008 stop watch.

Check as covered in (e).

(d) *Timer Used for 5-Minute Interval*
(L1 timer only)

(1) *Five-Minute Cam:* The timing interval as measured from the operation of the clutch magnet to the closure of the cam contacts shall be

Min 4 minutes, 52 seconds
Max 4 minutes, 56 seconds

(2) *One-Minute Cam:* The contacts of the cam which make when the spring is on the high portion of the cam shall close

Max 4 minutes, 49 seconds
and shall open

Min 5 minutes, 11 seconds
Max 5 minutes, 13 seconds

after operation of the clutch magnet.

Make and break of these contacts during the first four revolutions of this cam shall be disregarded for this requirement.

Use the KS-3008 stop watch.

Check as covered in (e).

(e) These requirements may be checked from the switchboard with the timer operating in the working circuit. To check the requirements in this way, insert the timing cord plug in the jack corresponding to the interval to be timed (2, 3, 4, or 5 minutes). Start measuring time at the instant the plug is inserted in the jack and measure the time to the flashing of the cord lamp. Also measure the time of duration of the flashing. The requirement is considered met if the flashing starts at least 3 seconds before the expiration of the timing interval (2, 3, 4, or 5 minutes) and continues for at least 10 seconds after which the lamp should light steadily.

2.12 Motor Cam: The timing interval as measured from operation of the clutch magnet to the opening of the motor cam contacts shall be

- Min 5 minutes, 14 seconds
- Max 5 minutes, 20 seconds

Use the KS-3008 stop watch.

To check this requirement, electrically operate the T relay by connecting ground to terminal 55, 56, 57, or 58 on the A terminal strip for timer 1, 2, 3, or 4, respectively. Operate the clutch magnet by connecting ground to terminal 15, 16, 17, or 18 of the A terminal strip for timer 1, 2, 3, or 4, respectively. Use two 1W13A cords equipped at each end with 365 tools for making these connections. Opening of the motor cam contacts is indicated by stopping of the timer.

2.13 Electrical Requirements: The clutch magnet shall meet the electrical requirements specified on the circuit requirement table.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, Materials, and Test Apparatus

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
365 (6 reqd)	Connecting Clip
415B	Spring Adjuster
416B	Spring Adjuster

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
KS-6320 (2 reqd)	Orange Stick
KS-6854	Screwdriver
KS-14162	Brush
KS-14250, List 1	Flashlight
R-2961	Allen Socket Screw Wrench
—	3-Inch C Screwdriver
—	4-Inch E Screwdriver

GAUGES	
68B	70-0-70 Gram Gauge
92A	0.010-Inch Nonmagnetic Offset Thickness Gauge
92E	0.015-Inch Nonmagnetic Offset Thickness Gauge
92T	0.005-Inch Nonmagnetic Offset Thickness Gauge
92U	0.006-Inch Nonmagnetic Offset Thickness Gauge
92W	0.008-Inch Nonmagnetic Offset Thickness Gauge
KS-3008	Stop Watch

MATERIALS	
KS-14774, List 2G	Lubricating Grease

TEST APPARATUS	
1W13A (4 reqd)	Cord

3.002 Removing Cover: To gain access to the timer, remove the cover using the 4-inch E screwdriver to remove the cover screws. To gain access to certain parts of the timer, it may be necessary to remove the mounting screws and pull the timer away from the mounting. Use the 4-inch E screwdriver for removing the mounting screws.

3.01 Lubrication (Reqt 2.01) — Apply a film of KS-14774, L2G lubricating grease to the periphery of the gears and around the edge of

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the bearings with the KS-14162 brush. Apply the grease sparingly and avoid getting grease on the cams.

3.02 *Contact Spring Roller Position* (Reqt 2.02)

3.03 *Contact Alignment* (Reqt 2.03)

3.04 *Freedom of Movement of Contact Spring Rollers* (Reqt 2.04)

- (1) If any of these requirements are not met, replace the timer.

3.05 *Contact Pressure* (Reqt 2.05)

3.06 *Contact Separation* (Reqt 2.06)

3.07 *Clearance Between Contact Spring Roller and Cam* (Reqt 2.07)

- (1) To adjust contact springs for these requirements, use the 415B spring adjuster for the lighter springs and the 416B spring adjuster for the heavier springs. Place the adjuster on the spring behind the contact and slide it as close to the pile-up as possible. Adjust the spring as required.

3.08 *Position of Clutch Magnet Detent* (Reqt 2.08)

- (1) If the requirement is not met, slightly loosen the magnet mounting screws with the KS-6854 screwdriver. Shift the position of the magnet as required. Securely tighten the mounting screws and recheck the requirement.

3.09 *Release of Timer* (Reqt 2.09)

- (1) If the requirement is not met, check requirement 2.08(a), and adjust if required. If the timer still fails to release properly, replace the timer.

3.10 *Motor Operation* (Reqt 2.10)

- (1) If the requirement is not met, replace the motor as covered in Section 030-159-801.

3.11 *Timing Requirements* (Reqt 2.11)

- (1) If the timing requirements are not met, proceed as follows. First determine the cam contact timing directly from the contacts

as covered in (a). Then reset the cams on the shaft as required as covered in (b).

(a) Operate the T relay by connecting a ground to terminal 55, 56, 57, or 58 on the A terminal strip for timer 1, 2, 3, or 4, respectively. Use the 1W13A cord equipped at each end with the 365 tool. Connect the KS-14250, L1 flashlight by means of two 1W13A cords equipped at one end with the 365 tool to the terminals of the contact springs associated with the cams to be checked. In checking the 1-minute cam, connect the cords to the outer and middle contact springs. Close the flashlight switch. Electrically operate the clutch magnet by connecting a ground to terminal 15, 16, 17, or 18 of the A terminal strip for timer 1, 2, 3, or 4, respectively. Use the 1W13A cord equipped at each end with the 365 tool. Time the interval from the time that the clutch magnet is operated to the time the flashlight lamp lights. When checking the 1-minute cam, also check the length of time the lamp remains lighted. Remove the connections from the terminal strip and the timer.

(b) Adjust the position of the cam as required by loosening the cam setscrews with the R-2961 wrench. Position the cam as required and securely tighten the setscrews.

3.12 *Motor Cam* (Reqt 2.12)

- (1) If the requirement is not met, adjust the position of the cam as required by loosening the cam setscrews using the R-2961 wrench. Position the cam as required and securely tighten the setscrews.

3.13 *Electrical Requirements* (Reqt 2.13)

- (1) If the clutch magnet fails to meet the operate requirement, slightly loosen the armature backstop mounting screw, using the 3-inch C screwdriver, and move the backstop to reduce the unoperated armature air gap. Check that requirement 2.08 is still met. Securely tighten the backstop mounting screw.

REASONS FOR REISSUE

1. To revise the requirement for release of timer (2.09).
2. To add information for the KS-16329, L2 timer (2.11).
3. To add the electrical requirements for the clutch magnet (2.13).
4. To revise the procedure for contact spring roller position, contact alignment, and freedom of movement of contact spring rollers (3.02 — 3.04).
5. To revise the procedure for release of timer (3.09).
6. To add a procedure for electrical requirements for the clutch magnet (3.13).