U-5 Switch Circuit Controller

ASTS USA Part Numbers
N181359
N181359xxx
N184034
N193030
N193030001

- Installation
- Maintenance

Proprietary Notice

Important Notice

ASTS USA constantly strives to improve our products and keep our customers apprised of changes in technology. Following the recommendations contained in the attached service manual will provide our customers with optimum operational reliability. The data contained herein purports solely to describe the product, and does not create any warranties.

Within the scope of the attached manual, it is impossible to take into account every eventuality that may arise with technical equipment in service. Please consult an ASTS USA local sales representative in the event of any irregularities with our product.

ASTS USA expressly disclaims liability resulting from any improper handling or use of our equipment, even if these instructions contain no specific indication in this respect. We strongly recommend that only approved ASTS USA spare parts are used as replacements.

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Revision History

Rev.	Date	Nature of Revision
Original	February 1979	Initial Issue
*	May 1991	Updated Parts List
2	August 2007	Incorporated ECOs EM-2488, EM-2496, EM2498, EM-2499, EM-2500, EM-2505, and EM-2870.
3	September 2007	Incorporated ECO 140222-1; corrected the gap settings on the contact springs. Incorporated ECO 2870C; revised Figures 5-3 and 5-4 and corrected part lists.
4	March 2008	Incorporated ECO EM-2979; revised parts lists for N181359003 and N181359005.
5	June 2009	Incorporated ECO EM-2870G; revised parts lists.
6	January 2010	Revised Table 5-6, Table 5-7, Table 5-8, Figure 5-5, and Figure 5-7 for items 8 and 47.

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1. GENERAL INFORMATION

1.1. Scope of Manual

This manual contains the installation, operation, and maintenance procedures for the four-way U-5 Switch Circuit Controller (Figure 1-1). The manual is applicable to four-way U-5 Switch Circuit Controllers manufactured after July 15, 2007. Specific ASTS USA part numbers covered by this manual are presented in Table 5-1.

1.2. Introduction

The U-5 Switch Circuit Controller monitors the position of rail switch points and provides electrical signals to control various pieces of equipment based on the position of the points. The terminals, contacts, operating cams, and other components are installed in a weather tight steel housing. A hinged cover provides easy internal access for inspection, adjustment, and maintenance. Two elbow type ventilators provide for air circulation to minimize condensation within the steel housing.

The machine has a 1-1 /2 inch diameter cam shaft which provides a large bearing surface to reduce bushing wear. This cam shaft also provides a large surface area to engage a micrometer adjusting screw to prevent wear and a loss of sensitivity. All of the shaft bearings are self-lubricating.

Although this manual covers only the four-way U-5 Switch Circuit Controller, the controller is available in several other standard and yard type configurations by contacting ASTS USA (see Section 6). Standard type machine designs include two-way, four-way, or six-way sizes for two-position, three-position, and polarized applications. Three-way, three-position and one-way, two-position designs are available for yard type machines.

Figure 1-1. U-5 Switch Circuit Controller (Four-Way)

The major assemblies of the U-5 Switch Circuit Controller are shown in Figure 1-2.

The operating crank of the U-5 Switch Circuit Controller is solidly connected to the end points of a switch layout and as the switch points move, the operating crank rotates a cam shaft inside the Circuit Controller. As the cam shaft rotates, it moves cams along operating arms causing them to open and close contact springs in a contact board. The return spring arrangement is shown in Figure 1-3.

1.3. Specifications

1.3.1. Mechanical

Overall Dimensions: Height = 7-1/2"
Width = 7-3/4"
Depth =17”

Weight: Approximately 68 pounds (including crank)

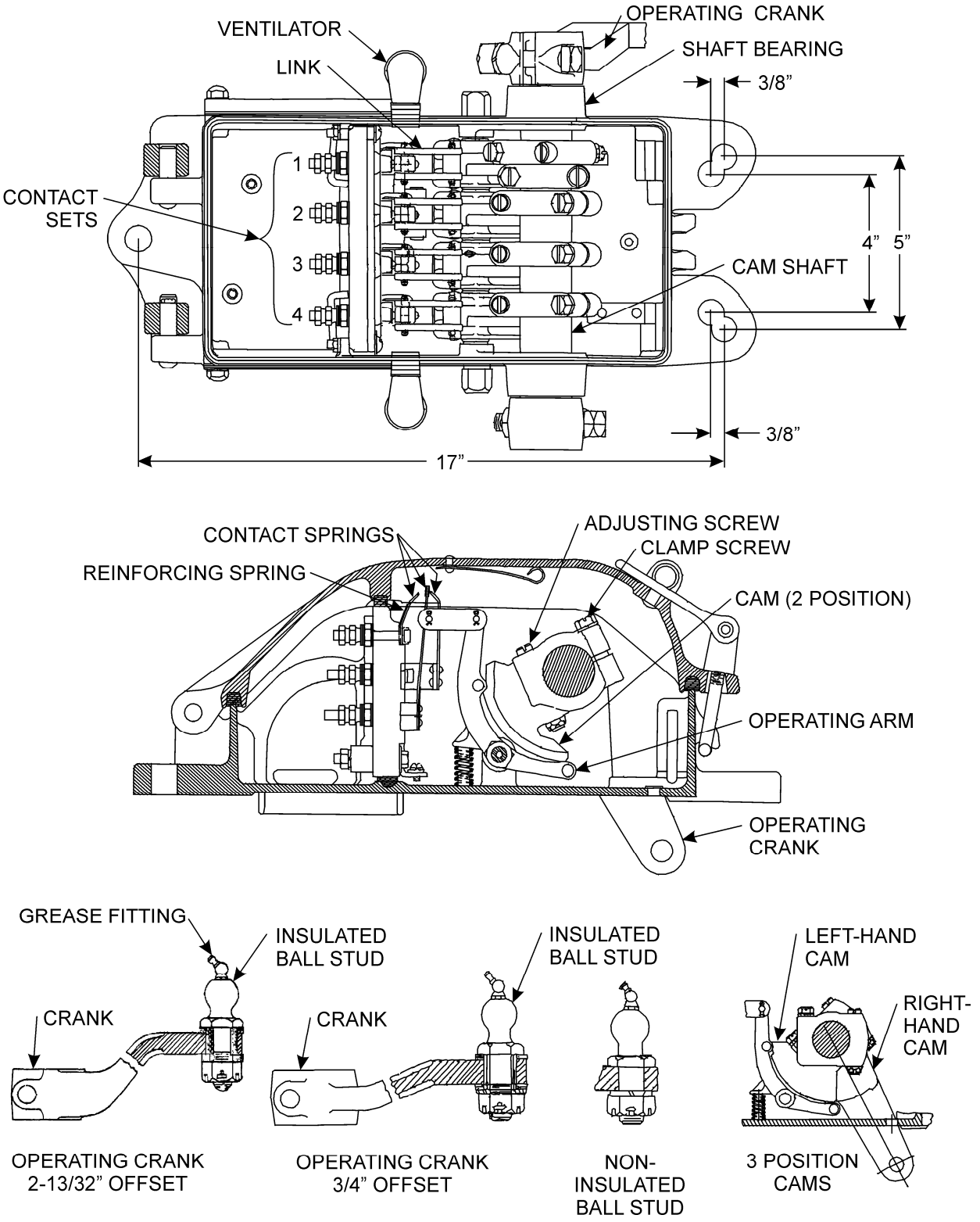
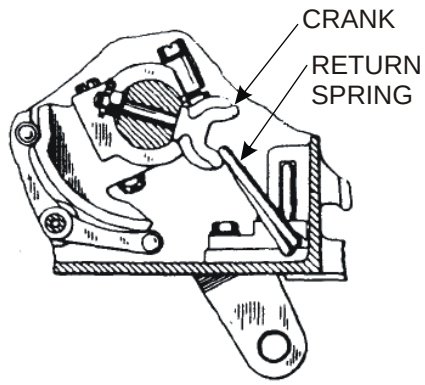
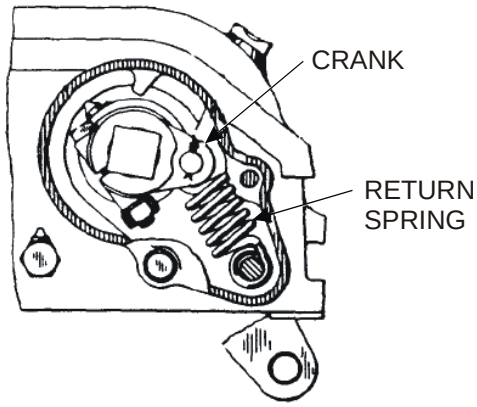


Figure 1-2. U-5 Switch Circuit Controller Major Assemblies



A. RETURN SPRING ARRANGEMENT



B. RETURN SPRING ARRANGEMENT FOR 4-WAY 3-POSITION ONLY (MOUNTED OUTSIDE OF CASE)

Figure 1-3. Return Spring Arrangements

2. INSTALLATION

2.1. General

WARNING

The U-5 Switch Circuit Controller contains operating voltages which can be harmful. Before opening the U-5 Controller it is important to disable all power to the unit. Failure to do so could result in serious personal injury or loss of life.

The U-5 Switch Circuit Controller should be installed in accordance with the railroad's approved mounting plans for the switch layout.

The specific application in which the U-5 is used determines the following installation requirements:

1. Circuit controller size and cam arrangement. (Section 5 presents all of the part numbers for the U-5 Circuit Controller.)

2. Crank offset (3/4 inch or 2-13/32 inch) as determined by the "Z" dimension identified in Figure 2-1.

3. Circuit controller operating rod and point detector lugs as applicable to near or far point installation and "Z" dimension.

The versatile U-5 Switch Circuit Controller can be installed in either right-hand or left-hand layouts and connected to either the near or far switch point. Typical switch machine right-hand and left-hand layouts are shown in Figure 2-2 and Figure 2-3, respectively. The U-5 Circuit Controller is connected to the near point in these figures.

2.2. Mounting

The following standard mounting procedures associated with the typical layouts shown in Figure 2-2 and Figure 2-3 assume that all equipment (including the point detector lug and the circuit controller operating rod) has been installed with the exception of the U-5.

1. Manually move the switch points to their normal position.

2. Using the studs, nuts, and washers, secure the U-5 (without the crank) in position on Tie Number 1 as shown in Figure 2-2 or Figure 2-3.

3. Install the crank on the U-5 in the normal position for a right-hand (Figure 2-2) or left-hand (Figure 2-3) installation. Orient the crank so that in the normal position of the switch, the point at which the U-5 crank will connect to the operating rod stands approximately 2-3/8 inches from the centerline of the cam shaft. Keeping cam shaft motion to a minimum, secure the crank to the cam shaft with the clamp. Ensure that the crank is secured to the cam shaft so that it does not bind against the U-5 case and allows the cam shaft to rotate freely.

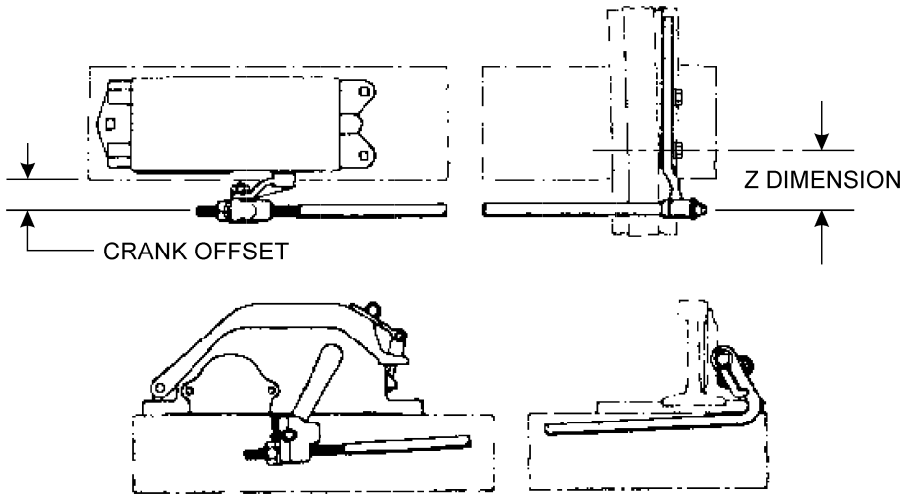
4. Attach the circuit controller operating rod to the U-5 crank.

5. Open the U-5 cover and attach the conduit to the U-5 case.

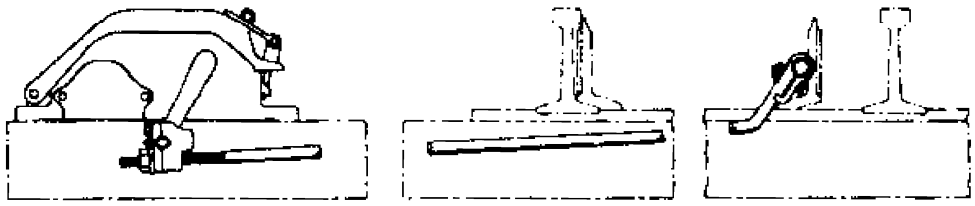
6. Wire the U-5 terminal board according to the appropriate installation drawings.

7. Close and secure the hinged cover of the U-5 Switch Circuit Controller.

8. Adjust the cams per Section 2.3.



APPLICATION OF SWITCH CIRCUIT CONTROLLER TO NEAR SWITCH POINT



APPLICATION OF SWITCH CIRCUIT CONTROLLER TO FAR SWITCH POINT

Figure 2-1. Installation

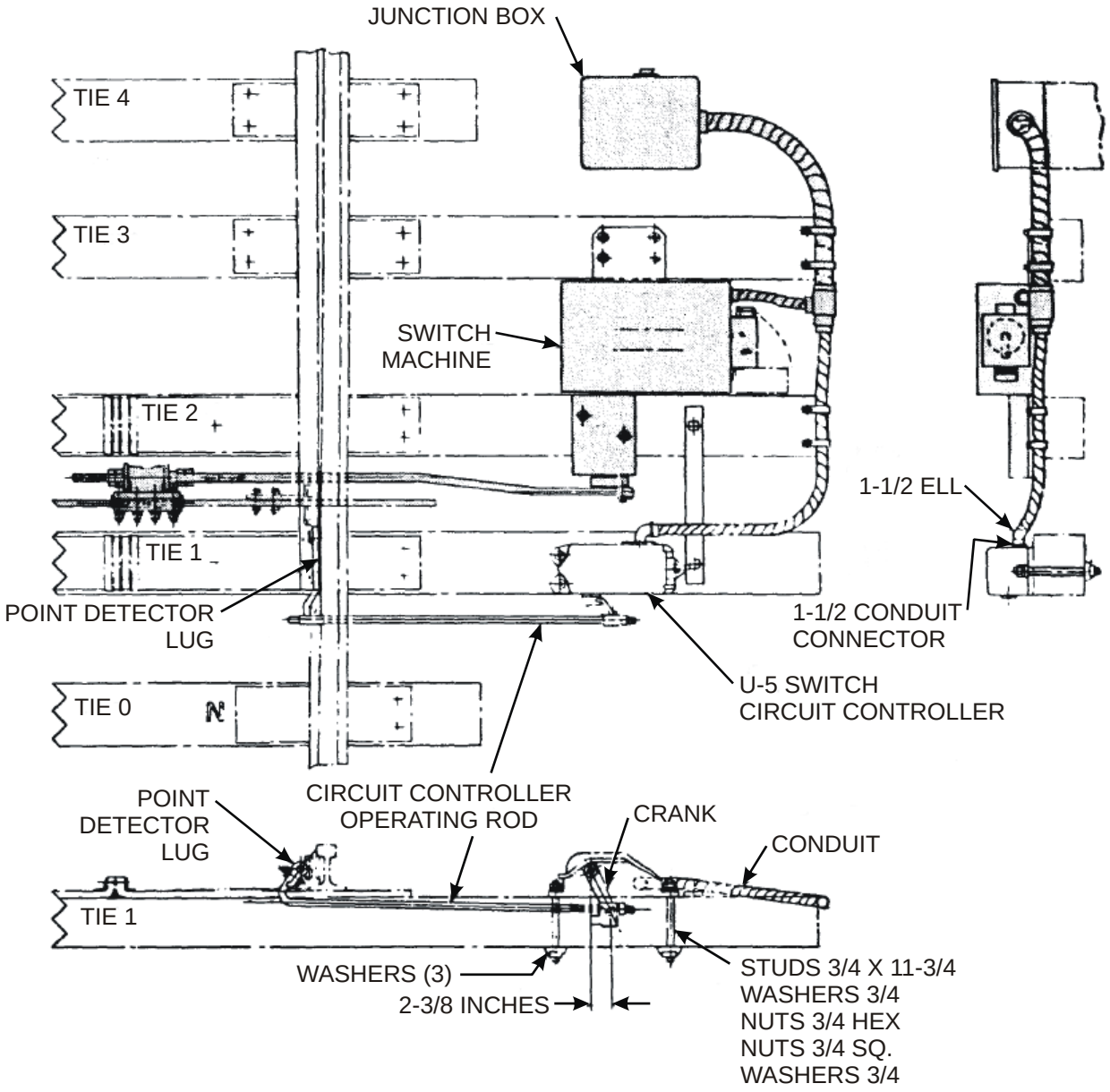


Figure 2-2. Typical Installation for Right-Hand, Near-Point Layout

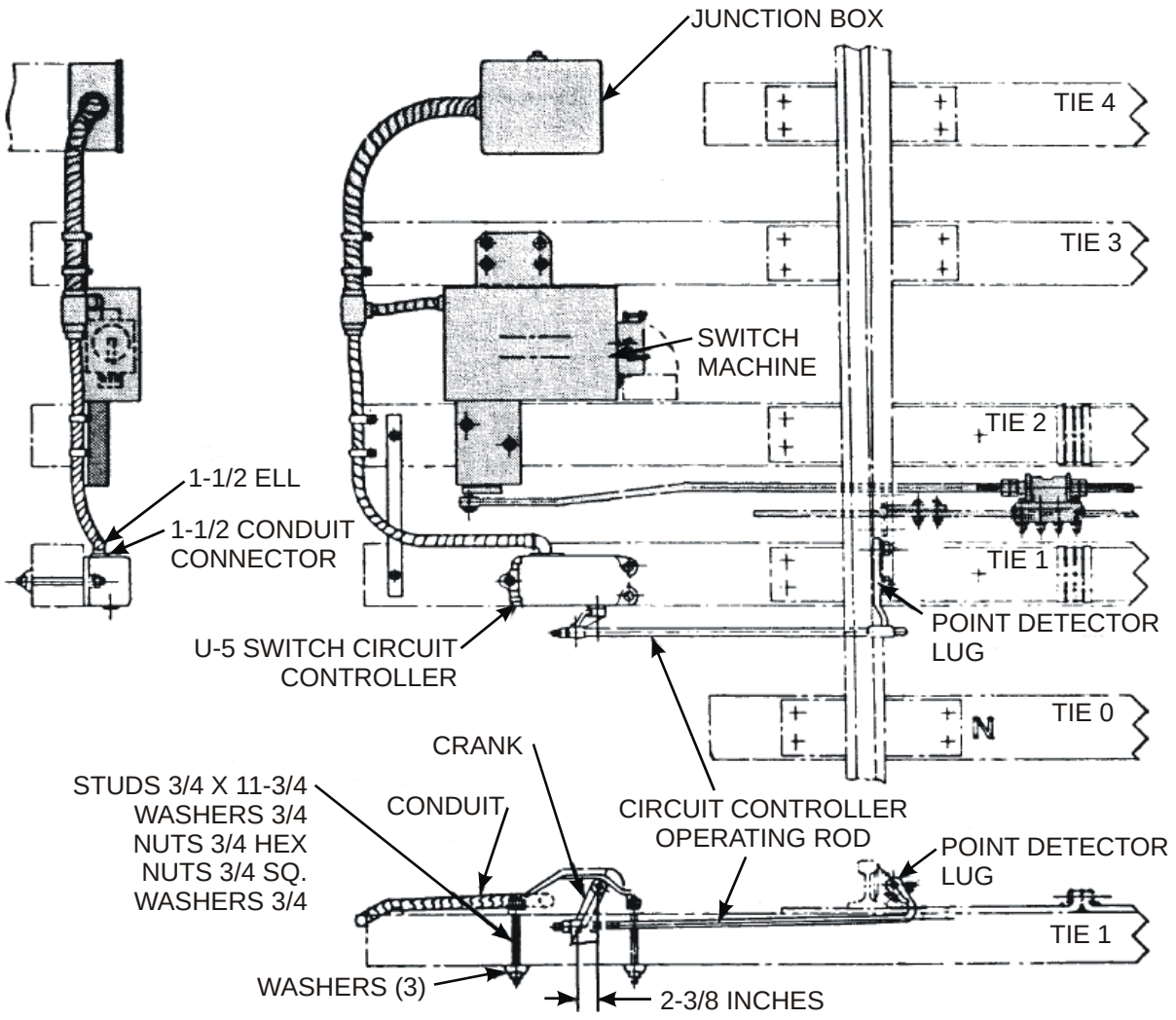


Figure 2-3. Typical Installation for Left-Hand, Near-Point Layout

2.3. Cam Adjustments

The following procedure describes the cam adjustment for a four-way, two-position U-5 Switch Circuit Controller installed in a right-hand layout to provide a polarized indication.

1. If the switch points are not already in the normal position, manually move the switch points to the normal position.

2. Open the cover of the U-5.

3. Make an initial (coarse) adjustment of the two pairs of cams (see Figure 2-4, polarized two-position cams) for a normal-to-the-right, right-hand layout by performing Steps 3a and 3b, or for a normal-to-the-left, right-hand layout by performing Steps 3a and 3b.

CAUTION

When tightening the clamp screws, do not exceed 14 foot-pounds of torque or mechanical damage may occur to the cams.

NOTE

Contact sets are numbered 1 through 4 from left to right, facing the terminal strip (Figure 2-4). The cams which control Contact Sets 1 and 2 are the "A" cams and those that control Contact Sets 3 and 4 are the "B" cams. In the lower portion of Figure 2-4 the positions of the "A" and "B" cam contact sets are shown when the switch point is in the normal position for a normal-to-the-right and a normal-to-the-left installation for the polarized two-position cam application.

Initial (coarse) adjustment for a normal-to-the-right, right-hand layout.

a. Loosen the clamp screws of the two "A" cams and turn the adjusting screws so that the operating arms are just activated and the movable contact springs just make contact with the outer contact springs, i.e., those closest to the terminal strip. Tighten the clamp screw on the two "A" cams.

b. Loosen the clamp screws of the two "B" cams and turn the adjusting screws so that the two "B" cams are offset from the two "A" cams by approximately 30 degrees, with the operating arms activated and the movable contact springs making contact with the outer contact springs, i.e., those closest to the terminal strip. Tighten the clamp screw on the two "B" cams.

Initial (coarse) adjustment for a normal-to-the-left, right-hand layout.

a. Loosen the clamp screws of the two "A" cams and turn the adjusting screws so that the operating arms are just released and the movable contact springs just make contact with the inner contact springs, i.e., those farthest from the terminal strip. Tighten the clamp screw on the two "A" cams.

b. Loosen the clamp screws of the two "B" cams and turn the adjusting screws so that the two "B" cams are offset from the two "A" cams by approximately 30 degrees, with the operating arms released and the movable contact springs make contact with the inner contact springs, i.e., those farthest from the terminal strip. Tighten the clamp screw on the two "B" cams.

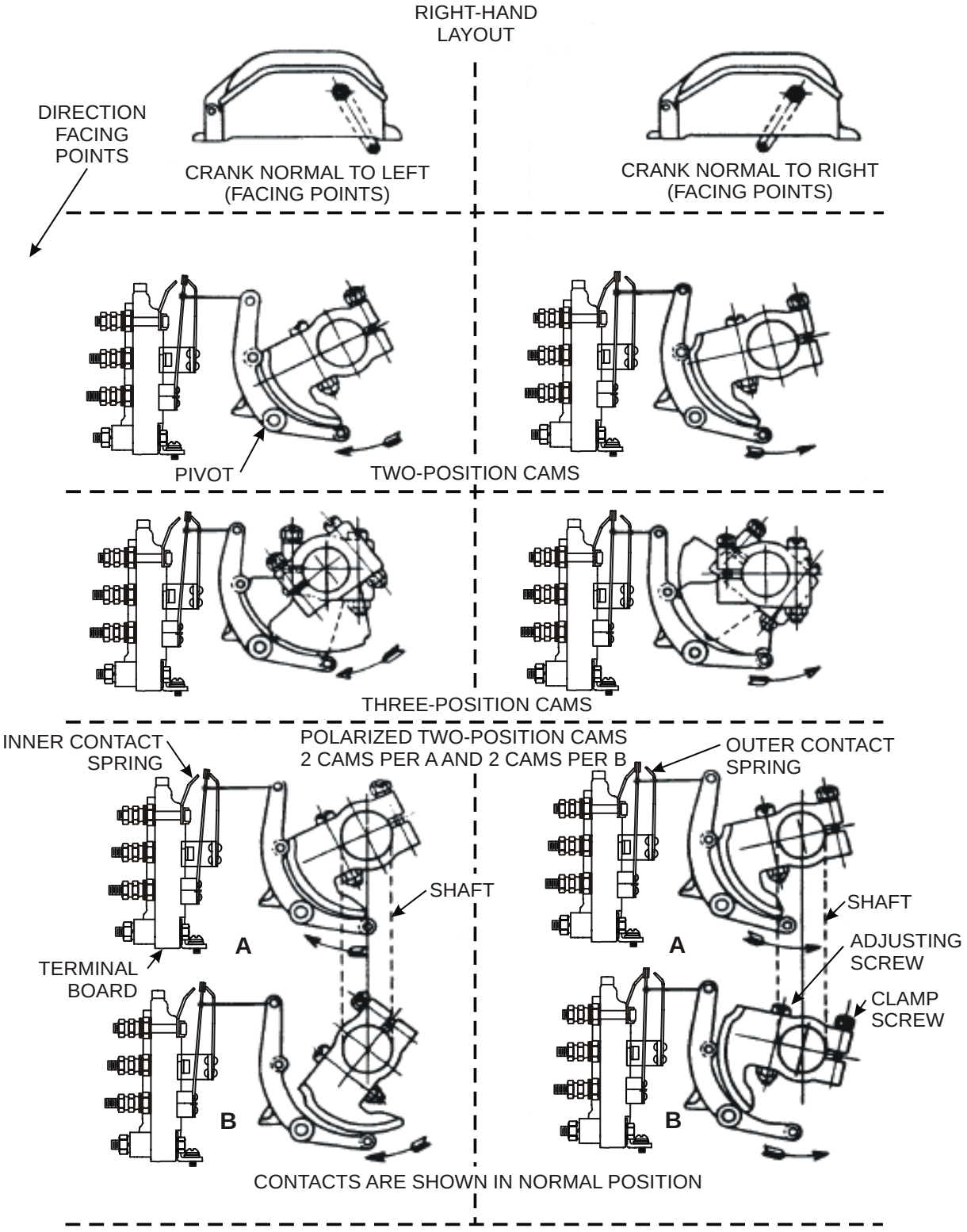


Figure 2-4. Cam and Contact Settings

4. Place a 1/4-inch obstruction between the stock rail and the open (reverse) point, six inches from the tip of the point.

5. Manually move the switch points toward the reverse position and against the obstruction.

6. Check that the U-5 Switch Circuit Controller contacts are in the following positions:

   a. The movable contact springs of Contact Sets 1 and 2 (the "A" cams) contact their reverse position contact springs.

   b. The movable contact springs of Contact Sets 3 and 4 (the "B" cams) are separated from their reverse position contact springs by 1/16" or greater.

NOTE

The reverse position of each contact set is opposite to the normal position shown in Figure 2-4.

7. If necessary, make a fine adjustment of the Contact Set 3 and 4 cams as described in Steps 7a through 7c:

   a. Loosen the clamp screws of cams 3 and 4.

   b. Turn the adjusting screws of the cams until their associated movable contact springs are separated from their reverse position contact springs by 1/16" or greater.

   c. Tighten the clamp screws.

8. Manually move the switch points away from the reverse position and remove the obstruction.

9. Manually move the switch points back to the reverse position.

10. Check that the U-5 Switch Circuit Controller contacts are in the following positions:

    a. The movable contact springs of Contact Sets 1 and 2 (the "A" cams) contact their reverse position contact springs.

    b. The movable contact springs of Contact Sets 3 and 4 (the "B" cams) are in contact with their reverse position contact springs.

11. Place a 1/4-inch obstruction between the stock rail and the open point, six inches from the tip of the point.

12. Manually move the switch points toward the normal position and against the obstruction.

13. Check that the U-5 Switch Circuit Controller contacts are in the following positions:

    a. The movable contact springs of Contact Sets 3 and 4 make contact with their normal position contacts.

    b. The movable contact springs of Contact Sets 1 and 2 are separated from their normal position contacts by 1/16” or greater.

14. If necessary, make a fine adjustment of the 1 and 2 cams as described in Steps 7a through 7c for Contact Sets 3 and 4.

15. Manually move the switch points away from the normal position and remove the obstruction.

16. Manually move the switch points back to the normal position.

17. Check that the U-5 Switch Circuit Controller contacts are in the following positions:

    c. The movable contact springs of Contact Sets 1 and 2 (the “A” cams) are in their normal position.

    d. The movable contact springs of Contact Sets 3 and 4 (the “B” cams) are in their normal position.

18. Repeat Steps 4 through 17 until the U-5 contacts are in their expected positions without any adjustments.

19. Check that all of the cam clamp screws are tight. If they are not tight, tighten them.

2.4. Initial Lubrication

After the U-5 has been installed and adjusted, it must be lubricated to ensure optimum operation. Figure 2-5 illustrates the U-5 lubrication points, and the following steps outline the lubrication procedures.

2.4.1. Recommended Lubrication Equipment and Materials (or Equivalent)

Device/Material	Specifications
Grease Gun	To fit grease fitting
Grease	Specification M-7650-01
Oil Can	Able to handle SAE 30 oil
Paddle	For spreading oil
Oil	SAE-30

2.4.2. Lubrication Procedure

1. Use a grease gun to apply grease to the grease fitting on the ball stud on the operating crank (Figure 2-5).
2. Use an oil can and paddle to apply SAE 30 oil to the rollers on the operating arms and the link connections.
3. Use an oil can to apply a few drops of SAE 30 oil to the cover hinges, hasp pin, and threads of the hasp T-head bolt.
4. Apply a light coat of grease to the cover gaskets.
5. Check to ensure that the drain plug is open and unobstructed.

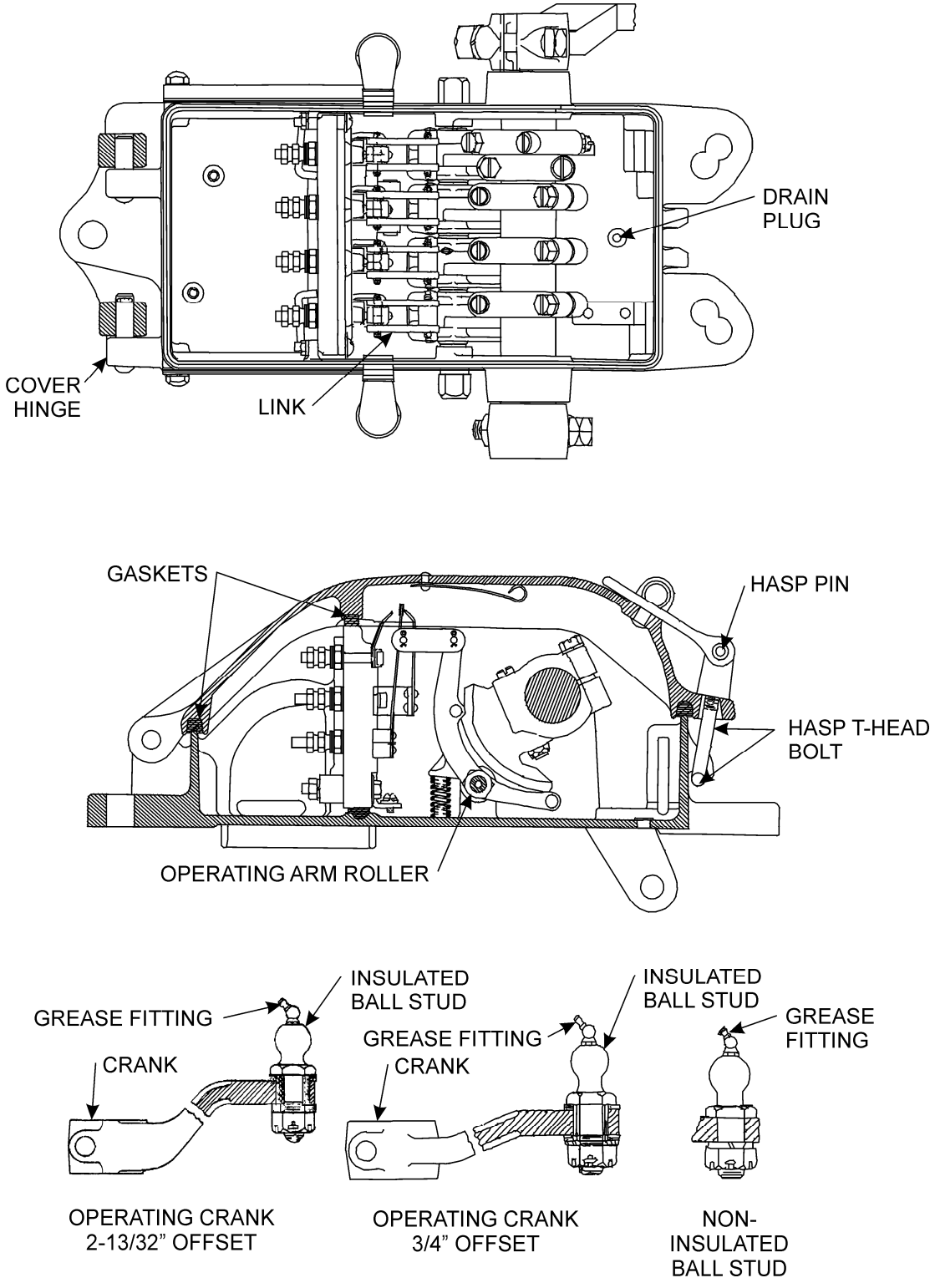


Figure 2-5. Lubrication Points and Drain Plug

3. FUNCTIONAL DESCRIPTION

In the typical application, the U-5 Switch Circuit Controller is used to monitor the position of the switch points (normal and reverse) and provide electrical signals to control various pieces of equipment based on the position of the points. The operating crank (Figure 1-2) is driven by the switch points via the circuit controller operating rod. The operating crank in turn drives the circuit controller cam shaft and the cams mounted on the shaft.

Each cam is used to drive or release a spring-loaded operating arm around a pivot. Force is thus imparted through a link to the movable contact spring. When the operating arm is released as shown in Figure 1-2, the movable contact spring makes contact with one of the stationary contact springs (inner or outer) (cutaway view shows one set of contacts). After the operating arm has been driven by the cam, the movable contact spring makes contact with the other contact spring.

Figure 2-4 shows (for both two-position and three-position cams) the orientation of the operating crank, operating arms, cams, and contacts for both a normal-to-the-right and normal-to-the-left condition. Note that in the typical application described in this manual the four two-position cams are arranged in two pairs with each pair oriented at a different position on the cam shaft (polarized). In this arrangement it is assumed that the switch points are driven from the normal position shown in Figure 2-4 to reverse. When the switch points go past 1/4 inch away from the normal position, the pair of “A” contacts transfer; and when the switch points arrive 1/4 inch away from the reverse position, the pair of “B” contacts transfer. Conversely, for a reverse-to-normal move the “B” contacts transfer just beyond 1/4 inch from reverse and then the “A” contacts transfer at 1/4 inch from normal.

The three-position cams are used for applications that require, in addition to two contact closures, an intermediate position where the contact is open, i.e., the movable contact spring does not make contact with either the inner or outer contact springs.

As shown in Figure 2-4 there are two return spring arrangements (when used): one for four-way, three-position types only, mounted outside of the case, and one for all other types. The return springs are designed to bring the operating crank to its center position in the event that the operating rod is broken or disconnected. When this occurs the circuits will act as though the switch points are in transit, and will not give an erroneous normal or reverse indication. The return spring also functions to reduce vibration and consequent wear on the cam shaft bearings.

4. MAINTENANCE AND TEST PROCEDURES

4.1. General

WARNING

The U-5 Switch Circuit Controller contains operating voltages which can be harmful. Before opening the U-5 Controller it is important to disable all power to the unit. Failure to do so could result in serious personal injury or loss of life.

This section contains procedures for preventive maintenance, field maintenance, and shop maintenance for the U-5 Switch Circuit Controller.

4.2. Preventive Maintenance

Sections 4.2.1 through 4.2.3 outline procedures for periodic cleaning, inspection, and lubrication of the U-5 Switch Circuit Controller. These procedures must be performed at least once every six months to ensure continued fault-free operation. Preventive maintenance should be done in accordance with Table 4-1.

Table 4-1. Typical Preventive Maintenance Schedule

Function	Frequency				
	Weekly	Semi-Monthly	Monthly	Every 6 Months	Prior to Expected Freezing Weather
Cleaning				X	
Inspection				X	X
Lubrication				X	

4.2.1. Cleaning

Extensive cleaning is not required. However, it is imperative that the U-5 is cleaned at the time of inspection (once every six months). Cleaning prevents excessive wear and corrosion. It also ensures that electrical components are not pitted or possibly shorted because of excessive filtration of sand and/or dust. In addition, cleaning prepares the surfaces of the U-5 cams, operating arm rollers, and linkages for lubrication. Clean the U-5 as outlined in Sections 4.2.1.1 and 4.2.1.2.

4.2.1.1. Recommended Cleaning Equipment and Materials (or Equivalent)

Device/Material	Specifications
Degreaser	Standard household type
Cloths	Clean, lint-free

4.2.1.2. Procedure

20. Dampen a clean, lint-free cloth with household degreaser.

21. Wipe the U-5 components free of any accumulated dust and dirt. Pay particular attention to ventilators, electrical contacts, terminals, and moving parts, e.g., cams, rollers, contacts, contact springs, return springs, and linkages.

22. Dry the U-5 components with a clean, lint-free cloth.

4.2.2. Inspection

In general, inspection consists of observing the appearance and integrity of the U-5 components, the associated electrical conduit, and the point detector connecting rod. A judgment is then made as to whether the U-5 appears to be in good condition, or whether a potential or obvious faulty condition exists. When any faulty condition is observed, it is to be corrected immediately. Inspection should be performed following the cleaning, i.e., once every six months:

1. Check the U-5 internal components for any sign of pitting, corrosion, or general deterioration. Any such equipment must be replaced.

2. Check for loose or damaged electrical connections. Repair or replace any electrical problem found.

3. Check for burned, frayed, or broken insulation. Replace all damaged insulation.

4. Check for accumulation of dust, dirt, and foreign material. Remove any foreign material and accumulations of dirt.

CAUTION

Step 5 should be performed prior to anticipated freezing weather in addition to every six months. If not, moisture trapped inside the U-5 housing could freeze and cause faulty operation.

5. Check that there are no signs of moisture accumulation within the U-5 Switch Circuit Controller housing. If there is moisture present, check to see if the drain plug (Figure 2-5) is installed in the U-5 drain hole. If so, remove the drain plug to allow moisture to drain out of the housing. The drain plug may be removed by grasping it with a pair of pliers and pulling it out of the drain hole. After the compartment is drained, reinstall the drain plug by pushing it back into the drain hole.

NOTE

The drain plug should have been installed initially if the U-5 is in a location where blowing sand or dust is troublesome; otherwise the drain hole may be left open.

6. Check the U-5 Switch Circuit Controller cover gaskets for resiliency and signs of wear. The gaskets should form a tight seal when the hinged cover is closed, i.e., the hinged cover should not be loose. Replace all worn gaskets.

NOTE

Low points in the gaskets may be built up by placing thin pieces of felt or similar material in the groove under the gasket.

7. Check that the conduit to the U-5 is not crimped, nicked, cut, or otherwise damaged. If it is damaged to the point where it has a tear through the conduit, replace it.

8. Operate the U-5 crank back and forth as often as necessary and check for the following:

   a. Proper movement of U-5 Switch Circuit Controller operating crank and return spring mechanism (where used).

   b. Excessive or unusual vibration and noise.

   c. Excessive wear or lost motion.

   d. Positive and firm contact between the movable contact springs and the stationary contact springs.

   e. Check that the U-5 Switch Circuit Controller cover hinge pins, ventilators, cams, contacts, and linkages do not show excessive wear.

9. With the circuit controller operating rod disconnected from U-5 crank, check that the return spring (where used) brings the operating crank to its center position. In this position the pair of "A" contacts (refer to Section 3) will be transferred, but the pair of "B" contacts will not have transferred. The U-5 controller in this position indicates neither normal nor reverse. Reconnect the operating rod following this check.

4.2.3. Lubrication

After the U-5 has been cleaned and inspected, refer to Section 2.4 and perform the described lubrication procedures. Lubrication should be performed at the time of inspection and cleaning, i.e., every six months.

4.3. Field Maintenance

Maintenance at the field level is limited to adjustment of the cams and contact springs, and replacement of those components which are easily replaced in the field (such as cover gaskets). It is recommended that more difficult component removal and replacement be performed in the shop. Procedures for removing the U-5 as an assembly from its environment are considered obvious and are not included in this manual.

4.3.1. Cam Adjustments (Figure 4-1)

4.3.1.1. Recommended Test Equipment

Device/Material	Specifications
Obstruction	1 /4 inch thick

4.3.1.2. Procedure

In general the cam adjustment procedures are similar to those presented in Section 2.3. Section 2.3 describes the adjustment of the cams immediately following installation, which requires both coarse and fine adjustment procedures. After installation, however, only the fine adjustments are necessary. The following procedure describes cam adjustments for a four-way, two-position U-5 controller in a right-hand layout of a switch machine control and indication circuit.

1. If the switch points are not already in the normal position, manually move the switch points to the normal position.

2. Open the hinged cover of the U-5.

3. Ensure that the movable contact springs make contact with the proper normal position contact springs.

CAUTION

Do not exceed 14 foot-pounds when tightening the clamp screws or mechanical damage may occur to the cams.

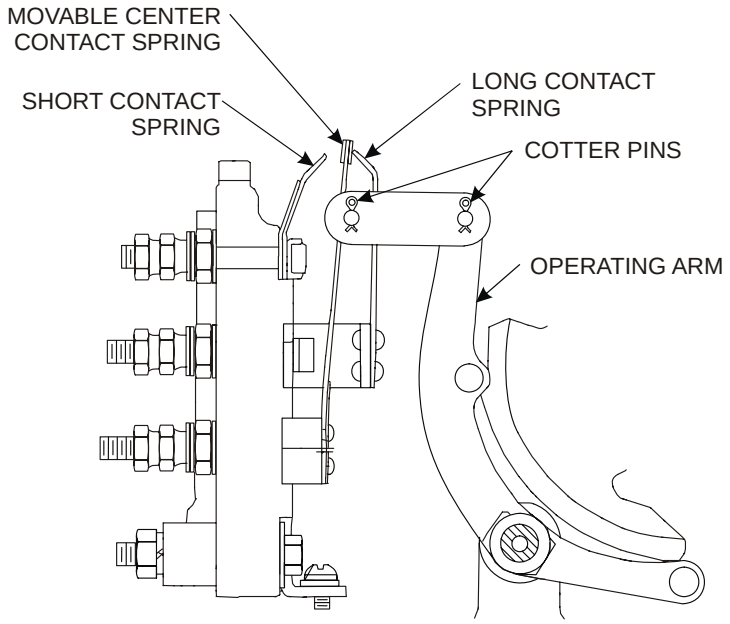


Figure 4-1. The Contact Spring Board

NOTE

For right-hand layouts where the right position of the circuit controller crank corresponds with the normal position of the switch points, the circuit controller movable contact springs make contact with the shorter contact springs. For right-hand layouts where the left position of the circuit controller crank corresponds with the normal position of the switch points, the circuit controller movable contact springs make contact with the longer contact springs. (See Figure 4-1.)

4. Place a 1/4-inch obstruction between the stock rail and the open point, six inches from the tip of the point.

5. Manually move the switch points toward the reverse position and against the obstruction.

6. Check that the U-5 Switch Circuit Controller contacts are in the following positions:

a. The movable contact springs on Contact Sets 1 and 2 contact their reverse position contact springs.

b. The movable contact springs on Contact Sets 3 and 4 are separated from their reverse position contact springs by 1/16” or greater.

NOTE

For reference purposes, the circuit controller contact sets are numbered 1 through 4 from left to right, facing the terminals of the terminal strip (Figure 4-1). The reverse position contact spring of each set is the contact spring opposite the normal position contact spring defined in preceding note.

7. If necessary, adjust the “B” cams of Contact Sets 3 and 4 as described in Steps 7a through 7c.

   a. Loosen the clamp screws of cams 3 and 4.

   b. Turn the adjusting screws of the cams until their associated movable contact springs are separated from their reverse position contact springs by 1/16” or greater.

   c. Tighten the clamp screws.

8. Manually move the switch points away from the reverse position and remove the obstruction.

9. Manually move the switch points back to reverse position.

10. Check that U-5 Switch Circuit Controller contacts are in the following positions:

    a. The movable contact springs of Contact Sets 1 and 2 (the “A” cams) contact their reverse position contact springs.

    b. The movable contact springs of Contact Sets 3 and 4 (the “B” cams) are in contact with their reverse position contact springs.

11. Place a 1/4-inch obstruction between the stock rail and the open point, six inches from the tip of the point.

12. Manually move the switch points toward the normal position and against the obstruction.

13. Check that the U-5 Switch Circuit Controller contacts are in the following positions:

    a. The movable contact springs of Contact Sets 3 and 4 make contact with their normal position contact springs.

b. The movable contact springs of Contact Sets 1 and 2 are separated from their normal position contact springs by 1/16” or greater.

14. If necessary, adjust the cams of Contact Sets 1 and 2 as described in Steps 7a through 7c for the cams of Contact Sets 3 and 4.

15. Check that all of the cam clamp screws are tight. If not, tighten them.

16. Manually move the switch points away from the normal position and remove the obstruction.

17. Manually move the switch points back to the normal position.

18. Check that U-5 Switch Circuit Controller contacts are in the following positions:

    a. The movable contact springs of Contact Sets 1 and 2 (the “A” cams) contact their normal position contact springs.

    b. The movable contact springs of Contact Sets 3 and 4 (the “B” cams) are in contact with their normal position contact springs.

19. If necessary, adjust the cams as described in Steps 7a through 7c for the cams of Contact Sets 3 and 4.

20. Close and secure the hinged cover of the U-5 Circuit Controller.

4.3.2. Contact Spring Adjustment

The contact springs are inspected every six months and adjusted as needed.

4.3.3. Recommended Equipment (or Equivalent)

Device/Material	Specifications
Degreaser	Standard household type
Cloths	Clean, lint-free
Feeler Gauge	1/4”
Feeler Gauge	17/64”
Spring Scale	calibrated from 0 to 5 pounds
Spring Bender	ASTS USA Part No. M230724

4.3.3.1. Procedure

1. Open the hinged cover of the U-5.

2. Remove the insulated links from the top of the operating arm by removing the cotter pins from the pin on either end of the link and sliding the link off of the pins (Figure 4-2).

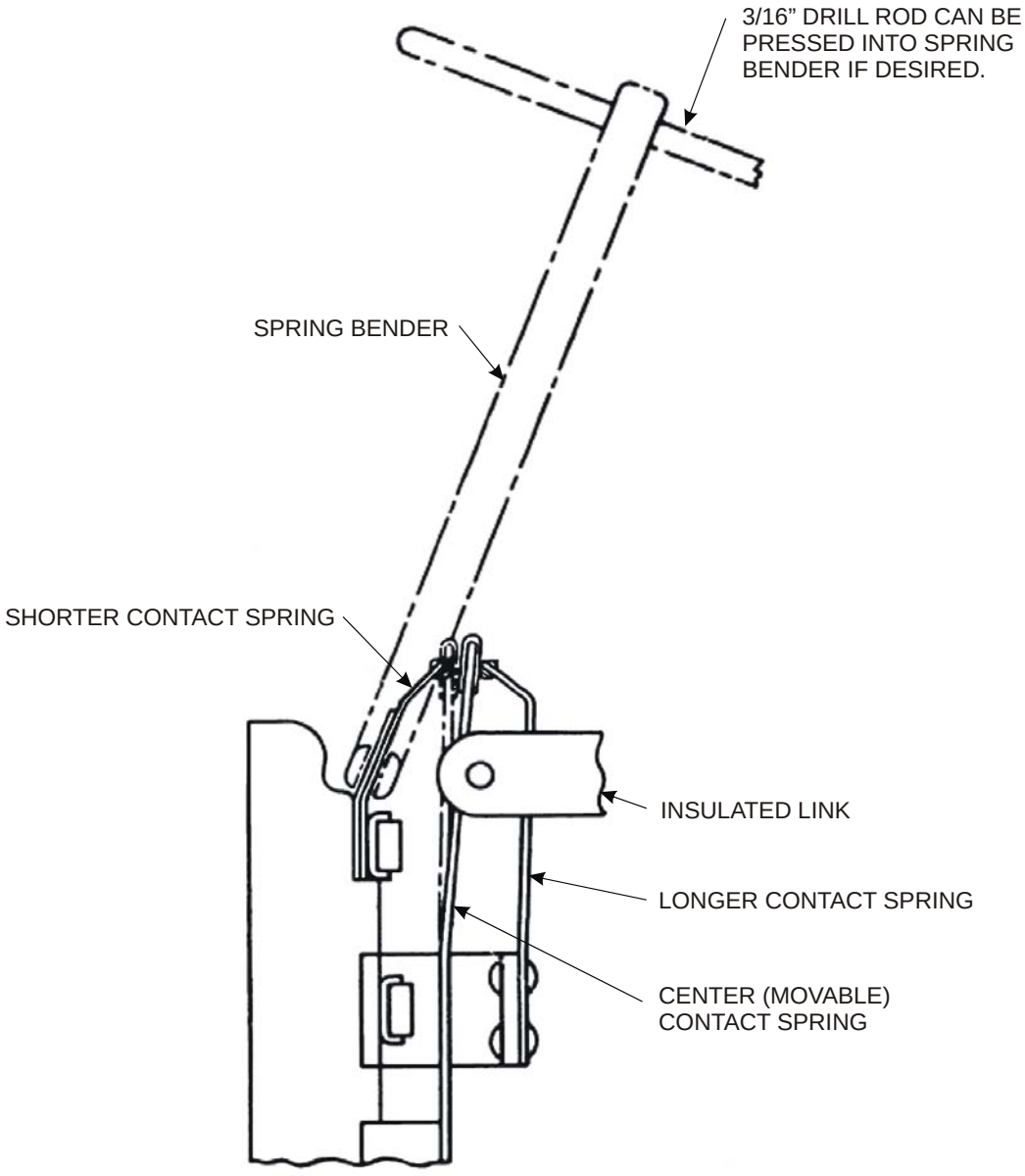


Figure 4-2. Contact Spring Adjustments

3. Use a spring bender to set the center contact springs approximately midway between the long and short contact springs.

NOTE

When bending a contact spring to increase compression, always bend slightly beyond the desired point then bend back carefully until the proper compression is obtained.

4. When the movable center contact spring has been set, replace the insulated links. Slide the links onto the pins of the center contact spring and secure the links with the cotter pins removed in Step 2.

5. Manually move the switch points in a direction that will allow the movable center contact springs make contact with the shorter stationary contact springs. Manually move the switch points so that the point is closed against the stock rail.

6. With the movable center contact spring compressing the short contact spring, adjust the long contact spring until the gap between the long contact spring and movable center contact spring is 1/4 inch, i.e., a 1/4 inch feeler gauge should just pass through this gap.

7. Manually move the switch points in the opposite direction so that the movable center contact spring makes contact with the longer stationary contact spring. Manually move the switch points so that the point is against the stock rail.

8. With the movable contact spring compressing the long contact spring, adjust the short contact spring until the gap between the short contact spring and the movable center contact spring is 17/64 inch, i.e., a 17/64 inch feeler gauge should just pass though this gap.

9. Close and secure the hinged cover of the U-5 Circuit Controller.

4.4. Shop Maintenance

4.4.1. General

Shop maintenance of the U-5 Switch Circuit Controller consists of restoring a damaged, worn, or otherwise defective circuit controller to operable condition. In general, shop maintenance involves the following operations:

- Cleaning
- Inspecting
- Disassembling
- Replacing Parts
- Reassembling
- Lubricating
- Adjusting the Contact Springs

The parts lists and supporting illustrations in Section 5 of this manual identify and show the relationship between the U-5 components and their attaching parts. The parts list illustrations provide information to assist in disassembling and assembling the circuit controller. Except for the replacement of the cam shaft bushings, disassembly and assembly of the U-5 Switch Circuit Controller does not require detailed instructions.

4.4.2. Procedure

1. Clean and inspect the circuit controller as described in Sections 4.2.1 and 4.2.2.
2. Disassemble the circuit controller to the extent necessary to replace worn, defective, or damaged parts, using the illustrated parts diagrams in Section 5 as guides.
3. If the cam shaft bushings must be replaced, perform the procedure described in Section 4.4.3.
4. Reassemble the circuit controller, using the illustrated parts diagrams in Section 5 as guides.
5. Lubricate the circuit controller as described in Section 2.4.
6. Perform the contact spring adjustments as described in Section 4.3.2.

4.4.3. Cam Shaft Bushing Replacement

1. Refer to the illustrated parts diagrams in Section 5.
2. Remove bolts (13), nuts (14), and lockwashers (35) from both sides of the U-5.
3. Remove the collar (46) and the operating crank.
4. Loosen the cam clamp screws (6) of all the U-5 cams.
5. Slide the cam shaft (28) out of the U-5 allowing the cams (50, 51, 52) to slide off of the cam shaft as it moves out of the U-5.
6. Remove the cams (50, 51, 52) from the U-5 interior.
7. Coat the outside of the new bushing with thin white lead (Figure 4-3).
8. Place the U-5 on an arbor press bed as shown in Figure 4-3.
9. Place cold rolled steel removal tools 1 and 2 on the bushing as shown in Figure 4-3 - Removal.
10. Bring the arbor press down until the worn bushing falls out of the U-5 case.

11. Invert the U-5 on the arbor press bed and repeat Steps 9 and 10 to remove the bushing on the opposite side of the U-5.

12. To replace the bushings, press it into the U-5 housing using the insertion tool as shown in Figure 4-4. Press one bearing in and then rotate the U-5 case and replace the second bushing.

13. As shown in Figure 4-4, clamp a plate with a 1.5-inch diameter shouldered cone to the drill press table.

14. Insert a 1.502-inch to 1.504-inch diameter reamer into the drill press. The reamer should have flutes of 10 inches minimum length.

15. Center the reamer on the shouldered cone.

16. Lock the drill press column.

17. Lift the reamer and place the U-5 on the drill press with the bottom bushing centered on the shouldered cone.

18. Ream the top bushing only.

19. Lift the reamer and invert the U-5 case.

20. Center the reamed bushing on the shouldered cone.

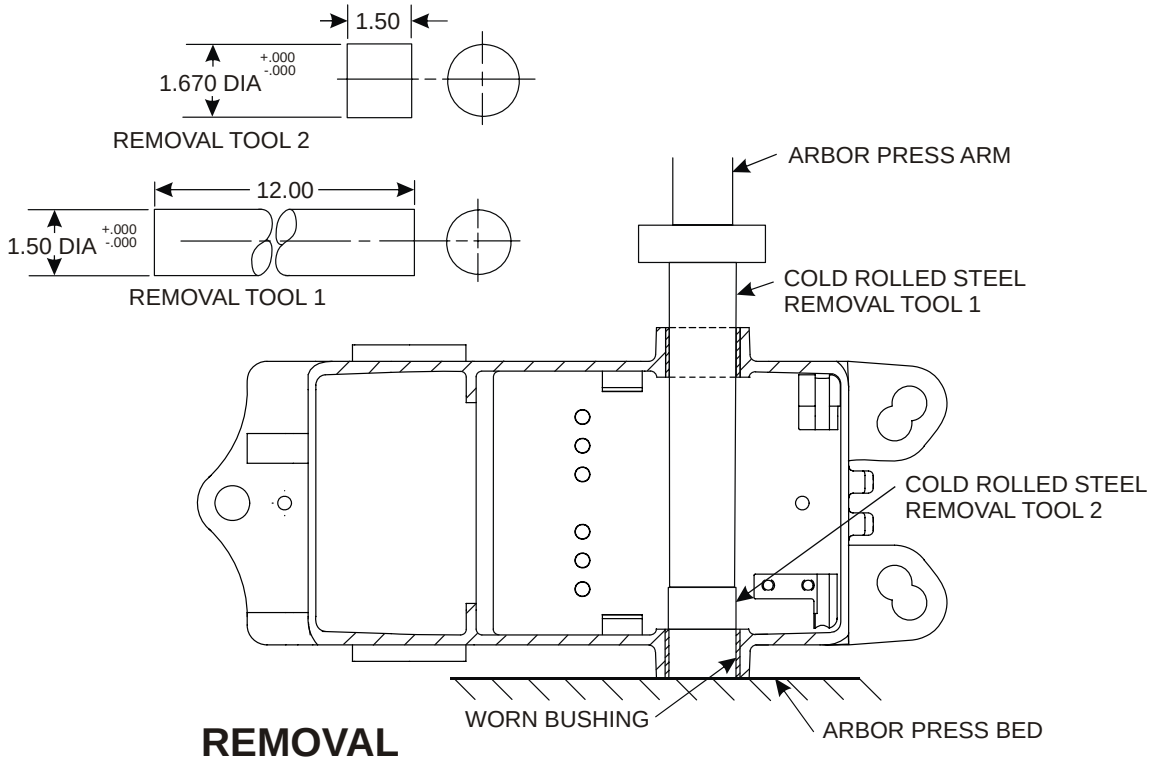
21. Ream the second bushing.

22. Extend the reamer until it goes through both bushings and is centered on the shouldered cone. Lift the U-5 from the shouldered cone and ream both bushings simultaneously.

23. Ensure that the bushings are reamed before reassembling the cam shaft into the U-5 case by reversing Steps 2 through 6.

CAUTION

Do not exceed 14 foot-pounds when tightening the clamp screws or mechanical damage may occur to the cams.



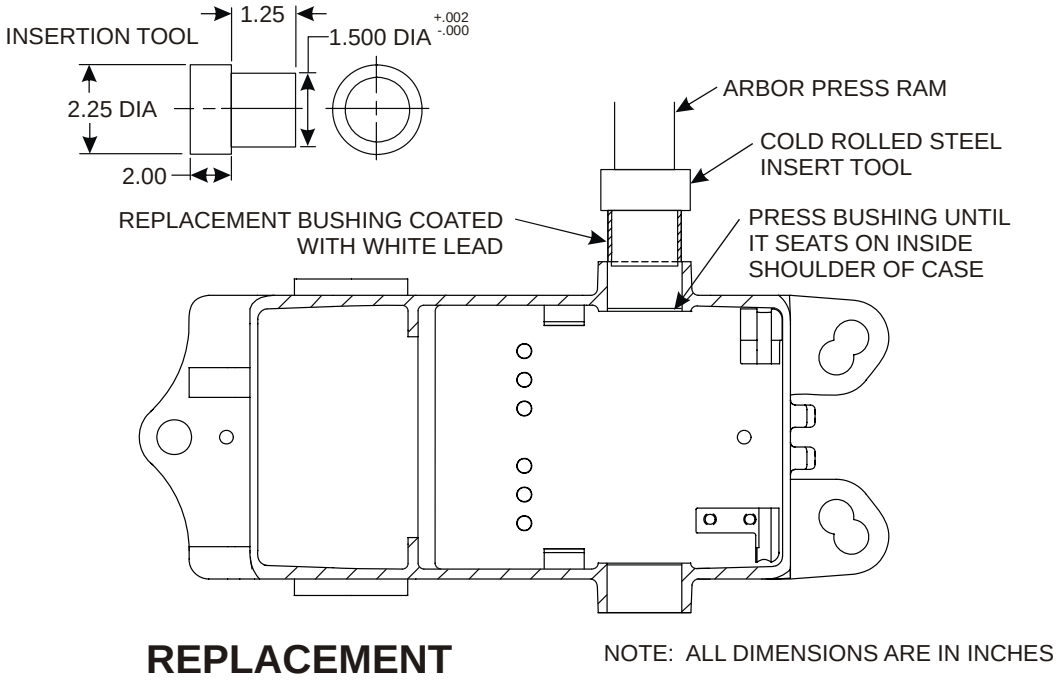


Figure 4-3. Removal and Replacement of Cam Shaft Bushings

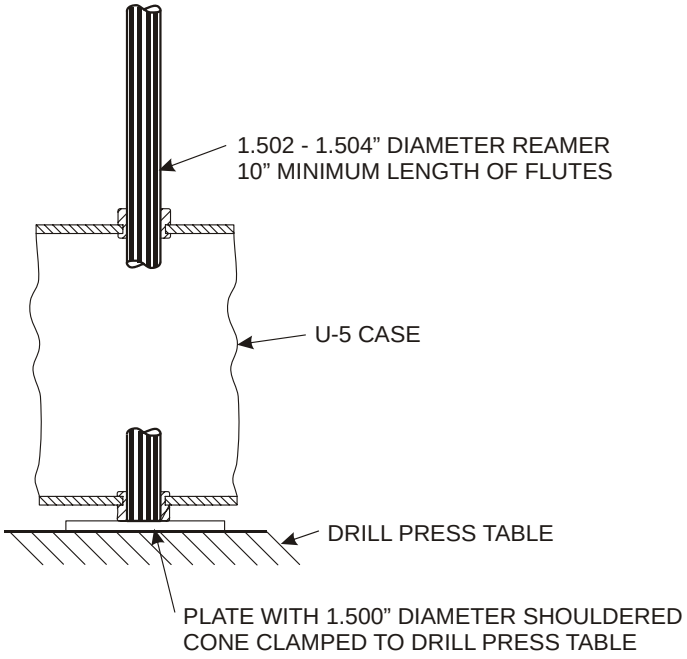


Figure 4-4. Reaming Cam Shaft Bushings

5. PARTS LIST

Table 5-1. U-5 Circuit Controller Part Numbers

Controller Part Number	Position (X Way)	Reference Table	Reference Figure
N181359	2	Table 5-2	Figure 5-1
N181359001	2	Table 5-3	Figure 5-2
N181359002	2	Table 5-4	Figure 5-3
N181359003/N181359005	2	Table 5-5	Figure 5-4
N184034	2	Table 5-6	Figure 5-5
N193030	2	Table 5-7	Figure 5-6
N193030001	2	Table 5-8	Figure 5-7

Table 5-2. Parts List for the N181359 U-5 Switch Circuit Controller

(See Figure 5-1)

Item No.	Description	Part Number
1	Case	N48200701
2	Cover	N107693
3	Hasp	PN102112001
4	Screw, 1/2” - 13 x 2-1/2", Round Head	J5001240278
5	Nut, 1/2" - 13, Flex Lock	J0481620019
6	Cap Screw, 3/8" - 16 x 1-1/2", Hex Head, SS	J5073490124
7	Washer, Lock, 3/8", SS	J4751210113
8	Operating Arm Assembly	N48201001
9	Nut,1/4” - 20, Hex, SS	J4802110108
10	Washer, Lock, No1/4, SS	4751210111
11	Pin, Bronze, Phos Rd	M051765
12	Cotter Pin, x 3 /8”	J048600
13	Bolt,1/2” x 3”, Sq Head	J046664
14	Nut, 1/2” - 13, UNC, 2B, Heavy	J048013
17	Bracket, 3/16” x 3/4” Steel	M178386
18	Washer - 1/2", Plain, Flat, SS	J4751200116
19	Board, Contact Spring	PN4511363601
20	Protector - Cap plug, Tapered	J703319
21	Washer, 0.62" OD, 0.383” ID, SS	J4751200192
22	Protector - Tapered, Non-Threaded, Low Density Polyethylene - Red	J703404
23	Gasket	J047123
24	Cotter Pin, 1/8” x 3/4” Spring Steel	J048618
25	Bolt, T-Head, 3/8” - 16 x 3-3/4"	J5001240273
26	Bag, Plastic	N337810
27	Screw - 1/4” - 20 x 1-1/2”, Round Head, SS	J5001360124
28	Shaft	M48201101
31	Tag	S001858
32	Shaft, SS	M48200901
33	Spring, Phos Bronze	M221867
34	Washer	M022008
35	Washer, Lock, 1/2", Steel	J047783

Item No.	Description	Part Number
37	Washer	M041210
42	Ventilator	PN070109
46	Collar, Mi	M178314
49	Protector, 1/2" Pipe Thread	J032922
50	Segment	M48201201
62	O-Ring, 1-1/2"OD, 1-1/4" ID, 1/8" Thickness	J0675840024
63	Plug, 1-1/2", Pipe, Square Head, Cast Iron, Galvanized	J3920440108
64	Cap Screw, 1/4" - 20 x 1/2" Hex Head, SS	J5000970108
65	Washer, Plate, No. 1/4, SS	J4751200112
80	Bag, Plastic, Zip Lock 8" x 10"	J055639

Table 5-3. Parts List for the N181359001 U-5 Switch Circuit Controller

(See Figure 5-2)

Item No.	Description	Part Number
1	Case	N107685
2	Cover	N107693
3	Hasp	PN102112001
4	Screw, 1/2" - 13 x 2-1/2" Long, Round Head	J5001240278
5	Jam Nut, Flex Lock, 1/2" – 13	J0481620019
6	Cap Screw, 3/8" - 16 x 1-1/2", Hex Head, SS	J5073490124
7	Washer, Lock, 3/8", SS	J4751210113
8	Operating Arm Assembly	N48201001
9	Nut, 1/4" - 20, Hex Head, SS	J4802110108
10	Washer, Lock, No. 1/4, SS	J4751210111
11	Pin, Phos Bronze, Rd	M051765
12	Cotter Pin,1/16" x 3/8" Spring Brass	J048600
13	Bolt, 1/2" x 3", Square Head	J046664
14	Nut, 1/2" - 13 UNC 2B Heavy	J048013
17	Bracket, 3/16" x 3/4" Steel	M178386
18	Washer, 1/2", Plain, Flat, SS	J4751200116
19	Board, Contact Spring	N4511363602
20	Protector, Cap Plug, Tapered, 2"	J703319
21	Washer, 0.620" OD x 0.383" ID, SS	J4751200192
22	Protector – Tapered, Non-Threaded	J703404
23	Gasket	J047123
24	Cotter Pin, 1/8" x 3/4" Spring Steel	J048618
25	Bolt, T-Head, 3/8" - 16 x 3-3/4" Long	J5001240273
26	Bag, Plastic	N337810
27	Screw, 1/4"-20 x 1-1/2" Round Head, SS	J5001360124
28	Shaft	M48201101
31	Tag	S001858
32	Shaft, SS	M48200901
33	Spring, Phos Bronze	M221867
34	Washer	M022008
35	Washer, Lock, 1/2", Plate Steel	J047783
37	Washer	M041210
42	Ventilator	PN070109
46	Collar, Mi	M178314
49	Protector, 1/2", Pipe Thread	J032922

Item No.	Description	Part Number
50	Segment	M48201201
62	O-Ring, 1-1/2" OD, 1-1/4" ID, 1/8" Thick	J0675840024
63	Plug, Pipe, 1-1/2", Square Head	J3920440108
64	Cap Screw, 1/4" - 20 x 1/2" Hex Head, SS	J5000970108
65	Washer, Plate, No. 1/4, SS	J4751200112
66	Heater	N388242
67	Bracket, Mounting	M4511876401
68	Clamp, Heater	M4511876501
69	Screw, 10 - 32 x 3/8" Rd Head Steel	J052564
70	Washer, Lock, No. 10, Steel	J047733
71	Cap Screw, 1/4" x 1-1/2" Hex Head	J050023
72	Washer, 1/4", Steel	J047501
73	Washer, Lock, 1/4", Steel	J047775
80	Bag, Zip Lock, 8" x 10"	J055639

Table 5-4. Parts List for the N181359002 U-5 Switch Circuit Controller

(See Figure 5-3)

Item No.	Description	Part Number
1	Case	N48200701
2	Cover	N107693
3	Hasp	PN102112001
4	Screw, 1/2" - 13 x 2-1/2", Round Head	J5001240278
5	Jam Nut, Flex Lock, 1/2" – 13	J0481620019
6	Screw, 3/8" - 16 x 1-1/2" Hex Head	J5073490124
7	Washer, Lock, 3/8", SS	J4751210113
8	Operating Arm Assembly	N48201001
9	Nut, 1/4" - 20, Hex Head, SS	J4802110108
10	Washer, Lock, No. 1/4, SS	J4751210111
11	Pin, Phos , Bronze, Rd	M051765
12	Cotter Pin, 1/16" x 3/8" Spring Brass	J048600
13	Bolt, 1/2" x 3", Square Head	J046664
14	Nut,1/2" - 13, UNC, 2B, Heavy	J048013
17	Bracket, 3/16" x 3/4" Steel	M178386
18	Washer, 1/2", Plain Flat	J4751200116
19	Board, Contact Spring	N4511363602
20	Protector, Cap Plug, 2"	J703319
21	Washer, 0.62" OD, 0.383" ID, SS	J4751200192
22	Protector, Tapered, Non Threaded	J703404
23	Gasket	J047123
24	Cotter Pin, 1/8" x 3/4" Spring Steel	J048618
25	Bolt, T-Head, 3/8" - 16 x 3-3/4"	J5001240273
26	Bag, Plastic	N337810
27	Screw, 1/4" - 20 x 1-1/2", SS	J5001360124
28	Shaft	M48201101
31	Tag	S001858
32	Shaft, SS	M48200901
33	Spring, Phos Bronze	M221867
34	Washer	M022008
35	Washer, Lock, 1/2", Plate Steel	J047783

Item No.	Description	Part Number
37	Washer	M041210
42	Ventilator	PN070109
46	Collar, Mi	M178314
49	Protector,1/2" Pipe Thread	J032922
50	Segment	M48201201
54	Cotter Pin, 3/32” x 5/8” Spring Steel	J048610
62	O-Ring, 1-1/2"OD, 1-1/4" ID	J0675840024
63	Ppg, CI, Galvanized, 1-1/2”	J3920440108
64	Screw, 1/4” - 20 x 1/2” Hex Head, SS	J5000970108
65	Washer, Plate, No. 1/4, SS	J4751200112
66	Resistor, 800 Ohms, 30 Watts	N438866001
67	Screw, 8 - 32 x 3/4” Fil Head	J052257
68	Nut, 8 - 32 Hex Head, Steel	J048166
69	Washer, Lock, No. 8, Shakeproof, SS	J047714
70	Bracket, Heater Mounting	M4515635001
71	Screw, 1/4” x 1-1/4”, Hex Head	J050021
72	Bag, Zip Lock, 8” x 10”	J055639

Table 5-5. Parts List for the N181359003 and N181359005 U-5 Switch Circuit Controller

(See Figure 5-4)

Item No.	Description	Part Number
1	Case	N48200701
2	Cover	N107693
3	Hasp	PN102112001
4	Screw, 1/2” - 13 x 2-1/2", Rd Head	J5001240278
5	Jam Nut, Flex Lock, 1/2" - 13	J0481620019
6	Screw, 3/8” - 16 x 1-1/2” Hex Head	J5073490124
7	Washer, Lock, 3/8”, SS	J4751210113
8	Operating Arm Assembly	N48201001
9	Nut, 1/4” - 20, Hex Head, SS	J4802110108
10	Washer, Lock, No. 1/4, SS	J4751210111
11	Pin, Phos Bronze, Rd	M051765
12	Cotter Pin, 1/16” x 3/8”, Spring Brass	J048600
13	Bolt, 1/2” x 3”, Sq Head	J046664
14	Nut, 1/2” - 13, UNC, 2B, Heavy	J048013
17	Bracket, 3/16” x 3/4” Steel	M178386
18	Washer, 1/2", Plain Flat	J4751200116
19	Board, Contact Spring	PN4511363601
20	Protector, Cap Plug, 2"	J703319
21	Washer, 0.62" OD, 0.383” ID, SS	J4751200192
22	Protector, Tapered, Non Threaded	J703404
23	Gasket	J047123
24	Cotter Pin, 1/8” x 3/4” Spring Steel	J048618
25	Bolt, T-Head, 3/8” - 16 x 3-3/4"	J5001240273
26	Bag, Plastic	N337810
27	Screw, 1/4” - 20 x 1-1/2”	J5001360124
28	Shaft	M48201101
31	Tag	S001858

Item No.	Description	Part Number
32	Shaft, SS	M48200901
33	Spring, Phos Bronze	M221867
34	Washer	M022008
35	Washer, Lock, 1/2”, Plate Steel	J047783
37	Washer	M041210
42	Ventilator	PN070109
46	Collar, Mi	M178314
49	Protector, 1/2", Pipe Thread	J032922
50	Segment	M48201201
54	Cotter Pin, 3/32” x 5/8”, Spring Steel	J048610
55	Crank, Operating	M198044
56	Spring, Return	M222146
57	Clamp, 5/8”, Sq Steel	M222144
58	Nut, 3/8” - 24, SAE Castle	J048081
59	Screw, 5/16” - 18 x 7/8", SS	J5001380114
60	Washer, 5/16”, Plate, SS	J4751200113
61	Screw, 5/16” - 18 x 1.25”, SS	J5001380120
62	O-Ring, 1-1/2"OD, 1-1/4" ID	J0675840024
63	Ppg, CI, Galvanized, 1-1/2”	J3920440108
64	Screw, 1/4” - 20 x 1/2” Hex Head, SS	J5000970108
65	Washer, Plate, No. 1/4, SS	J4751200112
80	Bag, Zip Lock, 8” x 10”	J055639

Table 5-6. Parts List for the N184034 U-5 Switch Circuit Controller

(See Figure 5-5)

Item No.	Description	Part Number
1	Case	N48200701
2	Cover	N107693
3	Hasp	PN102112001
4	Screw, Adjusting	M103637
5	Nut, Castellated or Slotted	J048096
6	Screw, 3/8” - 16 x 1-3/4”, Hex Head	J5073490128
7	Washer, Lock, 3/8”, SS	J4751210113
9	Nut, 1/4” - 20, Hex Head, SS	J4802110108
10	Washer, Lock, No. 1/4, SS	J4751210111
11	Pin, Phos Bronze, Rd	M051765
12	Cotter Pin, 1/16” x 3/8”, Spring Brass	J048600
13	Bolt, 1/2” x 3”, Sq Head	J046664
14	Nut, 1/2” - 13, UNC, 2B, Heavy	J048013
17	Bracket, 3/16” x 3/4”, Steel	M178386
18	Washer, 1/2”, Plain Flat	J4751200116
19	Board, Contact Spring	PN4511363601
20	Protector, Cap Plug, 2”	J703319
21	Washer, 0.62” OD, 0.383” ID, SS	J4751200192
22	Protector, Tapered, Non-Threaded	J703404
23	Gasket	J047123
24	Cotter Pin, 1/8” x 3/4”, Spring Steel	J048618
25	Bolt, T-Head, 3/8”-16 x 3-3/4”	J5001240273

Item No.	Description	Part Number
26	Bag, Plastic	N337810
27	Screw, 1/4” - 20 x 1-1/2”	J5001360124
28	Cam Shaft	M482013001
31	Tag	S001858
32	Shaft, SS	M48200901
33	Spring, Phos Bronze	M221867
34	Washer	M022008
35	Washer, Lock, 1/2”, Plate Steel	J047783
37	Washer	M041210
42	Ventilator	PN070109
46	Collar, Mi	M178314
47	Operating Arm Assembly	N48201002
49	Protector, 1/2”, Pipe, Threaded	J032922
51	Cam	M182334
52	Cam	M182335
53	Tag	S002786
54	Cotter, 3/32” x 5/8”, Spring Steel	J048610
55	Bag, Zip Lock, 8” x 10”	J055639
62	O-Ring, 1-1/2” OD, 1-1/4” ID	J0675840024
63	Ppg, CI Galvanized, 1-1/2”	J3920440108
64	Screw, 1/4” - 20 x 1/2”, Hex Head, SS	J5000970108
65	Washer, Plate, No. 1/4, SS	J4751200112

Table 5-7. Parts List for the N193030 U-5 Switch Circuit Controller

(See Figure 5-6)

Item No.	Description	Part Number
1	Case	N48200701
2	Cover	N107693
3	Hasp	PN102112001
4	Screw, Adjusting	M103637
5	Nut, Castellated or Slotted	J048096
6	Screw, 3/8” - 16 x 1-1/2” Hex Head	J5073490124
7	Washer, Lock, 3/8”, SS	J4751210113
8	Operating Arm Assembly	N48201001
9	Nut, 1/4” - 20, Hex Head, SS	J4802110108
10	Washer, Lock, No. 1/4, SS	J4751210111
11	Pin, Phos Bronze, Rd	M051765
12	Cotter Pin, 1/16” x 3/8”, Spring Brass	J048600
13	Bolt, 1/2” x 3”, Square Head	J046664
14	Nut, 1/2” - 13, UNC 2B, Heavy	J048013
17	Bracket, 3/16” x 3/4” Steel	M178386
18	Washer, 1/2”, Plain Flat	J4751200116
19	Board, Contact Spring	PN4511363601
20	Protector, Cap Plug, 2”	J703319
21	Washer, 0.62” OD, 0.383” ID, SS	J4751200192
22	Protector, Tapered, Non-Threaded	J703404
23	Gasket	J047123
24	Cotter Pin, 1/8” x 3/4”, Spring Steel	J048618
25	Bolt, T-Head, 3/8”-16 x 3-3/4”	J5001240273

Item No.	Description	Part Number
26	Bag, Plastic	N337810
27	Screw, 1/4” - 20 x 1-1/2”, SS	J5001360124
28	Cam Shaft	M48201401
31	Tag	S001858
32	Shaft, SS	M48200901
33	Spring, Phos Bronze	M221867
34	Washer	M022008
35	Washer, Lock, 1/2“, Plate Steel	J047783
37	Washer	M041210
42	Ventilator	PN070109
46	Collar, Mi	M178314
47	Operating Arm Assembly	N48201002
49	Protector, 1/2”, Pipe Thread	J032922
50	Segment	M48201201
51	Cam	M182334
52	Cam	M182335
53	Tag	S002786
54	Cotter Pin, 3/32” x 5/8”, Spring Steel	J048610
55	Bag, Zip Lock, 8” x 10”	J055639
62	O-Ring, 1-1/2” OD, 1-1/4” ID	J0675840024
63	Ppg, Cl, Galvanized, 1-1/2”	J3920440108
64	Screw, 1/4” - 20 x 1/2, Hex Head, SS	J5000970108
65	Washer, Plate, No. 1/4, SS	J4751200112
66	Screw, 1/2” - 13 x 2-1/2”, Round Head	J5001240278
67	Jam Nut, Flex Lock, 1/2”-13	J0481620019
68	Screw, 3/8” - 16 x 1-3/4” Hex Head	J5073490128

Table 5-8. Parts List for the N193030001 U-5 Switch Circuit Controller

(See Figure 5-7)

Item No.	Description	Part Number
1	Case	N48200701
2	Cover	N107693
3	Hasp	PN102112001
4	Adjusting Screw	M103637
5	Nut - Castellated or Slotted	J048096
6	Screw, 3/8” - 16 x 1-1/2” Hex Head	J5073490124
7	Washer, Lock, 3/8”, SS	J4751210113
8	Operating Arm Assembly	N48201001
9	Nut, 1/4” - 20, Hex, SS	J4802110108
10	Washer, Lock, No. 1/4, SS	J4751210111
11	Pin, Phos Bronze, Rd	M051765
12	Cotter Pin, 1/16” x 3/8”, Spring Brass	J048600
13	Bolt, 1/2” x 3”, Square Head	J046664
14	Nut, 1/2” - 13 UNC 2B, Heavy	J048013
17	Bracket, 3/16” x 3/4” Steel	M178386
18	Washer, 1/2” Plain Flat	J4751200116
19	Board , Contact Spring	PN4511363601
20	Protector, Cap Plug, 2”	J703319
21	Washer, 0.62” OD, 0.383” ID, SS	J4751200192

Item No.	Description	Part Number
22	Protector, Tapered, Non-Threaded	J703404
23	Gasket	J047123
24	Cotter Pin, 1/8” x 3/4” Spring steel	J048618
25	Bolt, T-Head, 3/8” - 16 x 3-3/4” Long	J5001240273
26	Plastic Bag	N337810
27	Screw, 1/4 - 20 x 1-1/2”	J5001360124
28	Cam Shaft	M48201401
31	Tag	S001858
32	Shaft, SS	M48200901
33	Spring, Phos Bronze	M221867
34	Washer	M022008
35	Washer, Lock, 1/2”, Plate Steel	J047783
37	Washer	M041210
42	Ventilator	PN070109
46	Collar, MI	M178314
47	Operating Arm Assembly	N48201002
48	Bag, Zip Lock, 8” x 10”	J055639
49	Protector, 1/2”, Pipe Thread	J032922
50	Segment	M48201201
51	Cam	M182334
52	Cam	M182335
53	Tag	S002786
54	Cotter Pin, 3/32” x 5/8”, Spring Steel	J048610
55	Operating Crank	M198044
56	Return Spring	M222146
57	Clamp, 5/8” Square Steel	M222144
58	Nut, 3/8” - 24, SAE, Castle	J048081
59	Screw, 5/16” - 18 x 7/8”	J5001380114
60	Washer, 5/16” Plate SS	J4751200113
61	Screw, 5/16” - 18 x 1.25”	J5001380120
63	O-ring, 1-1/2” O.D., 1-1/4” I.D.	J0675840024
64	PPG-CI Galv, 1-1/2”	J3920440108
65	Screw, 1/4” - 20 x 1/2”, Hex, SS	J5000970108
66	Washer, No. 1/4, Plate SS	J4751200112
67	Screw, 1/2” - 13 x 2-1/2” Long, Rd Head	J5001240278
68	Nut, Jam, Flex Lock, 1/2” - 13	J0481620019
69	Screw, 3/8” - 16 x 1-3/4”, Hex Head	J5073490128

Table 5-9. Parts List for the N4511363601 and N4511363602 Contact Spring Board

(See Figure 5-8)

Item No.	Description	Part Number
5	Tegit Moulded, Insulated Board (for PN4511363601)	J077614
	Terminal Board (for PN4511363602)	M437934
10	Terminal Post	M130593
15	Terminal Post	M113978
20	Washer	M029104
25	Nut, Hex Head, Brass	M031670
30	Reinforcing Spring	M120158
35	Spring Contact	N4511422201
40	Spring Contact	N4511422301
45	Spring Contact, Ph Bronze	J680201
50	Washer, Lock	M188259
55	Lock Bolt	M268468
60	Insulated Molded Link	J077665
65	Cotter Pin, 1/16” x 3/8”, Spring Brass	J048600
70	Bolt, 1/4” - 20 x 2”, Hex Head	J046508
75	Washer	M022008
80	Washer	M038149
85	Washer, 1/4”, Lock, Plate Steel	J047766
90	Nut, Jam, 1/4” - 20 UNC 2B	J048003

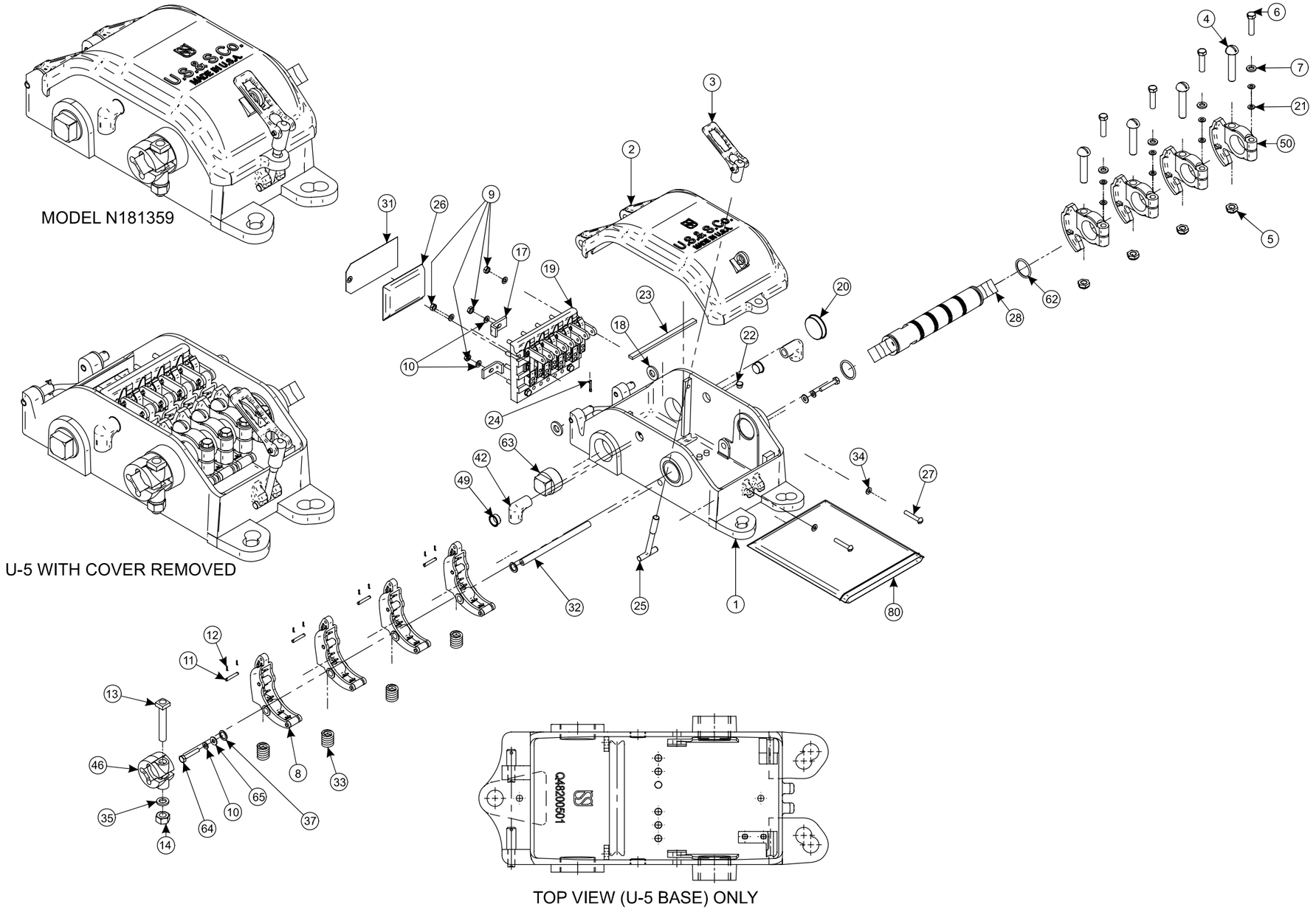


Figure 5-1. N181359 U-5 Switch Circuit Controller (Drawing 1576-0023A)

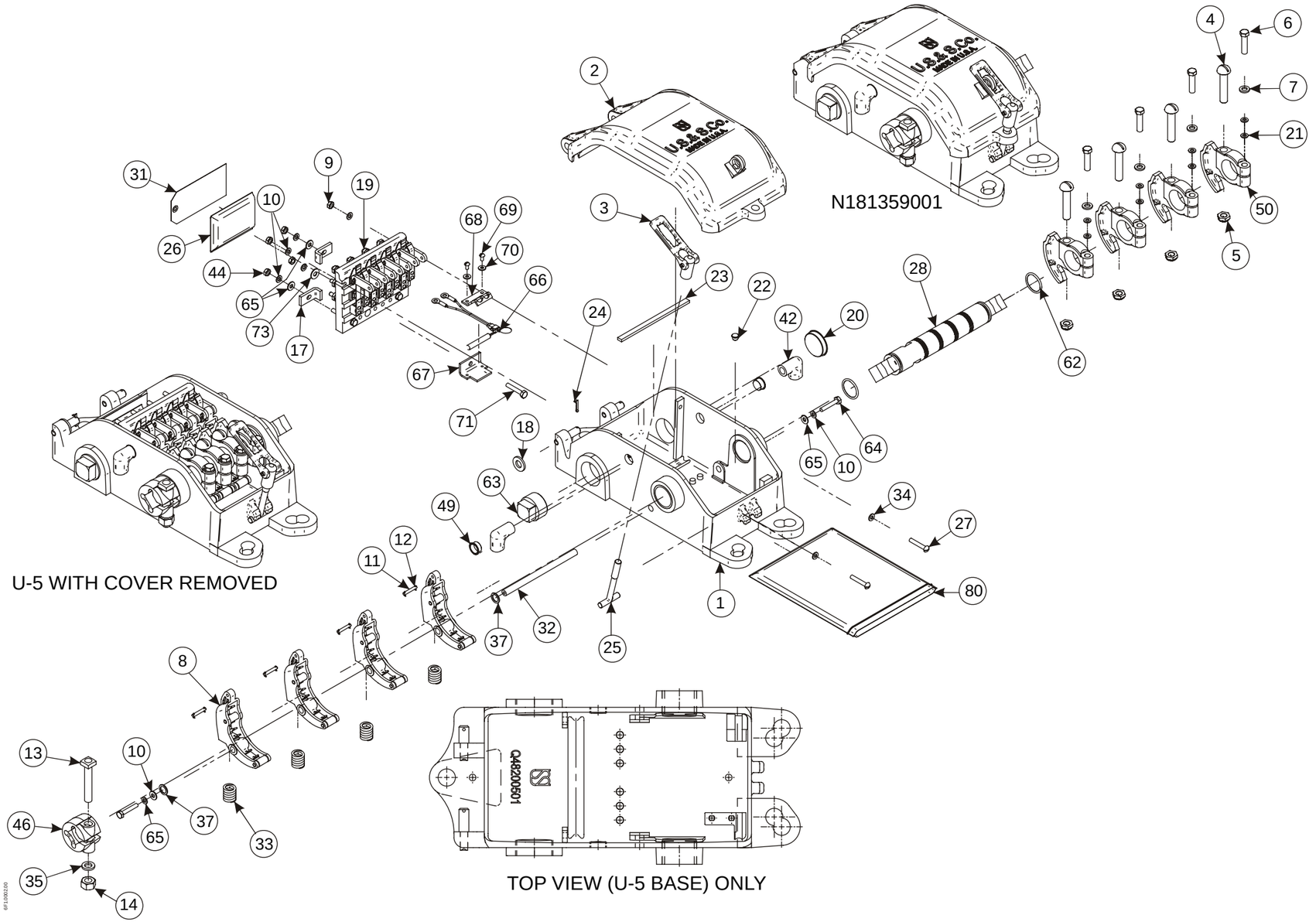
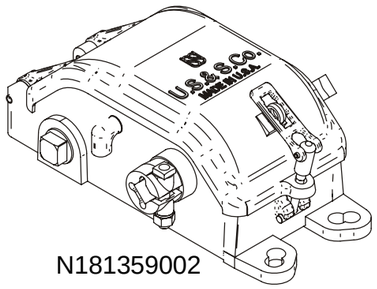
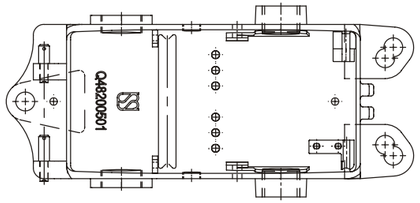


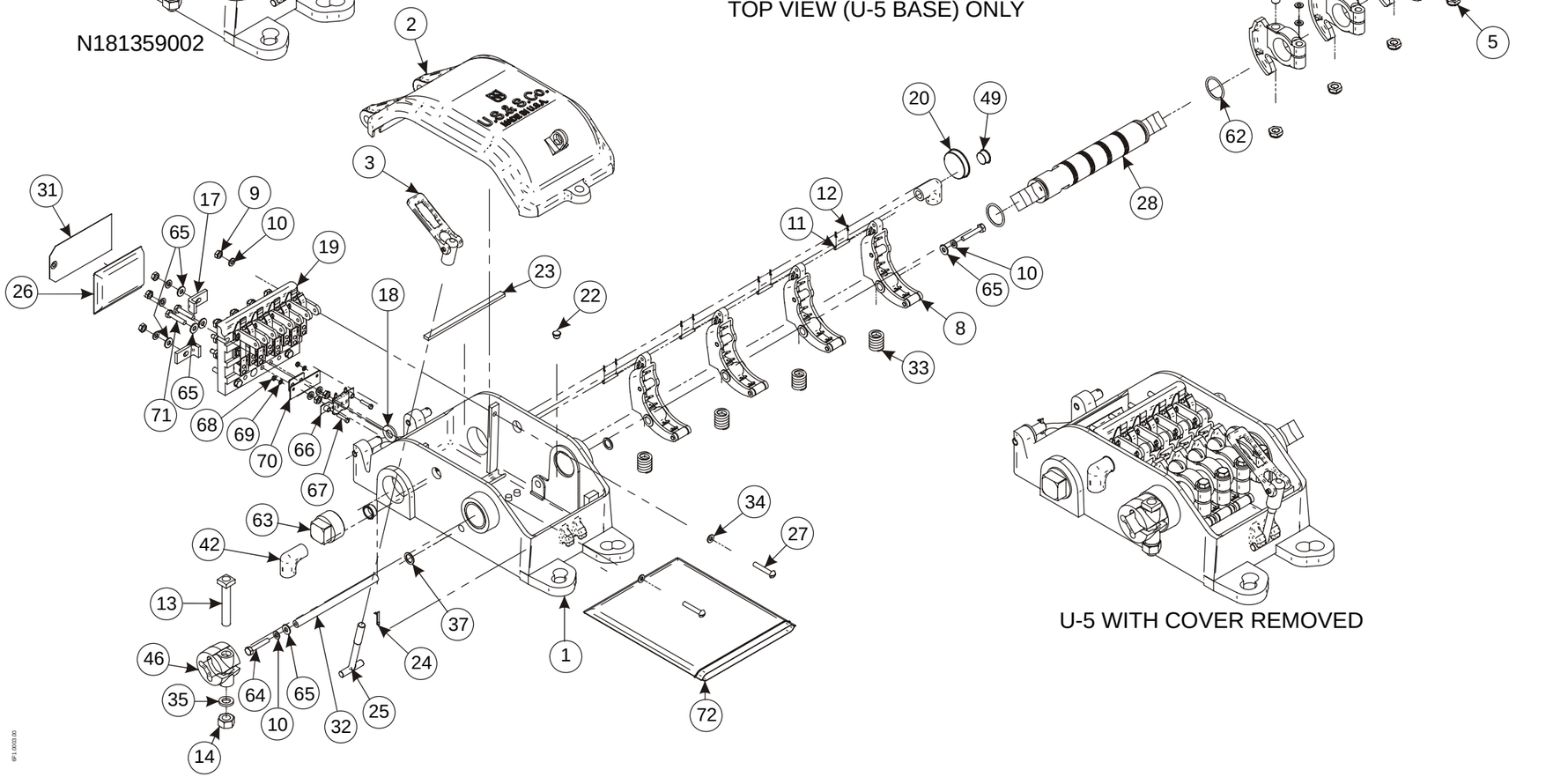
Figure 5-2. N181359001 U-5 Switch Circuit Controller (Drawing 1576-0023C)



N181359002

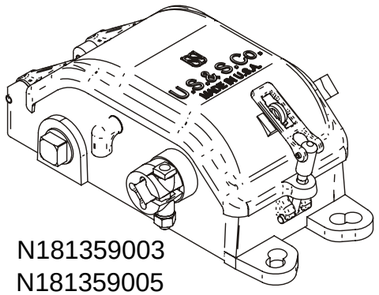


TOP VIEW (U-5 BASE) ONLY

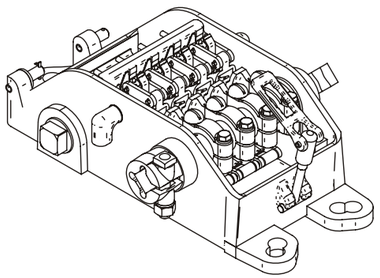


U-5 WITH COVER REMOVED

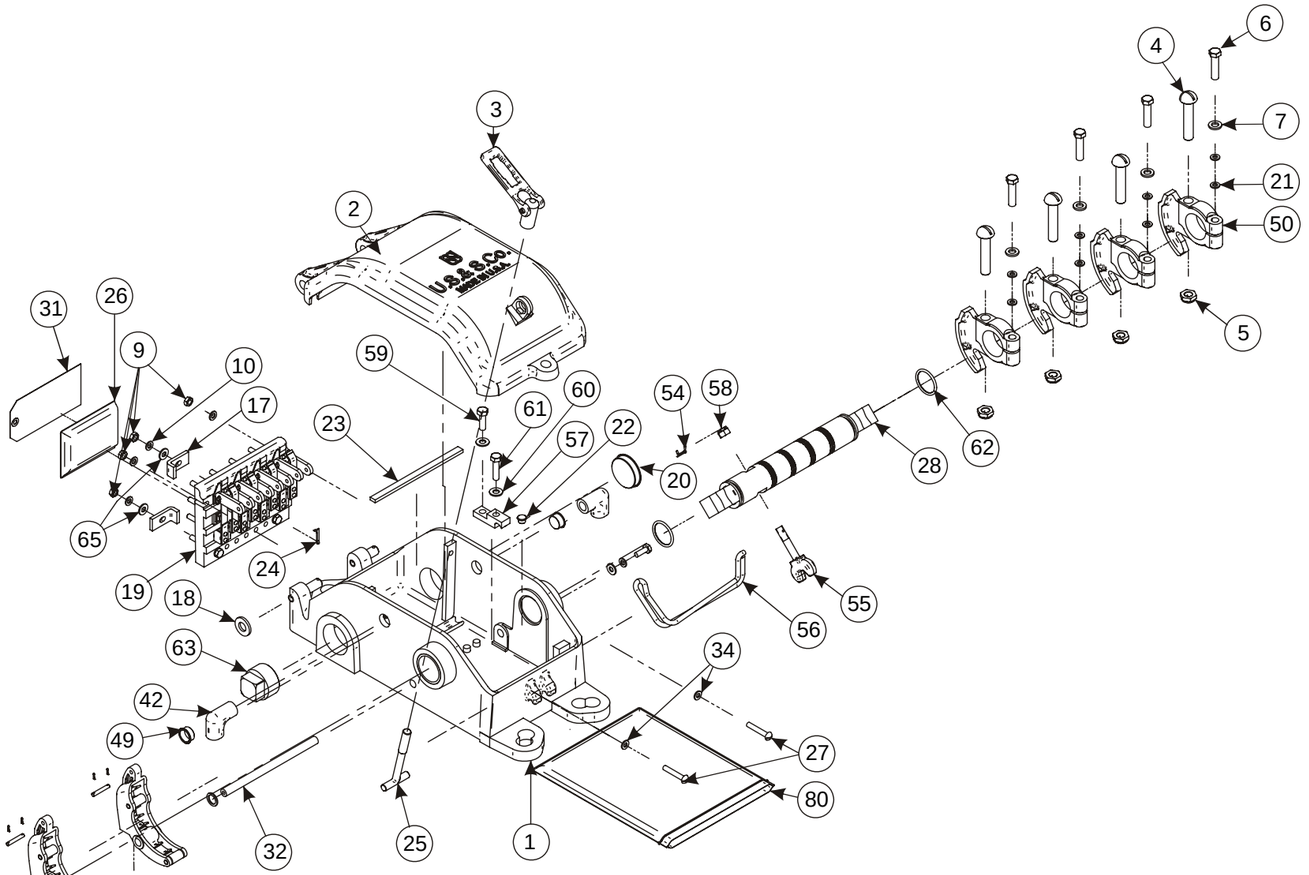
Figure 5-3. N181359002 U-5 Switch Circuit Controller (Drawing 1576-0023D)

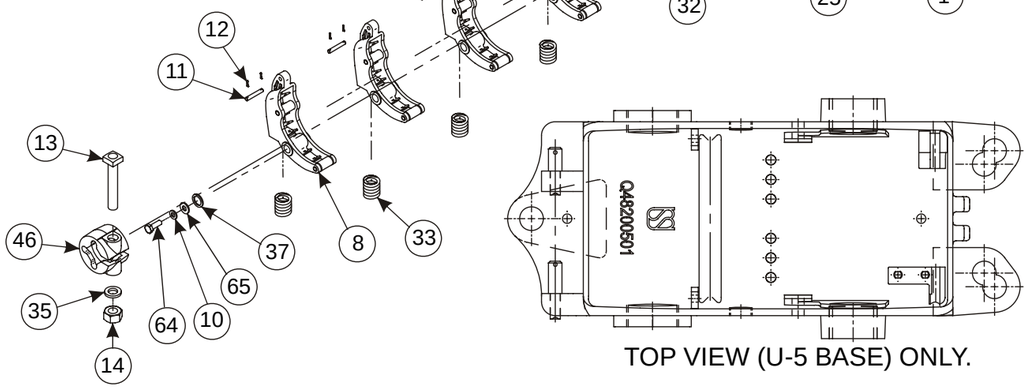


N181359003
N181359005



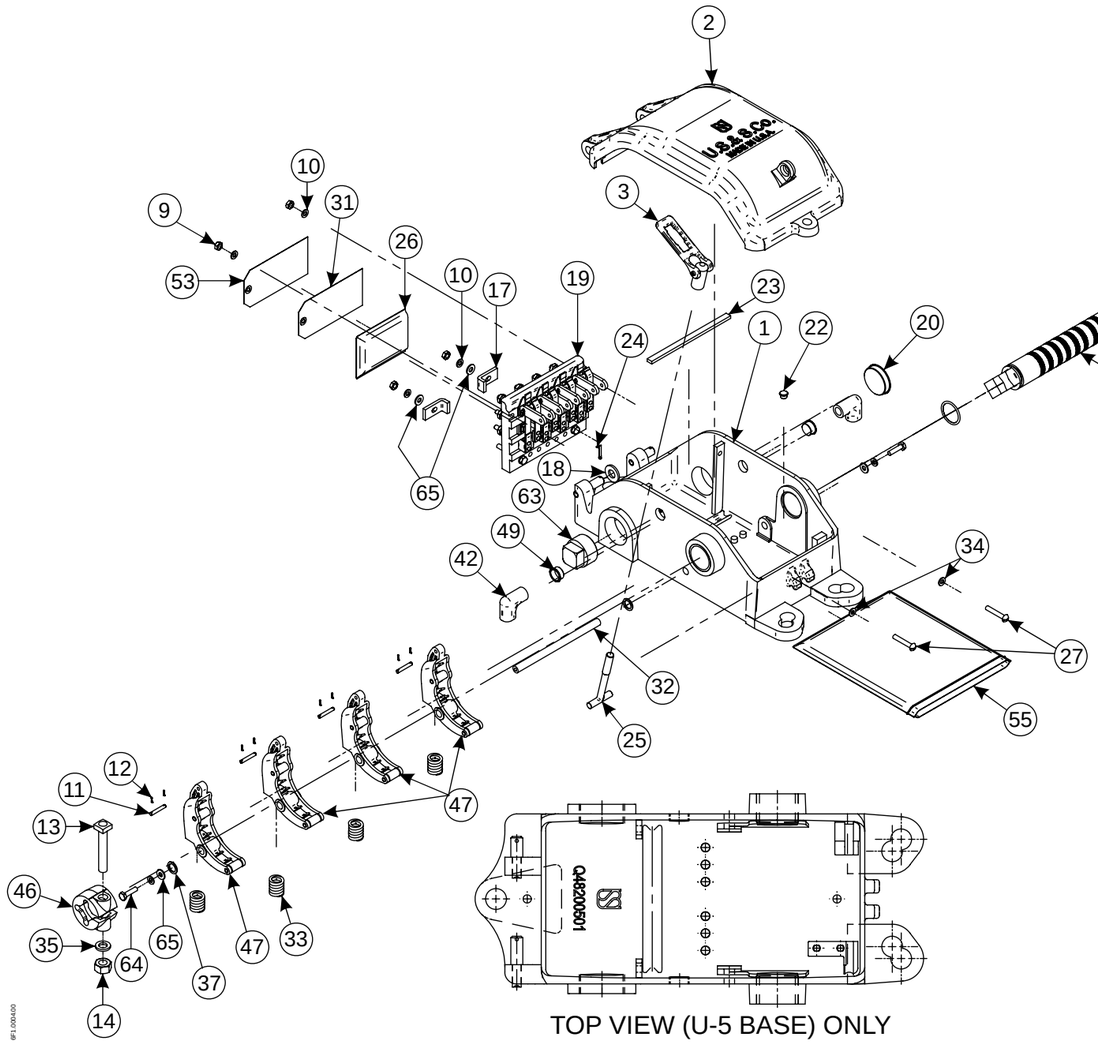
U-5 WITH COVER REMOVED



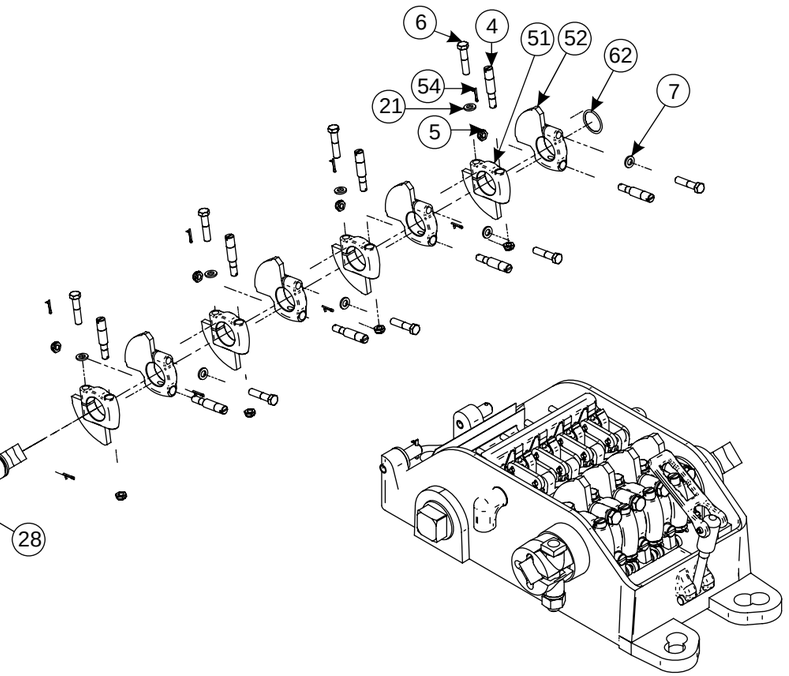


TOP VIEW (U-5 BASE) ONLY.

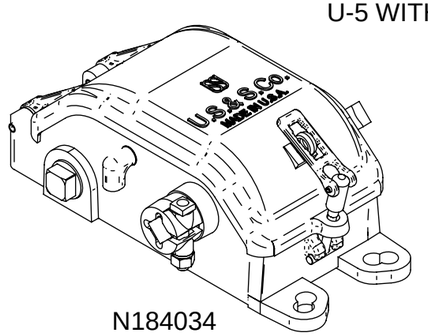
Figure 5-4. N181359003 and N181359005 U-5 Switch Circuit Controller (Drawing 1576-0023B)



TOP VIEW (U-5 BASE) ONLY

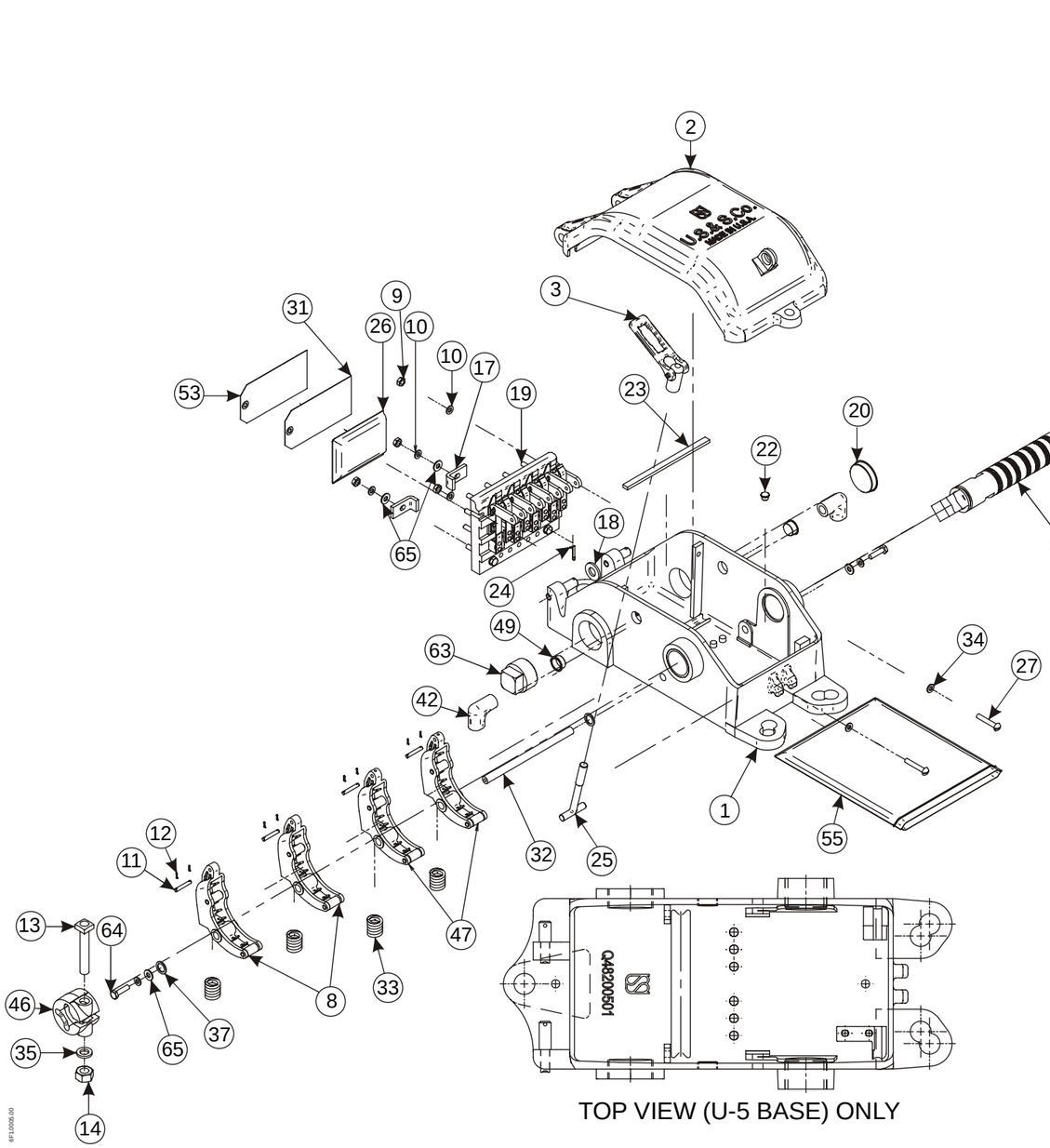


U-5 WITH COVER REMOVED

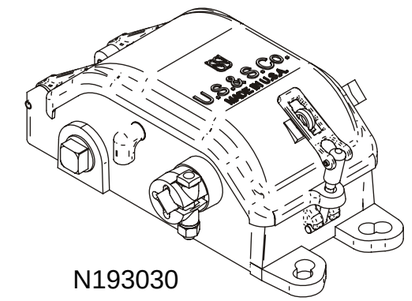


N184034

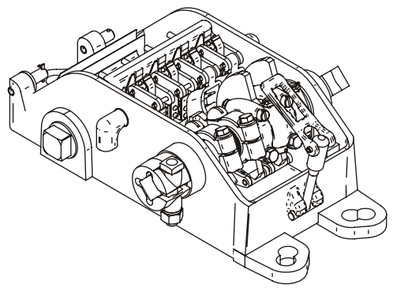
Figure 5-5. N184034 U-5 Switch Circuit Controller (Drawing 1576-0023E)



TOP VIEW (U-5 BASE) ONLY



N193030



U-5 WITH COVER REMOVED

Figure 5-6. N193030 U-5 Switch Circuit Controller (Drawing 1576-0023F)

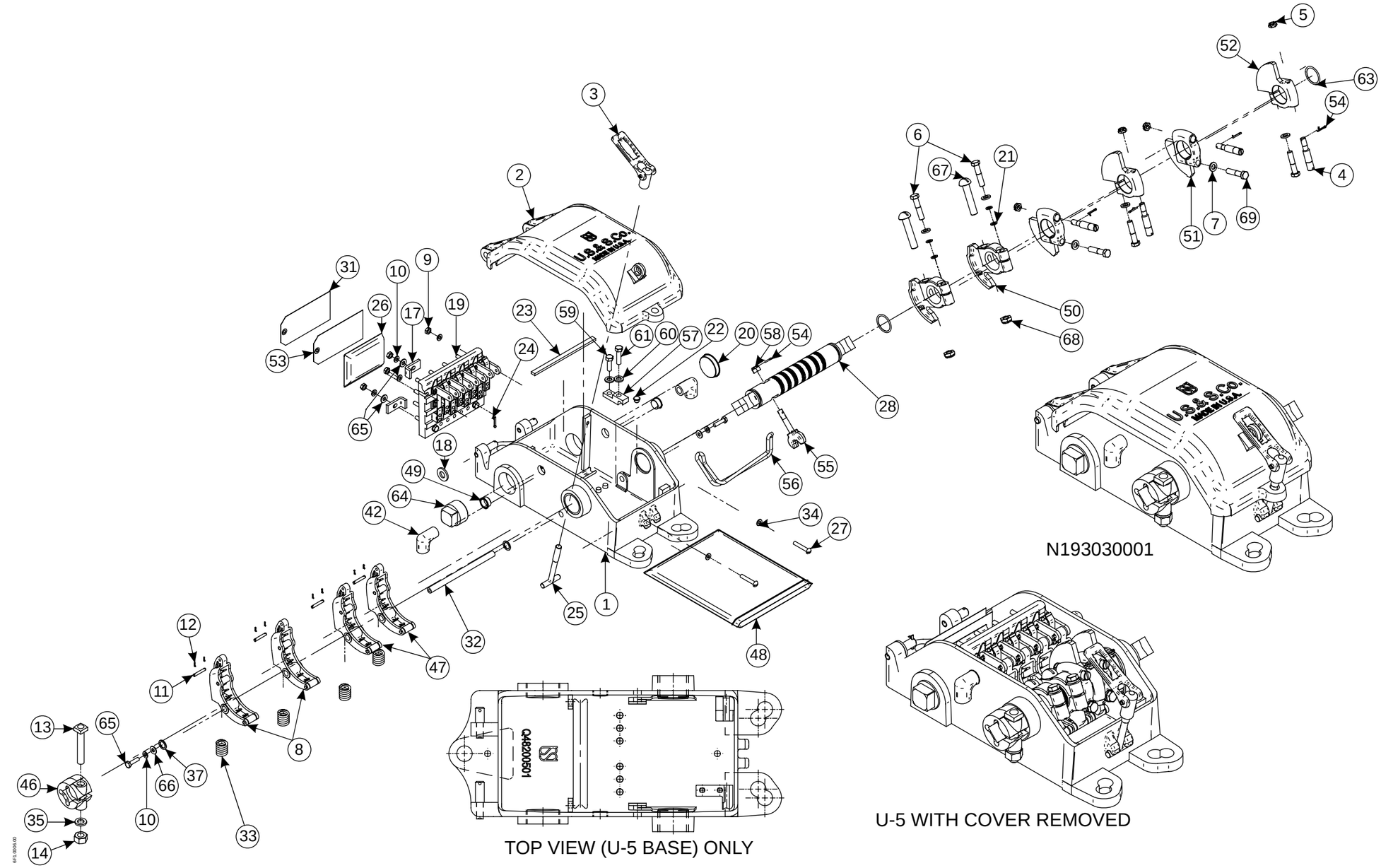


Figure 5-7. N193030001 U-5 Switch Circuit Controller (Drawing 1576-0023G)

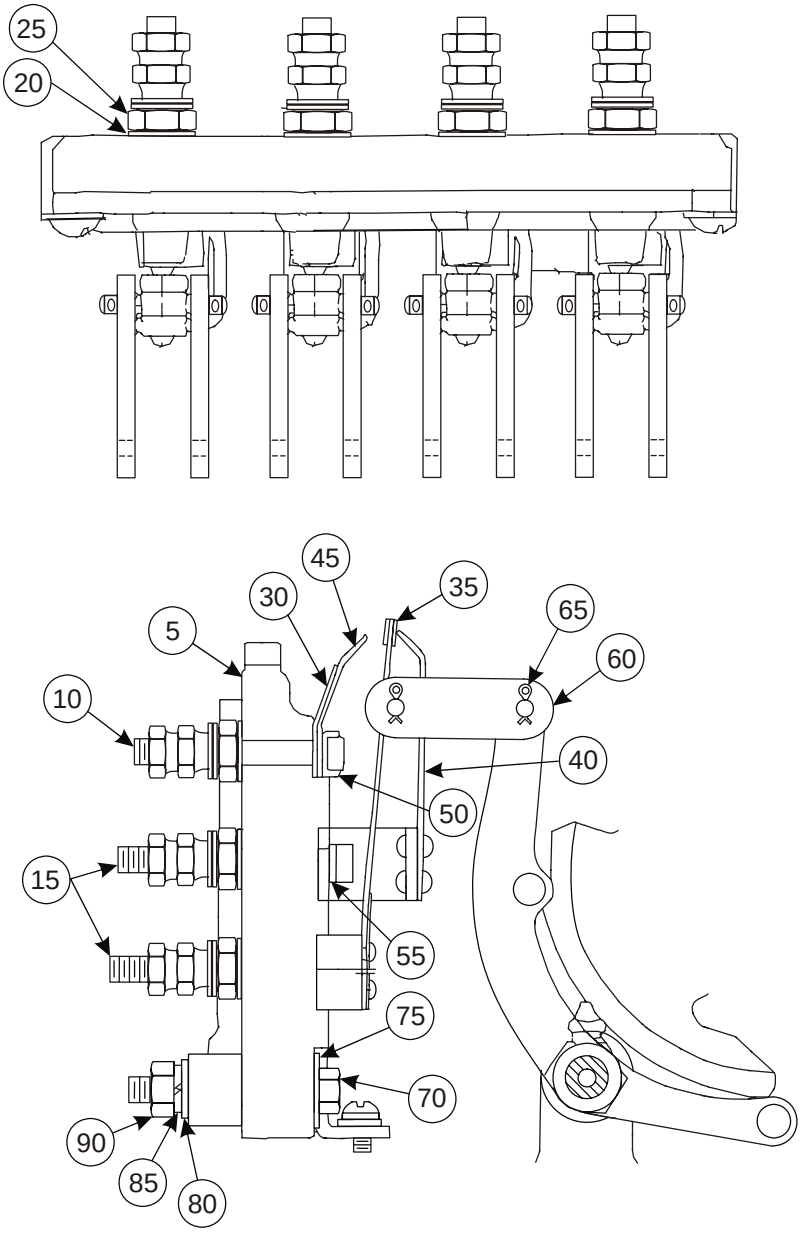


Figure 5-8. The Contact Spring Board

6. RAIL TEAM AND TECHNICAL SUPPORT

The Rapid Action Information Link Team (RAIL Team) is a group of experienced product and application engineers ready to assist you to resolve any technical issues concerning this product. Contact the RAIL Team in the United States at 1-800-652-7276 or by e-mail at railteam@ansaldo-sts.us.

End of Manual