Nuclear Division
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April 08, 2025

U.S Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

Subject: GE Over/Under Voltage time delay relay PN: 12IAV69A1A

Dear Sir or Madam:
This letter serves as an official report in accordance with 10CFR Part 21.21 on a failure of a Curtiss Wright (CW) supplied GE Time Delay Relay PN: 12IAV69A1A, Mfg. SN: AIAV111700032, CW Tag # CJ678001, CW SN: 03.

On 2/13/25 Curtiss Wright (CW) received from Constellation the failed, CW supplied, GE Time Delay Relay PN: 12IAV69A1A, Mfg. SN: AIAV111700032, CW Tag # CJ678001, CW SN:03 for CW to begin its evaluation of the failure.

On 12/10/24 Constellation notified Curtiss-Wright about the failure of a relay provided under CW project CJ6780 (Tag number CJ678001 S/N 03) which was seismically qualified in the EPRI/SQURTS report S1333.0 dated 12/19/2013. The Relay was dedicated by CW and shipped 4/13/2017 to Constellation.

Constellation stated the relay failed a planned maintenance test. The induction disc was unable to complete the full travel towards the UV trip due to obstruction from the stationary contact which slipped down along the shaft onto which it was mounted and made contact on the induction disc. Constellation stated this relay was in a relatively static state as it had not seen an undervoltage or overvoltage condition in four years. The failed unit was sent by Constellation for a failure analysis to Constellation Power Labs facility. Constellation Power Labs report dated 11/5/2024 confirmed the failure.

Further research discovered that LaSalle had a similar failure in 2002 (Report provided to CW from Constellation on 1/16/25) but there haven't been any other reported failures in the nuclear industry until this one. CW did not provide this relay.

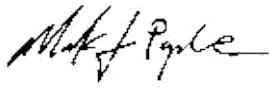
On 2/6/2025 CW issued a Return Authorization Form per Constellations request and the relay was received by CW on 2/13/2025

On 4/7/25, Revision 2 was generated (attached) of the failure analysis that was written by the Constellation Power Labs Facility which stated that the induction disc was unable to complete the full travel towards the UV trip due to the obstruction from the stationary contact which had slipped down along the shaft onto which it was mounted and made contact on the induction disc. The bracket, even when fully tightened could not hold its position on the shaft. The root cause of the failure could not be determined.

Because CW cannot establish a root cause, the following checks are recommended:

1) CW has modified the dedication plan to apply mild vertical force to assure that the clamp is secure as part of the dedication process.
2) End user should provide a similar mechanical test to be sure that the clamp remains secure during periodic surveillance and maintenance activities.
These actions should preclude a possible recurrence of this failure mechanism.

Sincerely:



Mark Papke
QA Manager
Curtiss-Wright
4600 East Tech Drive, Cincinnati, OH 45245 UNITED STATES
mpapke@curtisswright.com | www.curtisswright.com
Ph: 513-201-2118

Papke, Mark

From: Papke, Mark
Sent: Wednesday, April 9, 2025 8:18 AM
To: 'Hoc, HOO X'
Subject: RE: Curtiss-Wright Transmittal DT258613 (PO# N/A): Response required [#EEECNDDDNDDYNMC#] [EXTERNAL]

To Whom It May Concern:

Please see requested information below in red.

Thank you

Mark Papke
QA Manager

Curtiss-Wright
4600 East Tech Drive, Cincinnati, OH 45245 UNITED STATES
mpapke@curtisswright.com | www.curtisswright.com
Ph: 513-201-2118o who

From: Hoc, HOO X <HOO1@nrc.gov>
Sent: Tuesday, April 8, 2025 4:16 PM
To: Hoc, HOO X <HOO1@nrc.gov>
Subject: FW: Curtiss-Wright Transmittal DT258613 (PO# N/A): Response required [#EEECNDDDNDDYNMC#] [EXTERNAL]

Questions regarding this Part 21 report:

1) Which of your customers besides Constellation were supplied the relay and were thus affected, if any? No Other Customers Supplied

2) The letter documents a Revision 2 of the failure analysis is said to be attached, but we did not receive any attachments aside from your letter. Letter to be resubmitted 4//9/2025 with the attachment and a copy of this email

How are you planning on communicating checks to your affected customers? We have send out test procedure to our customer. We have indicated that they should perform the same check on the contact / clamp as they do their routine maintenance.

Thank you for your prompt reply.

Headquarters Operations Officer
U. S. Nuclear Regulatory Commission
☏ phone: 301-816-5100

fax: 301-816-5151
hoo.hoc@nrc.gov
secure: hoo1@nrc.sgov.gov

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

From: Hover, Margie <mhover@curtisswright.com>
Sent: Tuesday, April 8, 2025 3:45 PM
To: Hoc, HOO X <HOO1@nrc.gov>
Cc: Hover, Margie <mhover@curtisswright.com>
Subject: [External_Sender] Curtiss-Wright Transmittal DT258613 (PO# N/A): Response required [#EEECNDDDNDDYNMC#]

Document Control Workflow Notification

Dear Customer,

Please confirm receipt of attached documentation by replying Yes to this email.

Responding Yes not only confirms your receipt, but also initiates an update of our Submittal/Tracking Transmittal Database.

Thank you.

NOTICE: The documents listed in the DT below will be delivered via attachments to this email.

Nuclear Division 4600 East Tech Drive, Cincinnati, OH 45245 T: 513.528.7900 | F: 513.528.4537	**DOCUMENT TRANSMITTAL** Number DT258613	Contract N/A Customer/Vendor Purchase Order Number N/A
Originated By Hover, Margie	Originated Date 4/8/2025	Project GE Over/Under Voltage Time Delay Relays

Name	Company	Email
Headquarters Operation Officer	U.S. Nuclear Regulatory Commission	hoo.hoc@nrc.gov

Document Number	Rev	Document Type	Qty	For...
GE Over/Under Voltage Time Delay Relay P/N: 12IAV69A1A	N/A	Other	1	Final Record

Remarks

Contact Information for Originator of Part-21 Notification:

MARK PAPKE
Curtiss-Wright Nuclear Division
Quality Assurance Manager
(513) 201-2118, mpapke@curtisswright.com

U.S. Nuclear Regulatory Commission
ATTN: NRC Document Control Desk
Washington, DC 20555-0001
Phone: (301) 816-5100
Fax: (301) 816-5151

ACKNOWLEDGMENT: Please confirm receipt of the referenced documentation by replying "YES" to the email you received. The referenced documentation will default to a status of UNCONTROLLED if your "YES" reply is not received within 30 days.

Document Control Use Only	
Transmitted By Hover, Margie	Transmitted Date 4/8/2025

020-07-91 Rev. 6

For simplicity, EasyResponse is enabled. You can simply reply with a valid outcome such as yes or no on a line by itself at the top of the return email.

Constellation PowerLabs, LLC
36400 S. Essex Road Wilmington, IL
1-800-971-LABS
www.constellationpowerlabs.com

To: Ismael Rivera J, Dresden Station

From: Justin Bowers,
Justin.Bowers2@constellation.com

Project: DRE-76112, Revision 2

Subject: **Failure Analysis of:** Undervoltage Relay

PO No: FAILURE ANALYSIS
Manufacturer: General Electric
Stock Code/Cat ID: 146636601
Batch/Lot/Serial: AIAV111700032
Quantity Received: 1

AR/CR/WO: 04813364
Model: 12IAV69A1A
Inspection No: Not Provided
Component ID: 127-1 B33-1

Date: 04/07/2025, Revision 2

Revision 2 was released on 04/07/2025 to update the conclusions and observations.

DESCRIPTION

During performance of step I.3 of DOS 6600-03, loads fed from Bus 33-1 (3A LPCI, 3B LPCI, 3A Core Spray, 3A RWCU Recirc, 3A Shutdown Cooling pump) did not load shed. Additionally, Bus 33-1 and 23-1 cross tie breaker did not trip. See IR 4813361 for Bus 35 to 36 not closing. A potential cause that UV relay for Bus 33-1 did not actuate while performing DOS 6600-03. See previous IR 4380004 during D3R26. During the performance of DOS 6600-03, the UV relay's disc failed to rotate towards the stationary contact. The undervoltage relay was removed and sent to PowerLabs for failure analysis.

CONCLUSIONS

The undervoltage relay's disc failed to rotate towards the stationary undervoltage contact at the station. This failure was replicated during the mechanical testing as shown in Figure 4. This test involves moving the stationary undervoltage contact further away from the main moving contact by increasing the time setting and allowing it to complete its travel while verifying there is no binding. During this test there was binding observed. After further investigation it was identified that the reason why the disc did not complete its travel was because the plastic disc, which is connected to the bigger disc by the shaft, was rubbing against the stationary undervoltage contact, as shown in Figure 5 with the yellow arrow.

It was first assumed that the screws that secure the stationary undervoltage contact clamp to the time dial shaft, as shown in Figure 5 in the bottom right photograph, were loose. There was an attempt to torque these screws, and they were able to be torqued slightly but even after the screws were fully torqued the clamp would not hold and was able to be moved freely up and down. The stationary undervoltage contact clamp was then removed and the inside gap was measured at 0.138 in., as shown in Figure 6. The time dial shaft was measured at 0.134 in., as shown in Figure 7. The gap in the stationary contact clamp is 0.004" larger than the shaft which allowed it to slide down the shaft, impede the rotation of the disc, and prevented the relay from actuating.

COMMENTS AND RECOMMENDATIONS

There is no guidance from instruction GEI-90810 on what the time dial shaft width measurement should be, or on what the stationary undervoltage contact clamp gap should be.

REQUIREMENTS

Provide failure analysis of the relay. This relay part of the EDG Under voltage Tech Spec required surveillance which initially failed due to the relay. NRC is requesting all related information; therefore, the site is requesting an expedited failure analysis.

TEST PLAN

1. Perform visual inspection of the as-received sample. Photograph any manufacturer tags.
2. Perform functional electrical and mechanical testing of the undervoltage relay.
3. Disassemble relay as required and inspect individual components.

Technician(s): Justin Bowers

Prepared by:	Justin Bowers	04/07/2025
	ANSI Level II/ Engineering Analyst III	Date
Reviewed by:	Robert McBride	04/07/2025
	ANSI Level III/ Sr. Engineer	Date
Approved by:	Dismas D. Hutti	04/07/2025
	ANSI Level III/ Supervisor, Technical Services – West	Date

The test plan and final approval are electronically authenticated in the Constellation PowerLabs project record.

OBSERVATIONS AND DATA

The as-received photographs of the front and back of the undervoltage relay are shown in Figure 1. The undervoltage relay was identified as a model 12IAV69A1A, with serial number AIAV111700032, and the manufacturer is General Electric. The relay case had a serial number of AIAV472000080. The station indicated that the relay was installed on 10/28/2020 so it was in service for approximately four years. The Closing Voltage was identified as 100% of the tap for the left overvoltage contactor and 60-95% of the tap for the right undervoltage contactor and the tap setting was set to 93 Volts. It is rated for 120 Volts and the instruction for this relay was identified as GEI-90810 which will be reference throughout this report. This information is also documented in Table 1.

The cover of the relay was removed, and as-received photos of the internal relay were taken, as shown in Figure 2 in the photograph to the left. The photograph to the right highlights what caused the failure and is a close up of the as-received photograph to the left. It highlights the time dial shaft, as shown with the red arrow, that the stationary undervoltage contact assembly is clamped to. The stationary undervoltage contact was making contact with the plastic disc impeding its travel as shown with a blue arrow. Figure 3 was added from GEI-90810, the instruction for this style of relay, as a parts breakdown of the front and back of the relay. It will be referenced throughout the report.

The relay was initially inspected to verify there was no damaged or missing parts and that there were no foreign objects inside the relay casing. The results of this inspection were documented in Table 2. The resistance was measured from 5-6 to check the operating coil and it measured 124.83 ohms. Standard PQI type functional electrical testing was performed on the relay and the relay functioned as intended. The results can be viewed in Table 3 under the Pickup Voltage and Over/Under Voltage Relay Operations tests. Current was applied to both the over voltage and undervoltage target/seal-in units and they functioned as intended. The results of this can be viewed in Table 4.

The next functional test performed was a mechanical test that was referenced from instruction GEI-90810 from page 6 and it was the second step. This test involves rotating the time dial to the No. 7 setting and verifying that the disk rotates towards the stationary undervoltage contact without binding or touching the drag magnet or U-magnet. During this test the main moving contact, which is connected to the disc by the shaft, stopped halfway through its travel, as shown in Figure 4. This test was performed multiple times at various time settings and the disc would not complete its travel intermittently. The reason why its travel was impeded was that the plastic disc attached to the shaft was dragging on the stationary undervoltage contact as shown in Figure 5. The bottom left photo is of the stationary undervoltage contact clamp lower on the time dial shaft allowing the stationary undervoltage contact to make contact with the plastic disk, as shown with the yellow arrow. This was the as-received condition. The top left photo is the stationary undervoltage contact after it was moved up along the shaft to show how it should be positioned. The bottom right photo is of the backside of the stationary undervoltage contact clamp that fastens it to the time dial shaft, notice there is a gap, and it has slid down. The top right photo is after the clamp was moved up. The red arrow points to the stationary undervoltage contact assembly, the blue arrow points to the stationary undervoltage contact clamp, and the green arrow points to the time dial shaft. There was an attempt to torque the clamp screws, and they were able to be torqued slightly but the clamp would not fasten to the time dial shaft and was still able to be moved freely up and down by hand even after torquing.

The stationary undervoltage contact clamp was removed from the shaft so the inside gap could be measured. The gap was measured at 0.138 in. after it was fully torqued, as shown in Figure 6. The time dial shaft, that the stationary undervoltage clamp tightens to and recorded at 0.134 in., as shown in Figure 7. The clamp was fully torqued, and it could still not be fastened to the time dial shaft and this makes sense since the clamp gap was measured at 0.138 in. fully tightened, and the time dial shaft width was measured at 0.134 in. During the removal of the stationary undervoltage contact clamp from the time dial shaft a wire tore apart from the ferrule it was crimped to, as shown in Figure 8.

Table 1.

Nameplate Verification	Verify and document the nameplate information on the sample(s).

Sample	**Model Number**	**Type**	**Voltage Rating**	**Closing Volts (% Tap—Left / Right)**		**Tap Setting**	**Instructions**
1	12IAV69A1A	IAV	120	100	60-95	93	GEI-90810

Table 2.

Visual Inspection	Verify and document the condition of the sample(s). Confirm there are no foreign objects inside the chassis.

Sample	**Broken / Damaged?**	**Missing Parts?**	**Foreign Objects?**
1	SAT	SAT	SAT

Table 3.

Pickup Voltage	Utilizing a variable ac voltage source on terminals 5 / 6 and with the Time Dial set for 0, verify that the relay left contacts close at the tap setting ±5%. Next, lower the ac voltage to a percentage of the tap value (from 90 to 60%) and verify the right side relay contacts close.
Over / Under Voltage Relay Operation	Utilizing a variable ac voltage source on terminals 5 / 6, set the Time Dial for 3. Preset the ac voltage source for ≈ 128 V ac. Suddenly apply the voltage to the relay and verify the relay left contacts close in approximately 4 seconds (also verifies contact function). Increase the voltage to the nameplate rating and apply it to the relay. Suddenly reduce this voltage to ≈ 50 V ac and verify the relay right contacts close in approximately 8 seconds (also verifies contact function). Refer to GEI-90810, Figure 4 for Time Voltage Curve data.

Sample	**Relay Pickup Left / Right (V ac)**		**Voltage Tap & Time Dial Settings**	**Relay Closure Left / Right (seconds)**		**Contact Function Left / Right**	
1	92	82	SAT	4	8	SAT	SAT

Table 4.

Target / Seal-In Unit	Set the seal-in unit to the 0.2 A setting Next block the voltage relay closed. Connect a dc current source to the relay, limiting the current output to 0.2 A maximum. Slowly increase the dc current source until the relay picks up. Verify it operates at approximately 0.2 amps and its target drops freely. Verify target can be reset.

Sample	**Left Seal-In (A dc)**	**Left Target Drops?**	**Left Target Resets?**	**Right Seal-In (A dc)**	**Right Target Drops?**	**Right Target Resets?**
1	0.17	SAT	SAT	0.17	SAT	SAT

Figure 1. As-received photographs of the front and back of the undervoltage relay are shown. The undervoltage relay was identified as a model 12IAV69A1A, with serial number AIAV111700032, and the manufacturer is General Electric. The relay case had a serial number of AIAV472000080. The Closing Voltage was identified as 100% of the tap for the left overvoltage contactor and 60-95% of the tap for the right undervoltage contactor. It is rated for 120 volts and the instruction for this relay was identified as GEI-90810 which will be reference throughout this report.

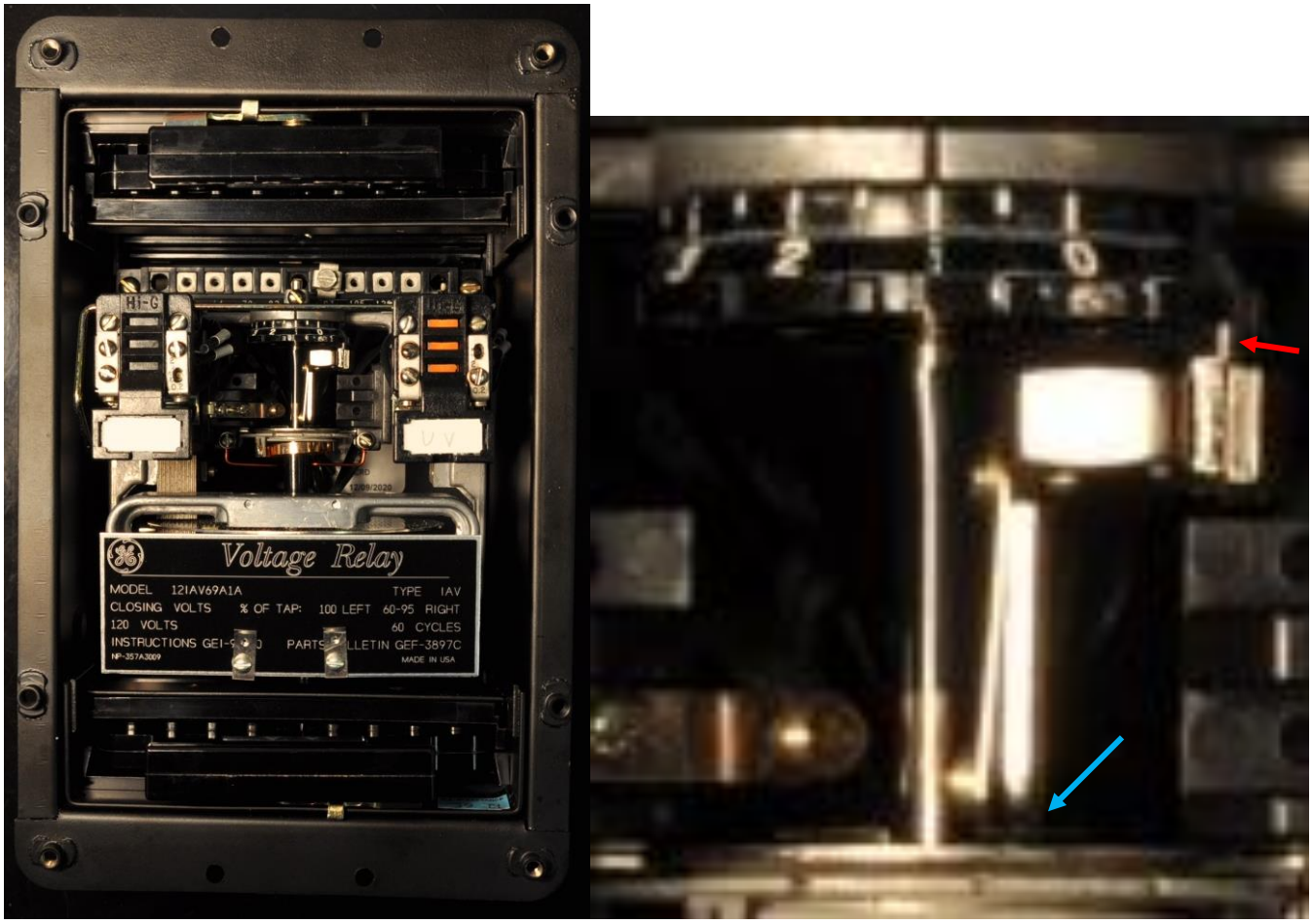


Figure 2. As-received photographs of the front and back of the undervoltage relay are shown in the two photos above. The left photo is with the cover removed. The right photo is a close up of the time dial to show the time dial shaft, as shown with the red arrow, that the stationary undervoltage contact assembly is clamped to. The stationary undervoltage contact was making contact with the plastic disc impeding its travel as shown with a blue arrow.

GEI-90810 Voltage Relay Type IAV69A And B

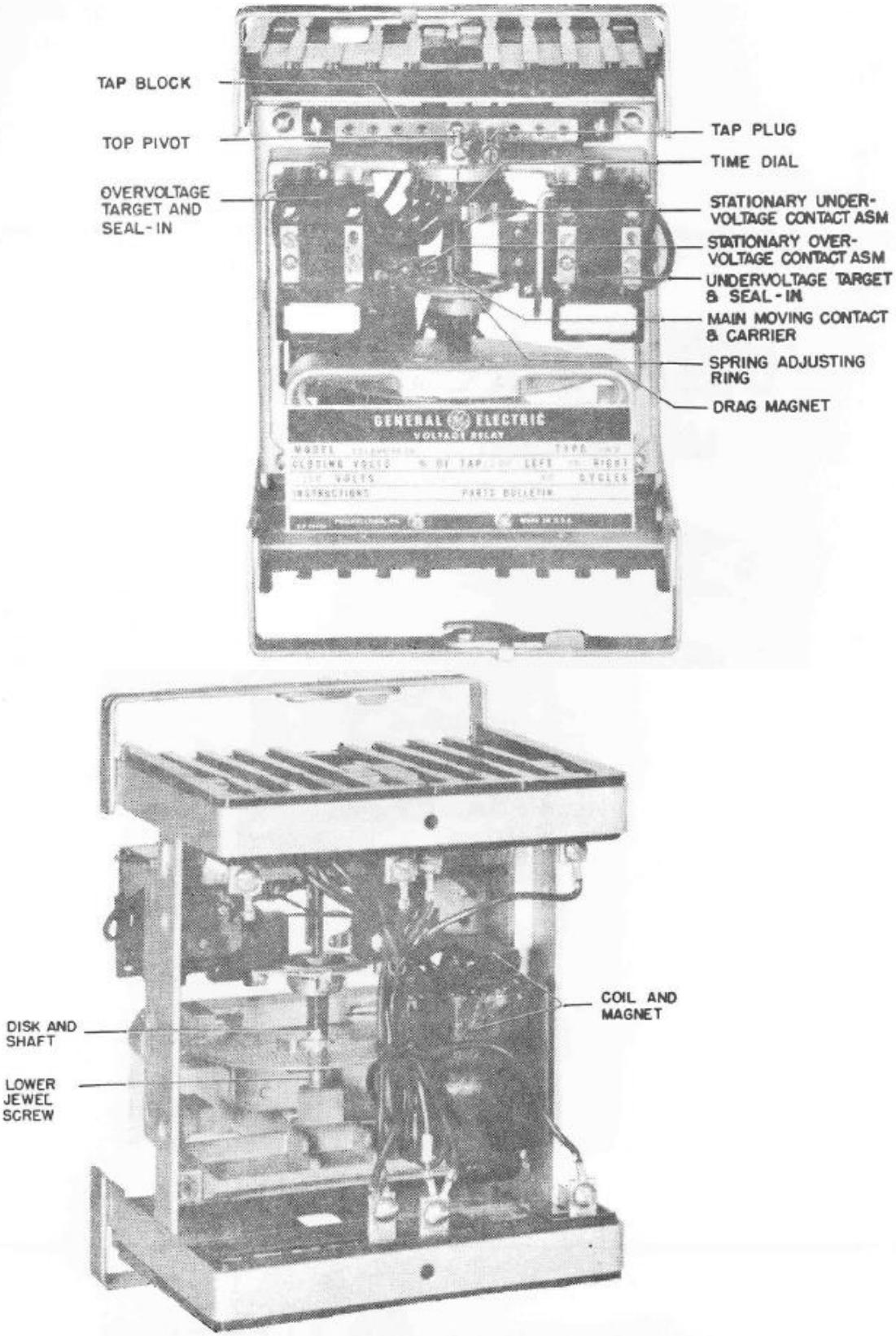
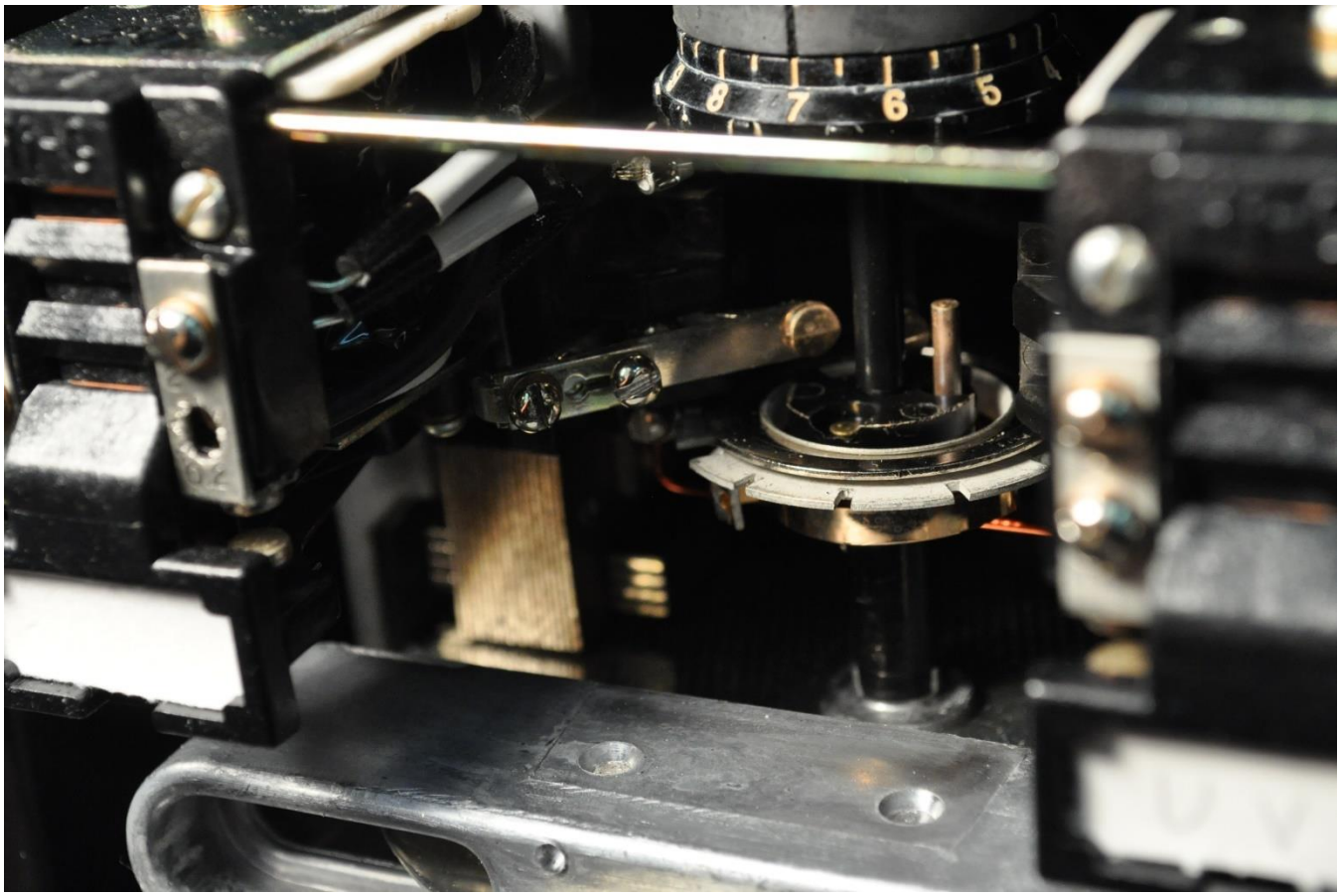


Fig. 1A (8031862) Back View of Relay Type IAV69A Withdrawn From Case.

Figure 3. Front and back view of the relay Type IAV69A are shown above with a parts breakdown.



2. Rotate the time dial to the No. 7 setting and check that disk rotates without binding or touching the drag magnet or U-magnet.

Figure 4. The step in the bottom picture above was taken from the GEI-90810 instruction for this type of relay from page 6 and it is the second step of the “Mechanical Tests”. During this test the disc did not complete its travel by means of the main moving contact engaging the stationary undervoltage contact, it stopped halfway. This was repeatable intermiddently. After a closer investigation of what was impedding the travel of the disc, as shown in Figure 5, it was discovered that the plastic disc was rubbing against the stationary undervoltage contact and dragging.

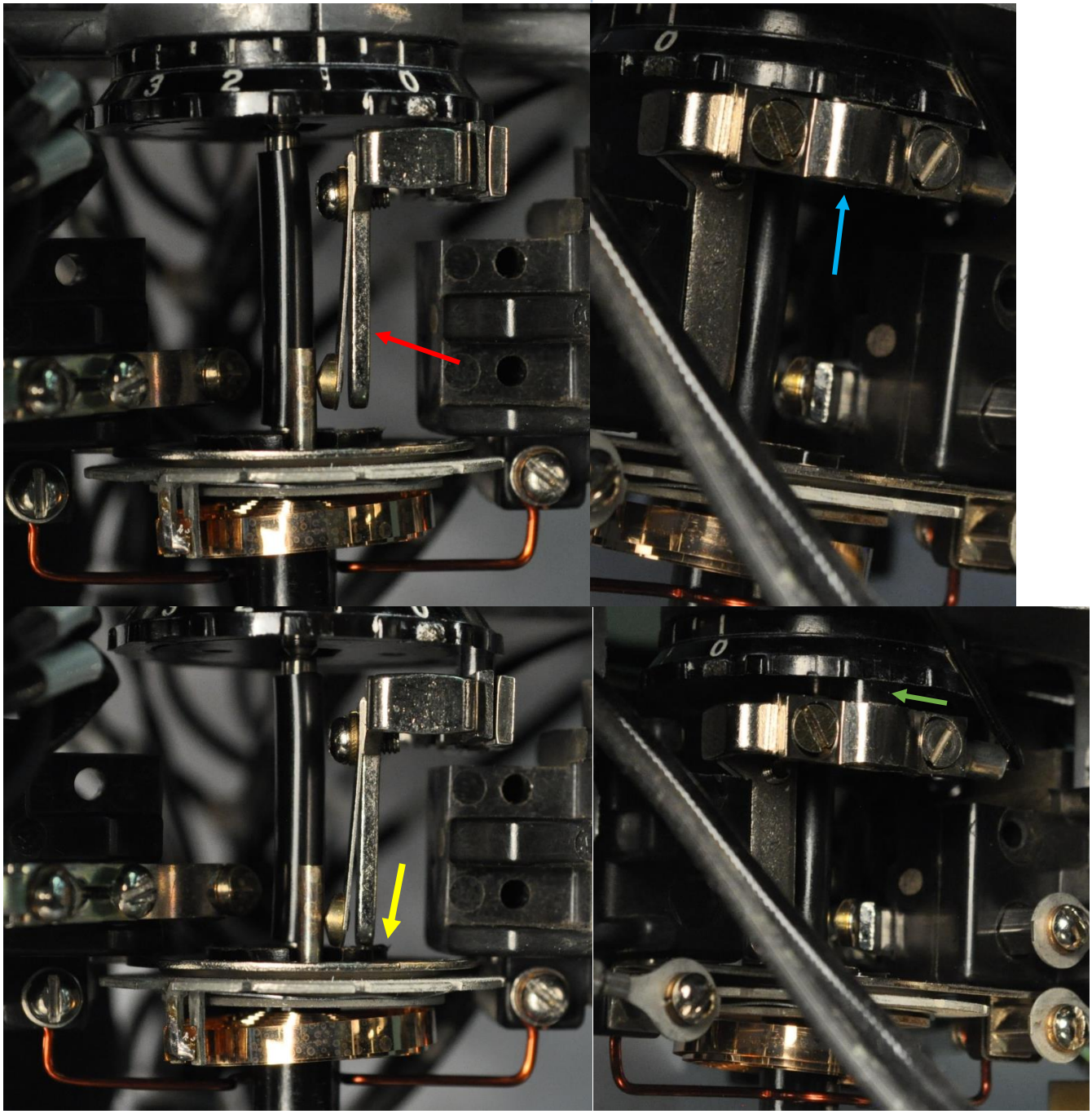


Figure 5. The bottom left photo is of the stationary undervoltage contact clamp lower on the time dial shaft allowing the stationary undervoltage contact to make contact with the plastic disk, as shown with the yellow arrow. This was the as-received condition. The top left photo is the stationary undervoltage contact after it was moved up along the shaft to show how it should be positioned. The bottom right photo is of the backside of the stationary undervoltage contact clamp that fastens it to the time dial shaft, notice there is a gap, and it has slid down. The top right photo is after the clamp was moved up. The red arrow points to the stationary undervoltage contact assembly, the blue arrow points to the stationary undervoltage contact clamp, and the green arrow points to the time dial shaft. There was an attempt to torque the clamp screws, and they were able to be torqued slightly but the clamp would not fasten to the time dial shaft and was still able to be moved freely up and down by hand.

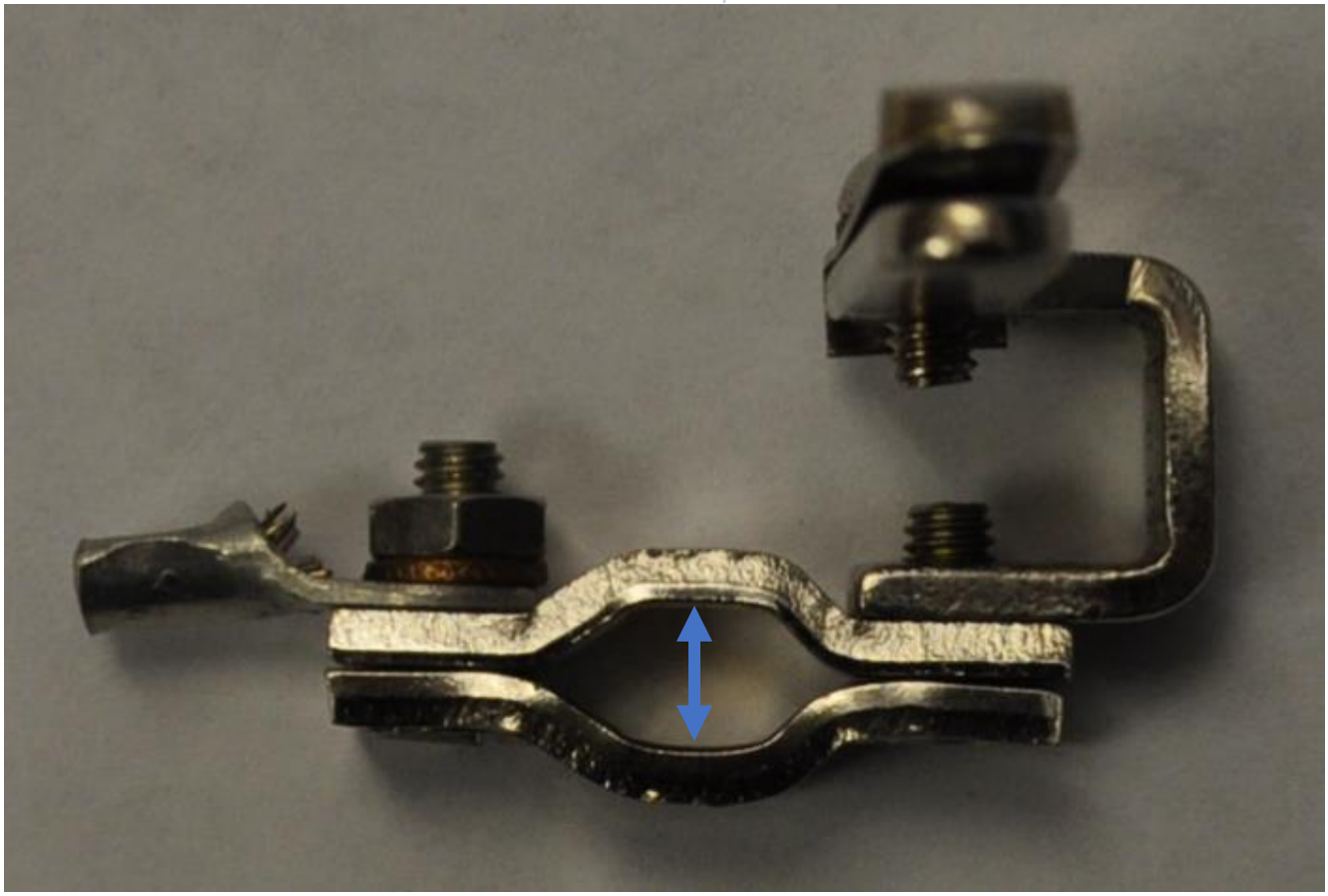


Figure 6. The inside gap of the stationary undervoltage contact clamp was measured, as indicated by the blue arrow, and recorded at 0.138 in. This was with the clamp fully torqued.

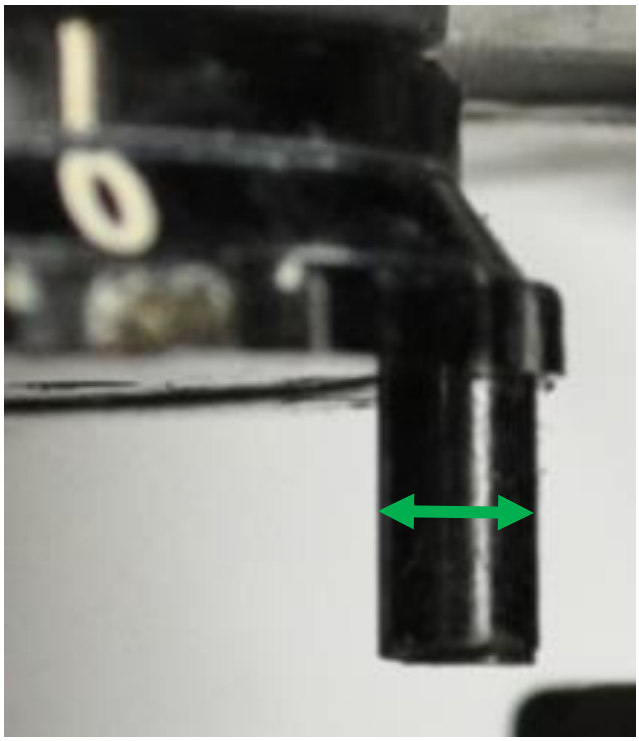


Figure 7. The time dial shaft that the stationary undervoltage contact clamp tightens to was measured, as indicated by the green arrow, and recorded at 0.134 in.

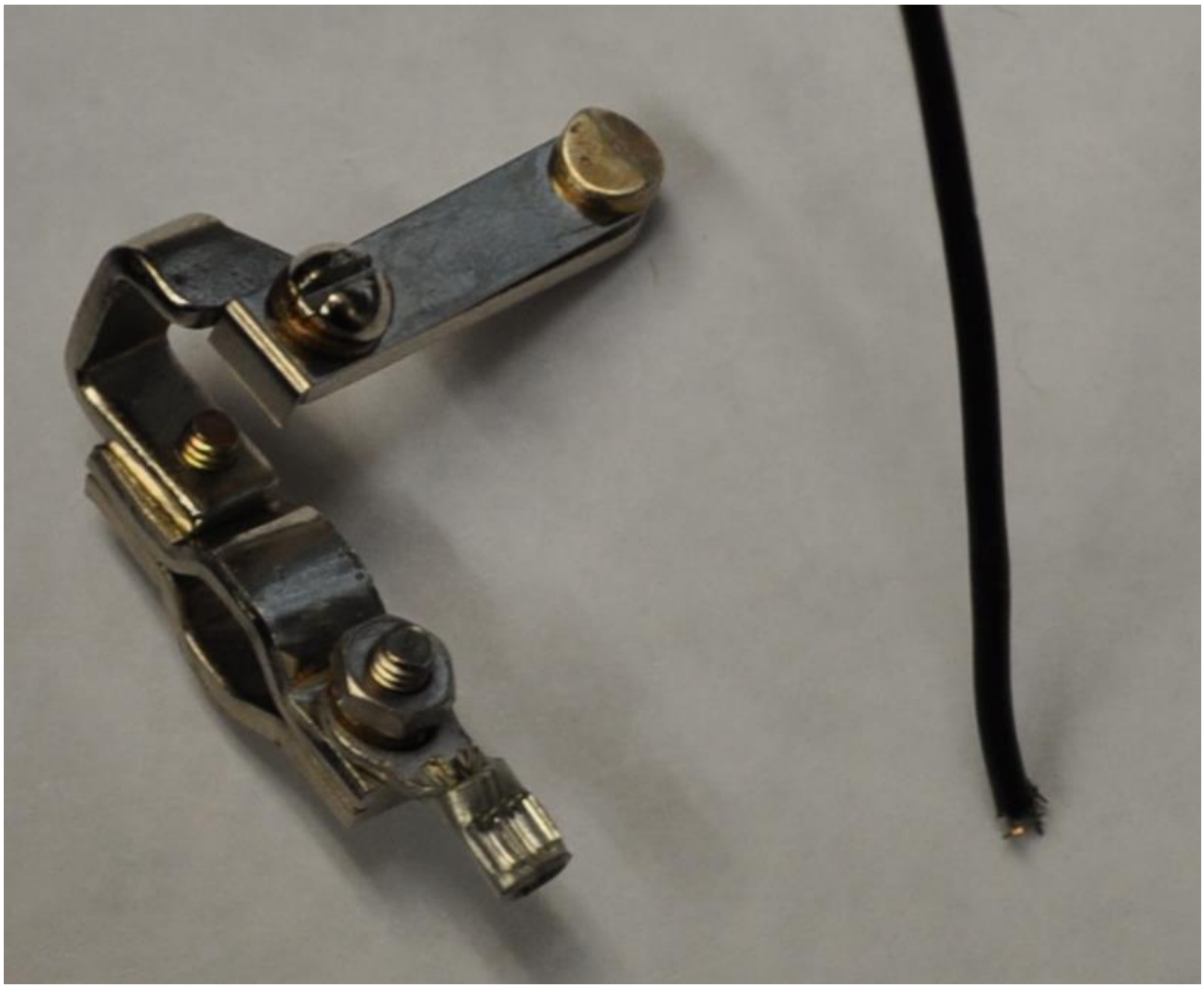


Figure 8. A wire tore apart from the ferrule that is connected to the stationary undervoltage contact assembly during removal from the time dial shaft as shown above.