

Switch Maintenance and Inspection Program for Electric Transmission

SUMMARY

This utility procedure establishes the inspection cycle and maintenance steps required for electric transmission switches. Electric transmission switches are widely used within the PG&E system and their proper operation is crucial to public and employee safety, system reliability, and operational efficiency.

Level of Use: Informational Use

TARGET AUDIENCE

- Electric transmission maintenance and construction (M&C) employees
- Electric regulatory strategy and transmission asset management employees

SAFETY

Failure to follow proper transmission field switching procedures may result in employee injuries, public safety exposure, or damage to facilities.

Consistent execution of this procedure helps ensure compliance with PG&E’s safety standards including, but not limited to, those described in [SAFE-1001S, “PG&E Injury & Illness Prevention Plan \(IIPP\),”](#) and the [Code of Safe Practices \(CSP\)](#).

BEFORE YOU START

USE appropriate personal protective equipment (PPE) at all times during transmission switching. PPE includes, but is not limited to, the following:

- Flame-resistant (FR) clothing
- Hard hat
- Safety glasses
- Class II rubber gloves
- Suitable footwear

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PROCEDURE STEPS

1 General Information

1.1 SCHEDULE detailed inspections of transmission switches as part of the routine maintenance plan established for each electric transmission circuit. Switch inspection intervals and record retention must be consistent with the current [Electric Transmission Preventative Maintenance \(ETPM\) Manual](#) (TD-1001M).

1. USE this procedure in conjunction with [Utility Form TD-1006P-02-F01, "Electric Transmission Line Switch Inspection/Function Test."](#)

1.2 Many existing parts of the electric transmission system cannot be cleared without creating area-wide outages to numerous substations and customers.

1. IF a function test must be postponed,
THEN SUBMIT an exemption, as described in [ETPM Manual, Section 3.3, "LC Notification Maintenance Approach."](#)

2 Inspection Cycles

2.1 INSPECT all transmission switches at regular intervals, as specified in [Table 1](#) below.

1. Inspection intervals must follow overhead inspection frequencies. SEE [Utility Procedure TD-8123P-100, "Transmission Patrols and Enhanced Inspection Frequency Guidelines."](#)

a. Opportunities for an inspection outside the regular inspection cadence may occur when a line is deenergized for project or maintenance work.

2. Exceptions listed below can drive additional inspections.

a. Component failure (failure of like components) or components proven defective through testing or the Material Problem Reporting (MPR) process.

b. Intermittent or unknown status alarms through Supervisory Control and Data Acquisition (SCADA).

Table 1. Switch Inspection Cycle

Voltage	Switch Type	Structure Type	Detailed Visual Inspection ²	Function Test (Years) ²
500 kV ¹	NA	NA	NA	NA
230 kV	Manual	Steel	<ul style="list-style-type: none"> Max 6 years or as triggered. Visual inspections must be done with structural inspections cycles described in TD-8123P-100. 	6 years or as triggered
115 kV 60/70 kV	Manual	Wood		
		Steel		
	Motor-Operated	Wood		
		Steel		

¹ 500 kV switch maintenance is performed within the Substation Maintenance Plan.

² A Detailed Visual Inspection may not necessarily include a Function Test.

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2.1 (continued)

NOTE

Planned shutdowns offer an opportunity for a more thorough inspection of switches, as listed in [Step 2.1.3](#) below.

3. Components of a Detailed Switch Inspection

a. INSPECT the items listed below on all switches, as applicable.

- Switch operating name and number
 - IF the switch operating name and number are not present, THEN INSTALL the operating name and number provided by the Grid Control Center (GCC) using the name and numbering kit (Code 621835). REFER to [Attachment 3, "Procedure for Marking Transmission Switches,"](#) for additional information.
- Switch platform and associated bonding
- Control mechanism
- Insulators
- Switch contacts
- Switch attachments (arcing horns, quick breaks, vacuum interrupters)
- Motor operator (MO) or motorized switch operator (MSO), batteries, and accessory wiring
- Potential transformers (PTs) or other power supply, antennas, and miscellaneous switch equipment

3 Detailed Visual Inspection

The following information details the specific inspection criteria for components listed in [Step 2.1.3](#) above.

3.1 Switch Platform

NOTE

Platform installation information can be found in [Numbered Document 073443, "Installation of Switch Grounds on 60–230 kV Transmission Lines."](#)

1. CHECK that all bonding connections and/or straps between the platform and the switch handle are secure.

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3.1 (continued)

2. CHECK that all ground connections between the switch handle, ground rods, and motor operator (if equipped) are secure.
3. CHECK ground-mounted platforms to ensure that foreign objects, such as vegetation, dirt, metal objects, or debris do not ground them.
4. CHECK that the platform is secured and properly positioned on supporting piers.

3.2 Control Mechanism

1. INSPECT the operating handle and control rod guides to verify that they have not been bent or damaged.
2. CHECK that the operating handle mounting bolts are tight and secured.
3. CHECK the fiberglass control rod (if equipped) for “fiber blooming” (exposed fibers). This type of degradation compromises the insulating capability of the rod.
4. CHECK to ensure that the approved transmission switch padlock is being used.

NOTE

The brass PG&E Corporation “Number 2” padlock is **NOT** approved for use on transmission switches.

- a. IF the brass “Number 2” padlock is being used,
THEN PERFORM the following actions:
 - (1) REFER to [Utility Procedure SEC-2001P-24, “Key Management Procedure.”](#) for instructions on obtaining the transmission switch padlock.
 - (2) REMOVE the brass “Number 2” padlock.
 - (3) INSTALL the approved transmission switch lock.

3.3 Insulators

1. CHECK all insulator units for cracks, flash marks, or contamination.
2. CHECK that the switch mechanism post insulators are plumb to the mounting surface.

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3.4 Switch Contacts

1. INSPECT each switch unit to ensure that it is in the normal operating position.
2. ENSURE that each contact is aligned both vertically and horizontally.

3.5 Switch Attachments

1. Arcing Horns (Including Quick Breaks)
 - a. Visually INSPECT arcing horns AND catch assembly for excessive wear and engagement.
2. High Speed (Break) Interrupters
 - a. Visually VERIFY that the whip is properly engaged with the catch when the switch is in the closed position.
 - b. Whip lengths may vary. REPLACE whips when material loss is observed due to burning or improper installation.
3. Vacuum Interrupters
 - a. VERIFY that the trip arm AND catch arm are properly latched when the switch is closed.
 - b. REPLACE interrupters that show signs of external arcing (black soot), cracks on the external housing, or oil leaks.

3.6 Motor Operator (MO) or Motorized Switch Operator (MSO)

This section details required inspection steps for the MO or MSO (if equipped). INSPECT motor-operated switches according to the schedule defined in [Table 1](#) on Page 2.

1. Cabinet
 - a. NOTIFY the appropriate switching center before opening any MO or MSO cabinet.
 - b. CHECK the MO or MSO cabinet for leaks or water intrusion.
 - c. Thoroughly CHECK to ensure that there is no damage from vandalism or third-party contact.
 - d. ENSURE that the ground wire and associated connections are present and in proper condition.

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3.7 Miscellaneous Equipment

This section details miscellaneous equipment present on transmission switch structures (if applicable).

1. Potential Transformer (PT)
 - a. Visually INSPECT the PT for signs of abnormal conditions, including flash marks, corrosion, and damage.
 - b. Visually INSPECT the wiring of the PT for disconnected, loose, broken, or damaged wires.
 - c. CHECK for signs of oil leaks.
 - d. IF a sight glass/meter is present
THEN INSPECT the PT's oil level.
 - e. ENSURE that the ground wire and associated connections are in proper condition.
2. Secondary Feed
 - a. Visually INSPECT the secondary source for signs of damage, abnormal conditions, or obstructions.
 - b. Visually INSPECT the wiring of the secondary source to the MO/MSO for damaged, loose, or disconnected wires.
3. Telecom Equipment
 - a. Visually INSPECT telecom equipment for abnormalities, damage, or vandalism.
 - b. Visually INSPECT wiring for damaged, loose, or disconnected wires.

4 Function Test

NOTE

REFER to [Utility Procedure TD-1006P-05, "Transmission Switching Procedure – Field Instructions,"](#) before operating a switch.

4.1 Switch Function Test Requirements

1. CONFIRM that the switch operating name and number are present.

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4.1 (continued)

- a. IF the switch operating name and number are **not** present,
THEN INSTALL the operating name and number provided by the GCC, using the name and numbering kit (Code 621835).
 - REFER to [Attachment 3, "Procedure for Marking Transmission Switches,"](#) for additional information.
2. REPLACE all round fiberglass and wood operating rods as described in [Attachment 1, "Criteria for Operating Transmission Line Switches," Section 3.5.](#)
3. EXERCISE the switch units to check for proper open and close alignment.
 - a. Switches may have multiple methods of operation, which may include the following:
 - (1) Locally, using the manual operating handle
 - (2) Locally, using the motor operator
 - (3) Remotely, via SCADA from the GCC
 - b. EXERCISE each method, when applicable.
4. CHECK that attachments engage correctly.
5. CLEAN AND LUBRICATE switch contacts with appropriate lubricant.



CAUTION

DO NOT LUBRICATE **SEECO** switch contacts. Lubricant attracts dirt and dust, creating a glue-like effect that renders the switch more difficult to operate. In lieu of using the lubricant, RE-ADJUST the SEECO switch for correct operation.

- a. CLEAN switch contact surfaces thoroughly.
- b. LUBRICATE switch contacts with Mobil 28 lubricating grease.
 - (1) APPLY grease to top and bottom of rotating contact jaws.

NOTE

Chevron FM NLGI Grade 2 or Molykote 33 grease may be substituted for Mobil 28 lubricating grease. These lubricants are all non-sulfur containing greases.

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4.1 (continued)

6. TEST the batteries.
 - a. Visually INSPECT the battery case for bulging, terminal corrosion, and case leakage.
 - (1) CLEAN the battery contact AND COAT it with corrosion inhibiting compound.
 - b. PERFORM voltage drop test on batteries. Battery voltage drop must not exceed 3 volts (V).
 - (1) INSTALL voltmeter on battery.
 - (2) PRESS the **TEST** button on MO or MSO, AND CHECK if voltage on voltmeter drops more than 3 V during the test cycle.
 - c. ENSURE that the battery charger is operating properly, according to manufacturer's recommendation.

NOTE

Battery life under normal operating conditions is 2 to 3 years, depending on battery type. It is recommended that batteries be replaced every 2 years or more often if conditions warrant.

- d. REPLACE batteries as part of the detailed inspection cycle.
 - (1) IF the battery was replaced within 6 months before the inspection date **AND** the battery passes the voltage drop test (3 V or less),

THEN DO NOT REPLACE the battery.
 - e. SEE [Attachment 2, "Procedure for Changing Batteries for Inertia Switch Motor Operator."](#)
7. CHECK all internal components for proper working condition, wear, corrosion, and tightness (e.g., battery terminals and secondary connections).
- ### 4.2
- PERFORM a functional test of the MO or MSO via SCADA/Power Fail/Automatics (if equipped).
 1. REQUEST GCC operator to open and close the switch in order to witness correct operation at switch.
 2. VALIDATE communication through SCADA.

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- 4.3 PERFORM a functional test of SCADA.
 1. CHECK SCADA communication with GCC.
 - a. CHANGE the local/remote selector switch and Couple/Decouple status points.
 2. VERIFY the status change.

END of Instructions

DEFINITIONS

NA

IMPLEMENTATION RESPONSIBILITIES

The director of transmission maintenance and construction (M&C) is responsible for the implementation of this maintenance procedure.

Transmission electric superintendents ensure that electric transmission supervisors in their areas conduct tailboards on this procedure.

GOVERNING DOCUMENT

[Utility Standard TD-1006S, "Transmission Line Air Switches"](#)

COMPLIANCE REQUIREMENT / REGULATORY COMMITMENT

Records and Information Management:

Information or records generated by this procedure must be managed in accordance with the Enterprise Records and Information Management (ERIM) program policy, standards, and Enterprise Records Retention Schedule (ERRS). Refer to [GOV-7101S, "Enterprise Records and Information Management Standard,"](#) and related standards. Management of records includes, but is not limited to:

- Integrity
- Storage
- Retention and Disposition
- Classification and Protection

REFERENCE DOCUMENTS

Developmental References:

NA

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REFERENCE DOCUMENTS (continued)

Supplemental References:

- [Code of Safe Practices](#)
- [Electric Transmission Preventative Maintenance Manual](#) (TD-1001M)
- Institute of Electronic and Electrical Engineers (IEEE) Standard C37.30.1-2011 (or most recent revision) and applicable manufacturer recommendations
- [Numbered Document 073443, "Installation of Switch Grounds on 60–230 kV Transmission Lines"](#)
- [Utility Procedure SEC-2001-24, "Key Management Procedure"](#)
- [Utility Procedure TD-1006P-05, "Transmission Switching Procedure – Field Instructions"](#)
- [Utility Procedure TD-8123P-100, "Transmission Patrols and Enhanced Inspection Frequency Guidelines"](#)
- [Utility Standard SAFE-1001S, "PG&E Injury & Illness Prevention Plan \(IIPP\)"](#)

APPENDICES

NA

ATTACHMENTS

[TD-1006P-02-Att01, "Criteria for Operating Transmission Line Switches"](#)

[TD-1006P-02-Att02, "Procedure for Changing Batteries for Inertia Switch Motor Operator"](#)

[TD-1006P-02-Att03, "Procedure for Marking Transmission Switches"](#)

[Form TD-1006P-02-F01, "Electric Transmission Line Switch Inspection/Function Test"](#)

DOCUMENT REVISION

This utility procedure cancels and supersedes Utility Procedure TD-1006P-02, "Switch Maintenance and Inspection Program for Electric Transmission," Rev. 1, issued 03/05/2021.

DOCUMENT APPROVER

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REVISION NOTES

Where?	What Changed?
Throughout the document	Updated links and references.
Safety section	Updated safety message.
Section 1	<ul style="list-style-type: none"> • Included guidance that record retention must be consistent with TD-1001M. • Added link to Switch Inspection Form TD-1006P-02-F01. • Removed obsoleted bulletin for postponing inspections.
Section 2	<ul style="list-style-type: none"> • Removed reference to obsoleted bulletin TD-1001M-B009 and replaced it with TD-8123P-100. • Updated Footnote #2 in Table 1. • Added bullet point to Section 2.1.3.a: PTs or other power supply, antennas, and miscellaneous switch equipment.
Section 3	<ul style="list-style-type: none"> • Updated language in Section 3.2.3. • Updated link for obtaining switch padlock to SEC-2001P-02. • Added Section 3.7.
Section 4	<ul style="list-style-type: none"> • Added Note with reference to TD-1006P-05. • Updated Note regarding battery life. • Expanded Step 4.1.3.
Reference Documents	<ul style="list-style-type: none"> • Added reference to TD-1006P-05. • Removed obsoleted documents TD-1001M-B009 and TD-1001M-B011. • Updated reference to IEEE document.
Document Approver, Document Owner, Document Contact sections	<ul style="list-style-type: none"> • Updated names and titles. • Updated Approver from T-Line M&C Superintendent to T-Line M&C Director.