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# SSIT-401(b) Relays - DC Polar

## Purpose

Proper functionality of relays is vital to the safety of train operations and grade crossing warning systems. Relays shall be electrically tested to ensure they are in suitable working condition .

## Test Intervals

DC polar relay inspections and tests shall be performed when installed, as required, and at least once every two (2) calendar years. Refer to *SSIT-7 Signal System Inspection and Test Intervals* for all test intervals.

## Rail Safety

Employee shall ensure the site is safe for employees, the public, vehicular traffic and train operations as defined in *SSIT-8 Protecting Train Operations* prior to performing tests and inspections.

## Equipment Manuals

A copy of relevant relay equipment manufacturer's manual should be on hand for reference when performing tests.

## Operating Characteristics

The following table outlines the required shop and field operating values for the testing of DC polar relays:

| Test | Shop Values | Field Values |
|---|---|---|
| Initial Charge | Four times relay pick-up value. | Reverse working current or voltage |
| Drop-away value<br>(silicon steel magnetic relays) | Not less than 95% of original marking. | **Track Relays** – Not less than 85% of original marking, not less than 45mA for 2Ω relay, not less than 32mA for 4Ω relay.<br>**Line relays** – Not less than 67% of original marking. |
| Drop-away value<br>(iron magnetic relays) | Not less than 90% of original marking, not less than 43% of pick-up value. | **Track Relays** – Not less than 67% of original marking, not less than 35mA for 2Ω relay, not less than 25mA for 4Ω relay.<br>**Line relays** – Not less than 67% of original marking. |
| Normal pick-up | Not more than 110% of original marking. | Not more than 110% of original marking. |
| Normal working | Not more than 110% of original marking. | Not more than 110% of original marking. |
| Reverse working | Not more than 110% of original marking. | Not more than 110% of original marking. |
| Normal/Reverse polar pick-up & working values | Not more than 70% of pick-up of neutral armature. | Not more than 80% of pick-up of neutral armature. |

## Procedure

The following electrical tests shall be performed on all DC polar relays:

| Step | Procedures |
|---|---|
| 1. Perform Visual Inspections | • relay inspections shall be done using relay inspection and test procedures *SSIT-401(a) Relays – Visual Inspection*. |
| 2. Obtain Manufacturer Specifications | The following requirements are required from manufacturer specifications for testing:<br>• Normal pick-up value not to exceed percentage of original marking.<br>• Reverse pick-up value not to exceed percentage of original marking.<br>• Normal working value not to exceed percentage of original marking.<br>• Reverse working value not to exceed percentage of original marking.<br>• Drop-away value not to be less than percentage of pick-up. |
| 3. Test Neutral Armature Drop-Away | • Apply initial current to coils in normal direction.<br>• Reduce current gradually until neutral armature drops away.<br>• Check drop-away value is greater than manufacturer minimum.<br>**If drop-away value is less than minimum:** Relay must be removed from service. Apply necessary protection and arrange for relay replacement. |
| 4. Test Neutral Armature Pick-Up | • Open circuit for 1 second and apply current to coils<br>• Increase current gradually until front contacts of neutral armature are just closed.<br>→ Check pick-up value is under manufacturer maximum<br>**If pick-up value exceeds maximum:** Relay must be removed from service. Apply necessary protection and arrange for relay replacement. |
| 5. Test Neutral Armature Normal Working | • Increase current gradually until the neutral armature is against the stop.<br>→ Check normal working value is under manufacturer maximum<br>**If normal working value exceeds maximum:** Relay must be removed from service. Apply necessary protection and arrange for relay replacement. |
| 6. Test Reverse Polar Pick-Up | • Increase current to its initial value then decrease current to zero.<br>• Open circuit for 1 second and apply current in reverse direction.<br>• Increase current gradually until the polar armature moves to reverse.<br>→ Check reverse polar armature moves to against its stop.<br>**If armature not against stop:** Relay must be removed from service. Apply necessary protection and arrange for relay replacement. |
| 7. Test Neutral Armature Reverse Working | • Increase current gradually until the neutral armature is against the stop.<br>→ Check reverse working value is under manufacturer maximum<br>**If reverse working value exceeds maximum:** Relay must be removed from service. Apply necessary protection and arrange for relay replacement. |

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| Step | Procedures |
|---|---|
| 8. Test Normal Polar Pick-up | • Increase current to its initial value then decrease current to zero.<br>• Open circuit for 1 second and apply current in normal direction.<br>• Increase current gradually until the polar armature moves to normal.<br>→ Check normal polar armature moves to against its stop.<br>**If armature not against stop:** Relay must be removed from service. Apply necessary protection and arrange for relay replacement. |
| 9. Verify Armature Operation | • Polar armatures must remain in last energized state when current removed. |
| 10. Update Log Book | • Add any notes of issues observed, or adjustments made. |
| 11. Complete Test Form | • Record the test as completed on SSIT test form. |