

TEST NO.6.0
FRA RULE: 234.263 and 236.106
RELAYS – A.C./D.C.

TEST						INSPECTION	
BY	INTERVAL	FORM				BY	INTERVAL
		FORM #	DISTRIBUTION		RETAIN		
			ORIGINAL	COPIES			
Designated Employee	4 YEARS / 2 YEARS*	electronic	Manager Signals	MAINTAINER	4 Years	Designated Employee	4 YEARS / 2 YEARS*

*Applies to D.C. polar and relays with soft iron magnetic structure.

Purpose

Test is to ensure that operating characteristics of relays shall be maintained within the limits such relays are designed to operate.

Procedure – General

- 1.0 When making test of relays, approved instruments must be used and it must be known that no unsafe conditions are set up by the application of the test instrument.
- 2.0 New relays and shop repaired relays when placed in service must comply with shop required operating characteristics specified in Table 1 except in an emergency relay placed in service meeting field required operating characteristics of Table 2 may be used. Relays retained in service must be in compliance with field values of Table 2. New in service relays or shop repaired relays can be placed into service without reconfirming shop service testing specifications; however, a complete operational check must be performed. The relays shall be entered in the RMIS System by the designated employee. It is the Designated Manager Signals responsibility to ensure this has been done.

- 3.0 Relays failing to pass inspection or whose operating characteristics do not meet requirements must be adjusted, repaired or replaced without undue delay.
- 4.0 All wires, jumpers, resistors, capacitors or other accessories must be removed from the positive control terminal before making pickup and drop-away test. This will ensure that when the test instrument is operated, the test current will flow through relay in same direction as normal service current.
- 5.0 Power transfer relays shall be tested with the original AC rectifier connected to the relay coils.
- 6.0 Test of relays may be made by current or voltage readings to establish drop-away, pickup and working values.
- 7.0 When taking current readings, voltmeter must be disconnected. When taking voltage readings, voltmeter must be connected directly across the coils of the relay.
- 8.0 Before testing, check that the relay to be tested is correct relay for circuit as designated on circuit plan.

Inspection

- 1.0 Determine by actual operation that relay has a positive drop-away and relay contacts open without retardation of movement due to friction or any other cause.
- 2.0 Inspect all screws, nuts and binding posts to determine that they are securely fastened and lock washers, where used, are effective.
- 3.0 Determine by observation that sufficient front, back and polar contact openings exist and that back contacts do not open due to vibration of passing trains or other causes.
- 4.0 Determine by observing operation of relay that adequate clearance exists between cover and moving parts and between all visible fixed and moving parts.
- 5.0 Determine that parts inside relay have a clean appearance and are free from rust and corrosion. See that there is no foreign matter inside the relay, particularly on the armature or pole pieces.
- 6.0 Contacts and ribbons must be visually inspected for charring, pitting, alignment and operation in all contact positions.

- 7.0 As charge is reduced in the process of obtaining drop-away value, closely observe the action of the neutral armature as it leaves the stop pin. It will usually move slowly at this point. A sudden movement of the armature as it leaves the stop pin may indicate that a sticky substance is on the stop pin surface, in which case the relay must be replaced with a new or repaired relay.
- 8.0 With the relay de-energized, rock the relay from side to side to determine that the armature slides freely on its trunnion within the limits of its end play.
- 9.0 Resistors placed across relay coils shall be observed for proper condition.

Test - Neutral Relays

- 1.0 Drop-away, pickup and working values of neutral relays must be determined in the normal direction of energization (energy applied with polarity as marked on the relay coil terminals), as follows:
 - 1.1 An initial charge of at least the service working current or voltage must be applied to the coils and then gradually reduced until the armature drops away. This value is termed "drop-away."
 - 1.2 The circuit must then be opened for one second and current or voltage again applied to the coils in the same direction and gradually increased until the front contact just closes. This value is termed "pickup."
 - 1.3 The current or voltage must then be gradually increased until the armature is against the stop. This value is termed "working."
 - 1.4 Resistors placed across relay coils shall be tested for proper value at the time the relay is tested. The relay also should be observed to ensure that the resistor properly snubs the relay drop-away.

Test - Polarized Relays

- 2.0 Drop-away, pickup and working values of polarized relays must be determined as follows:
 - 2.1 An initial charge of at least the service working current or voltage must be applied to the coils in normal direction and gradually reduced until the neutral armature drops away. This value is termed "neutral armature drop-away."
 - 2.2 The circuit must then be opened for one second and charge again applied to the coils in the same direction and gradually increased until the front contacts of neutral armature just close. This value is termed "neutral armature pickup."

- 2.3 The charge must then be gradually increased until the neutral armature moves against the stop. This value is termed “neutral armature normal working.”
- 2.4 The charge must then be increased to at least the service working current or voltage and then decreased to zero. Circuit must then be opened for one second and charge applied in reverse direction, gradually increasing from zero until the polar armature reverses. At this value the polar armature must go against its stop. This value is termed “reverse polar pickup and working.”
- 2.5 Increase the charge gradually until the neutral armature is against the stop. This value is termed “neutral armature reverse working.”
- 2.6 The charge must then be increased to at least the service working current or voltage and then decreased to zero. Circuit must then be opened for one second and charge applied in normal direction, gradually increasing from zero until the polar armature goes against its stop. This value is termed “normal polar pickup and working.”
- 2.7 After obtaining normal polar pickup and working values, continue to increase the energy in the same direction until neutral armature is against its stop. The value must not exceed that specified for neutral armature reverse working.
- 2.8 Polar armatures must remain in the last energized position without current in either direction in the coils.

Test - D.C. Biased Neutral Relay

- 3.0 With normal energy applied to the relay [positive energy to the coil marked (+) and negative energy to the coil marked (-)] the D.C. relay will pick-up. With reverse energy applied to the relay [negative energy to the coil marked (+) and positive energy to the coil marked (-)] the D.C. relay will NOT pick-up.
 - 3.1 Code-generating relay must be tested for proper on-time value.

Test – A.C. Power Transfer Relay

- 4.0 All AC power transfer (power-off) relays shall be tested using AC voltages.
 - 4.1 It is necessary to test the power transfer relay with the existing AC rectifier connected to the relay coils.
 - 4.2 The power transfer relay shall be tested as a neutral relay.

- 4.3 The minimal field drop-away tolerance is 63%,
- 4.4 The relay may be tested with the contacts connected in the circuit.

Caution: Do not operate crossing lights and/or open the lighting circuit 'Load' test terminal when testing power transfer relays. This will avoid pitting the relay contacts due to arcing when contacts open and close.

Contact Resistance (Not Required)

Note: After initial inspection the following values may be used for further evaluation .

- 1.0 The contact resistance must not exceed the following values, per contact:
 - 1.1 For **front** contacts, when relay is energized at working current or voltage.
 - 1.1.1 Metal to Metal, 0.03 ohm.
 - 1.1.2 Metal to Carbon, 0.18 ohm.
 - 1.1.3 Metal to Impregnated Carbon, 0.09 ohm.
 - 1.1.4 Carbon to Carbon, 0.40 ohm.
 - 1.1.5 Metal Impregnated Carbon to Metal Impregnated Carbon, 0.20 ohm.
 - 1.2 For **back** contacts, when relay is de-energized:
 - 1.2.1 Metal to Metal, 0.03 ohm.
 - 1.2.2 Metal to Carbon, 0.36 ohm.
 - 1.2.3 Metal to Metal Impregnated Carbon, 0.18 ohm.
 - 1.2.4 Carbon to Carbon, 0.80 ohm.
 - 1.2.5 Metal Impregnated Carbon to Metal Impregnated Carbon, 0.40 ohm.

**TABLE 1
OPERATING CHARACTERISTICS
OF TRACTIVE ARMATURE
DIRECT CURRENT RELAYS**

**TABLE 2
OPERATING CHARACTERISTICS
OF TRACTIVE ARMATURE
DIRECT CURRENT RELAYS**

(***INSERT TABLES HERE***)

