

Government of India
Ministry of Railways
Research, Designs & Standards Organisation
Manak Nagar, Lucknow - 226 011

No.EL/3.2.10/GEN.

Dt 24.12.1995

MODIFICATION SHEET NO. RDSO/WAG-5/19, (New No. MS 232)

RELIABILITY IMPROVEMENTS ON RELAYS

1. OBJECT

1.1 Reliability study of various relays used in electric locomotives indicates certain manufacturing deficiencies which all though do not appear in the prototype testing yet effect overall efficiency of the equipment as well as locomotives by way of premature failures.

1.2 In order to ensure use of proper quality of material and to obtain improved performance of these equipment the following quality checks and improvements measures are required to be ensured by incorporating it in the procuring specification.

2. WORK TO BE CARRIED OUT

As per details given in Annexure 1.

3. APPLICATION TO CLASS OF LOCOMOTIVES

- All electric locomotives fitted with ABB vadodara make PC-8 relays and BCH make pneumatic timer relays.
- Apart from these makes, all improvements and quality checks shall be applicable on resistance and solenoids of all suppliers.

4. MATERIAL REQUIRED

NIL.

5. MATERIAL RENDERED SURPLUS

NIL

6. AGENCY OF IMPLEMENTATION

Quality checks and improvement measures as per annexure 1 to be implemented by CLW specially for ABB and BCH relays. The recommendations on resistors and Solenoids shall be applicable on all suppliers.

7. DISTRIBUTION

- (i) GM/Electrical CLW/Chittaranjan
- (ii) CEEs of Electrified Railways for informing workshops.

A handwritten signature in red ink, appearing to read 'R.N.LAL', with a horizontal line drawn underneath it.

(R.N.LAL)

Encl; As above

for Director General(Elect.)

ENCLOSUR TO MS NO. WAG5/19

RELIABILITY IMPROVEMENTS ON RELAYS

1. ABB RELAYS

- 1.1** Cases of economy resistance open circuit and manufacturing defects such as bad soldering, irregular surface, cracks on the procelin tube etc. have been observed in some of the sheds. It is possible that a few batches of supplies might have gone in service with poor quality materials, It is necessary to examine and approve the QAP adopted by M/s. ABB to improve the reliability of economy resistors.
- 1.2** It is suggested that the recommendations made in RDSO,s reliability insurance specification No. E-16/1 (Rev.A) be also followed for all dropping resistors. It is suggested to include environmental test in type test, and to adopt adequate derating factors for service rating, screening of supplies at rated power.
- 1.3** The rating of economy resistor selected from the relevant standard should be at least three times the normal calculated power dissipation in the resistor.
- 1.4** Where the economy resistor is mounted inside the relay case, the temperature rise of the air inside the relay case should not be higher than 30 deg.C after 24 hrs. of continous energisation of the relay at 125 V with economy resistor in circuit.
- 1.5** The resistor should be dipped in a 1% solution of ammonium chloride for one hour and allowed to drain in air for 22 hrs. This should be repeated seven times. At the end of this exposure the resistor should be washed and dried. The resistor should then be tested at rated current and power for 24 hrs. There must be no failure.
- 1.6** Soldered connections of economy resistors should be checked visually to see that:
 - 1.6.1** The wire is twisted around the terminal strip and secured fully before soldering.
 - 1.6.2** The soldered joint shows proper pre-tinning and wetting of the surface.
- 1.7** The economy resistors should be screened by operating them for 168 hrs. at rated power dissipation. The resistance at ambient temp. should be measured before and after heat run test. Resistors, which show an increase in resistance by more than 2% should not be used.

- 1.8** Some of the PC8 ABB make relays have been supplied with out circlip in the mounting screws. The screws get lost during fitment and removal of relays. It should be ensured that each and every relay is supplied with the clips at the back of mounting screws and cover fitting screws so that the screws remain in place during transportation, removal and fitment.
- 1.9** Burn-in test and surge comparison test shall also be carried out by M/s ABB as routine test on all solenoids being supplied to IR for locomotive applications.

2. CUTLER HAMMER RELAYS

- Burn -in test and surge comparison test as being carried out in the solinoids of EE make relays should also be introduced by M/s. Cutler Hammer for the solenoids. This should be incorporated as routine test in the QTD 105, 106 and Q48 relays procurement specifications.
- 2.2** M/s. Cutler Hammer uses high remanance steel for core, support plate and armature sub-assembly. The firm should be advised to control the remanance to the lowest possible value by tightening the stage inspection of incoming materials.
- 2.3** It is observed that nylon stem in the timer unit wears out frequently due to constant impact and vibrations. The firm may please be asked to use nylon stem of higher mechanical strength so that upto POH there is no need of changing or built up of nylon stem.
- 2.2** As the micro switches are totally sealed type and do not permit any maintenance, the workability of micro switches can only be ascertained through milli volt drop test. M/s. Cutler Hammer should furnish the max. permissible milli volt drop in their micro switches. This value should be advised to all user railways by CLW so that the micro switches could be repaired in time before any failure takes place.
- 2.5** It is observed that coil mounting `U` shaped bracket cracks from corners. The reason is very sharp bends which are prone to fatigue fractures from micro cracks produced during cold bending. It is necessary to ensure that the radius of bends is not less than three times the thickness of the plate. This may need a minor modification in the design of the solenoid for proper assembly inside the bracket. M/s. BCH should be advised to review the drawings and manufacture the bracket accurately as recommended above.

- 2.6** Foundation studs used for mounting of these heavy relays are found broken very often. Considering the weight of relay and vibrations on locomotive, it is desirable to use mounting studs of diameter 50% above the existing stud diameter with a ultimate tensile strength of at least 80 kg/mm sq. this may be advised to M/s.BCH for implementation.
- 2.7** Cut in dates for all the improvements should be obtained by CLW and furnished to RDSO for record and performance feed back from user railways.