

14 REPERFORATOR-TRANSMITTER  
MAINTENANCE INSPECTIONS AND TESTS

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1. GENERAL

1.01 This section specifies the procedure for carrying out the maintenance of 14 reperforator-transmitters at a switching center where there are complete facilities for routing and testing available. In those installations in which the test bench facilities are not available, it is recommended that these procedures be followed so far as is practicable and that test methods be provided to adequately test the operation of the unit after routing.

1.02 The apparatus requirements and adjusting procedures for any particular item which may require adjusting either on a routine inspection or a trouble visit will be found in the section covering requirements and adjustments.

1.03 The lubrication procedures for the 14 reperforator-transmitter are covered in the section on lubrication. The lubricants referred to in that section are those specified in the section covering the general lubrication requirements.

1.04 The materials for carrying out the cleaning and routines are specified in the section covering the general cleaning procedures and the teletypewriter tools and maintenance supplies with the following exceptions:

(a) For cleaning of contacts, the use of a 374A tool and KS-6528 linen tape may be found to be desirable.

(b) For general cleaning, an air blast is specified in the following. If a source of compressed air, or if a small compressor is not available for this purpose, relatively good results have been obtained using the exhaust port of a vacuum cleaner such as the Morrill and Morrill with the end of the outlet tube reduced to give an orifice approximately 1/16 inch to 1/8 inch in diameter.

1.05 Studies consistently show that a high percentage of troubles occur shortly after a routine inspection. Some appear to be due to the methods of carrying out the maintenance work. These instructions have been prepared to avoid such troubles and it is important that they be carefully followed.

1.06 The frequency of routine inspections can best be determined locally. Factors to be considered include daily service hours, speed of service, and other local conditions. In general, the inspection interval should be the maximum consistent with adequate lubrication.

1.07 The periodic cleaning, lubrication, and inspection should be carried out in the order shown. The work should be confined to the items specified except for the correction of any conditions obviously requiring attention. Items which it is felt do not require special attention at each routine are not specified in this section. Also, local experience may indicate the desirability of other changes in the list of items to be checked.

2. ROUTINE MAINTENANCE PROCEDURES

2.01 Do all work safely. Do not scatter tools or equipment so as to constitute a hazard. Give special attention to avoiding damage to the customer's property.

A. Preparation for Routine

2.02 Obtain release of equipment as follows:

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(1) Where spare units are not provided, obtain the local customer's permission to routine the apparatus, and wait until any accumulated tape has cleared before removing the unit from service. Advise the testroom that a routine inspection is being made and indicate the length of time the customer will be out of service. If unexpected delay is later encountered, advise the testroom.

(2) Where spare units are provided, wait until any accumulated tape has cleared before removing the unit from service.

2.03 While waiting, observe operation for any abnormal conditions which should be investigated during the routine. Check the tape produced by the unit for clean punching and for cutting or bruising of the tape by the type, etc.

2.04 Upon release of unit proceed as follows:

- (1) Disconnect the source of power.
- (2) Remove the unit from the machine cabinet, exercising care to avoid damaging parts in close proximity to cabinet surfaces.
- (3) Wipe out the cabinet surface to remove oil and dirt.
- (4) Remove unit to the work location.

B. Routine

2.05 To permit a minimum of handling or shifting of the unit during routine, it is recommended that the cleaning and lubrication be performed on a mechanism-by-mechanism basis rather than first cleaning the entire unit, then relubricating the entire unit.

2.06 During the inspection, observe the condition of the machine but avoid unnecessary dismantling or disturbance of adjustments. In so far as possible, operating tests should be used to determine the condition of the machine.

**CAUTION: WHEN IT IS NECESSARY TO MAKE ANY ADJUSTMENT, ALL ADJUSTMENTS THAT MIGHT BE AFFECTED SHOULD BE CHECKED AND, IF NECESSARY, CORRECTED IN ORDER TO MINIMIZE THE POSSIBILITY OF SUBSEQUENT TROUBLE.**

(1) Bent, loose or missing parts, binds in parts, elongated springs, and parts out of place or obviously out of adjustment should

be investigated and corrective action taken, if required. Check all terminal boards and terminal wires of cables for loose connections or broken wires.

(2) Worn parts which experience indicates may cause trouble before the next scheduled inspection should be replaced. Red or rust-colored deposits indicate wear due to lack of lubrication. If on investigation it appears that the parts are not worn sufficiently to require replacement, special care should be taken in lubricating to see that the lubricant reaches the bearing surfaces.

2.07 The procedure suggested for cleaning of contacts throughout the unit is as follows:

- (1) Place a piece of lintless cloth such as KS-2423 twill cloth or KS-6528 linen tape over a burnisher such as a 374A tool.
- (2) Moisten the cloth with KS-19578, L1 trichloroethane and pass the cloth back and forth between the contacts.
- (3) Repeat the operation using a dry cloth.
- (4) Burnish the contacts.

2.08 Cleaning of items other than those listed should not be done unless it appears that dirt which may be present is likely to cause trouble by working into bearing surfaces or being deposited on contacts before the next scheduled inspection. Before the start of the detailed cleaning outlined below, the chad box should be removed and emptied, loose deposits of dirt or tape lint should be carefully brushed off the mechanism, and as much of the remainder of the tape lint and dirt as possible removed by means of compressed air. In applying the compressed air, a nozzle having an orifice of approximately 1/16 inch in diameter should be used, and the air blast should be applied to dislodge the lint and the dirt from mechanisms rather than to blow the lint and the dirt into bearings.

2.09 In the following list, detailed information on lubrication is not given. The detailed information on items requiring lubrication and lubrication required on an initial lubrication is given in the section covering the lubrication of the 14 reperforator-transmitter. For oiling, use KS-7470 oil except where KS-6232 oil is specified.

**CAUTION:** IN THE FOLLOWING WHERE LUBRICATION IS SPECIFIED, OIL OR GREASE SHOULD BE APPLIED ONLY IF THE PART IN QUESTION DOES NOT HAVE SUFFICIENT LUBRICANT TO CARRY OVER TO THE NEXT REGULAR INSPECTION PERIOD. WHERE LUBRICATION IS REQUIRED, LUBRICANTS SHOULD BE APPLIED SPARINGLY UNLESS OTHERWISE SPECIFIED. EXCESS LUBRICANT MAY AFFECT OPERATION OF CONTACTS OR OTHER PARTS NOT REQUIRING LUBRICATION, THEREBY INTRODUCING TROUBLE.

## 2.10 Cleaning and Lubrication:

- (1) Remove the ribbon.
- (2) Clean type pallets.
- (3) Remove code punch block.
- (4) Remove stripper springs, if necessary, to adjust tension or if desired to facilitate cleaning.
- (5) Remove lint from punch block using compressed air.
- (6) Rinse punch block in clean petroleum spirits and blow out with compressed air.
- (7) Remove any remaining particles of lint from punch block by use of a toothpick or similar instrument.

**CAUTION:** THE TWO TOP SCREWS THAT HOLD THE SPRING ARM BRACKET AND DIE PLATE TO THE CODE-PUNCH-BLOCK ASSEMBLY SHOULD NOT BE LOOSENED. TO FACILITATE CLEANING, THE CODE-PUNCH-BLOCK SUPPORT MAY BE REMOVED BY REMOVING THE FOUR SCREWS WHICH MOUNT THE SUPPORT TO THE CODE-PUNCH-BLOCK. IF THE PUNCH PINS ARE REMOVED, THEY SHOULD BE REPLACED IN THEIR ORIGINAL LOCATIONS.

- (8) Clean stripper pins.
- (9) Reinstall stripper springs, if removed, after insuring that all springs meet specified requirements.
- (10) Lubricate the punch block sparingly at following points using KS-6232 oil; feed-roll bearings, stripper pins, and slots in lower ends of punch pins.
- (11) Check tension of stripper springs.

Note: It shall require minimum 4-1/2 ounces to start the punch stripper pins

moving. This tension shall be checked by hooking an 8-ounce scale under the shoulder on the stripper pins and pulling in a horizontal direction to start the pins moving by compressing the springs.

- (12) Remove code-punch-block tape-guide and platen support, if necessary, to facilitate cleaning.
  - (13) Wipe out tape passage in guide.
  - (14) Check condition of platen. Replace if necessary.
  - (15) Clean prepunch mechanism.
  - (16) Clean prepunch tape guide and tape passage in prepunch block using standard cleaning tool followed by blast of compressed air if necessary.
- Note: Air should be applied at the end of the punch block adjacent to the feed roll.
- (17) Clean the type-bar-segment comb, shift linkages and mechanism at the front of the unit.
  - (18) Lubricate prepunch mechanism.
  - (19) Lubricate all bearing points of typing mechanisms and shift linkage.
  - (20) Check adjustment of pullbar guard.
  - (21) Check condition of typebar backstop.
  - (22) Check clearance between pullbars and codebars with main bail in lowermost position.
  - (23) Clean selector fingers and associated linkages including the vertical link mechanism.
  - (24) Lubricate ends of selector fingers which engage punchpins and all bearing points.
  - (25) Reinstall punch block and tape guide. Lubricate detent star wheel and other parts requiring addition of lubricants.
  - (26) Check punch selector finger-code punch pin alignment.
  - (27) Remove sensing contact guard.
  - (28) Clean transmitter yoke and lid, and transmitter mechanism and linkages between sensing pins and sensing contacts.

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- (29) Clean sensing contacts where necessary. Check that springs are not easily shifted sideways.
- (30) Check sensing-contact spring pileup for contact alignment and make-and-follow adjustments.
- (31) On 14G units, check continuity of sensing contacts for FIGS, LTRS, H, CAR RET, and LINE FEED combinations. On 14F units, check continuity of sensing contacts for FIGS, LTRS, H, Blank, and Z combinations. These combinations may be checked by using the test-bench facilities and setting up the combinations manually.
- (32) Lubricate transmitter mechanism and linkages between sensing pins and sensing contacts.
- (33) Reinstall sensing-contact guard.
- (34) Remove the guard for the sensing magnet. Clean the magnet armature and core. Check connections to magnet coils. Lubricate the mechanism and fill the oil-cup for the rear bearing. Replace guard.
- (35) Clean external surfaces of motor and portions of base at the rear of the unit.
- (36) Shift motor assembly to rear, and clean mechanisms at rear of type basket.
- (37) Lubricate mechanisms at rear of unit.
- (38) Lubricate main-shaft cam and cam rollers, operating lever and operating-lever shaft.
- (39) Fill oil-cup on operating-lever shaft and saturate the felt washers associated with main-bail spring.
- (40) Reposition motor.
- (41) Remove the range finder.
- (42) Clean the range-finder mechanism and check the adjustments of the mechanism (stoppawl, trip-latch spring, and stoppawl lever spring adjustments).
- (43) Lubricate the range-finder mechanism. Use KS-6232 oil.
- (44) Remove the TP102375 clutch-release lever.
- (45) Clean the selector mounting-plate.
- (46) Clean the selector-magnet core and armature assembly using KS bond paper or lintless cloth.
- (47) Lubricate the armature lever and the selector-arm pivot-screws, applying KS-6232 oil sparingly.
- (48) Remove the selector cam-sleeve assembly.
- (49) Replace friction washers, if necessary.
- (50) Lubricate washers: saturate washers with oil and remove excess by pressing washers between two pieces of cloth.
- (51) Fill main-shaft cavity with oil.
- (52) Reinstall selector cam-sleeve assembly.
- (53) Check alignment of selector levers and selector cam-sleeve peaks.
- (54) Check magnet-armature pivot-screw for wear, selector-magnet-bracket position, selector-arm operating-screw clearance, and locking-lever clearance.
- (55) Reinstall clutch-release lever and range finder.
- (56) Check trip-off screw adjustment.
- (57) Check engagement of range-finder stop-lever and selector-cam stoparm.
- (58) Check adjustment of main-clutch throw-out lever.
- (59) Lubricate selector mechanism.
- (60) Lubricate main clutch and throwout lever.
- (61) Lubricate main-cam friction washer.
- (62) If unit is equipped with pullbar-operated contacts, clean contacts, check adjustments and clean and apply film of grease to camming portion of bakelite blocks.
- (63) Connect unit to test bench facilities.
- (64) Remove baseplate and wipe off. Tighten base-plate mounting-screws to avoid scratching bench surface.

- (65) Clean the cavity of the base, and wipe out the tape chute between the code punch block and the transmitter mechanism.
- (66) Check sensing-contact pileup screws for tightness. If screws require tightening, recheck adjustments of sensing contacts after tightening.
- (67) Remove one screw holding distributor contact-adjusting-screw bridge to mounting structure. Loosen second screw and shift bridge structure out of position to provide access to contacts.
- (68) Clean distributor contacts.
- (69) Clean distributor contact-adjusting-screw bridge and put back in place.
- (70) Clean distributor cam surfaces and distributor contact-operating levers.
- (71) Apply grease sparingly to cam surfaces to distributor cam and sensing cam.
- Note: If felt lubricators are employed, apply oil sparingly to lubricators.
- (72) Lubricate sparingly all bearing points of operating levers associated with cams.
- (73) Clean distributor-magnet pole faces. Check connections to magnet coils.
- (74) Lubricate armature pivot points.
- (75) Clean auxiliary contacts, tape-out contacts, transmitter stop contacts, and universal contacts. Check the pileup screws of the auxiliary contacts, tape-out contacts, and universal contacts for tightness. Clean the contacts.
- (76) Fill distributor-shaft rear bearing oil-cup.
- (77) Apply 2 to 6 drops of oil in the sensing- and distributor-shaft cavities.
- (78) Apply oil sparingly to sensing- and distributor-shaft clutches, and to detent mechanisms associated with cams.
- (79) Check that inside surface of prepunch chad tube is clean. If necessary chad tube may be removed for cleaning.
- (80) Lubricate all bearing points and gears in cavity of base.

### C. Check Tests

2.11 After completion of routine, make the following check tests, using the facilities of the test bench. The requirements to be met are included for convenience of reference. In case of any question with respect to requirements, the Bell System Practice covering requirements and adjustments should be referred to:

- (1) Check and adjust the distributor contacts if necessary. Using a 1A teletypewriter test set associated with the test bench, the signal trace on the stroboscope for any individual element should be within 3 per cent of the length of a perfect signal, as indicated by the reference scale. There should be no breaks in the signal trace for any individual element, but with the LTRS signal being transmitted, breaks between adjacent elements are permissible.
  - (2) Check spacing of tape feed holes.
  - (3) Check alignment of feedholes with respect to code-punch holes. The center lines of the feedholes and the code-punch holes should coincide. Also, the center line of the code-punch holes should be at right angles to the edge of the tape.
  - (4) Check alignment of the transmitter tape-guide plate and code-punch block. The right edge of the transmitter tape-guide plate should be parallel to the left edge of the code-punch block, and the tape slot of the code-punch block shall be in line with the tape passage of the tape-guide plate.
  - (5) Check adjustment of transmitter tape-guide plate with respect to the code-punch holes. The transmitter pins should be located approximately centrally with the code-punch holes with the transmitter assembly at the center, extreme right, or extreme left of its travel.
- Note: Install ribbon.
- (6) Check depth of punching. The code-punch holes should be cleanly punched with a minimum of tear of the chad lids.
  - (7) Check selector clutch and main-bail cam-clutch torques.
  - (8) Check distortion tolerance. The unit should tolerate 40 per cent marking and

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spacing bias at a single setting of the range-finder arm; at the optimum setting for bias it should tolerate 35 per cent marking and spacing end-distortion or 35 per cent switched bias.

Note: Incoming line or incoming trunk re-perforator-transmitters should be tested using a spare incoming line circuit patched to the test bench, and with neutral or polar signals as required, transmitted through this circuit to the re-perforator-transmitter under test.

(9) Check operation of all special contacts and other features. The lamps associated with the test set should be lighted when characters corresponding to them are sent. In the case of pullbar operated contacts, the lamps should be lighted when the associated characters are received. Also, the universal-contact closure should be bridged by the pullbar contact closure. This may be checked with a 1A Teletypewriter Test Set.

(10) Connect the distributor circuit to a teletypewriter having all switching-control-contact combinations. Arrange to send message and switching signals to the unit; then with the transmitter assembly adjacent to the code-punch block, the copy and the operation

of the several control contacts should be observed to be without error for a test period of at least ten minutes.

(11) Reinstall base plate and chad box.

Note: There should be clearance between the base plate and the distributor-contact mounting-bracket. If the clearance is less than 1/64 inch, the mechanism should be adjusted upward to provide clearance or a depression should be embossed in the base plate adjacent to the contact mounting-bracket. After installation of base plate, recheck signals if any adjustment has been made.

2.12 Clean selector-magnet pole faces.

2.13 If a line circuit to a test room is available, a final check of the contact adjustments may be made with a 118-type transmission measuring set at test room. When checked over a line or loop to a test room, the total bias or distortion measured shall not exceed that specified for the 14-type transmitter-distributors given in the section covering teletypewriter station orientation and distortion tests.

2.14 Remove excessive lubricants and return unit to service.