

CENTRAL OFFICE MAINTENANCE ADMINISTRATION
 IN COMMUNITY DIAL OFFICES

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relatively small amount of equipment and apparatus in a small dial office does not justify the more detailed system of records employed in larger offices for trouble analysis.

1.04 It is not felt that trouble results alone will produce adequate data in small offices to permit reliable equipment analysis. Neither is there any assurance that apparatus will not fail in service shortly after it has performed satisfactorily during routine testing. However, experience has proven where limited analysis data is available that visual inspections at periodic intervals, supplemented by limited routine performances, is the surest and most expedient method of recognizing equipment deterioration trends and adverse dirt conditions.

1.05 Since the detection of equipment failures during unattended periods is dependent almost solely upon alarms, it is imperative that the alarm circuits function properly. It is recommended that the following alarm tests be made on each visit to unattended offices or a frequency of once every two weeks.

Note: Predicated on the concepts of Qualitative Maintenance other alarm insurance tests may be assigned by the supervisor in charge if deemed necessary.

1. GENERAL

1.01 This section describes the methods to be applied in the administration of maintenance in community dial offices and establishes a standard for judging central office equipment conditions in these offices. This practice should be followed in all small dial offices. (3,000 stations or less).

1.02 This practice should be used instead of Sections 226-013-000 and 226-014-000 which also outline a maintenance plan for community dial offices.

1.03 The basic objectives of central office equipment maintenance in small dial offices are the same as apply to the larger offices. However, the

- (a) Line Finder Call Block Alarm - B.S.P. 225-340-500 Test (C).
- (b) Switch Frame Fuse Alarm - B.S.P. 225-340-500 Test (E).

(c) Verification of Alarm Transfer to Operator Office - B.S.P. 225-340-500 Test (H).

(d) Ringing machine transfer and high and low voltage alarms should be tested at least once every three months. These tests are covered by appropriate Bell System Practices.

1.06 This practice, along with the practices referred to herein, constitute the central office maintenance administration plan that should be used in all small dial offices. (3,000 stations or less).

2. CENTRAL OFFICE TROUBLE TICKET

2.01 Since the volume of trouble reports in these offices are relatively small, Form S-6219 (Repairman's Trouble Ticket) may be used as the central office trouble ticket. Form S-6219 is described in Section 469-060-921 SW. If the equipment or circuits involved are not repaired immediately and it is necessary to remove them from service, Form S-6124 (out of service ticket) should be prepared along with the trouble ticket. Form S-6124 is described in 201-101-902 SW.

2.02 There is no real need for a continuing stroke record of trouble reports received in these small offices. However, this in no way implies that you should not analyze trouble reports but that a review of the trouble tickets should be sufficient to pinpoint trouble spots.

3. SCHEDULING AND ASSIGNMENT OF ROUTINES

3.01 The object of this plan is to eliminate routine effort that is non-productive or routines that detect marginal non-service affecting troubles. A specific routine test is classified as "Insurance", "Productive" or "As Required" in accordance

with its service protection and trouble detecting quality (See B.S.P. 201-106-001 for details). Routine effort should be limited to "Insurance" and "Productive" unless equipment inspections or service reactions indicate a definite need for the performance of a specific "As Required" routine.

Note: E Series Routines for toll terminal equipment shall be made at the frequency specified in the Bell System Practices.

3.02 The scheduling and assignment of routine effort in these offices shall be the responsibility of the supervisor directly in charge of the maintenance of the office. Routines for a particular office should be recorded on Form E-858, Routine Schedule and Progress Chart. This form should be kept in the office from which the maintenance effort is directed. Form E-858 is described in Bell System Practices Section 201-106-001

3.03 A record of all routine effort performed in the unattended office should be recorded on Form E-2760, or E-2761 Assignment Data and Test Record. It is imperative that routine effort be accurately recorded on this record in order that an analysis of the productivity of the routine may be made by the supervisor in charge. This record may be kept either at the unattended office or at the office from which the maintenance activity is directed, as specified by the supervisor in charge. Form E-2760 and E-2761 are described in Bell System Practice 201-106-001.

3.04 A review of routine effort from the Assignment Data and Test Record shall be made by the supervisor in charge at a frequency of not less than once a year to determine if routine effort should be cur-

tailed or extended. The history of past routine performances, visual inspection data and subscriber reports should be integrated for analysis purposes before scheduling routine effort.

3.05 One of the most important parts of maintaining a dial office is to schedule and carry out at regular intervals visual inspections of the equipment. You must find out the physical condition of the equipment before effective corrective action can be taken.

4. JUDGING CENTRAL OFFICE EQUIPMENT CONDITIONS

4.01 Central office equipment and apparatus is designed and manufactured to meet high standards of quality, however, due to inherent characteristics, progressive deterioration will always be present. This deterioration will be greatly accelerated through poor housekeeping, adverse environmental conditions, improperly trained personnel and the failure to restore margins within the equipment.

4.02 The condition of equipment is usually based on the analytic evaluation of various data, such as reports, alarms, routines and inspections integrated into an overall picture of the office. However, due to the limited number of reports and other equipment data available in small offices, these methods have been inadequate in that they frequently fail to detect an adverse trend until the equipment has deteriorated to a service affecting condition. Experience has proven that limited quantities of equipment can be adequately and economically maintained through periodic inspection of certain integral parts known to be subject to excessive wear or abnormal dirt conditions. Parts 4, 5, 6, 7, and 8 of this practice suggest practical means of judging visually the degree of dirt and

wear present in these equipment parts.

5. BANKS

5.01 The condition of banks has a direct and material affect on the quality of service in the office. Dirty banks are likely to cause contact noise and excessive wiper and bank terminal wear. Poorly maintained banks may also cause double connections, wrong numbers, no ringing signal (incomplete connections) and failure of switches to release properly.

5.02 The cleanliness of banks can be readily checked by using a small magnifying glass and a portable lamp or flash light. The accumulation of dirt or lint on wiper tips as shown in Fig. 1 is an indicator that the bank requires cleaning. Fig. 2, by contrast, shows wipers free of lint and dirt indicating that the banks are clean.

5.03 Banks do not have to be exceptionally dirty to cause rapid wiper wear since some kinds of fine gritty dust require only small deposits to bring about this condition. Any evidence of appreciable wear of the bank terminals is serious and calls for immediate corrective action since this wear, if unchecked, may require complete replacement of the banks. Fig. 3 shows an enlarged picture of a dirty bank in which an accumulation of dirt and lint particles on the bank terminals and other parts of the bank is readily visible. Fig. 4 shows, by contrast, a relatively clean bank.

6. WIPERS

6.01 Worn or dirty wipers will cause the same service affecting conditions as poorly maintained banks described in Part 5. As the wiper wears, a greater area comes into contact with the bank terminal, decreasing the unit pressure and increasing the probability of contact noise. If the

flat area becomes great enough, it may cause the line wiper to bridge terminals and produce clicks on talking connections as it passes over the terminals.

6.02 Fig. 5 shows the various stages of wiper wear. The wiper wear is categorized by stages A, B, C and D. An A stage wiper is a new wiper or one only slightly worn. A category B wiper will show more wear but is still satisfactory for service. It is not economical to replace wipers in category B as they still have considerable service life. The C stage wiper will have its tip worn to a feather edge and should be scheduled for replacement. The D stage wiper is badly worn and will have its tip partially worn away. Category D wipers are a service hazard and should be replaced immediately.

6.03 It is generally agreed that wipers should be changed before they reach stage D, in which the wiper is worn through at the end and a V notch appears. The condition of the wipers can be readily checked with a small dental mirror inserted between the wiper tips as shown in Fig. 6. The switch should be made busy by placing a 375A make busy tool in the make busy jacks before this type of inspection is made. Since most of the wear occurs on the upper wiper, there is seldom need for inspecting the bottom wiper. However, if desired, the bottom wiper may be inspected by pressing it down with an orange stick.

7. CONTACT EROSION

7.01 Contact erosion or contact wear is caused from the sparking condition produced as a result of make or break operations of relay contacts carrying relatively heavy currents. This contact erosion occurs principally on the SP relays of line finder control circuits,

the A and B relays of selectors and connectors, and on the Vertical-Off-Normal Spring Assemblies of line finders, selectors, and connectors.

7.02 Erosion necessitates readjustment of the contact springs to preserve proper contact follow and contact separation and in its more severe stages requires replacement of contacts or relays. Contact erosion cannot be entirely prevented by maintenance but it can be minimized by maintaining proper relay adjustments, restoring margins and by insuring that the contact protection networks are of the correct type and functioning properly. Service can be safeguarded by changing the contacts before erosion reaches a point of affecting service.

7.03 Fig. 7 illustrates contact points (dome type) in various stages of erosion. Contact erosion is categorized by stages A, B, C and D. An A stage contact is a new contact or one with no perceptible erosion. The category B contact will show slight contact erosion. The C stage contact will show more erosion but is still satisfactory for service. Relays with C category contacts should have their contact adjustment margins restored or should be scheduled for contact replacement. Relays with new spring assemblies or replaced contacts should have the contact springs gauged and the relay winding current flowed in accordance with specified circuit requirement tables to insure proper operation. The D stage contact will be eroded down to the base metal. D category contacts are unreliable and should be replaced immediately.

7.04 Build-up and pits on the contacts of relays and other apparatus may result from the action of electric current as the

contacts make and break. Sharp pointed build-up similar to those illustrated in Fig. 8 may result in the mechanical locking of the contacts in the operated or closed positions. The appearance of build-ups or pits on contacts is not necessarily an indication that the end of the useful life of the contact has been reached, but usually that the contact requires cleaning or conditioning. Bell System Practice Section 069-306-801 describes the method of cleaning and reconditioning relay contacts.

8. DISTRIBUTING FRAMES

8.01 Cross-Connection work on distributing frames is one of the important operations being continuously performed in the central office. The quality of this work and the care with which it is performed, often is the controlling factor in obtaining a satisfactory result for central office subscriber line troubles.

8.02 Two of the more important features to be considered in judging the condition of a frame are (1) the reliability of the soldered connection, and (2) the condition of the terminal block (should be free of loose solder and wire clippings.) The 069 division of the Bell System Practices discusses distributing frame cross-connections and describes methods of making soldered connections. Fig. 9 shows a neatly terminated, properly soldered, clean and well dressed terminal strip. A series of improper jumper termination is shown in Fig. 10.

8.03 Quality inspections should be made in accordance with Section V63.101 the Quality Results Plan for distributing frame work.

9. SWITCH LUBRICATION

9.01 Bearings and ratchets of step-by-step switches are lubricated in accordance with standard practices. Lubrication is applied both to reduce wear and to prevent corrosion on unfinished bearing surfaces. It is difficult to determine from a superficial inspection whether some parts of the switch are properly lubricated, however, under normal conditions if the armatures, pawls, and the shaft are free from bind and lubricant can be seen in both the vertical and rotary ratchet notches, the switch may be considered adequately lubricated. Too frequent or too liberal application of lubrication is indicated by oil spattered on the inside of the switch cover or running down on parts obviously not requiring lubrication.

10. HOUSEKEEPING

10.01 Precautionary measures including those relating to personnel activity and environmental control should be a prime consideration in preventing the introduction of dirt in equipment areas. As the exclusion of all dirt may be impractical and uneconomical, standard methods are provided for its removal from quarters and equipment.

10.02 The proper maintenance procedure for central office equipment quarters and furniture and fixtures, as covered in the H series of Bell System Practices provides a means for cleaning with minimum equipment reaction.

10.03 Surface dusting, vacuum and pressure cleaning methods, as covered in the 069 division of the Bell System Practices, should be used to effectively remove dirt from equipment.

10.04 Cleaning equipment frames by means of compressed air is a thorough and effective method. This method is sometimes necessary following Western Electric Installation projects or when the equipment becomes infested with dirt or lint to the extent that surface dusting is impractical and the continuity of service is threatened. Bell System Practice Section 069-503-801 describes the methods and procedures to be followed when cleaning equipment with compressed air. Fig. 11 shows switch covers that require cleaning while Fig. 12 shows clean switch covers. Fig. 13 is an example of dirty bank multiple wiring that can be effectively cleaned only with compressed air.

Note: As a safety precaution, a filter respirator and goggles shall be worn as a protection against dust and other foreign particles when using compressed air cleaning apparatus. Air compressor sets are heavy and as a precautionary measure to prevent back injuries, two men may be needed when lifting or moving portable units.

10.05 In general, material should not be stored, unpacked, or crated in equipment areas; tools, test equipment, instructions, prints and necessary maintenance material should be stored and maintained in a manner to prevent accumulation of dirt.

11. QUALITY INSPECTIONS

11.01 Inasmuch as below standard workmanship will cause trouble, quality verification inspections should be made in accordance with Bell System Practice V63.102, Quality Results Plan for central office forces.

12. SELECTIVE MAINTENANCE

12.01 You must have an effective selective maintenance improvement program in order to maintain a central office at a desirable service level. Bell System Practice 201-101-901 (Central Office Selective Maintenance Improvement Program) should be followed in all dial offices. The records maintained under this procedure will give you a complete story of the improvement work completed or to be completed in an office. Historical data from these records are essential in planning an effective maintenance program.

13. FORM SW-6204, EQUIPMENT INSPECTION SHEET

13.01 Good equipment maintenance in small offices requires that the inspection of equipment be made at regular intervals so as to afford the supervisor the necessary data for determining that the equipment is being maintained satisfactorily and to plan his maintenance effort. The interval, at which equipment inspections are made, shall be determined locally by the supervisor in charge of the central office maintenance based on past office performance, environmental conditions and job experience.

13.02 Form SW-6204, Equipment Inspection Sheet, is 8-3/8 in. x 10-7/8 in. It is printed on white paper and available in pads of 50 sheets. This form is intended for reporting the results of equipment inspection. Equipment items most susceptible to dirt or wear are shown on the form. When equipment groups or pieces of equipment not included on the form are found to be dirty, worn, or defective, they should be written in the "Other" space and appropriately recorded under the applicable column. The "Remarks" space is provided for listing individual switches requiring

treatment and for recording explanatory information supporting inspection results. This space may also be used for reporting building or miscellaneous conditions and

for making recommendations. Exhibit 1, attached, shows typical entries on Form SW-6204.

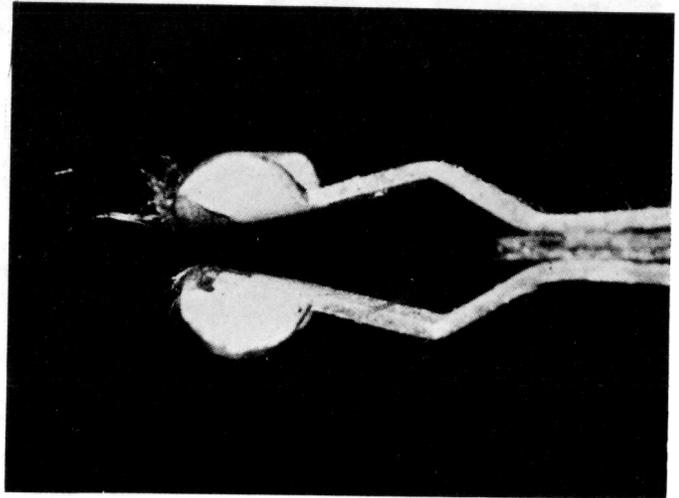
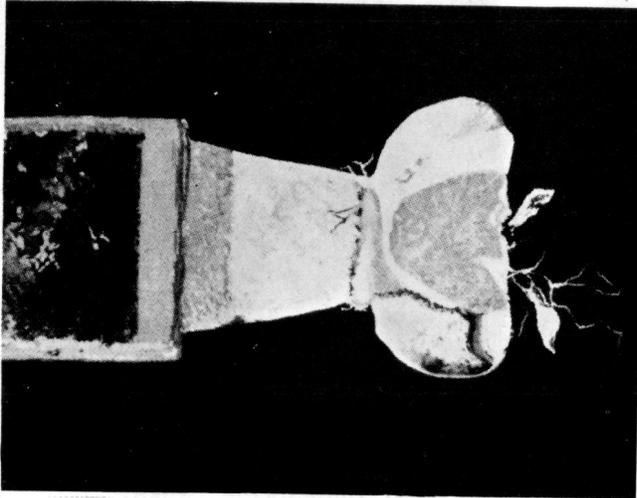


Fig. 1 - DIRTY WIPERS

Such wipers, even when not badly worn, are service hazards. The compacted oil and dirt, together with the lint, make contact unreliable.

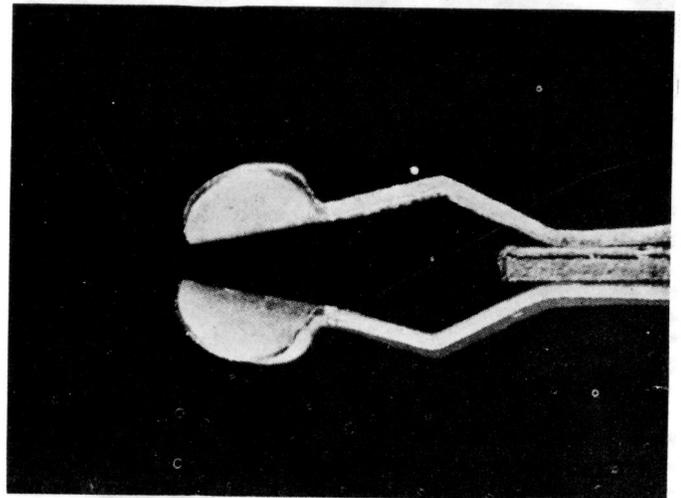
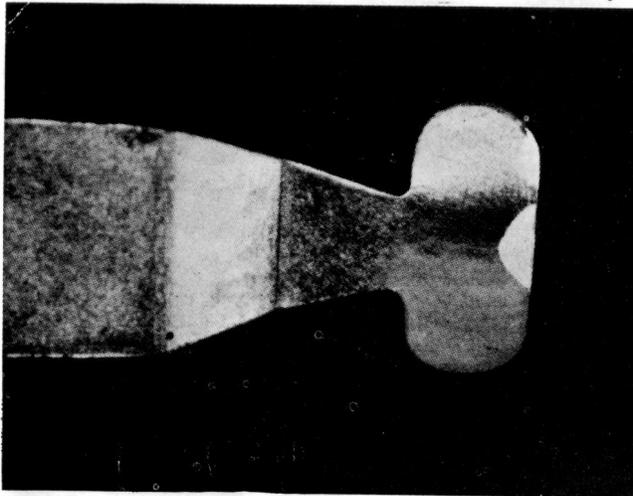


Fig. 2 - CLEAN WIPERS

For good contact, wipers should be properly adjusted and not excessively worn. Well kept wipers always have clean tips except for a slight oil coating on contact surfaces. (See B.S.P. 030-705-704 for requirements and adjusting procedures)

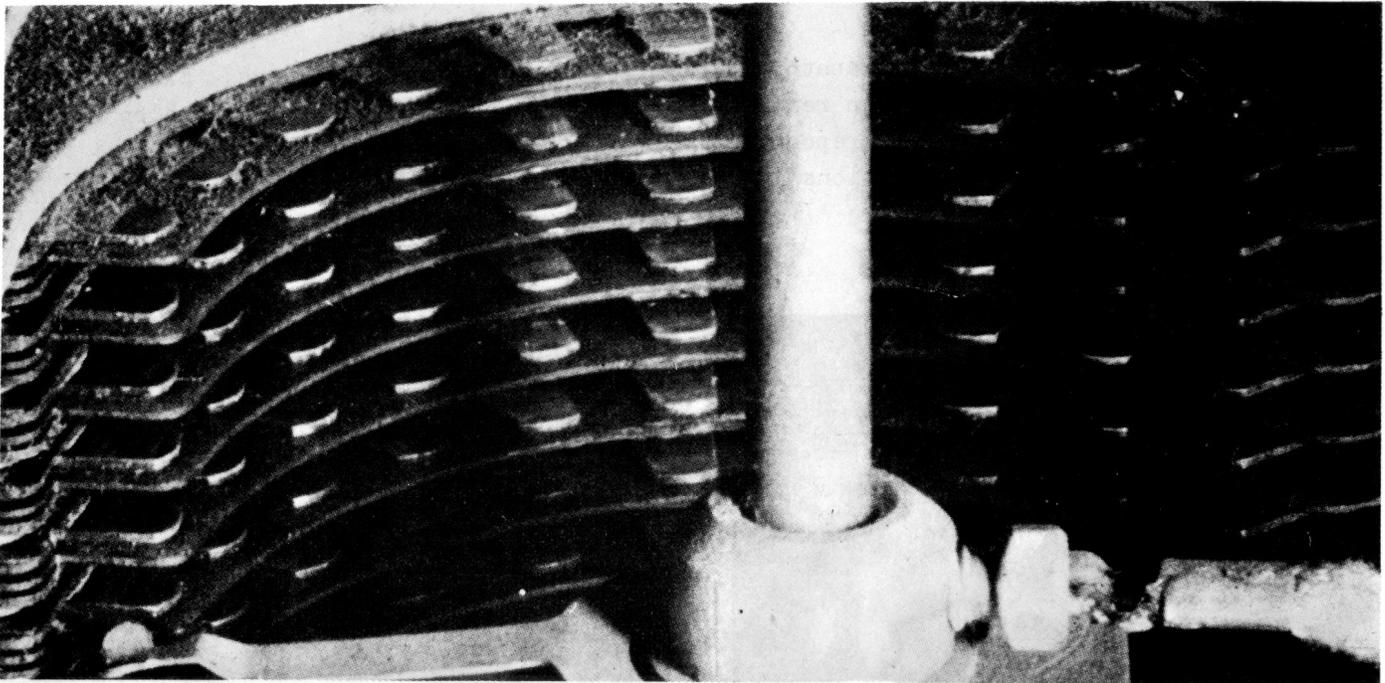


Fig. 3 - SWITCH BANK WITH DUST ACCUMULATION

Dirt accumulations like this cause excessive wiper wear as well as noisy connections and circuit troubles. Use magnifying glass and flashlight when inspecting banks.

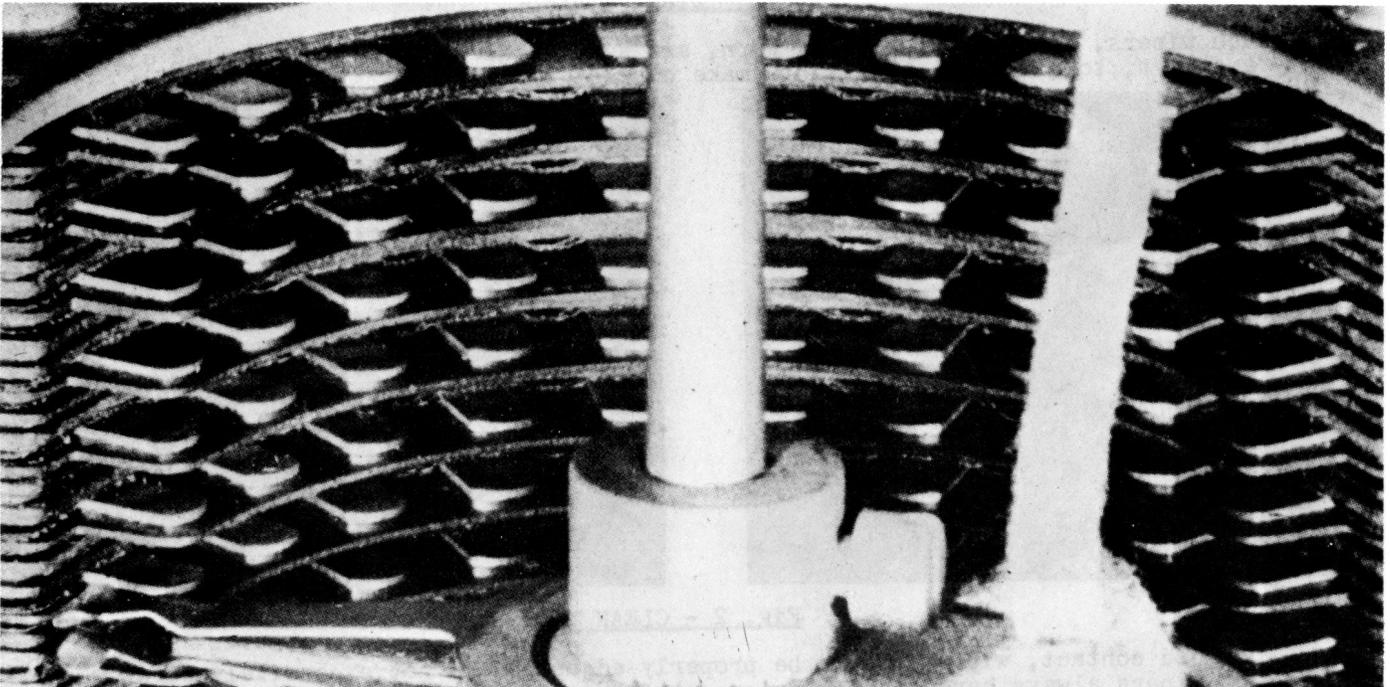


Fig. 4 - CLEAN SWITCH BANK

Clean banks minimize bank and wiper wear and contact troubles.



A

A - Slight wear, satisfactory for service.



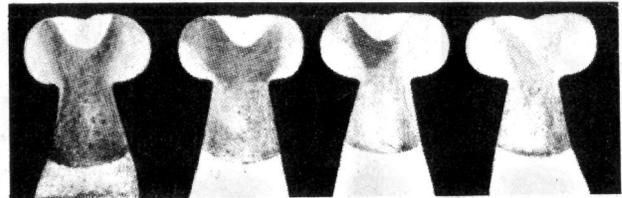
B

B - More wear but still OK for service.



C

C - Worn to feather edge - should be replaced.



D

D - Badly worn - a service hazard.

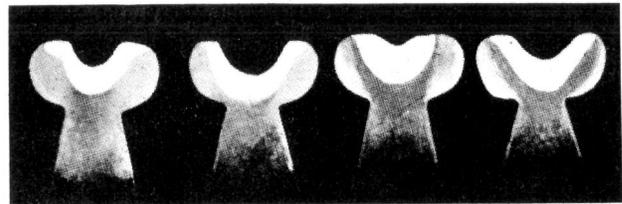


Fig. 5 - STAGES OF WIPER WEAR

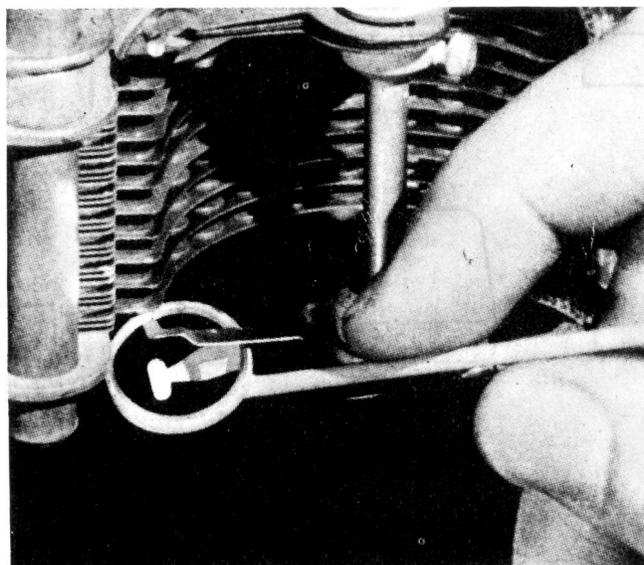


Fig. 6 - WIPER INSPECTION

Insert small dental mirror between tips to inspect for wear on upper spring.
Make switch busy before inspecting wipers.

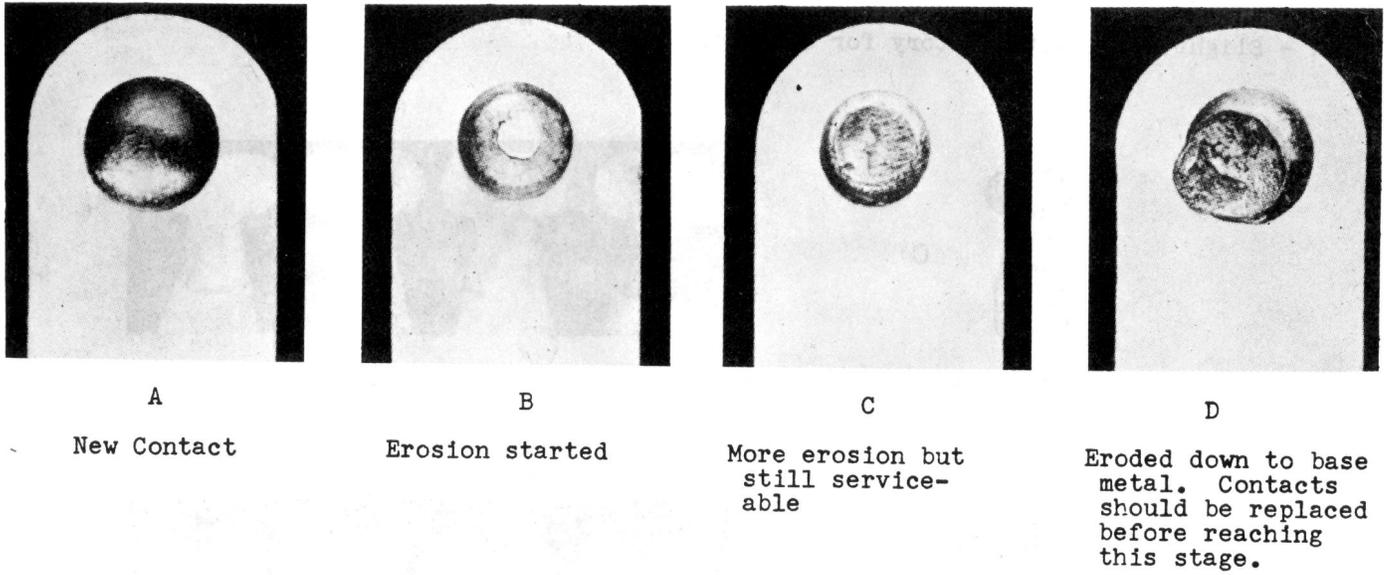


Fig. 7 - STAGES OF CONTACT EROSION

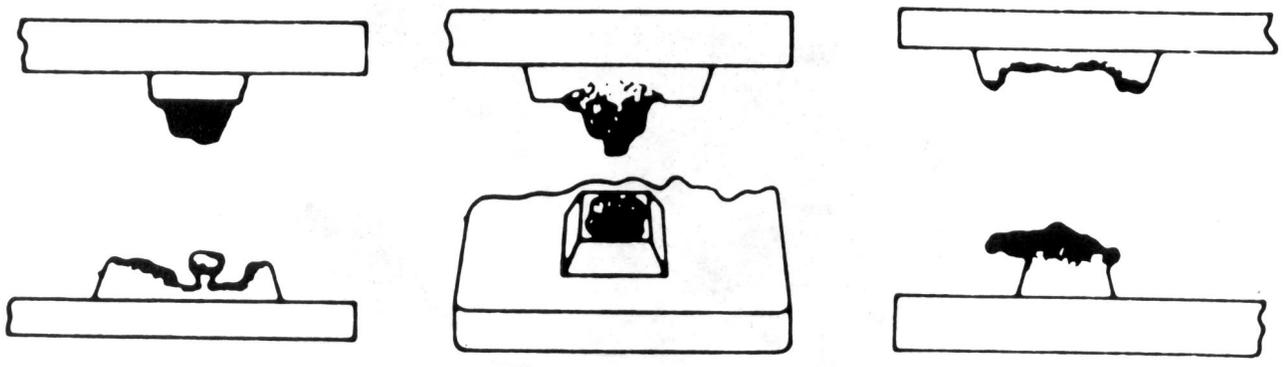


Fig. 8 - CONTACT BUILDUPS

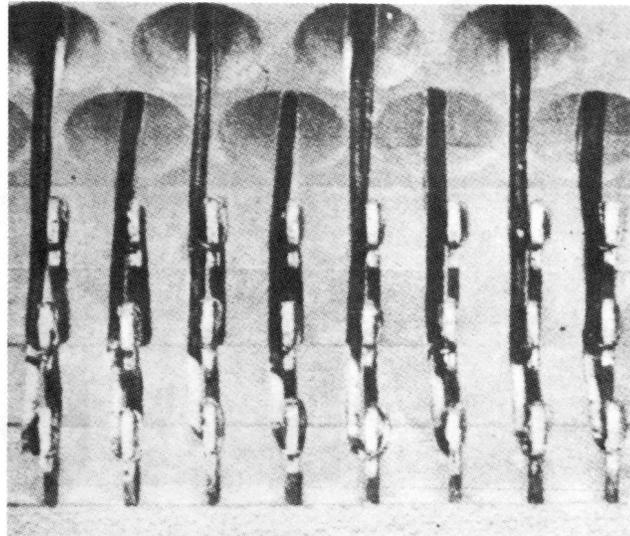


Fig. 9 - NEAT WELL DRESSED TERMINAL STRIP

Wires neatly terminated, properly soldered and well dressed.



Poorly Soldered



Poorly Dressed



Excess Solder



Frayed Insulation



Wire Clippings



Improper Wrap



Wires Not Soldered

Fig. 10-POOR TERMINATIONS

These terminations need to be improved. B.S.P. Section 069-120-801 discusses the proper methods for terminating jumpers on distributing frame.

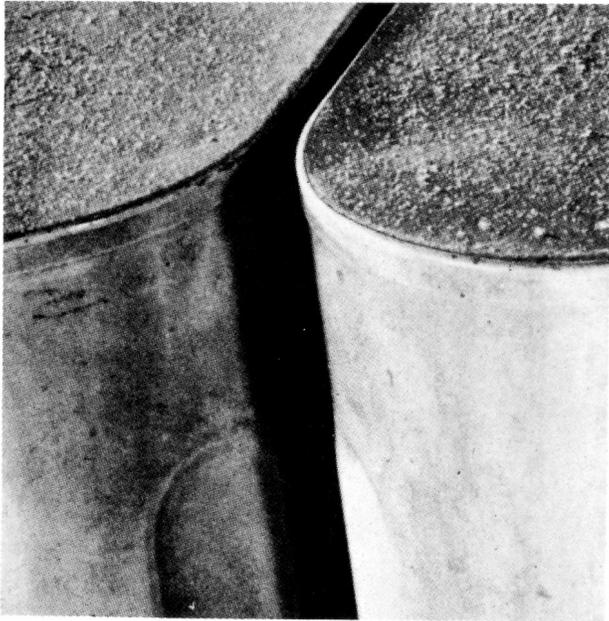


Fig. 11 - DIRTY SWITCH COVERS

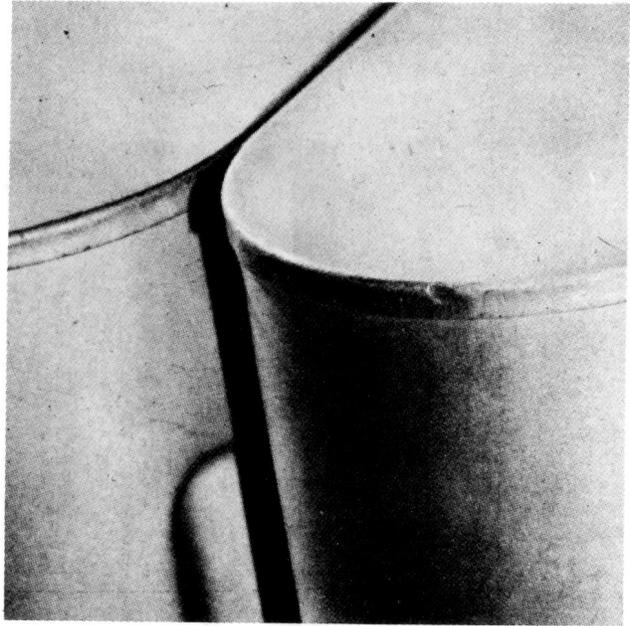


Fig. 12 - CLEAN SWITCH COVERS

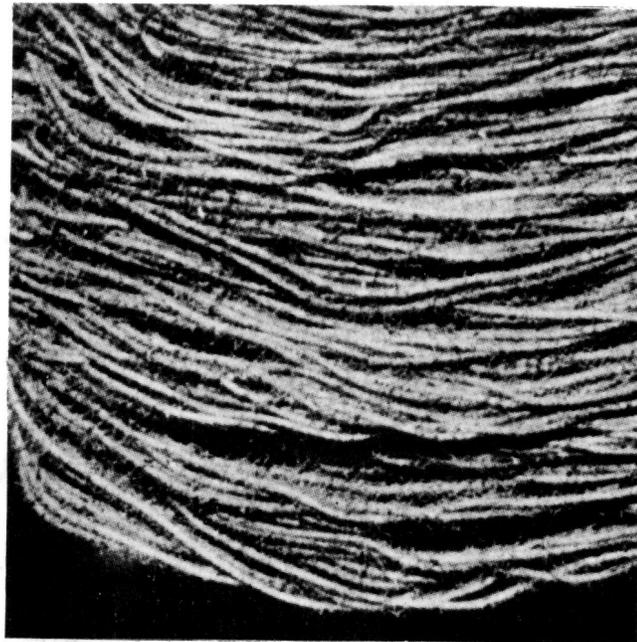


Fig. 13 - DIRTY BANK MULTIPLE

When switch covers are removed they frequently strike the bank multiple above, causing the dirt to fall on the exposed relays. Result - contact trouble.

EXHIBIT 1

Form SW-6204

B. S. P. 201-101-904

EQUIPMENT INSPECTION SHEET

SW-6204
(7-65)OFFICE ANYTOWN
DATE _____

MADE BY _____

EQUIPMENT	AMOUNT CHECKED	DIRTY	DEGREE OF WEAR				INSUFNT. CONTACT FOLLOW	REQUIRES	
			A	B	C	D		LUBRICANT	ADJUSTMENT
LINE FINDER	54							20	
BANKS	152	162							
WIPERS	216		110	69	30	7	25		25
CONTACTS:									
"C" RELAY									
"E" RELAY									
V.O.N. SPRINGS	54		50	3	1		4		8
"SP" RELAY	6		4	1	1		3		3
SELECTOR	89								
BANKS	178	178						45	
WIPERS	178		6	60	42	10	15		15
CONTACTS:									
"A" RELAY	89			84	3	2			
"B" RELAY	89		80	7	2		7		
V.O.N. SPRINGS	89		80	7		2	6		5
CONNECTOR	48								
BANKS	96	96							
WIPERS	96		20	26	35	8	7		7
CONTACTS:									
"A" RELAY	48			42	4	2			
"B" RELAY	48		45	3	1		7		2
V.O.N. SPRINGS	48		40	3		1	3		4
OTHER									
RINGING HAC. #1	1						3		
" " #2	1						2		

REMARKS

HORIZONTAL SIDE OF MDF HAS CONSIDERABLE DEBRIS IN BLOCKS AND THREE LOOSE CONNECTIONS.
ALL EQUIPMENT IN NEED OF COMPRESSED AIR CLEANING.