

PREVENTIVE }  
MAINTENANCE } General Section

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# PREVENTIVE MAINTENANCE

## General Section

**PREVENTIVE MAINTENANCE** consists of three phases: cleaning, lubricating and inspecting. All members of the Customer Engineering Department should understand and adhere to the principle that intelligent and effective preventive maintenance is the foundation of quality customer engineering operations. Proper use of preventive maintenance will reduce peak load breakdowns and keep the machines in such condition that will permit the customer engineer to schedule his work and time efficiently.

Machine usage and conditions in the customer's office where the machine is located will determine the frequency with which this is necessary. Inspections should be made often enough to insure good operation of the machines, but unnecessary inspection of the machines is uneconomical and should be avoided. In some cases cleaning and lubricating is needed more frequently than inspecting. The customer engineer, knowing the general condition of his machines and the amount of use they receive, can best determine when each of the phases, cleaning, lubricating or inspecting, is required.

A preventive maintenance procedure is given for each machine. Since some units are subject to more wear than others, the customer engineer should follow the procedure for only those units which he feels necessary to cover at any given time. Rigid adherence to the procedures given here is not mandatory but rather they should serve as a guide. As each customer engineer gains experience, he will become more efficient in applying preventive maintenance procedures.

The instructions for preventive maintenance consist of two types of sections, a general section and a section designed for each specific machine. The general section should be placed in the front of the Customer Engineer's Reference Manual, and the specific sections should be placed with the adjustment section for each machine. In both sections the headings may be used as a general outline to follow, while the information under the headings will suggest means of accomplishment.

Call reports should carry code 08 for all preventive maintenance, except for repairs made as a result of the inspection. A separate call report coded 02 should be made on these repairs. Time involved in improving the external appearance of the machine should also be coded 08 but time involved in removing covers for refinishing should be entered under the appropriate code.

Under ordinary conditions the entire machine need not be inspected at one time. If only one unit of a machine is inspected at a time, the customer engineer will be in a position to return the machine to the customer quickly in the event of an emergency call. A chart should be kept showing when various units have been inspected. This will enable the customer engineer to make sure that all units receive periodic inspections.

No unit should be dismantled unless the customer engineer is reasonably sure that there are worn parts or that proper cleaning or lubricating can be accomplished only if the unit is dismantled. When making a repair on any unit, it is well to inspect the entire unit if the time is available.

Inspected machines or units should always be tested with test cards before being turned over to the customer. Shortening the duration of the CB's when testing a machine will bring to light potential intermittent troubles caused by insufficient margin of safety with the regular CB timing. This should be accomplished by advancing the break time rather than by retarding the make time.

Machines should be cleaned of dust and dirt frequently with particular attention to the feeds. Do not leave dust or dirt in the card lever or hopper contact. In brushing dust from the machine, care should be taken to deposit it into a waste basket or some other receptacle.

## MACHINE APPEARANCE

EVERY CUSTOMER ENGINEER is charged with the responsibility of maintaining the machines in his territory in good mechanical condition and in **FIRST-CLASS CONDITION WITH RESPECT TO APPEARANCE**. The appearance of all machines should be checked frequently. If plated parts have become discolored or chipped, they should be replaced with newly plated parts. Machines should be checked to determine that painted surfaces are not chipped or scratched and that the porous surface of the paint has not become filled with dust, dirt or oil. Painted surfaces which have become filled with dust or oil may be renewed by the application of Isbell's Polish, Part No. 450419. This polish is a milky white liquid which is easily applied. Saturate a cloth with the liquid (just as you would when applying liquid wax) and rub it on the painted surface. It may be necessary to rub extremely dirty spots more vigorously. The surface should then be polished with a dry cloth. The frequency with which the Isbell's Polish need be applied will vary with the conditions in the customer's office. This will be best determined by each customer engineer consistent with the high level of appearance required by IBM.

When covers warrant refinishing, report to your field supervisor or manager of customer engineering so that proper steps may be taken in accordance with the present policy concerning refinishing covers.

The machines must be kept clean at all times. Upon the completion of a service call or inspection the machine must be checked, and any dirt or oil appearing on the machine covers must be removed. Isbell's Polish does a good job of drying an oily surface. Furthermore, a machine inspection shall include a thorough inspection of the machine to determine if any plated parts should be replaced or any covers need refinishing.

All covers should be properly attached to the machine with a full complement of cover screws or the appropriate fastening devices. All cover latches on the new type covers should be maintained in proper adjustment.

## SAFETY

**THERE IS** but one approved way to work—**THE SAFE WAY**. The customer engineer shall at all times adhere to working methods and habits that are safe, not only for himself, but for others working with him or near him. Safety glasses must be worn when engaging in any activity which might conceivably result in an eye injury.

The customer engineer shall observe special precautions with respect to grounded machines. When machines are serviced or inspected, the power cord should be removed from the power receptacle whenever possible to prevent accidents. If it is necessary to have power on and the work is being done on machines that are on grounded circuits, the disconnect screw is to be removed for convenience and safety. However, it must be remembered that with the disconnect screw removed from **ONE** machine in an installation, a difference of potential may exist between that machine and all others in the group. Caution should be further exercised with the test light leads to prevent them from contacting a grounded machine when checking circuits of an ungrounded machine or when using a test light for any other purpose. When repairs are completed, the **CUSTOMER ENGINEER IS RESPONSIBLE FOR REPLACING THE GROUND DISCONNECT SCREW, FOR IF IT IS NOT REPLACED, THE ENTIRE PROGRAM OF GROUNDING IS DEFEATED, AND AN INCREASED HAZARD RESULTS.**

When servicing machines which are coupled with Summary Punches, it should be remembered that with the ground disconnect screw removed from either machine, the ground to the other machine will still be effective and, therefore, both machines will still be connected to ground as long as the cable between the machines is still intact.

On machines equipped with a 110-volt machine circuits such as the Collator, Type 89; Tube Collator, Type 77; Electric Accounting Machine, Type 285; etc., it is imperative to note that in order to prevent grounding the machine circuit, control panel wires must not be left hanging from the control panel. This procedure should be followed on all machines, and all operators should be instructed accordingly.

## B A S E S

**SENTINEL SWITCHES** on all machines should occasionally be checked for loose wires and for wear on the contact points. A small amount of IBM #17 applied to the points will measurably increase the life of the switch.

**STACKER POCKET** tubes should be cleaned with a cloth saturated with cleaning fluid; they should not be oiled.

**CONTROL PANEL** contacts may be cleaned with a stiff wire brush. All spring connections should be checked for position and tension, using the gauge at least once every 2 years.

A **LUBRICANT** when applied in small amounts at the proper place will produce better results than an excess of the lubricant applied indiscriminately. Too much oil attracts dust and dirt, causing sluggish action and increased wear. The use of a pipe cleaner saturated with oil and applied to the spot desired is an efficient means of lubricating parts in confined areas that require only a light film of oil. Greases should never be heated to facilitate their application to our equipment. Heating may destroy the physical characteristics of the grease, and the danger from fire is enhanced.

**MOTORS AND GENERATORS** on all machines should be checked and lubricated at regular intervals. When lubricating, care should be taken not to get too much oil on bearings as it will saturate the windings and commutator. Brushes and commutators should be checked for wear, dirt and oil. Belt tension should be checked because too much tension will cause excessive wear on the rotor bearings and too little tension will cause slippage.

The link belt used on the Type 77 and the Type 552 machines must be tighter than the conventional "V" belt. As the link belt has a smaller area of contact with the pulley and a greater tendency to stretch, the tighter adjustment is necessary to prevent slippage. It is also necessary to avoid excessive tension of the link belts in order to minimize wear of the motor and pulley bearings. Therefore, when tightening a loose link belt, one link should be removed at a time until a half-inch movement of either side of the belt at the base of the machine results in a barely perceptible movement of the motor assembly. Sufficient links should be used when installing a new belt to permit the same adjustment procedure. The link belt should be placed on the Type 77 and the Type 552 machines so that the small ends of the links lead. This favors the small motor pulley and, on the Collator, decreases the possibility of interference between the front side of the link belt and the lower CR cam shaft, as the motor pulley will tend to push the links together. This will also decrease the possibility of interference between the belt and the slot in the Type 552 base.

**TOGGLE SWITCHES** on machines less than two years old or new switches installed on machines in the field should be lubricated to prolong their life. The possibility of flushing foreign matter onto the blades in older switches makes it inadvisable to lubricate them. The use of IBM lubricant #6 is advised and only a small amount should be applied at the base of the toggle handle. Application once every three months should be sufficient.

**COVER REMOVAL:** It is suggested that only the covers over the unit being inspected be removed during inspection; then the machine can be covered quickly in case the customer engineer finds it necessary to leave that machine.

## HORIZONTAL FEEDS

*THE FEED gets as much or more use than any other part of a machine and for that reason requires more attention in cleaning, inspection*

*and lubrication. Particular care should be taken with preventive maintenance on the feed since the satisfactory operation of all of the rest of the machine depends upon how accurately the card is fed. MANY INTERMITTENT TROUBLES HAVE BEEN TRACED TO SLIGHT IRREGULARITIES IN THE FEED.*

1. **CLEANING:** All dust and dirt should be brushed out of the hoppers. Clean all dirt from around the roller throat and see that the roller turns freely. The feed knife slide assembly and slide guides should be removed to clean properly. On machines, such as the 77 and the 513, only one assembly should be removed at a time so that the remaining one can act as a guide to retime properly the one being cleaned. Also on these feeds be sure all dirt is removed from the gear teeth on the bottom of the feed knife slide and its rocker operating arm. Adjustment of the feed knife should be checked before replacing the feed knife slide assembly. Remove the hopper posts and clean all dirt from them, taking care not to lose any shims that may be used with them. Clean all dirt from feed roll surfaces and from the teeth of the feed roll drive gears as this will make the feed rolls bounce and result in crooked feedings. An easy way of cleaning dirt from the surface of the feed rolls is to hold the end of a card that has been dipped in IBM #6 lubricating oil and allow it to drag between two rolls while they are turning. This wiping action will take most of the dirt off the roll. When using this method on feed rolls just in front of brushes, be sure to remove brushes first, or do not let card move far enough in to damage the brushes. Be sure to brush all dust from the feed roll supporting brackets.

2. **FEED KNIFE ADJUSTMENTS:** If the feed knife holder is worn, it should be stoned to a flat surface before setting the knife. This may be done with an oil stone, or for faster cutting, a piece of Trimite Paper on a flat surface. The knife should be replaced if it is badly worn. However, if it is only slightly worn it may be stoned along with the block. Set the edge of the knife only about .001" or less above the block, and stone the two until there is no indication of where the block leaves off and the knife begins. Then proceed to set the knife to the proper adjustment. Always use a Go-No-Go gauge to set the knife—never a feeler gauge.

3. **FEED KNIFE GUIDE SLIDES:** These should have a minimum of play and no binds. After setting these, always turn the machine over by hand to check for binds before turning on the power.

4. **EVEN FEEDING OF CARDS:** This can easily be checked by placing a card through the throat, up to, but not in, the first feed rolls. Keeping the card from going into the feed rolls, turn the machine by hand until feed knives come up against the card when it is placed tight against the feed roll. If the knives are set to feed the card properly, they will both touch the edge of the card at the same time. If not adjusted correctly, set the machine with the first feed knife touching the card and bring the other knife up to the card by means of the knife holder adjusting screw.

5. **HOPPER SIDE PLATES:** Exact positioning of the plates depends upon the machine type, but they should be set so that with about 500 cards in the hopper; one card placed upright between the end of the 500 cards and the side plate will pull out easily, but two cards will have a drag.

6. **ROLLER THROAT:** The throat knife should be checked for wear at knife edge—the roller, for flat spots or wear on the pivot point. Either of these should be replaced, if worn. The roller throat should be checked for proper adjustment.

7. **FEED ROLL TENSION:** If any one of the feed rolls is eccentric, it will cause a difference in tension of the two ends and result in crooked feeding. This can be checked by holding two pieces of card in the feed rolls, one at each end of the roll, while the machine is running. If the feed rolls are true, the drag on both pieces of card will be the same.

8. **TIMING OF FEED KNIVES:** This varies with machine type and is covered under each machine.

9. **HOPPER POSTS:** These should be set so that the feed knife will come back .020"-.040" beyond the edge of the card.

## BRUSH ASSEMBLIES

1. **CLEANING:** Clean all dust and dirt from entire brush assembly, paying particular attention to dirt between brush separators. Use the emery polishing stick, part number 450503 for cleaning all contact rolls.

2. **BRUSH SEPARATORS** for breaks; also look for burned or carbonized brush separators due to grounds or shorts.

3. **BRUSHES** for wear, bent or crossed strands, and tightness of individual brush clamps.

4.  $\frac{1}{8}$ " **PROJECTION** on all but 77 and 552; the brushes should project about  $\frac{1}{8}$ " above separators. To prevent wear of contact roll, stone edge of any new common brush before installing.

5. **BRUSH ALIGNMENT TO SCRIBED LINE:** Heel of brushes should be set on scribed line on brush separators to align brushes to center of contact roll.

6. **BRUSHES EVENLY SPACED BETWEEN SEPARATORS:** Use the brush bending tool for this. When installing a new set of brushes this spacing may be facilitated before installing the brush holder in the assembly by the following method: After tightening all of the individual brush clamps, place a card punched with one number in all 80 columns on top of the brush holder block and brush ferrules so that by looking through the holes in the card you can see the part of the brush ferrules that extend beyond the block. Align the card so that the ferrule on brush #1 is in the center of the hole in column #1 and fasten in this position with Scotch tape. The other 79 brush ferrules can then easily be aligned to their corresponding holes with the use of the brush bending tool.

7. **BRUSH TRACKING:** The hoppers must have been previously set correctly before making this check.

The following is a recommended procedure for accuracy and convenience:

(a) Punch a card in registration, preferably X and 8 alternately, or as a "Q" in alternate columns.

(b) Fold a piece of lightweight carbon paper, slightly shorter than twice the width of a card, over the leading edge of the card, creasing it well. The carbon surface must be toward the card, its non-folded edges toward the feed knives. The use of lightweight carbon will prevent making throat alterations.

(c) Insert the test card between a group of cards to obtain a more natural feeding condition.

(d) Feed cards through machine under power. When the carbon paper is removed from the test card, a perfect tracking of the brush can be seen as related to the card in registration.

8. **BRUSH TIMING:** Whenever possible, this should be checked with a dynamic timer, checking both CB's and brushes at the same time, Pre-punch a group of cards 1-3-5-7-9 in odd-numbered columns and 2-4-6-8 in even-numbered columns. Run all cards through under power, checking brushes on one dynamic timer circuit and CB's on the other to check overlap of brushes and CB's. When using the dynamic timer all 80 brushes should be checked one at a time. If no dynamic timer is available, timing of several brushes at each end of card should be checked by hand, using a test light and timing on a five hole.

## CIRCUIT BREAKER CAMS

ALL CIRCUIT-BREAKER type cams should be checked for air gap and timing a month or two after installation of new machine, as these may change

due to shrinkage of linen dilecto cams and insulators. Cam surfaces should be cleaned of all old dirt and re-lubricated with a thin film of IBM #17 before checking any other part. On all inspections, watch for indication that cam is warped or eccentric.

1. **LOOSE DRIVE GEARS** may be determined by rocking a row of cams and noting the amount of play.

2. **WORN CAM FOLLOWERS AND PIVOT POINTS:** Any contacts with worn parts should be replaced.

3. **DIRTY, WORN OR LOOSE POINTS:** Clean all dirty or worn points with flexstone. A piece of Trimite paper folded several times may be used as a flexstone. On many machines all points in one row may be cleaned at the same time by using a long strip of Trimite paper folded so that the Trimite side is out. Place this between the points of one row and draw it lengthwise several times through all of the points. To aid in inserting the paper, all of the points may be held open at once by means of a long rod. Each individual point should then be wiped with a clean cloth, and again with a clean finger to remove any filings or lint. Any points that are still dirty should be cleaned individually. Any badly pitted points should be replaced. Points should be adjusted for full contact by loosening the contact mounting screws and shifting straps.

4. **AIR GAP:** To facilitate adjusting the air gap on the CB and CF cam contacts, it is possible to approximate their air gap by counting the revolutions of the stationary contact screw.

If the specification for the contact being adjusted is for a .027"-.033" air gap, back off on the fixed point one complete turn. If contact specification is for .012"-.018" air gap, the screw should be backed off a half turn. As cams may become eccentric, a check should be made at several points of the cam periphery to insure that the best possible adjustment has been made. As the above is an approximation only, the air gap should be checked with feeler gauges at completion of the repair.

5. **TIMING:** Timing of contacts should be set for either make or break timing by shifting of cams on the shaft, not by changing air gap.

6. **LUBRICATION:** Exercise caution in lubricating contact assemblies on which the contact points are lower than the pivot points. If too much lubricant is used it will run down and prevent the points from making contact.

(a) Use IBM #6 on cam follower roller, followed by IBM #17.

(b) Use IBM #6 on cam contact pivot points.

(c) Put a very light film of IBM #17 on linen dilecto cam surfaces.

## MAKE AND BREAK CAM CONTACTS

1. **CLEAN:** Cleaning fluid may be used to wash oil and grease from these points. Wipe points out afterward with a piece of card. Care must be taken that no lint or paper fiber is left in the points as this will prevent their making contact.

2. **POINTS:** Use flexstone to stone down any burnt points. Replace loose points. Points should be aligned to make full contact.

3. **INSULATORS:** Check tightness of support screws.

4. **RISE OF STRAP:** Break contact should have  $\frac{1}{32}$ " rise, and make contacts  $\frac{1}{32}$ " gap.

5. **TIMING:** Set according to timing chart.

## CARD LEVER CONTACTS

1. **WEAR OR BINDS ON OPERATING LEVER.**

2. **CLEAN AND ALIGN POINTS.**

3. **GOOD RISE WHEN MADE PLUS  $\frac{1}{32}$ " GAP WHEN BROKEN.**

4. **TIMING:** If card lever is in a position where corner cuts will affect it, timing of both square and cut corners should be checked.

## DUO RELAYS

### I. Cleaning

Any relay that has accumulated dirt or oil should be washed with cleaning fluid. The core and residual may be cleaned by dipping a card in cleaning fluid and passing it between the core and residual while pressing on the armature.

### II. Inspection

1. **ARMATURE PIVOT:** Check for freedom of movement of armature. All pivot points may be easily reached for lubrication by a pipe cleaner saturated with IBM #6 lubricant. Red rust will cause sluggish action. Any points found with red rust should be cleaned by removing armature, wiping off pivot rod and running the saturated pipe cleaner through the pivot holes in the armature. This will leave sufficient oil to lubricate pivot properly.

2. **CORE** should be firmly secured to the frame.

3. **CONTACT PILE HOLDING SCREWS** may become loose due to shrinkage of the linen dielectric separators.

4. **POINTS:** Line up points to make full contact. Points should be cleaned with a piece of clean card or burnishing tool, never with Trimite paper or flexstone.

### III. Lubrication

Use IBM #6 on the following:

1. Armature pivot points.

Use IBM #17 on the following:

1. Very light film on the surface of the phenolic pad.

## SUMMARY PUNCH AND DIGIT TYPE EMITTERS

1. **WORN OR BURNT EMITTER SEGMENTS.**

2. **CENTERING OF EMITTER ON SHAFT:** This can be checked by backing out one of the screws in the brush holder until it just touches the inside surface of the emitter. Turn machine over by hand, watching to see that the screw just touches all the way around.

3. **BENT OR SHORT BRUSH STRANDS.**

4. **TRACKING OF BRUSHES.**

5. **TIMING OF BRUSHES:** Check this at 0-5-9 time.

6. **LUBRICATION:** Very light film of Nujol mineral oil on inside surface.

## BIJUR LUBRICATING SYSTEMS

AN ADEQUATE SUPPLY of oil should be maintained at all times. If any line has been disconnected at a junction point, be certain that oil is not prevented from flowing normally by an airlock. This may be prevented by operating the pump by hand (before reconnecting the tube) until oil flows out of it. When replacing a flow valve make sure that the arrow stamped on the valve is pointing in the direction of oil flow.

If conditions indicate that all bearings are receiving an insufficient supply of oil, inspect for:

1. Low level of oil in reservoir.

2. Broken, cracked or flattened tubes, or loose tubing connections. Wipe all tubes and connections and operate pump manually while watching for leaks.

3. Defective lubricator operation.

(a) Check oil level in lubricator and fill with IBM lubricant #9.

(b) Disconnect the tubing on the bottom of the pump, raise the piston part way and release. Oil should flow rapidly from the pump outlet. If there is



little or no flow of oil and the piston remains in an elevated position, the filter disc is probably clogged. Remove the filter disc as follows:

1. Remove two mounting screws from Bijur lubricator.
2. Drain oil from the lubricator.
3. Raise the piston and block it  $\frac{1}{4}$ " or more above its lowest position.
4. Remove the pump cylinder cap. Be sure to use a wrench to remove the cap, as placing a rod between the outlets and twisting will damage the die casting.
5. Lift out the piston seat plate and remove the filter disc. Should the filter disc be coated with dirt, replace it with a new one, if available (Part No. 173281); otherwise, wash the disc in carbon tetrachloride until it is clean before reassembly.

If there is an indication that only one bearing is receiving insufficient supply of oil, proceed as follows:

1. Inspect the tail tube for that bearing to determine that the nut is tightened sufficiently to prevent leaks, that the end of the tail tube is inserted in the bearing, and that the tube is not flattened or broken.
2. Remove the tail tube from the bearing and operate the lubricator two or three strokes; a drop of oil should appear at the end of the tube.
3. If no oil is delivered through the tube, disconnect the tail tube from the meter-unit and operate the lubricator manually. After two or three lubricator strokes, a drop of oil should be delivered through the meter-unit. If no oil appears, disconnect the meter-unit from the junction or junction bar and again operate the pump. Oil should flow freely from the junction bar. If oil flows from the junction or junction bar, but not from the meter-unit, replace the meter-unit. If oil does not flow from the junction or junction bar, inspect the feed tubes for breaks or leaks. If none is found, inspect the lubricator. After manually operating the pump for test purposes, wipe excessive oil from all line outlets.