

STEP-BY-STEP AUTOMATIC EXCHANGES

LUBRICATION

(NOTE: As this Instruction has been revised paragraphs have not been starred).

1. CANCELLATIONS Nil.

2. GENERAL

2.1 Oil, NZPO No. 1 is coloured blue for identification purposes and is used for the lubrication of mechanical parts, except where otherwise specified in Engineering Instructions.

2.2 To obtain maximum efficiency from the lubrication of mechanical parts, the following points must be observed:

- (1) Lubricate the mechanism when it is installed and thereafter as required.
- (2) As the amount and frequency of application of lubricant required for different mechanism points can vary considerably, further lubrication is carried out when either a control inspection or other indicator shows that it is necessary.
- (3) Before lubrication, thoroughly clean the mechanism with a dry cloth.
- (4) Syringes and lubricants must be kept clean and free from dust, grit or other extraneous matter.
- (5) Apply the lubricant as indicated in para. 5 to 8.
- (6) Apply it sparingly to the points specified in Tables 1 to 7, then after subsequent operation of the mechanism, carefully remove any excess lubricant to avoid its projection onto other parts.

2.3 Apply the minimum amount of oil as excessive lubrication results in a fine splash or spray being thrown off during the operation of the mechanism to the detriment of banks, wipers, cords, interrupter and relay contacts. This is not an unusual occurrence and an indication is given by the formation of an oily deposit on the inside of selector covers.

2.3.1 It has been established that selector interrupter contacts, which are in a highly inductive circuit and carry relatively large currents, are subject to accelerated wear when contaminated by lubricants.

2.3.2 Careless handling of a syringe can also deposit oil on parts where it will either be detrimental to switch operation or cause unnecessary cleaning.

2.4 The lubrication requirements for a selector will be dependent upon such conditions as:

- (1) The amount of traffic handled by the selector.
- (2) The proximity of the selector to sunlight, heating appliances, or air-conditioning ducts or outlets, and
- (3) The position of the selector in relation to floor level.

2.4.1 All factors must be taken into consideration by the Senior Technician during his "Control Inspection" to ensure the mechanisms are correctly lubricated.

3. LUBRICANTS

3.1 The only lubricants to be used on the equipment covered by this Instruction are:

- (1) Oil, NZPO No. 1.
- (2) Oil, Bearing, No. 16, where specifically mentioned.
- (3) Locally prepared oiled sleeving.
- (4) Grease, NZPO No. 1, where specifically mentioned.

3.2 Other lubricants must not be used.

3.3 Method to be Adopted when Making up Oiled Sleeving

- (1) Thoroughly mix 25 ml of Oil, Bearing No. 16 with 75 ml of the solvent described below.
- (2) Place one complete hank of unimpregnated sleeving in a plastic bag.
- (3) Sprinkle the oil/solvent mixture over the sleeving.
- (4) Seal the contents in the plastic bag for 48 hours, after which, suspend the treated sleeving in the open air for at least 48 hours, to disperse the solvent, before use.

3.4 The solvent used is a petroleum product in the Class 3(b) Dangerous Goods category. It has a flashpoint of approximately 38°C, is free of sulphur and grease and leaves virtually no residue on evaporation.

3.5 The solvent is to be purchased locally from an Oil Company depot. The purchaser must stress the Class 3(b) category requirement and ensure the correct fluid is obtained. The products available are as follows:

<u>Oil Company</u>	<u>Product</u>	<u>Minimum Quantity</u>
British Petroleum	B.P. White Spirit	5 litres
Europa	Europa White Spirit	20 litres
Mobil	Dry Cleaner Fluid	20 litres
Shell	Shell White Spirit	20 litres

3.6 Warning - the term white spirit is a loose one and the required fluid must not be confused with petroleum products retailed under various trade names such as Atrasol No. 1, Britolite, Clear Gas, Shell X55 or Shellite. These have a lower flash point, approximately 0°C, and are in the Class 3(a) Dangerous Goods category.

3.7 Where the minimum quantity able to be purchased locally exceeds the local requirements, the District Office should be advised and requested to arrange the supply of a more suitable quantity.

4. STORAGE OF LUBRICANTS IN CONTAINERS

4.1 Oil will generally be held ready for use in the bottles in which it is received from stock, but where required use the holder stocked in KG stock list, and small bottles to hold and transport the oil.

4.2 Store the oiled sleeving in a sealed plastic bag.

5. PREPARATION

5.1 A piece of dry cleaning cloth is to be used to remove dirty lubricant from parts other than bank contacts, wiper tips, collector rings or feeder brushes. For these exceptions see B 5306.

5.2 The syringe is to be filled and used in accordance with Gen T 1210.

6. POINTS OF APPLICATION

6.1 Points of application of the lubricant are given in Tables 1 to 7. Oil NZPO No. 1 is used in all cases except where specified otherwise.

6.2 The oil should be applied to the mechanism in the proper sequence. A sequence for the lubrication of new mechanisms is given in Tables 1 to 7. In subsequent lubrications, all points in the mechanism may not require treatment. Nevertheless, lubrication should be carried out in a systematic manner and deal only with those points requiring attention.

6.3 Fig. 1 shows the various points of application for 2000-type two motion selectors and is to be viewed in conjunction with Table 2.

6.4 NZPO drawing No. 34921, size A3, depicts Fig. 1 and is available for mounting on hardboard.

7. NOTES ON LUBRICATION

7.1 Ratchets

- (1) When an initial application of Oil, NZPO No.1 is to be made to a ratchet, first remove all dust from the parts by means of a piece of cleaning cloth. A minimum amount of oil from the syringe is to be applied and spread over the whole of the contacting surfaces by operating the mechanism several times. Ratchets must not appear as if the oil has been liberally applied.
- (2) When re-lubricating the ratchets, add a minimum amount of oil and distribute it as in (1) above.
- (3) If the oil appears dirty, clean the parts with a piece of dry cleaning cloth, then lubricate as in (1) above.

7.2 Pawl Stops and Other Exposed Surfaces - only a minimum amount of oil is to be applied to the bearing surfaces, any surplus being removed.

7.3 Bearings - a minimum of oil is to be applied to the points in Tables 1 to 7.

7.4 Wiper Carriage (2000-Type Selectors) - before lubrication, clean the shaft with a piece of cleaning cloth. The shaft must be lubricated as described in Table 2, 3(a). After lubrication, the wiper carriage must be raised to level 0 a few times. Remove any surplus oil.

7.5 Selector Shafts (pre 2000-Type Selectors)

- (1) The oil must not be applied directly to the felt washers or the shaft bearing. The shaft must first be cleaned with a cleaning cloth. Apply a minimum amount of oil to the shaft. Raise and lower it two or three times and clean off any surplus oil.
- (2) After lubrication, the shaft is to be raised once or twice by a light pressure applied beneath the cup spring, to ensure that it is free in its bearing. If the shaft does not feel free, examine the bearings and felt washers. If the felt washers have become clogged, change them.

7.6 Selector Shaft-Restore Springs (pre 2000-Type Selectors) - shaft-restore springs are lubricated by the Contractor before assembly. Subsequent lubrication is not necessary unless the complete shaft-restore-spring assembly is changed. Before fitting the new spring assembly lubricate with a minimum amount of oil.

7.7 Wiper Axles (BPO Types 1, 2, 3 and 4; also GEC uniselectors) - apply a minimum amount of oil to the wiper axles when they are assembled, or when they are removed from the uniselectors for any reason. On type-2 uniselectors, the outer surface of the ratchet-wheel hub is also to be lubricated.

7.8 Collector Rings (all Types of Uniselectors) - the inner surfaces of the collector rings should be trace lubricated by means of oiled sleeving when uniselectors are assembled, or when the wiper assemblies are removed from uniselectors for any reason. (See para. 3.3).

7.9 Wiper Tips (all Types of Uniselectors) - uniselectors should be rotated to a convenient position and the wiper tips trace lubricated by means of oiled sleeving. Rotation of the wipers electrically will evenly distribute the trace lubricant over the bank contact surfaces. Treat similarly when uniselectors are assembled or when the wiper assemblies are removed from uniselectors.

7.10 Wiper Tips (Minor Switches) - rotate minor switches to a position past the tenth contact when the switches are assembled or when the wiper assemblies are removed for any reason, and lubricate the wiper tips by means of oiled sleeving. After lubrication, step the wipers to the tenth contact a few times and release by hand.

8. LUBRICATION OF CLOCKS

8.1 BPO Type 44 - lubricate all bearings and rubbing surfaces sparingly.

8.2 Master Clocks, BPO Type No. 36 and 46, and Gents Type C7 - these clocks will normally operate for long periods without cleaning or lubrication of their mechanism. When the need to lubricate becomes apparent, clean the parts before oiling. Use oil, bearing, No. 16, sparingly on the pivots and wheel bearings and also on the crutch pin of the type C7 clock.

8.2.1 Do not use any lubricant, other than oil, bearing, No. 16.

8.2.2 Count and scape wheel teeth must not be oiled. They must remain clean and dry.

8.3 Time Dial Mechanisms in Master Clocks and Slave Clock Mechanisms are to be cleaned and lubricated in a similar manner to master clocks. Refer to POWER Building Services H 5210 for more detailed information about the lubrication of slave clocks.

9. LUBRICATION OF PULSE MACHINES

9.1 For the lubrication of pulse machines see B 5018.

10. REFERENCES B 5018 B 5306
Gen T 1210
POWER Building Services H 5210

(Tables 1 to 7 and Fig. 1 follow)

TABLE 1

TWO-MOTION SELECTORS (PRE 2000-TYPE) LUBRICATION SEQUENCE

<u>Selector Part or Bearing Surface</u>	<u>Points where a Minimum Amount of Lubricant is Applied</u>
1. <u>Vertical Armature</u>	
(1) Pawl guide	At contact between pawl guide and pawl extension
(2) Armature restore spring	At contact with T screw
2. <u>Rotary Armature</u>	
Armature restore spring	At contact with T screw
3. <u>Shaft Assembly</u>	
(1) Vertical ratchet	On tooth of ratchet, both at point where vertical pawl strikes and where vertical detent rides during vertical motion - see para. 7.1 (1)
(2) Rotary ratchet	Top of first and fifth tooth of rotary ratchet
(3) Shaft restoring spring brackets (when normal post springs are fitted to normal post)	Point on bracket which operates normal post springs
4. <u>Vertical Armature</u>	
(1) Armature spindle or bearing pins	Point of bearing between armature and spindle or bearing pins
(2) Pawl bearing	Between pawl and pawl bearing or collar
5. <u>Rotary Armature</u>	
(1) Armature bearing pins	Point of bearing between armature and bearing pins
(2) Pawl bearing	Between pawl and pawl bearing
6. <u>Double Detent, or Vertical and Rotary Detents</u>	
Spindle bearings	Between detent bearings and spindle
7. <u>Shaft Assembly</u>	
(1) Shaft bearings	See para. 7.5
(2) Shaft restoring spring	See para. 7.6

TABLE 1 (Cont'd)

8.	<u>Vertical Marking Wiper</u>	
	Bearing	Between shaft collar and wiper bracket

TABLE 2

TWO-MOTION SELECTORS (P.O. STANDARD 2000-TYPE)

LUBRICATION SEQUENCE

<u>Selector Part or Bearing Surface</u>	<u>Points where a Minimum Amount of Lubricant is Applied</u>
1. <u>Rotary Mechanism</u>	
(a) Armature	To exposed portion of lubricating wick.
(b) Armature restore spring	Where spring engages its adjusting screw
(c) Armature back-stop	At contact with armature
(d) Pawl	Between pawl and bearing collars.
(e) Vertical and rotary detent springs	At tip of springs where they contact the frame
(f) Vertical and rotary detent bearings	At points of bearing on spindle
(g) Vertical and rotary detent adjusting screws	At tip of screws where they contact the frame
(h) Pawl guide	At contact with pawl
(i) Pawl front-stop	At contact with pawl
(j) Rotary detent upper projection	Trace at point of engagement with rotary disc
(k) Pawl spring	Where tip of spring makes contact with pawl
2. <u>Vertical Mechanism</u>	
(a) Armature	To exposed portion of lubricating wick. Care must be taken to prevent oil getting onto the wiring form near this point
(b) Armature restore spring	Where spring engages its adjusting screw

TABLE 2 (Cont'd)

<u>Selector Part or Bearing Surface</u>	<u>Points where a Minimum Amount of Lubricant is Applied</u>
2. <u>Vertical Mechanism (Cont'd)</u>	
(c) Armature back-stop	At contact with armature
(d) Pawl	Between pawl and bearing collars
(e) Pawl spring	Where tip of spring makes contact with pawl
(f) Pawl front-stop	At contact with pawl
(g) Pawl guide	At contact with pawl
3. <u>Shaft and Wiper Carriage Assembly</u>	
(a) Shaft and carriage restoring spring	To the upper section of the shaft with the carriage normal, and to the lower section of the shaft with the carriage on level 'O'.
(b) Rotary disc	Trace to underside of disc and front edge of comb plate teeth
(c) Operating cam	At periphery of cam. (NR spring operating lug)
(d) Vertical ratchet	To first tooth at top of ratchet
(e) Rotary ratchet	To the top and middle of the 1st, 7th and 12th rotary teeth
(f) Vertical marker wiper bearing (if fitted)	Between locating collar and wiper bracket, and to bearing surfaces of tongue on wiper bracket
4. <u>Mechanically Operated Spring Levers and Rollers</u>	
(a) Levers	To upper and lower bearings
(b) Level springs roller	To roller bearing
(c) Level springs cam-plates (when fitted)	To bearing surface of cam plate
(d) Level springs auxiliary cam	To lower bearing (on later type of cam) To upper bearing (under surface of cam on earlier type of cam)

TABLE 2 (Cont'd)

<u>Selector Part or Bearing Surface</u>	<u>Points where a Minimum Amount of Lubricant is Applied</u>
4. <u>Mechanically Operated Spring Levers and Rollers (Cont'd)</u>	
(e) Off-normal spring operating arm	At point of contact with cam
(f) Rollers (rotating type)	To upper and lower bearings (on earlier type of lever)
(g) Rollers (fixed type)	Trace on contact surface
5. <u>Interrupter Springs</u>	
(a) Operating lever bearing pin	To both ends of bearings
(b) Loop spring (Type 1)	Trace to both bearings
(c) Loop spring (Type 2)	To the metal bearing

TABLE 3

MINOR SWITCHES (ALL TYPES) LUBRICATION SEQUENCE

<u>Selector Part of Bearing Surface</u>	<u>Points where a Minimum Amount of Lubricant is Applied</u>
(1) <u>Wiper Assembly and Hub</u>	
Ratchet wheel	Tooth point of ratchet wheel (see para. 7.1)
(2) <u>Pawl</u>	
Pawl front stop	Point where pawl strikes
(3) <u>Rotary of Operating Armature</u>	
Armature bearing pin	Point of bearing between bracket and armature
(4) <u>Pawl</u>	
Pawl bearing pin	Centre of pawl spring on bearing pin
5. <u>Wiper Assembly and Hub</u>	
(1) Shaft restoring spring (clock spring type)	See para. 7.6
(2) Wiper axle	Through hole provided in flat on ratchet wheel
(3) Wiper tips	Trace lubricate only. See para. 7.10.

TABLE 4

UNISELECTORS, BPO TYPES 1, 2 AND 3 AND GEC 3500

LUBRICATION SEQUENCE

<u>Selector Part or Bearing Surface</u>	<u>Points where a Minimum Amount of Lubricant is Applied</u>
1. <u>Armature</u>	
(1) Armature back-stop (BPO types No. 1, 2 and 3 and GEC)	Striking face of armature back-stop
(2) Armature knife-edge (BPO type No. 1) and GEC	Lower side of knife-edge, where armature rides
(3) Armature knife-edge and sides of locating hub (BPO types No. 2 and 3)	Lower sides, where armature rides
(4) Armature restoring springs (BPO types No. 1, 2 and 3 and GEC)	Point of attachment of armature restoring springs to armature
2. <u>Pawl</u>	
Pawl back-stop (all types, whether mild steel or moulded)	Back of pawl and striking face of pawl-stop
3. <u>Wiper Assembly and Hub</u>	
Ratchet wheel (all types)	On periphery of ratchet wheel (see para. 7.1)
4. <u>Armature</u>	
Armature restoring springs (BPO types No. 1, 2 and 3 and GEC)	Top of springs immediately above felt inserts
5. <u>Pawl</u>	
Pawl bearing (BPO type No. 1 and GEC 6 to 10 levs.)	Between pawl and armature
6. <u>Wiper Assembly and Hub</u>	
(1) Ratchet wheel hub (BPO type No. 2)	Outer surface of hub (see para. 7.7)
(2) Wiper axle (BPO types No. 1, 2 and 3 and GEC)	See para. 7.7
(3) Wiper tips (all types)	Trace lubricate only. See para. 7.9
(4) Collector rings (all types)	Trace lubricate only. See para. 7.8

TABLE 5

UNISELECTOR MOTOR DRIVE MD 2

LUBRICATION SEQUENCE

(See NOTE 1)

<u>Selector Part or Bearing Surface</u>	<u>Points where a Minimum Amount of Lubricant is Applied</u>
(1) <u>Cams on wiper wheel</u> (see NOTE 3)	-
(2) <u>Cams on rotor shaft</u>	Trace to working faces of cams
(3) <u>Rotor thrust face</u>	Trace to point of engagement between rotor and base of rotor spindle
(4) <u>Latch detail</u>	Trace between latch detail and latch restoring spring
(5) <u>Adjusting screw for latch restoring spring</u>	Trace only at point of contact between tip of screw and spring
(6) <u>Gear teeth</u>	Evenly distribute to working surfaces at point of engagement of gear teeth
(7) <u>Wiper assembly bearings</u>	To bearing at each end of assembly
(8) <u>Rotor spindle and wick</u> (see NOTE 2)	Remove rotor. Apply oil to bearing surfaces and wick. Lubricating wick should not protrude from the spindle and should be oiled fully but not to excess.
(9) <u>Idler spindle and wick</u>	Apply to end of the spindle, which is hollow and contains a wick. Wick should be fully oiled but should not carry an excess of oil.
(10) <u>Latch armature bearing</u>	To each bearing
(11) <u>Wiper tips</u>	Trace lubricate only. See para. 7.9.
(12) <u>Collector rings</u>	Trace lubricate only. See para. 7.8.

TABLE 5 (Cont'd)

- NOTES:
1. For convenience, remove the mechanism from the bank.
 2. To remove the rotor, first remove the interrupter assembly and mounting plate - the rotor can be lifted from the rotor spindle. On reassembly be careful to replace the rotor in its correct position.
 3. Do not lubricate the tips of the cams on the wiper wheel because there is a tendency for the lubricant to foul the contacts of the springsets.

TABLE 6

UNISELECTOR, BPO - TYPE 4

LUBRICATION SEQUENCE

<u>Selector Part or Bearing Surface</u>	<u>Points where a Minimum Amount of Lubricant is Applied</u>
(1) <u>Ratchet teeth</u>	Trace on periphery of ratchet (See para. 7.1)
(2) <u>Armature bearings</u>	On point of bearing between armature and bearing pins
(3) <u>Wiper axle</u>	To number wheel end of spindle (See also para. 7.7)
(4) <u>Wiper tips</u> (one tip of each level)	Trace lubricate only. See para. 7.9

TABLE 7

RATCHET RELAY
LUBRICATION SEQUENCE

<u>Relay Part of Bearing Surface</u>	<u>Points where a Minimum Amount of Lubricant is Applied</u>
1. <u>Armature</u>	
(1) Armature back-stop	To striking face of armature back-stop
(2) Armature knife-edge	Where armature rides
2. <u>Pawl</u>	
Pawl back-stop	To back of pawl and striking face of pawl-stop
3. <u>Ratchet</u>	On periphery of ratchet wheel
4. <u>Armature</u>	
Armature restore spring	To restore spring felt insert
5. <u>Hub</u>	Cam and ratchet wheel assembly bearing
6. <u>Cams</u>	To working faces of the cams. Use Grease, NZPO No. 1

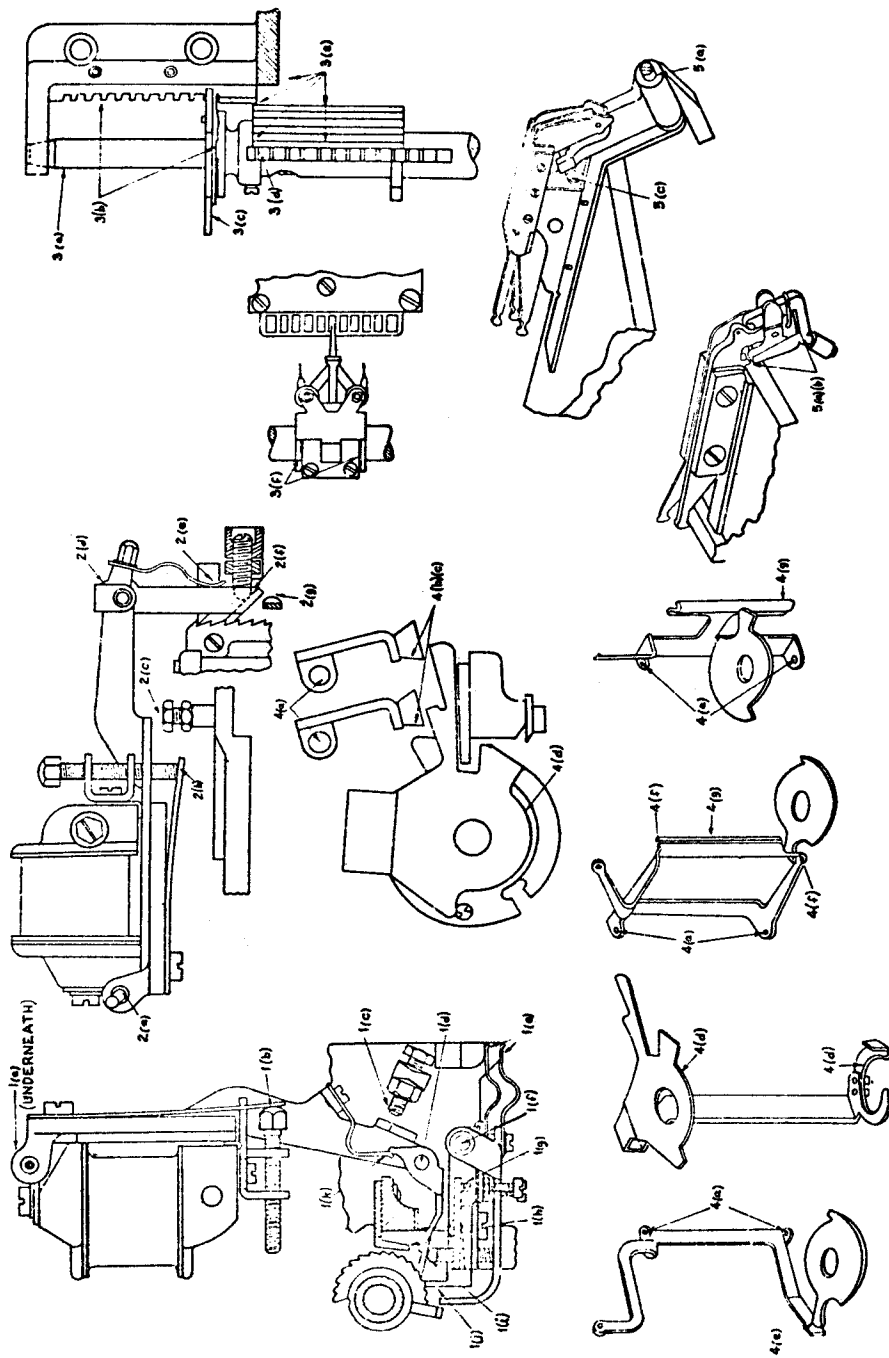


Fig. 1

END.