

CALCULAGRAPHS MODELS 6 AND 30 REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers Models 6 and 30 Calculagraphs.

1.02 This section is reissued to add the requirement and procedure covering the clearance between the card guides and the IBM card, to add Fig. 11, and to omit the information for the replacement of parts now covered in Section 030-102-801.

1.03 Reference shall be made to Section 020-010-711 covering general requirements and definitions for additional information necessary for the proper application of the requirements listed herein.

1.04 *Asterisk (*)*: Requirements are marked with an asterisk when to check for them would necessitate dismantling or dismounting of apparatus, or would affect the adjustment involved, or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons, or its performance indicates that such a check is advisable.

1.05 *One dip of oil* for the purpose of this section is the amount of oil retained on a KS-14164, No. 4 artist's show card brush after being dipped into the oil to a depth of 3/8 inch and then scraped on the edge of the container to remove the surplus oil. There should not be sufficient oil adhering to the brush to form one drop on the end of the bristles.

1.06 *The operated position of an operating lever* is that position in which the lever is moved to either front or rear and the cam is resting on the main plate.

1.07 *The normal (unoperated) position of an operating lever* is that position in which the lever is in the vertical position and the cam is resting on the plunger.

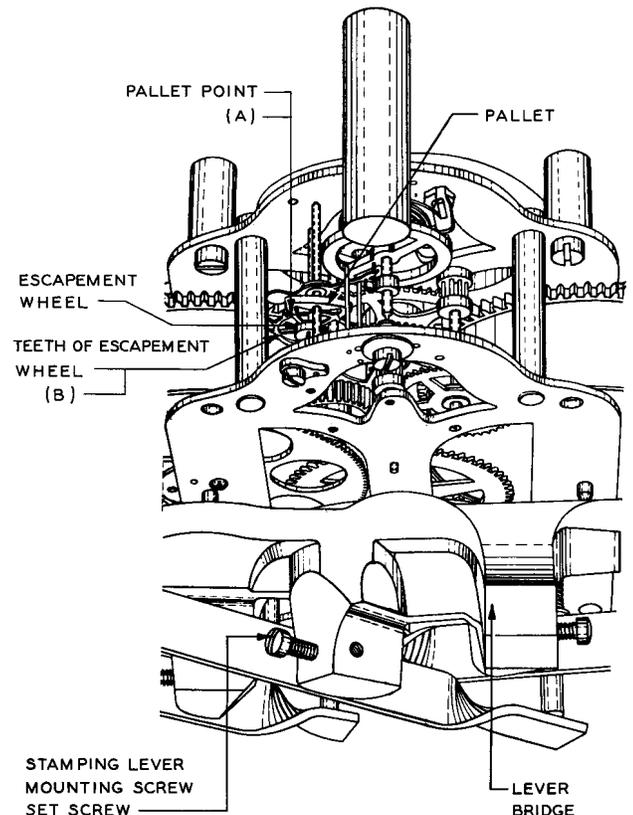


Fig. 1 — Clock Movement — Model 6 Calculagraph

2. REQUIREMENTS

2.01 *Cleaning*: The Calculagraph shall be cleaned in accordance with approved procedures.

2.02 *Lubrication*

(a) The points listed below shall be adequately lubricated with Calculagraph Clock Oil — 152. When lubrication is necessary, one dip shall be sufficient for application to four or five points:

Bearings of clock movement

Pallet points — Fig. 1(A) (Model 6 Calculagraph)

One tooth of the escapement wheel — Fig. 1(B) (Model 6 Calculagraph)

(b) The points listed below shall be adequately lubricated with KS-6232 oil. When lubrication is necessary, two dips shall be sufficient for application to four or five points.

Cams — pivots and bearing points on plungers — Fig. 2(A)

Plungers — sliding bearings and slotted ends — Fig. 2(B)

Stamping levers — pivots and points which bear against stamping shafts — Fig. 2(C)

Stamping shafts — bearing points — Fig. 2(D)

Time-of-day dial, pointer, and intermediate shaft — bearing points — Fig. 2(E)

Pawl, ratchet, and pivots of reverse mechanism — Fig. 2(F)

Caution: Do not lubricate or permit the lubricant to get on the hub of the 120-tooth wheel, the tube or spool of the hour wheel, on the teeth of any wheel except the escapement wheel, or the leaves of any pinion.

(c) Four teeth on the gear associated with the motor pinion shall be lubricated with Calculagraph Clock Oil — 152. When lubrication is necessary, one dip shall be distributed between these points.

(d) **Model 30 Calculagraph:** Fig. 3(A) — The motor bearing shall be adequately lubricated with Calculagraph Synchronous

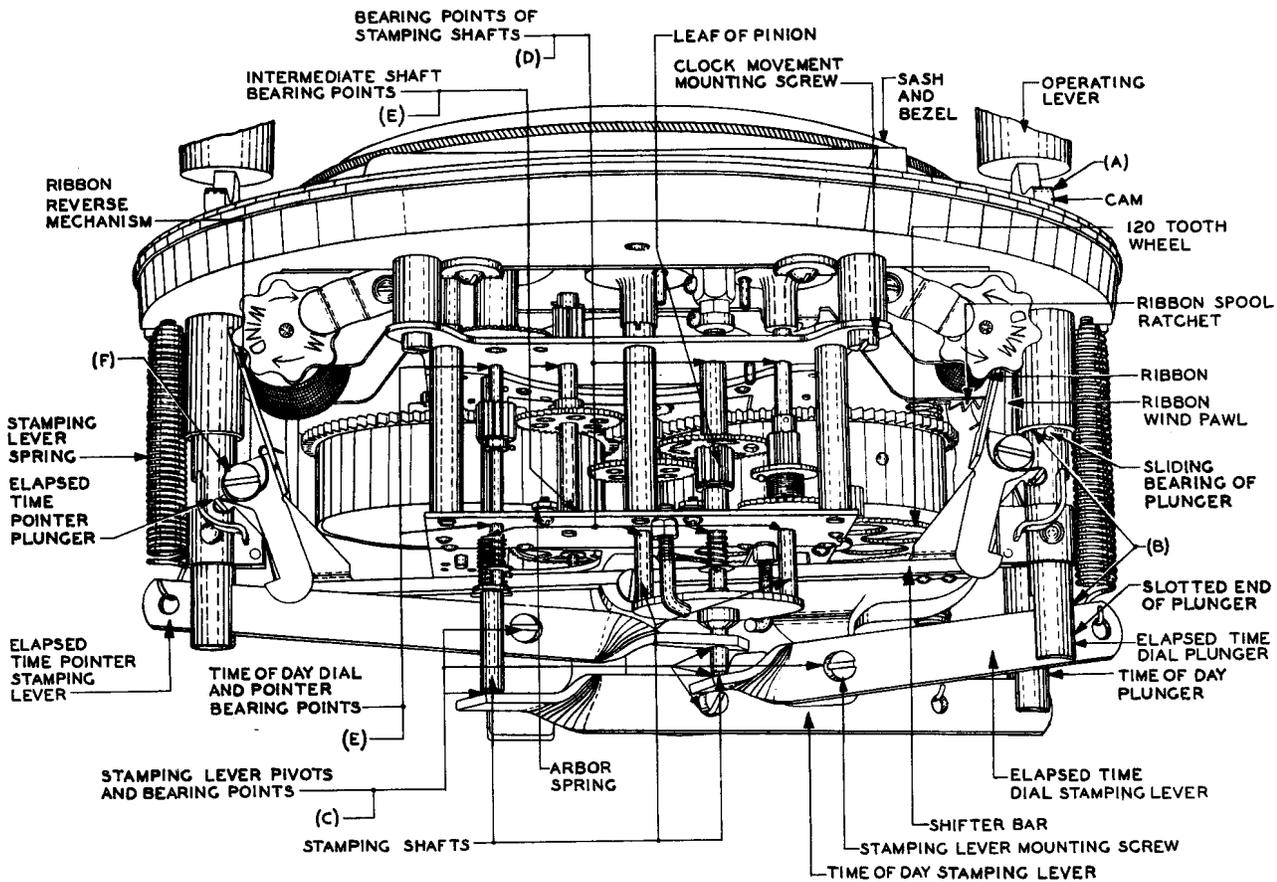


Fig. 2 — Unwound Spool Ribbon Reverse Mechanism — Model 6 Calculagraph

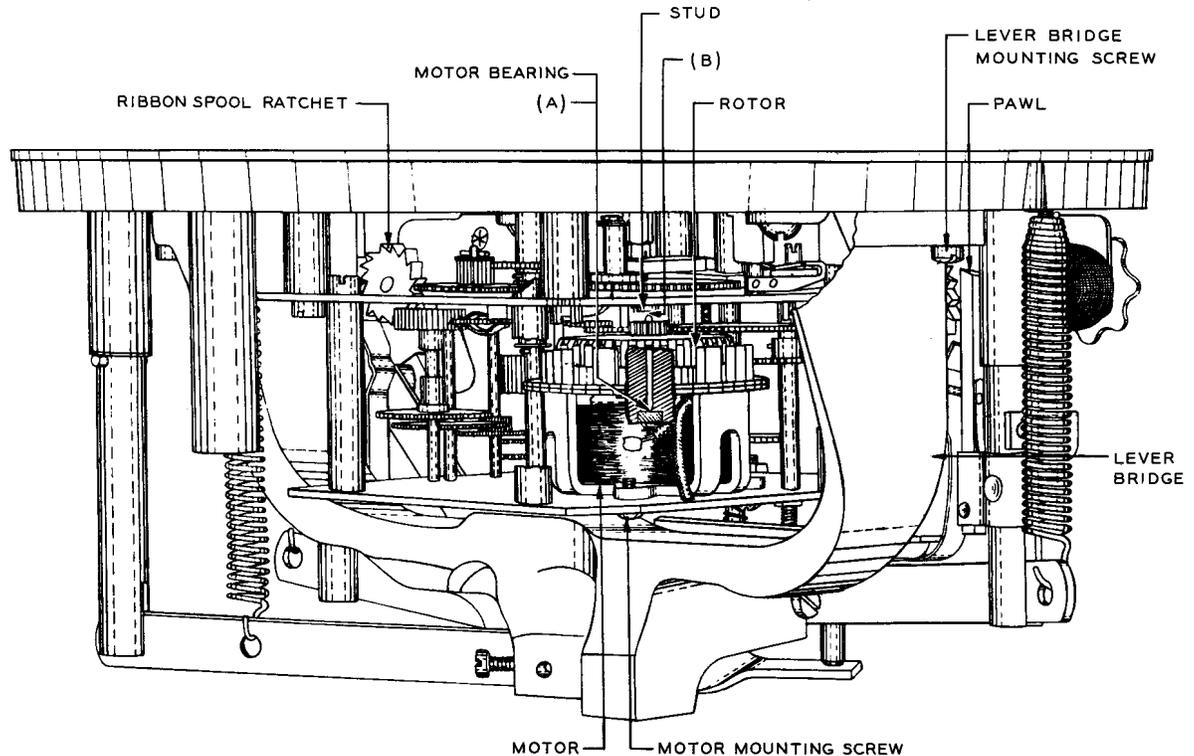


Fig. 3 — Motor Mechanism — Model 30 Calculagraph

Electric Motor Oil — 30-134. When lubrication is necessary, two dips shall be applied.

(e) Recommended Lubrication Intervals:

After turnover, it is recommended that the parts listed in requirements (c) and (d) be lubricated at intervals of 1 year, and the parts listed in requirement (b) be lubricated at intervals of 6 months. These intervals may be extended if periodic inspections have indicated that local conditions are such as to insure that the requirements will be met during the extended interval.

2.03 Record of Lubrication: During the period of installation a record shall be kept of the lubrication of the Calculagraph and this record shall be turned over to the telephone company with the equipment. If no lubrication has been done, it shall be so stated.

2.04 Inking: No ink shall be applied to the ribbon.

2.05 Freedom of Movement

* (a) All moving parts shall be free from bind.

Gauge by feel.

(b) The hour and minute hands shall not interfere with each other or with the dial, the regulator, or crystal in any position.

Gauge by eye.

2.06 Accuracy of Clock Movement

(a) **Model 6 Calculagraph:** The clock movement shall not lose or gain more than 1 minute in 24 hours. This shall be checked over a period of 48 hours.

(b) **Model 30 Calculagraph:** The clock movement shall not gain or lose any time over a period of 48 hours when connected to a power supply regulated for time service.

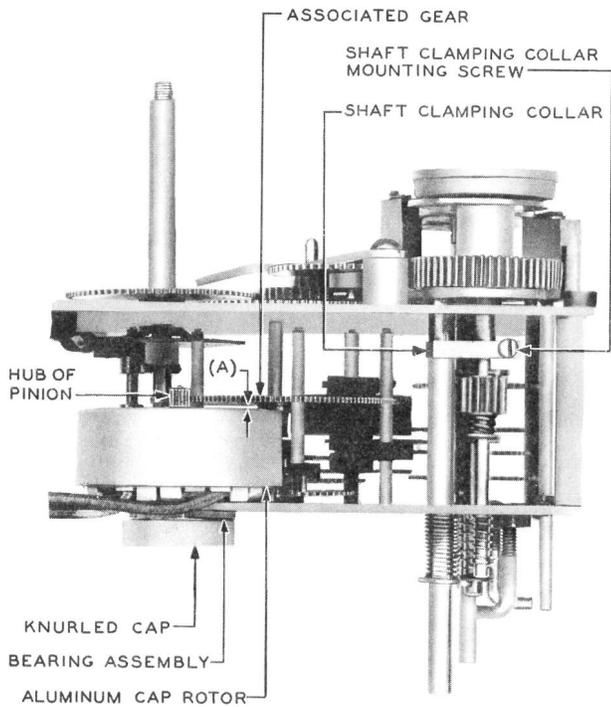


Fig. 4 - Illustrating Motor With Aluminum Cap Rotor

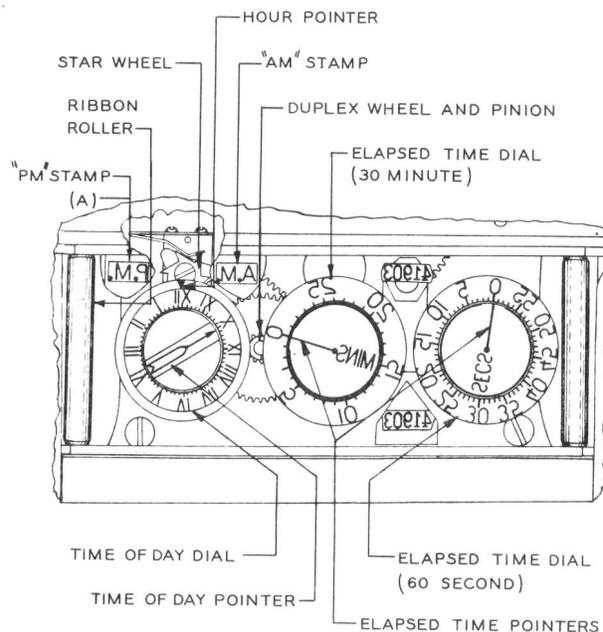


Fig. 5 - Stamping Mechanism - Model 30 Calculagraph Equipped With 30-Minute Elapsed-Time Dial

***2.07 Clearance Between Motor and Associated Parts**

(a) **Motors Equipped With Copper Bar Rotors:** Fig. 3(B) - With the motor shaft resting in its bearing, the clearance between the stud on the clock movement frame and the motor shaft shall be

Min 0.005 inch

Gauge by eye.

(b) **Motors Equipped With Aluminum Cap Rotors:** Fig. 4(A) - With the motor shaft resting in its bearing, the hub of the pinion on the motor rotor shall not touch its associated gear.

Gauge by eye.

2.08 Synchronism of Calculagraphs in Operating Room (Model 30 Calculagraph): The time indicated by the Calculagraph shall

agree within 1/2 minute with all the other Calculagraphs in the operating room.

2.09 Synchronism of Time-of-Day Dial and the Hands: The time registered by the time-of-day dial and the hands of the Calculagraph shall agree within 1 minute.

2.10 Relation Between Elapsed-Time Pointers (Model 30 Calculagraph): With the pointers of the minute and second dials indicating 0, the pointer of the minute dial shall be at or slightly behind the 0 and after an elapsed time of 60 to 65 seconds, the minute pointer shall indicate 1 minute.

Gauge by eye.

2.11 Reversal of AM and PM Stamps: Fig. 5(A), 7(A), and 8(A) - On Calculagraphs equipped with a 12-hour time-of-day dial, the AM and PM stamps shall reverse between 12:00 and 12:02 o'clock. The time of day as printed on the ticket shall be used as the basis for checking this requirement.

2.12 Movement of Stamping Mechanism

(a) **Model 6 Calculagraph:** The stamping mechanism dials and arrows shall rotate in such a manner that an impression made by the dials, followed after an interval of 1 minute by an impression from the arrows, will register 1 on the 5-minute dial and after four succeeding intervals of 1 minute each will register 2, 3, 4, and 0. After the fifth interval, the arrow on the 60-minute dial shall register 5.

(b) **Model 30 Calculagraph:** The stamping mechanism dials and pointers shall rotate in such a manner that an impression made by the dials, followed after an interval of 15 seconds by an impression from the pointers, will register 15 on the 60-second dial and after three succeeding intervals of 15 seconds each will register 30, 45, and 0, respectively. After the fourth interval, the pointer on the 30- or 60-minute dial shall register 1.

(c) The stamping mechanism after having been operated shall restore to normal unrestrained.

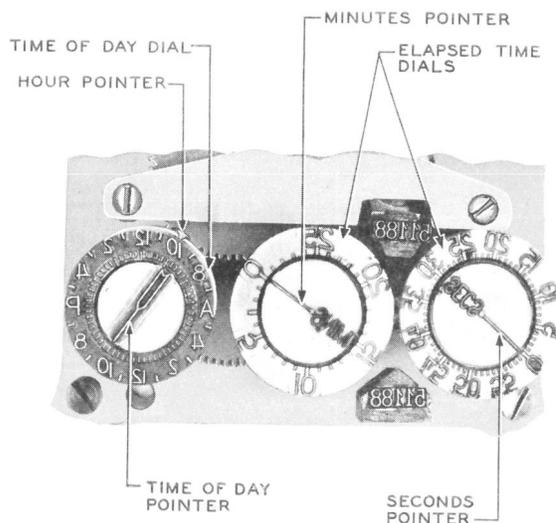


Fig. 6 — Stamping Mechanism — Model 30 Calculagraph Equipped With 30-Minute Elapsed-Time Dial Illustrating 24-Hour Dial

2.13 Operating Lever Movement: The operating levers shall return unaided from their operated to their normal positions.

Gauge by eye.

2.14 Plunger Operation: Fig. 10(A) — The operation of the stamping levers shall give a clear impression of the dials and arrows or pointers when a 0.015-inch gauge is inserted between the cam and main plate with the heel of the operating lever in contact with the gauge.

Use the No. 66D gauge.

***2.15 Position of Ribbon Frame:** The rear rail of the ribbon frame shall be approximately 0.005 inch overflush with main plate.

Gauge by eye with platen holder removed.

2.16 Ticket or Card Entry: Fig. 10(B) and 11(A) — The ticket or card shall enter the ticket slot freely.

Gauge by feel.

2.17 Clearance Between Card Guides and IBM Card: With the IBM card inserted into the ticket slot and one long edge of the card engaging the platen holder, the clearance between the other long edge of the card and both card guides shall be 0.005 inch.

Gauge by eye.

***2.18 Movement of the Ribbon Wind Pawl and Ribbon Spool Ratchet:** Fig. 12(A) — The ribbon wind pawl shall move the ribbon spool ratchet one tooth each time the operating lever associated with the pawl is released from the operated position, except when the ribbon reversing mechanism is operated.

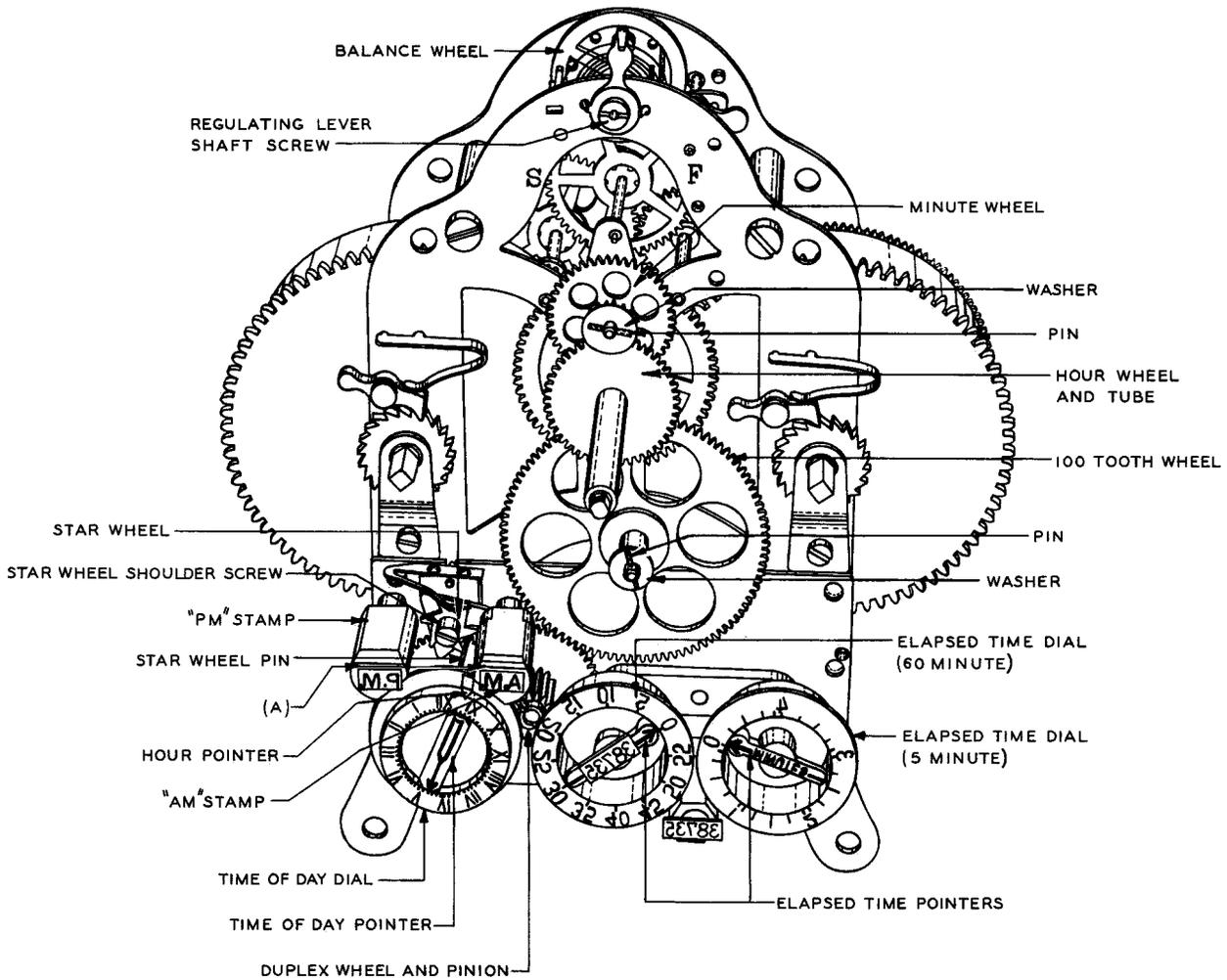


Fig. 7 — Stamping Mechanism — Model 6 Calculagraph

***2.19 Ribbon Reverse Mechanism**

(a) **Unwound Spool Type:** The ribbon reversing mechanism actuated by the unwound spool shall reverse the direction of rotation of the ribbon when there remain on the unwound spool approximately two turns.

Gauge by eye.

(b) **Full Spool Type:** The ribbon reversing mechanism actuated by the full spool shall reverse the direction of rotation when there remain on the unwound spool approximately ten turns.

Gauge by eye.

(c) To check these requirements proceed as follows. Wind the ribbon on the spool until it is nearly full. Then wind the last turn on the spool by means of the operating lever to guard against premature operation of the reversing mechanism.

***2.20 Tension of the Ribbon Spool Brake:**

Fig. 12(B) — The ribbon spool brake shall be so tensioned against the spoolhead that when the operating lever is operated or released quickly no slack will appear in the ribbon.

2.21 Winding (Model 6 Calculagraph): The Calculagraph shall be wound twice a week.

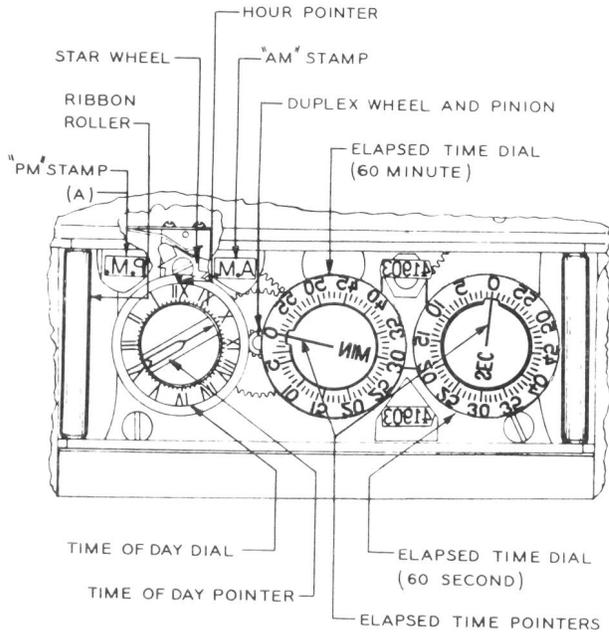


Fig. 8 — Stamping Mechanism — Model 30 Calculagraph Equipped With 60-Minute Elapsed-Time Dial

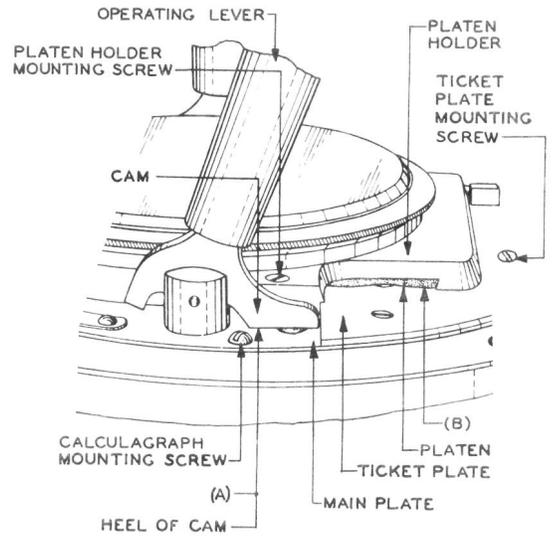


Fig. 10 — Operated Position of Operating Lever

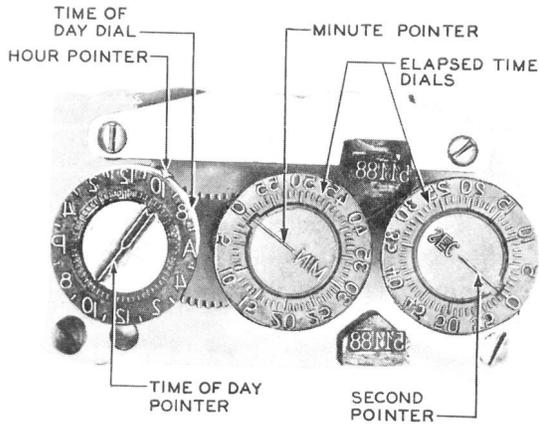


Fig. 9 — Stamping Mechanism — Model 30 Calculagraph Equipped With 60-Minute Elapsed-Time Dial Illustrating 24-Hour Dial

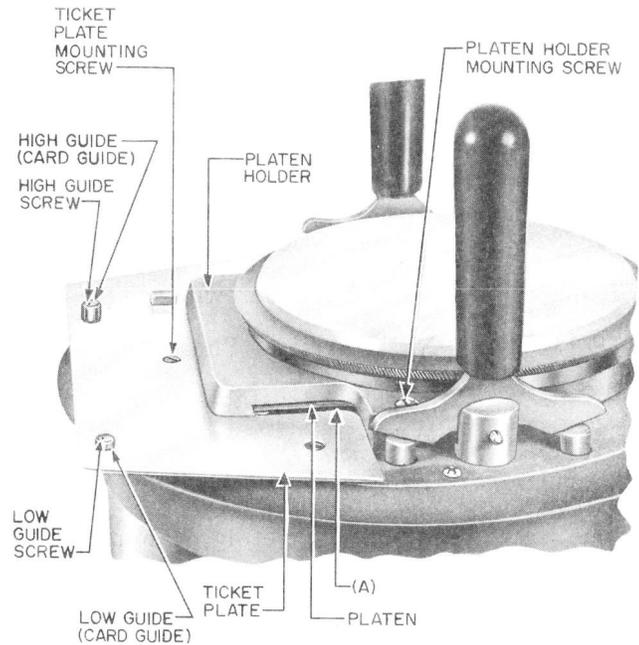


Fig. 11 — Ticket Plate, Platen, and Associated Parts

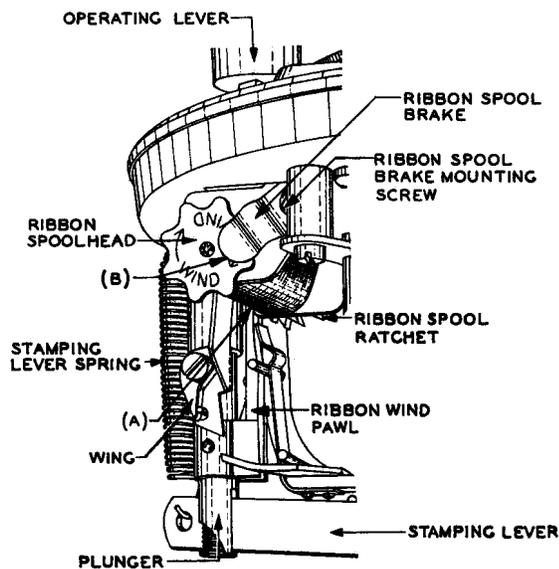


Fig. 12 — Full Spool Ribbon — Reverse Mechanism

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, and Materials

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
485A	Smooth-Jaw Pliers (2 required)
KS-2993	Brush
KS-6320	Orange Stick
KS-6854	3-1/2 Inch Screwdriver
KS-14164	No. 4 Artists Show Card Brush
R-2512	8-Inch Adjustable Single-End Wrench
R-2969	Typewriter Brush
—	4-Ounce Riveting Hammer
—	Long-Nose Pliers (or the replaced 6-1/2 inch P-long-nose pliers)
—	3/32-Inch Drive Pin Punch, L. S. Starrett Co. No. 565 (or equivalent)

CODE OR SPEC NO.

DESCRIPTION

TOOLS

—	B Splicers Scissors (or the replaced electricians scissors)
—	3-inch C Screwdriver (or the replaced 3-inch cabinet screwdriver)
—	4-Inch E Screwdriver (or the replaced 4-inch regular screwdriver)
—	Calculagraph Winding Tool — 135

GAUGES

66D	Thickness Gauge Nest
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MATERIALS

KS-2423 or KS-14666	Cleaning Cloth
KS-6232	Oil
KS-7860	Petroleum Spirits
—	Calculagraph Clock Oil — 152
—	Calculagraph Synchronous Electric Motor Oil — 30-134
—	Hardwood Toothpicks, Flat at One End and Pointed at Other
—	Small Flat Piece of Wood
—	Type Cleaner — Norta
—	String (for tying balance wheel)

3.002 When inserting pins in the shafts, gears, or pinions, take care that they do not interfere with the movement of any part.

3.01 Cleaning (Reqt 2.01)

- (1) Clean the external parts of a Calculagraph with a clean, dry cloth.
- (2) To clean the dial, raise the bezel and proceed as follows. If the dial is metal, clean it with the KS-2993 brush taking care not to bend or disturb the setting of the hands. If the dial is porcelain, wipe it with a cloth moistened with KS-7860 petroleum spirits.

(3) To clean other parts of the Calculagraph proceed as follows. Raise the bezel and remove the hands from the face of the Calculagraph. If the hands are secured in place with a pin, remove the pin with the long-nose pliers and remove the washer and the hands. If the hands are secured by a knurled cap, unscrew the cap and then remove the hands. Remove the platen holder mounting screws with the 4-inch E screwdriver and remove the dial, platen holder, and bezel as a unit. This may be removed more readily by inserting the blade of the 4-inch E screwdriver under the edge of the platen holder at the end of the platen and prying the unit up. In doing this take care not to burr the edge of the platen holder or the surface of the ticket plate.

(4) Clean the platen with a cloth slightly moistened with KS-7860 petroleum spirits, then wipe it with a dry cloth. If the platen is hard, torn, or cracked, remove the platen mounting screws with the 3-inch C screwdriver and replace it with a new one.

(5) Remove the ticket plate mounting screws with the 3-inch C screwdriver and remove the ticket plate. Clean it with a cleaning cloth moistened with KS-7860 petroleum spirits and then dry it with a clean, dry cloth.

(6) Remove the Calculagraph mounting screws with the 4-inch E screwdriver and remove the Calculagraph from the container. Unwind a portion of the ribbon so that the dials are exposed.

(7) The type faces of the stamping dials may be cleaned either with a toothpick as covered in (8) and (9) or with Norton type cleaner as covered in (10).

(8) Cut a slit in a piece of a cloth 4-1/2 inches long and pack it around the dials so that the slit in the cloth is placed over the dials and the cloth is pushed down and under the sides. This will prevent dirt from dropping into the clock mechanism. Remove all gummy substance, lint, and dirt from the dials with a clean toothpick and then clean the dials thoroughly with an R-2969 typewriter brush. Do

not use petroleum spirits or any other liquid when cleaning the dials as the liquid may carry ink and dirt into the shaft bearings causing faulty operation. With the dials satisfactorily cleaned, turn the Calculagraph face down so that the dirt will drop from the cloth. Then with the Calculagraph partially on its side, remove the cloth.

(9) Lift the AM and PM stamps from their positions of rest with the long-nose pliers, and clean them thoroughly with an R-2969 typewriter brush. Take care in cleaning the stamps that dirt does not collect in the vent holes (if provided) as this will interfere with their operation. If dirt collects in the holes, remove it by inserting a toothpick in the hole and forcing the dirt out through the bottom. Where the AM and PM stamps have slots in the under portion, clean the slots by flushing with KS-7860 petroleum spirits applied with a clean toothpick. Then allow to dry and re-mount the stamp.

(10) Remove the Norton from its container. Use approximately one-half a cake and press it down on the type so that it fills all the indentations in the type. Then, starting at one end, roll the Norton into a ball, working it out of the indentations as it is rolled up. If necessary, repeat this operation. Knead the Norton thoroughly and place the Norton in its container for future use.

(11) Thoroughly clean all bearings of the stamping mechanism and clock movement and pinions by flushing them with KS-7860 petroleum spirits applied with a toothpick. Operate the operating lever a number of times and reflush.

(12) Remove the petroleum spirits and all the old oil from the parts with a clean cloth wrapped around a small flat piece of wood.

(13) If the stamping lever bearings at the lever bridge or plunger screw are dirty, unhook the stamping lever spring from the stamping lever. To do this it may be necessary to straighten the hook of the spring with the long-nose pliers before removing the

spring. Then loosen the stamping lever mounting screw setscrews with the 3-inch C screwdriver and remove the mounting screws with the 4-inch E screwdriver. Remove all dirt and gummy oil from the stamping levers with a cloth moistened with KS-7860 petroleum spirits. Then clean the tapped holes in the lever bridge and the slots in the plunger with an R-2969 typewriter brush. Exercise care in cleaning the parts not to allow the dirt to be deposited on the clock or stamping mechanism. After cleaning, reassemble the parts in place.

(14) Allow the parts to dry and then lubricate as covered in 3.02.

(15) To clean the motor bearing of motors equipped with copper bar rotors, remove the stamping lever springs as covered in (13) and remove the lever bridge mounting screws with the 3-inch C screwdriver. Remove the lever bridge and plungers. Remove the motor mounting screws with the 3-inch C screwdriver and remove the motor. Remove the rotor from the motor. When necessary, flush out the bearing with Synchronous Electric Motor Oil — 30-134 applied with a clean toothpick. When the bearing is satisfactorily cleaned, lubricate and assemble as covered in 3.02.

(16) To clean the motor bearing of motors equipped with aluminum cap rotors, remove the lever bridge and plungers as covered in (13). Remove the knurled cap from the bearing assembly and remove the bearing assembly with the R-2512 wrench. Clean the shaft with a cloth moistened with KS-7860 petroleum spirits taking care not to damage the shaft. To facilitate this operation, wrap the cloth around a KS-6320 orange stick. Allow the petroleum spirits to dry and coat the shaft with a film of Synchronous Electric Motor Oil — 30-134. Lubricate the motor bearing as covered in 3.02. Remount the knurled cap securely in place. Engage the pinion on the rotor with the associated gear as covered in 3.06. Hold the motor in place and mount the bearing assembly over the shaft. Securely tighten the bearing assembly against the clock movement frame with the R-2512 wrench.

(17) After the Calculagraph is cleaned and lubricated, rewind the slack ribbon on the spool. Then remount the dial, platen holder, and bezel as a unit and remount the ticket plate. Then insert and tighten the mounting screws securely. Remount the hour and minute hands and synchronize the hands with the time-of-day dial as covered in 3.09.

3.02 Lubrication (Reqt 2.02)

(1) When lubricating the Calculagraph, remove it from the case as covered in 3.01.

(2) Lubricate the various parts with the proper oil applied with the KS-14164 brush. Distribute the oil retained by the brush after each dip as specified.

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(3) To lubricate the motor bearing of motors equipped with copper bar rotors, unhook the stamping lever springs from the stamping levers and remove the lever bridge mounting screws as covered in 3.01. Remove the lever bridge from the main plate and the plungers from the sockets. Remove the motor mounting screws with the 3-inch C screwdriver and remove the motor. Remove the rotor from the motor and lubricate the motor bearing as specified. Remount the rotor and allow the motor to run for 1 hour. Remove the rotor again. Oil appearing at the breather hole is an indication of adequate lubrication. Wipe off the excess oil with a cloth. Remount the rotor and then the motor and securely tighten the motor mounting screws. Take care when doing this to engage properly the gear on the motor shaft with the main gear. Remount the lever bridge and assemble the parts as covered in 3.09.

(4) To lubricate the motor bearing of motors equipped with aluminum cap rotors, remove the lever bridge and plungers as covered in (3). Remove the knurled cap from the bearing assembly and lubricate the motor by wiping the lubricant on the inside of the knurled cap. Securely remount the knurled cap in place and remount the lever bridge and plungers and assemble the parts as covered in 3.09.

3.03 Record of Lubrication (Reqt 2.03)
(No procedure)

3.04 Inking (Reqt 2.04)

(1) Do not apply any ink to the ribbon as it may interfere with the operation of the Calculagraph. If the ribbon is worn or exhausted of ink, replace it as covered in Section 030-100-801. At this time also note whether lubrication of the parts is necessary.

3.05 Freedom of Movement (Reqt 2.05)

(1) If binding occurs, clean the bearings or pivots as covered in 3.01.

(2) If the minute hand binds on the hour hand, it may be due to the hour hand not being satisfactorily positioned on the hour tube. In this case, depress the hour hand at the hub so that it clears the minute hand. If the hour hand binds on the dial, raise the hand on the hour tube until it clears the dial. Take care not to allow the hour hand to bind on the minute hand. If the hands still bind on the dial, adjust the hand at fault as required until a satisfactory clearance is obtained.

(3) If the minute hand binds on the crystal, adjust it until it clears the crystal. Take care not to bend the hand to such an extent that it binds either on the other hand or on the dial.

(4) If the 24-hour dial appears to bind, the trouble may be due to the gear of the synchronizing attachment being too high and resting on the gear with which it is supposed to mesh or to bind of the 24-hour dial and pointer shafts. If the gears do not mesh satisfactorily, raise the synchronizing gear slightly and rotate it enough to permit it to mesh with its associated gear; release the gear and it will return to its proper position. Make sure that requirements 2.08 and 2.09 are met. If they are not, synchronize the parts as covered in 3.08 and 3.09. If the 24-hour dial and pointer shafts appear to bind where the clamp has the screw at the center, back off the screw with the KS-6854 screwdriver from one-quarter to one-half turn.

3.06 Accuracy of Clock Movement (Reqt 2.06)

3.07 Clearance Between Motor and Associated Parts (Reqt 2.07)

(1) If the clearance between the parts is not satisfactory, refer the matter to the supervisor.

(2) If on Model 6 Calculagraphs the clock movement cannot be regulated satisfactorily by means of the clock regulator, proceed as covered in (1).

(3) If on Model 6 Calculagraphs the clock does not keep accurate time, it may also be due to dirty bearings, to faulty connections, or to poor alignment of the motor pinion and its associated gear. If the bearings are dirty, clean and lubricate them as covered in 3.01 and 3.02. If the clock still fails to keep accurate time, check the connections between the connecting block in the case and the motor. If the trouble is due to poor alignment between the pinion on the motor and its associated gear, loosen the bearing assembly as covered in 3.01 and shift the position of the motor as required. To insure good alignment of the parts, the teeth of the gear and pinion should engage at least one-half the depth of the teeth but should not engage the full depth. With the teeth satisfactorily aligned, securely tighten the bearing assembly in this position.

3.08 Synchronism of Calculagraphs in Operating Room (Reqt 2.08)

3.09 Synchronism of Time-of-Day Dial and the Hands (Reqt 2.09)

(1) To synchronize a Calculagraph with other Calculagraphs in the operating room, proceed as follows. Take an impression of the time-of-day dial. Note whether the time indicated by the hands agrees with the stamped record. If the stamped record agrees with the time indicated by the hands of the clock but the stamped record and hands do not agree with the other Calculagraphs in the operating room, raise the sash and bezel and move the hands in a clockwise direction to the correct position. If the hands of the clock agree with the time indicated by the other Calculagraphs in the operating room but the stamped record

does not, or if the stamped record agrees with the other Calculagraphs but the hands of the clock do not, proceed as covered in (2) to (10), inclusive, when the time-of-day pinion is secured to the time-of-day shaft by a pin, or proceed as covered in (11) when the time-of-day pinion is held in place by a friction spring.

(2) When the time-of-day dial and the hands of the Calculagraph are synchronized within 2 minutes, proceed as covered in (3); and when the dial and the hands are not synchronized, within 2 minutes, proceed as covered in (4) to (10), inclusive.

(3) *If the difference between the minute hand and the time-of-day dial is 2 minutes or less*, remove the minute hand and grasp the hub of the hand with one pair of No. 485A smooth-jaw pliers and the long portion of the hand as near as possible to the hub with another pair of No. 485A smooth-jaw pliers. Adjust the hand slightly to the right or left as required to bring it into its correct position. Take care in doing this not to mar the finish of the hand. In no case should this bend be such that the angle the center line of the slot in the hub makes with the center line of the long portion of the hand be more than 2-minute scale divisions. This may be checked by lining up the minute shaft so that the center line through its long axis coincides with "12" and then place the minute hand on the minute shaft. Under this condition the minute hand should not point away from "12" more than 2 minutes. Allow the Calculagraph to operate under its own power for approximately 2 minutes and take another impression of the time-of-day dial.

(4) *If the difference between the minute hand and the time-of-day dial is greater than 2 minutes*, remove the hands, platen holder, sash, and bezel as covered in 3.01. Remove the Calculagraph from the case and place it on its side so that it is resting on the operating levers and the edge of the main plate.

(5) On the Model 6 Calculagraph, stop the clock movement by looping a string through the balance wheel and tying the string to an adjacent stud or post on the clock

movement frame. Take care in doing this not to place a strain on the balance wheel. On the Model 30 Calculagraph, disconnect the power.

(6) Unhook the stamping lever springs from the stamping levers as covered in 3.01. Remove the lever bridge and clock movement mounting screws with the 3-inch C screwdriver and then remove the lever bridge and clock movement. Then remove the plungers from their sockets.

(7) Remove the pin from the minute wheel, which is in mesh with the main shaft gear and hour tube, with the long-nose pliers, exercising care not to bend the shaft. Remove the pin from the shaft of the 100-tooth wheel with the long-nose pliers, exercising care not to bend the shaft. Remove the washer and unmesh the 100-tooth wheel. Shift the position of the time-of-day pinion in a direction to synchronize the time-of-day pointer and minute hand one tooth for each 4 minutes that they are out of synchronism. With the parts then within 2 minutes of being synchronized, proceed as covered in (3).

(8) Remesh the 100-tooth wheel and remount the washer on the 100-tooth wheel securing it in place with the pin. Remount the clock movement on the main plate and securely tighten the mounting screws. On Calculagraphs provided with cylindrical spacing blocks for the movement mounting screws, it is essential, in remounting the movement on the main plate, that the grooves in the spacing blocks are toward the front of the movement, that is, nearest the stamping mechanism. Remount the lever bridge and insert and securely tighten the lever bridge mounting screws. Loosen the time-of-day stamping lever mounting screw setscrews and remove the stamping lever mounting screws with the 3-inch C screwdriver and remove the stamping lever. Place the time-of-day plunger in its socket and remount the stamping lever on the lever bridge, inserting one end of the lever in the slot in the plunger. Insert and tighten the mounting screws. After remounting the time-of-day stamping lever, remove the elapsed-time dial stamping lever and elapsed-time pointer stamping lever in the manner covered above. Remount the plungers in their respec-

tive sockets with the pawls in position to engage their respective ratchets. Then remount the elapsed-time dial stamping lever and the elapsed-time pointer stamping lever in the slots of their respective plungers. Insert and securely tighten the mounting screws. Take care when making the reassembly covered above that the levers do not bind on their shafts or at the mounting screws. After ascertaining that the levers do not bind, securely tighten the setscrews. Remount the Calculagraph in the case and place the platen holder assembly on the main plate.

(9) Take an impression of the time-of-day dial and then mount the hands so that they correspond with the impression just made. Securely tighten the knurled cap or washer and pin that hold the hands in place.

(10) When the hands and time-of-day dial are in synchronism or within the specified limit, restore the Calculagraph to service by connecting the power if motor driven or by releasing the balance wheel by cutting the string with the B splicers scissors if spring driven. Take care in doing this not to place a strain on the wheel.

(11) To synchronize a clock that is equipped with a synchronizing attachment, remove the Calculagraph from the case. Hold the Calculagraph with the other Calculagraph with the fingers and grasp the end of the shaft with the No. 485A smooth-jaw pliers, and turn the shaft as required. Connect the power and allow the clock to operate approximately 2 minutes. Take an impression of the time-of-day dial. After the hands of the clock and the stamped record are synchronized, synchronize the Calculagraph with the other Calculagraphs in the operating room as covered in (1).

3.10 Relation Between Elapsed-Time Pointers (Reqt 2.10)

(1) If the relation between the elapsed-time pointers is not satisfactory, refer the matter to the supervisor.

3.11 Reversal of AM and PM Stamps (Reqt 2.11)

(1) If the AM and PM stamps do not reverse satisfactorily, it is due either to a deposit of dirt in the star wheel bearing which prevents the operation of the star wheel, or to the star wheel pin not engaging the star wheel, or to the star wheel pin being bent so that the stamps do not reverse within the limits. To correct these conditions, proceed as follows.

(2) Remove the Calculagraph from the container, remove the hands, platen holder, sash, and bezel as covered in 3.01. Unwind a portion of the stamping ribbon and fold it back so that the dials are exposed.

(3) If the star wheel is dirty, proceed as follows. Remove the clock movement as covered in 3.09. Then remove the star wheel shoulder screw with the KS-6854 screwdriver and remove the shoulder screw and star wheel. Clean the star wheel by wiping it with a cloth moistened with KS-7860 petroleum spirits. Replace the star wheel and securely tighten the shoulder screw. Then lubricate the star wheel as covered in 3.02 and reassemble the clock movement as covered in 3.09.

(4) If the star wheel pin does not engage the star wheel, replace and secure the minute hand in place on the shaft and move the hand so that the time-of-day dial indicates 6:00 o'clock. Then bend the star wheel pin outward with the long-nose pliers. Turn the minute hand until the time-of-day dial indicates 11:58 o'clock and then let the spring or motor advance the hands and note that the pin fully engages the star wheel.

(5) If the AM and PM stamps do not reverse between 12:00 o'clock and 12:02 o'clock, replace and secure the minute hand on the shaft. Move the hand in a clockwise direction until the time-of-day dial indicates 11:58 o'clock. Then let the spring or motor advance the hands until the star wheel reverses the AM or PM stamps. With the star wheel in this position, the time-of-day dial should indicate some time between 12:00 and 12:02

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o'clock. If the time indicated is not satisfactory, bend the star wheel pin as required with the long-nose pliers. To do this, move the minute hand in a clockwise direction until the time indicated on the time-of-day dial is 6:00 o'clock. If the AM and PM stamps reverse before 12:00 o'clock, bend the pin slightly to the left (against the direction of rotation) or the right if the stamps reverse after 12:02 o'clock.

(6) If satisfactory reversal of the AM and PM stamps cannot be obtained, consideration should be given to the replacement of the star wheel and hour wheel spool assembly as covered in Section 030-100-801.

(7) With the stamps satisfactorily adjusted, remount and secure the parts that were removed as covered in 3.01.

3.12 *Movement of Stamping Mechanism* (Reqt 2.12)

(1) If the movement of the dials is not satisfactory or if the dials do not return to normal after being operated, it may be due to dirt collecting in the bearings, or to the stamping levers binding on the shaft or lever bridge. If the bearings are dirty, clean them as covered in 3.01.

(2) If a dial does not return to normal, it may be due to its associated stamping lever binding on the mounting screw or on the shaft. To correct, loosen the stamping lever mounting screw setscrew and stamping lever mounting screw as required with the 3-inch C screwdriver and shift the stamping lever as required. Then tighten the setscrew securely in place.

(3) If the dials still do not operate satisfactorily, the arbor spring may be jammed preventing the dial from operating or releasing. To correct, remove the arbor spring screw with the KS-6854 screwdriver and remove the nut and screw. Remove the arbor spring and adjust it as required with the long-nose pliers. Remount the spring and securely tighten it in place, exercising care not to allow the spring to have any lateral pressure against the arbor.

(4) If the dials still do not operate satisfactorily, return the Calculagraph for repairs in accordance with local instructions.

3.13 *Operating Lever Movement* (Reqt 2.13)

(1) If the operating lever does not operate or release satisfactorily, it is probably due to dirt collecting on the operating level bearing, or to the stamping lever spring being distorted. If the operating lever bearings are dirty, clean them as covered in 3.01.

(2) If the stamping lever spring is distorted, replace the spring.

3.14 *Plunger Operation* (Reqt 2.14)

(1) If a clear impression of each dial and pointer is not obtained when the operating lever is operated, remove the Calculagraph from the container, remove the stamping lever spring from the stamping lever, and loosen the stamping lever mounting screw setscrew, and remove the stamping lever mounting screw as covered in 3.01.

(2) Remove the stamping lever from the slot in the plunger and turn the plunger screw in a counterclockwise direction one or more half turns with the 3-inch C screwdriver. Remount the lever in the slot and remount and securely tighten the stamping lever mounting screw and the stamping lever mounting screw setscrew. Remount the stamping lever spring on the lever. Insert the gauge under the heel of the cam and take another impression of the stamping mechanism. If the impression is not satisfactory, readjust as covered above until a satisfactory impression is obtained.

(3) If irregular impressions of the stamping mechanism are obtained, remove the platen holder as covered in 3.01 and note whether the platen is worn or bulged. In either case, give consideration to replacing it. If it is satisfactory, give consideration to banking the surface of the platen holder under the platen.

3.15 Position of Ribbon Frame (Reqt 2.15)

(1) If the position of the ribbon frame is not satisfactory, remove the hands, bezel, platen holder, and ticket plate as covered in 3.01, and remove the lever bridge and clock movement as covered in 3.09.

(2) Rest the upper surface of the main plate on a smooth solid surface and proceed as follows. Place the 3/32-inch drive pin punch on the long straight portion of the ribbon frame rear rail near one of the mounting lugs and strike the punch sharply with the 4-ounce riveting hammer. Repeat this operation near the other mounting lug. Repeat the above operation until the rear rail of the ribbon frame is approximately 0.005 inch overflush with the main plate.

3.16 Ticket or Card Entry (Reqt 2.16)

(1) If the clearance between the platen and the ticket plate or between the platen and the ribbon is not satisfactory, it is probably due to the platen being old or cracked. Remove the hands from the face of the Calculator and remove the platen holder as covered in 3.01. If the platen is old or cracked, replace it as covered in Section 030-100-801.

(2) If the platen is satisfactory, a ticket gate spring is probably defective. In this case, remove the ticket plate mounting screws and replace the ticket plate.

3.17 Clearance Between Card Guides and IBM Card (Reqt 2.17)

(1) **Low Guide:** If the clearance between the low guide and an IBM card is not satisfactory, slightly loosen the low guide mounting screw with the KS-6854 screwdriver. Insert a card in place. Position the guide as required. While holding the guide in this position, tighten the screw securely.

(2) **High Guide:** If the clearance between the high guide and an IBM card is not satisfactory, remove the ticket plate mounting screws with the 3-inch C screwdriver and remove the ticket plate. Slightly loosen the high

guide mounting screw with the KS-6854 screwdriver. Place the ticket plate in position. Insert a card in place. Position the guide as required. While holding the guide in this position, remove the ticket plate. Tighten the guide mounting screw securely. Remount the ticket plate and insert and tighten the mounting screws securely.

3.18 Movement of the Ribbon Wind Pawl and Ribbon Spool Ratchet (Reqt 2.18)**3.19 Ribbon Reverse Mechanism** (Reqt 2.19)**3.20 Tension of the Ribbon Spool Brake** (Reqt 2.20)

(1) If the operation of the ribbon wind pawl is not satisfactory, adjust the end of the arm as required with the long-nose pliers.

(2) In case the length of the pawl is not satisfactory, replace the pawl, spring, and socket.

(3) **Unwound Spool Ribbon Reverse Mechanism:** If the operation of the ribbon reverse mechanism is not satisfactory, the wing retractile spring is either defective or the wing is not bearing satisfactorily on the spool, or the prongs of the ribbon clamp are extending over the edge of the slot in the shaft. If the spring is defective, remove it from the wing bearing screw with the long-nose pliers and replace it. If the position of the wing is not satisfactory, adjust it as required with the long-nose pliers. If the prongs of the ribbon clamp are extending over the edge of the slot in the shaft, position the clamp so that the straight portion of the clamp is upwards and the prongs clear the slot in the shaft.

(4) **Full Spool Ribbon Reverse Mechanism:** If the operation of the ribbon reverse mechanism is not satisfactory, adjust the end of the wing as required with the long-nose pliers.

(5) **Ribbon Spool Brake:** If the ribbon spool brake is not tensioned satisfactorily, remove the brake mounting screw with the

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3-inch C screwdriver and remove the brake. Adjust as required with the long-nose pliers. Then remount the brake and insert and securely tighten the mounting screw.

(6) *Twisting of Ribbon:* If twisting of the ribbon occurs, even though the tension of the ribbon spool brake is satisfactory, the trouble may be due to the ribbon frame being distorted or to worn ribbon roller bearing. In

this case, give consideration to replacing the frame as covered in Section 030-100-801.

3.21 *Winding* (Reqt 2.21)

(1) To wind the Calculagraph, raise the bezel and insert the Calculagraph winding tool—135 in the keyhole and turn the main spring as required. Take care not to wind the spring too tight or the spring may be broken.