

CALCULAGRAPHS
MODELS 6 AND 30 AND KS-7769 (MODEL 33)
OPERATING METHODS

1. GENERAL

1.01 This section covers the operating methods used to ensure a satisfactory operation of Models 6 and 30 and KS-7769 (Model 33) Calculagraphs.

1.02 Information on the method of checking the operation of Calculagraphs will be found under the following headings.

- A. Correctness of Time
- B. Winding of Model 6 Calculagraph
- C. Relation Between Elapsed Time Pointers
- D. Accuracy of Elapsed Time Stamps
- E. Reversing the Direction of Ribbon Travel and Advancing the Ribbon
- F. Stamping
- G. Operation of AM and PM Stamps
- H. New or Shop Repaired Calculagraphs
- I. Automatic Transfer of Electrically Driven Calculagraphs to the Reserve Power Supply
- J. Reserve Motor-Alternator

1.03 When the operating methods covered herein are applied and defects which cannot be corrected at the switchboard position are noted, the Calculagraph should be replaced by one in good operating condition. The Calculagraph that was removed should then be reconditioned as required.

1.04 To avoid smudging the platen with ink, it is important that a ticket or sheet of paper be placed in the ticket slot whenever there is occasion to move an operating lever from its normal position, or whenever the Calculagraph is removed from the switchboard.

2. LIST OF TOOLS AND TEST APPARATUS

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
KS-7769L3	Ribbon Winding Key
KS-7769L4	Hand Setting Key
—	No. 135 Calculagraph Winding Tool
—	4-inch Regular Screwdriver
TEST APPARATUS	
—	Watch equipped with a second hand

3. METHOD

A. Correctness of Time

3.01 General — All Calculagraphs: Compare the time indicated by the Calculagraph with the time of a watch known to be indicating the correct time. Reset any Calculagraph found to be more than 1/2 minute fast or slow.

3.02 Setting Hands — Models 6 and 30 Calculagraphs: When it is necessary to set a Calculagraph, raise the crystal and turn the minute hand manually. To maintain agreement between the hands and the time-of-day stamp, the final movement of the hands should always be a movement in the clockwise direction. If the Calculagraph is fast, turn the hands back as covered in 3.04 to an indicated time at least 5 minutes earlier than the correct time and then advance them. As there is some backlash in the gear train, the minute hand should be set about 1/2 minute faster than the correct time. When so set, the clock movement catches up to the setting of the hands and time-of-day stamp about 1 minute after the Calculagraph was set and thereafter the time as indicated and as stamped should be correct.

3.03 Setting Hands — KS-7769 (Model 33) Calculagraph:

When resetting, if the second hand is fast or slow, it should be reset first. This is done by inserting the longer end of the KS-7769L4 hand setting key into the hole to the right of the clock face and pressing the key down until the shoulder rests against the face plate. Set the second hand and smartly withdraw the key. To set the minute and hour hands, insert the shorter end of the key and press down as before. By applying very gently a slight turning force first one way and then the other, determine the amount of backlash between the movement and the hands. If the Calculagraph is fast, set it back to an indicated time at least 5 minutes earlier than the correct time. In all cases, then advance the hands to an indicated time faster than the correct time by the amount of the backlash between the movement and the hands. Finally, very gently turn the hands back to eliminate the backlash. The hands should then and from then on show the correct time. The minute hand should cross the minute markings as the second hand starts each new minute. Under this method, the time-of-day stamp should not be more than a fraction of a minute fast for some seconds until the movement closes up all backlash.

3.04 Setting Hands Backward: Subject to the precautions covered herein, the hands of any Calculagraph may be turned in a counterclockwise direction when such procedure would facilitate testing or setting. However, on those models not equipped with the 24-hour time-of-day dial, the mechanism controlling the transfer of the AM and PM stamps is not reversible, and care is therefore necessary, to guard against disturbing the adjustment of this mechanism. Care is also necessary to ensure that, after a Calculagraph has thus been set, the subsequent transfer from AM to PM, or vice versa, will occur when the hands pass through the interval where transfer should occur. To avoid disturbing the adjustment, do not start to turn the hands backward from a time between 11:58 and 12:05. In such cases, first advance them to 12:10 or later. To guard against subsequent failure to transfer, after the hands have been turned back through the transfer interval to an earlier time, always continue to turn them back at least as far as 11:00.

3.05 When any corrections for time are being made, make sure that the hands do not interfere with each other or rub against the crystal or face. At this time, check that the crystal is not loose, chipped or cracked, that the mounting screws which secure the Calculagraph in its case are tight, that slotted screws are not burred, and that the Calculagraph case is securely fastened in place. Any screws which present sharp edges or are badly worn should be replaced. Where the mounting screws have unslotted knurled heads, they should be tightened with the fingers only.

3.06 Regulating Spring-driven Calculagraphs:

Any spring-driven Calculagraph which gains or loses more than 1 minute per day should be regulated. In order to facilitate this regulation, a record should be made whenever a spring-driven Calculagraph is reset or regulated. This record should contain the time of day and date when the adjustment is made together with the amount by which the Calculagraph was fast or slow and a notation of any change made in the setting of the regulator. A Calculagraph which has stopped before the springs have run down or which cannot be regulated to keep correct time within the permissible gain is usually in need of repairs, cleaning, or lubricating.

3.07 Regulating Electrically Driven Calculagraphs:

Any electrically driven Calculagraph which runs slower than others operated from the same circuit, is usually in need of repairs, cleaning, or lubrication.

B. Winding of Model 6 Calculagraph

3.08 Exercise care when winding the springs not to force them by winding too tightly. To avoid forcing, winding should not be continued beyond the point where resistance to further winding begins to increase rapidly. This point is located about a half turn short of the fully wound position. Use the No. 135 Calculagraph winding tool.

C. Relation Between Elapsed Time Pointers**3.09 Model 30 and KS-7769 (Model 33) Calculagraphs:**

Place a ticket in the ticket slot, pull both the right- and left-hand levers forward simultaneously and release them, noting from the second hand of the checking watch the time the levers are operated. Remove the ticket. The seconds pointer shall indicate 0, and

the minute pointer shall be at or slightly behind 0. Replace the ticket. After an elapse of 60 to 65 seconds from the time of the above stamping, pull the left-hand lever forward and release it. Remove the ticket. The minute pointer shall indicate 1 minute of elapsed time.

D. Accuracy of Elapsed Time Stamps

3.10 Model 6 Calculagraph: Place a ticket in the ticket slot, pull the right-hand lever forward and release it, noting from the second hand of the checking watch the time the lever is pulled forward. At the end of 1 minute, pull the left-hand lever forward and release it. Reoperate the left-hand lever at the end of the second, third, fourth, and fifth minute, and remove the ticket. If the last impression of the pointer is noticeably out of agreement with the zero mark on the elapsed time 5-minute dial, or if the impressions do not show correctly the elapsed time, either the elapsed time dials are not turning freely or the relation between the dial and pointer is not satisfactory. If the shafts of the elapsed time dials are equipped with flat-type arbor springs, it is probable that these are causing the inaccuracy. If the springs show any indication of being bent or displaced they should be replaced.

3.11 Model 30 and KS-7769 (Model 33) Calculagraphs: Place a ticket in the ticket slot. When the second hand passes a convenient point, pull the right-hand lever forward and release it. When exactly 15 seconds have elapsed, pull the left-hand lever forward and release it. Reoperate the left-hand lever at the end of 30, 45, and 60 seconds, then remove the ticket. Repeat the above operations with another ticket, pulling the left-hand lever forward at the end of 1, 2, 3, 4, and 5 minutes. If the impressions do not show correctly the elapsed time, either the elapsed time dials are not turning freely or the relation between the dial and pointer is not satisfactory. If difficulty is experienced in reading the ticket, it may be due to eccentricity of the dials and pointers. In such cases, replace both the dial and pointer at fault. If the shafts of the elapsed time dials are equipped with flat-type arbor springs, it is probable that these are causing the inaccuracy. If the springs show any indication of being bent or displaced, they should be replaced.

E. Reversing the Direction of Ribbon Travel and Advancing the Ribbon

3.12 Ribbon Reverse Mechanism: Operation of the ribbon reverse mechanism is controlled by the number of turns of ribbon remaining on one of the two ribbon winding spools. There are two different types of ribbon reverse mechanisms, the unwound spool type where the mechanism reverses when approximately two turns remain on the unwound spool and the full spool type where the mechanism reverses when approximately ten turns remain on the unwound spool. Models 6 and 30 Calculagraphs may be arranged for either type of mechanism while the KS-7769 (Model 33) Calculagraph is always of the unwound type. The number of turns of ribbon remaining on a full spool mechanism will be dependent upon the amount of use the ribbon has been subjected to.

3.13 Advancing the Ribbon — All Calculagraphs: Advancing the ribbon from one spool to the other across the dials is accomplished by moving the proper operating lever forward and letting it return to normal. Before doing this, make sure that a ticket is in the ticket slot. On Models 6 and 30 Calculagraphs, when the ribbon is feeding to the right, return of the right-hand operating lever actuates the ribbon feed and the left-hand operating lever is similarly effective when the ribbon is feeding to the left. The sound of the ratchet during the forward movement indicates which operating lever on its return to normal is moving the ribbon. On the KS-7769 (Model 33) Calculagraph, either operating lever on its return to normal from the forward position is effective in actuating the ribbon feed regardless of the direction of ribbon travel.

Caution: *In early KS-7769 (Model 33) Calculagraphs which are not equipped with the safety latch described below, do not move the operating levers off normal unless the ribbon is in place as damage to the ribbon reverse mechanism may result. The later KS-7769 (Model 33) Calculagraphs are equipped with a safety or throwout latch which operates when the Calculagraph mechanism is removed from the case. On models so equipped, it should be noted that this latch operates, in which case, caution in regard to the movement of the operating levers with the ribbon removed is unnecessary.*

F. Stamping

3.14 While the Calculagraph is in normal operation and has been running for at least 2 minutes after being started or reset, insert a ticket into the ticket slot. Operate the right-hand lever backward, then forward, and release it. The first of these operations prints the time of day and the second prints the Calculagraph serial number and the elapsed time dials on the ticket. Pull the left-hand lever forward. This operation prints the elapsed time arrows or pointers and also prints the serial number a second time. Inspect the ticket for faint, blurred, or otherwise imperfect impressions and, on models not equipped with the 24-hour time-of-day dial, for proper stamping of the AM or PM stamp. Note that the same serial number is printed in both places and that the time-of-day stamp agrees with the time indicated by the hands. This agreement should be within 1 minute for Models 6 and 30 Calculagraphs and within 1/2 minute for KS-7769 (Model 33) Calculagraph. The ends of the cams of the operating levers of Models 6 and 30 Calculagraphs, when operated without exerting undue pressure, should touch the main plate in order to secure clear impressions of the stamping dials, and to insure proper operation of the ribbon feed mechanism. In the case of KS-7769 (Model 33) Calculagraphs, the levers should touch the stops provided.

3.15 If the impression on the ticket does not show the AM and PM stamps correctly, proceed as covered under G.

G. Operation of AM and PM Stamps

3.16 *Models Not Equipped With 24-hour Time-of-Day Dial:* Insert a ticket into the slot and advance the hands to 11:59. Immediately operate the right-hand lever backward to print the time of day. Remove the ticket. Insert another ticket, advance the minute hand to 12:03, and again operate the right-hand lever backward. One of the tickets should read AM and the other PM. If both tickets show the same impression of the AM-PM stamp, the instrument is in need of adjustment.

Note: If in connection with this test the hands are turned backward, they should be set back at least as far as 11:00 and then

advanced to 11:59 or 12:00 as required. Avoid turning the hands backward from an indicated time between 11:58 and 12:05. In such cases, first advance them at least as far as 12:10.

3.17 *Interchange of AM and PM Stamps on Models Not Equipped with 24-hour Time-of-Day Dial:* To avoid affecting the adjustment of the AM-PM transfer mechanism, rapid movement of the hands should be avoided when near the point of transfer. When the time-of-day stamp prints AM incorrectly instead of PM, or vice versa, the stamps may be interchanged by advancing the hands 12 hours except as covered in the note and resetting them to the correct time. After any setting operation involving an interchange of AM and PM, always check the correctness of the time-of-day stamp.

Note: At times within a few hours before noon or midnight, reversing the AM-PM stamp may be more easily accomplished by moving the hands forward to 12:10, then backward at least as far as 11:00 and then resetting as covered in 3.01. At times, within a few hours after noon or midnight (that is, after 12:05), the easier method involves setting the hands back to 11:00, then forward to 12:05 and as much farther forward as is required, following the procedure of 3.01.

3.18 *AM and PM Designations on Models Equipped With the 24-hour Time-of-Day Dial:* When the time-of-day stamp indicates AM incorrectly instead of PM, or vice versa, advance the hands 12 hours and reset to the correct time.

H. New or Shop Repaired Calculagraphs

3.19 *Model 6 Calculagraph:* Make a test for elapsed time stamping as follows. Remove the Calculagraph from its case by removing the mounting screws. Release the balance wheel by removing the clip which holds it steady during shipment and return the instrument to its case. In removing the clip, exercise care not to place a strain on the balance wheel. Wind both main springs of the Calculagraph. When the hands have been in motion for at least 2 minutes, place a ticket in the ticket slot, pull the right-hand lever forward, and release it noting from the second-hand of the checking watch the time the

lever is pulled forward. At the end of 1 minute, as determined from the checking watch, pull the left-hand lever forward and release it. Reoperate the left-hand lever at the end of the second, third, fourth, and fifth minutes and remove the ticket.

3.20 Model 30 and KS-7769 (Model 33) Calculagraphs: To test the elapsed-time dials of an electrically driven Calculagraph, connect the instrument to the power supply and note by observation of the hands on the clock face that it has started. After the clock has run at least 2 minutes, place a ticket in the ticket slot. When the second-hand passes a convenient point for reference, pull the right-hand lever forward. When exactly 15 seconds have elapsed, as indicated by the second-hand, pull the left-hand operating lever forward. Repeat this operation at the end of 30, 45, and 60 seconds, then remove the ticket. Repeat the above operations with another ticket, pulling the left-hand lever forward at the end of 1, 2, 3, 4, and 5 minutes.

3.21 All Models: If, in 3.19, the last impression of the pointer is noticeably out of agreement with the zero mark on the elapsed time 5-minute dial, or if in 3.19 or 3.20 the impressions do not show correctly the elapsed time, it shows that either the elapsed time dials are not turning freely or the relation between the dial and pointer is not satisfactory.

3.22 Setting Just After Starting a Calculagraph: After starting a Calculagraph, the hands may usually be set as covered in 3.02 and 3.03. However, when setting Models 6 and 30 not equipped with the 24-hour time-of-day dial to a time between 11:00 and 12:05, unless it is known that the hands have not been turned back through the transfer interval (11:58 to 12:05) since the last transfer, first turn them to 11:00 and check to see that AM or PM is printing correctly. Interchange the stamp, if necessary, as covered in 3.17. Then set the Calculagraph as covered in 3.02.

3.23 A check should be made for proper stamping as covered in F and the operation of the AM and PM stamps as covered in G.

I. Automatic Transfer of Electrically Driven Calculagraphs to the Reserve Power Supply

3.24 Where reserve power equipment is provided to keep electrically driven Calculagraphs in operation throughout failures of the regular power service, open the regular power supply to the Calculagraphs by removing the associated fuse unit in the SAF to FUSE cabinet. Note that the emergency motor-alternator starts.

3.25 Silence the alarm by operating the associated alarm transfer key.

3.26 Note that the associated Calculagraphs continue in operation and then immediately replace the fuse unit in the SAF to FUSE cabinet. Silence the alarm by restoring the alarm transfer key to normal.

3.27 See that the motor-alternator stops and that the associated Calculagraphs continue in operation.

3.28 Check each Calculagraph for correctness of time and, if necessary, reset them.

J. Reserve Motor-Alternator

3.29 In conjunction with routine running of the motor-alternator, such as a 15-minute no-load run weekly or as may be specified in other instructions, inspect the motor-alternator to see that it is clean and operates quietly without abnormal sparking at the brushes or heating of the bearings, as gauged by feel. If necessary, it should be cleaned, lubricated, adjusted, or new brushes or other parts provided.

Note: The motor-alternator may be operated without load by manually operating and blocking the "A" relay in the 24-volt supply leads to the motor.

3.30 If in any case it is suspected that the motor-alternator may not be running at the proper speed, this may be checked by means of a revolution counter held against one end of the shaft. Under conditions of normal voltage of the central office battery, the no-load speed should not be more than 3600 rpm nor less than 3200 rpm after a 15-minute run.