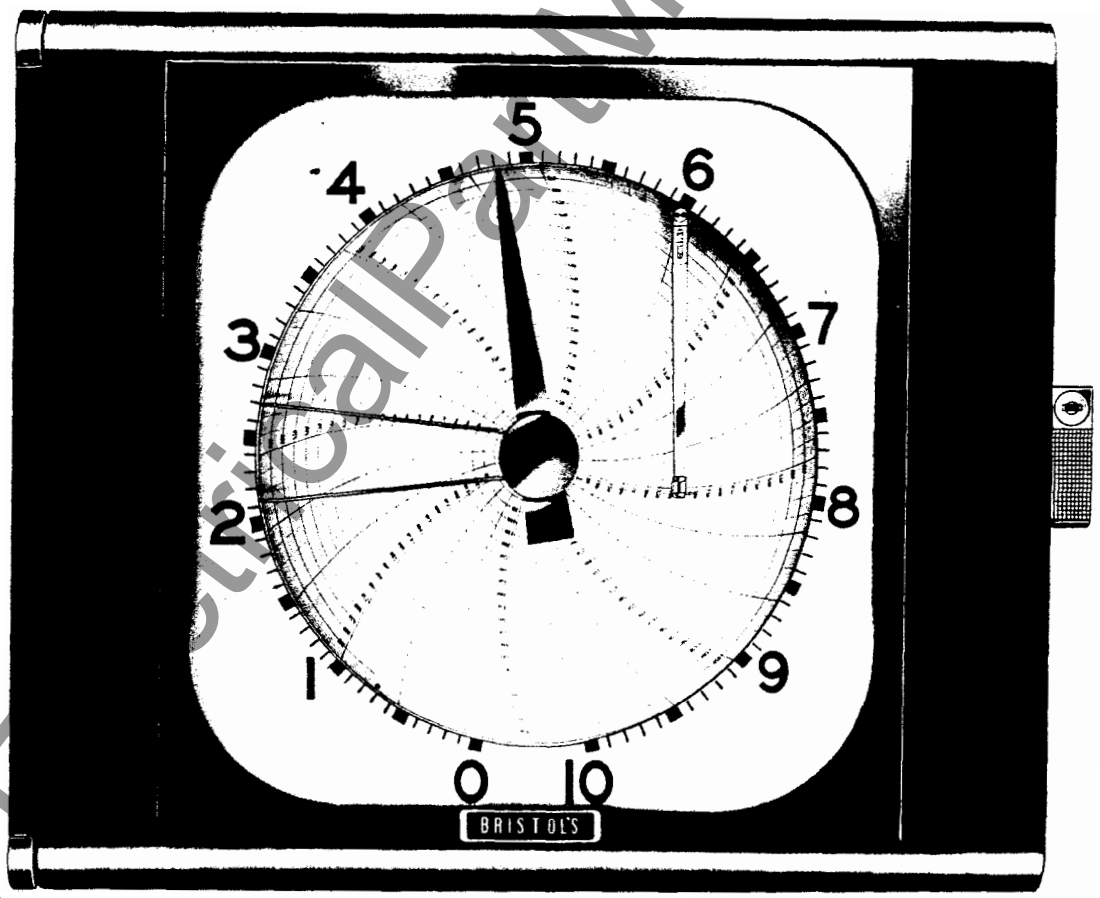
Instruction P12060
Issued 1/55

INSTRUCTION NO. P12060

(Issue No. 2 of 1/55)

INSTALLATION, OPERATION AND SERVICE BRISTOL'S MODEL 565 ROUND-CHART DYNAMASTER D-C POTENTIOMETER AND D-C BRIDGE



THE BRISTOL COMPANY WATERBURY 20, CONN.

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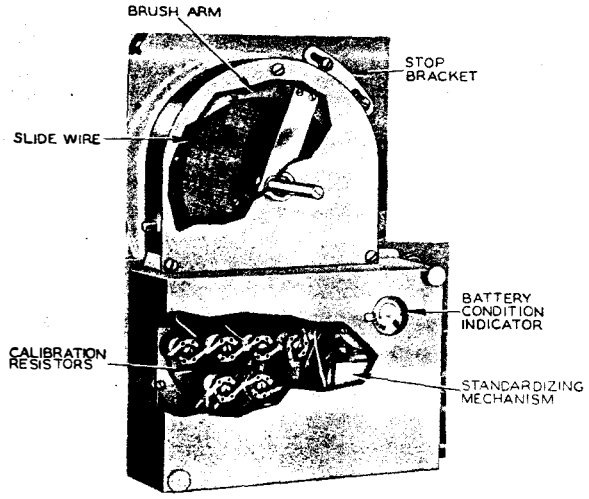

FIGURE 13. POTENTIOMETER UNIT WITH CASE CUTAWAY

6. Measuring System on Potentiometers The potentiometer type of Dynamaster uses the null-balance potentiometer circuit. From the simplified schematic wiring diagram (Fig. 2) it will be noted that the measuring element is wired in series with the potentiometer circuit, Syncroverter contacts and primary winding of the input transformer. This means that an open circuit anywhere in the measuring circuit, slide wire, Syncroverter contacts or primary winding of the input transformer will produce the same result: no error signal in the circuit and consequently no output from the amplifier to the balancing motor.

Check carefully the particular measuring element used to see that it is functioning correctly. Check particularly the wiring connections at both the measuring element and the instrument. Disconnect the measuring-element leads from the instrument and connect them to a potentiometric test set to be sure that the measuring element is producing the voltage required for the existing conditions. See separate instructions covering servicing and checking procedures for the particular measuring element used.

Caution: Never put an ohmmeter across any part of the measuring system without first disconnecting the input leads to the Syncroverter switch. The reason for this is that the ohmmeter produces a relatively high current and would damage the Syncroverter contacts.

Assuming that the measuring element and its leads have been eliminated as the source of trouble, proceed as follows:

a. Check battery voltage (1.5 or 6.0 volts depending upon the instrument).

b. Check standard-cell voltage (1.0185 to 1.0195 volts).

c. Check voltage across E spool (1.0185 to 1.0195 volts).

d. Check contacts on standardizing relay to see that they make good contact. This may be done by pushing the contacts down with a non-metallic object. The contacts may be cleaned with carbon tetrachloride or other solvent if they appear dirty.

e. Check to see that the slide-wire brush arm makes good contact with the slide wire. Try cleaning slide wire with carbon tetrachloride or other solvent. Allow to dry. Then apply a small amount of vaseline to slide wire and wipe off excess with a clean cloth.

If all of the above checks have been performed and the instrument still fails to function, the possible fault may be either an open circuit or a short circuit somewhere in the measuring system. Look for loose or poor connections or possibly a dab of solder that might short out two connections.

7. Measuring System on D-C Bridges. From the simplified schematic diagram (Fig. 3) it will be noted that the measuring element is wired so as to form one leg of the bridge. An open circuit anywhere in the bridge will produce an infinite resistance, driving the pen to the top or bottom of the scale depending upon what portion of the bridge is open-circuited. If an open circuit is suspected, it can easily be checked with an ohmmeter. See separate instructions covering servicing and checking procedures for the particular measuring element used.

Caution: Never put an ohmmeter across any part of the measuring system without first disconnecting the input leads to the Syncroverter switch. The reason for this is that the ohmmeter produces a relatively high current and would damage the Syncroverter contacts.

Assuming that the measuring element and its leads have been eliminated as the source of trouble, proceed as follows:

a. Check output voltage of power pack (7 to 9 volts d-c).

b. Check to see that the slide-wire brush arm makes good contact with the slide wire. Try cleaning slide wire with carbon tetrachloride or other solvent. Allow to dry. Then apply a small amount of vaseline to slide wire and wipe off excess with a clean cloth.

If all of the above checks have been performed and the instrument still fails to function, the possible fault may be either an open circuit or a short circuit somewhere in the measuring system. Look for loose or poor connections or possibly a dab of solder that might short out two connections.

D. Repairs, Correspondence and Shipping

If the Dynamaster cannot be repaired with the information furnished in this instruction, it should be shipped to the nearest Company Branch or Main Factory for repair or replacement. Do not ship instruments to Branch Offices. Be sure to mark your return address plainly.

In all correspondence please mention the instrument model and serial number (as listed on its nameplate) and your repair order number. Address all correspondence to the Bristol Company Branch or Main Offices, a list of which is found in all instruction manuals.

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Waterbury 20, Connecticut

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measuring element changes, current flows in the bridge and a d-c voltage unbalance is created in the bridge circuit. This d-c voltage unbalance is converted to an a-c voltage unbalance by the Syncroverter switch. The Syncroverter a-c unbalance output voltage is then increased by an input transformer or preamplifier before being amplified by the electronic amplifier to a power level sufficient to operate the balancing motor. The balancing motor adjusts the sliding contact on the slide wire to restore electrical balance in the bridge circuit and simultaneously moves the pen and pointer to record and indicate, on the chart or scale, the value of the variable being measured.

This balancing action starts with the slightest change in the resistance of the measuring element. Thus, recording and indicating of the measured quantity is practically instantaneous.

When balance has been restored, the entire bridge remains at rest until another change in the measured variable occurs.

PART II INSTALLATION

A. Unpacking the Instrument

Do not throw away the packing material until you have found the mounting brackets and screws as shown in the mounting-dimension drawing, and the other accessories, such as ink, charts, spare parts, etc.

B. Locating and Mounting the Instrument

The Dynamaster may be surface mounted or flush panel mounted. Although the instrument is exceptionally free from the effects of dust, dirt, vibration, corrosive fumes and extremes of temperature, it should be located as remotely as possible from such unfavorable conditions. The location should also be convenient for service and general utility.

The instrument should be reasonably level. Proper clearance should be allowed between the Dynamaster and other instruments on the wall or panel, and clearance must be given at the bottom of the case for the wiring or piping connections.

C. External Wiring and Piping

Before connecting any wiring to the Dynamaster, check the voltage and frequency listed on the nameplate of the instrument. To connect the Dynamaster to a voltage greater than 120 volts, a suitable stepdown transformer must be used. All wiring connections are made on the terminal strips mounted inside on the back of the case. The terminals are readily accessible by opening the door of the Dynamaster and swinging the panel out after first depressing its latch.

The instrument is provided with four holes in the bottom of the case to accommodate standard conduit fittings. Two of the holes accommodate $1\frac{1}{4}$" conduit connections and the other two accommodate 3/4" conduit connections. Conduit should be used whenever possible to bring all electrical circuits into the case. If conduit is not used, the rubber grommets supplied with the instrument should be used to keep the holes as tight as possible.

The wiring diagrams for your particular Dynamaster are provided separately. The measuring circuit is usually covered on one sheet and the power circuit on another sheet. If your instrument is equipped with an electric control or alarm, a third diagram will be furnished covering its wiring.

When connecting the power line to the instrument, make sure that the grounded side of the line is connected to the right-hand power terminal (L_2).

A good ground must be connected to the terminal marked GND.

Note: Do not install measuring circuits such as thermocouple wires in the same conduit with higher-voltage lines.

Piping or tubing will be required if a pneumatic control is supplied in the instrument. Air-control instruments are provided with case connections in the bottom of the case for standard 1/4" pipe or 3/8" copper tubing.

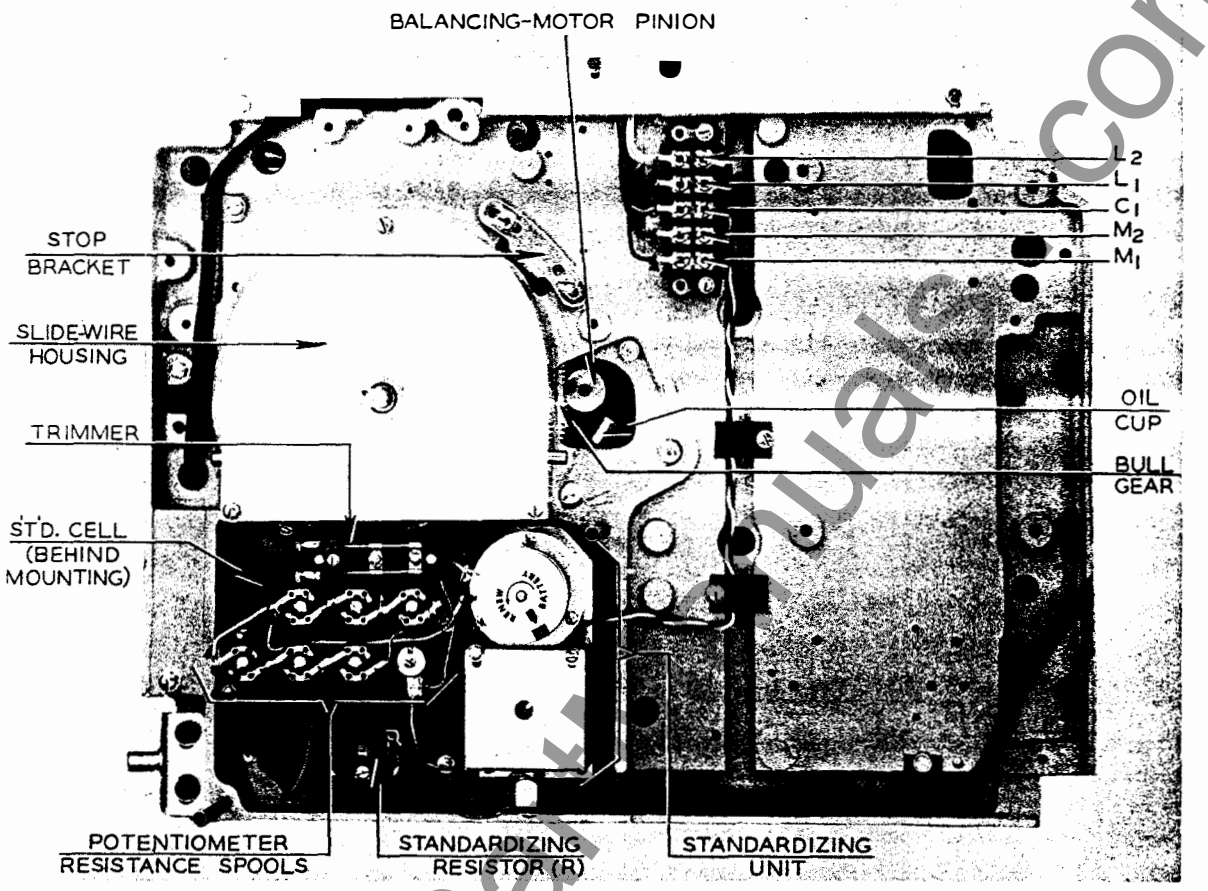

FIGURE 6. REAR VIEW OF HINGED PANEL

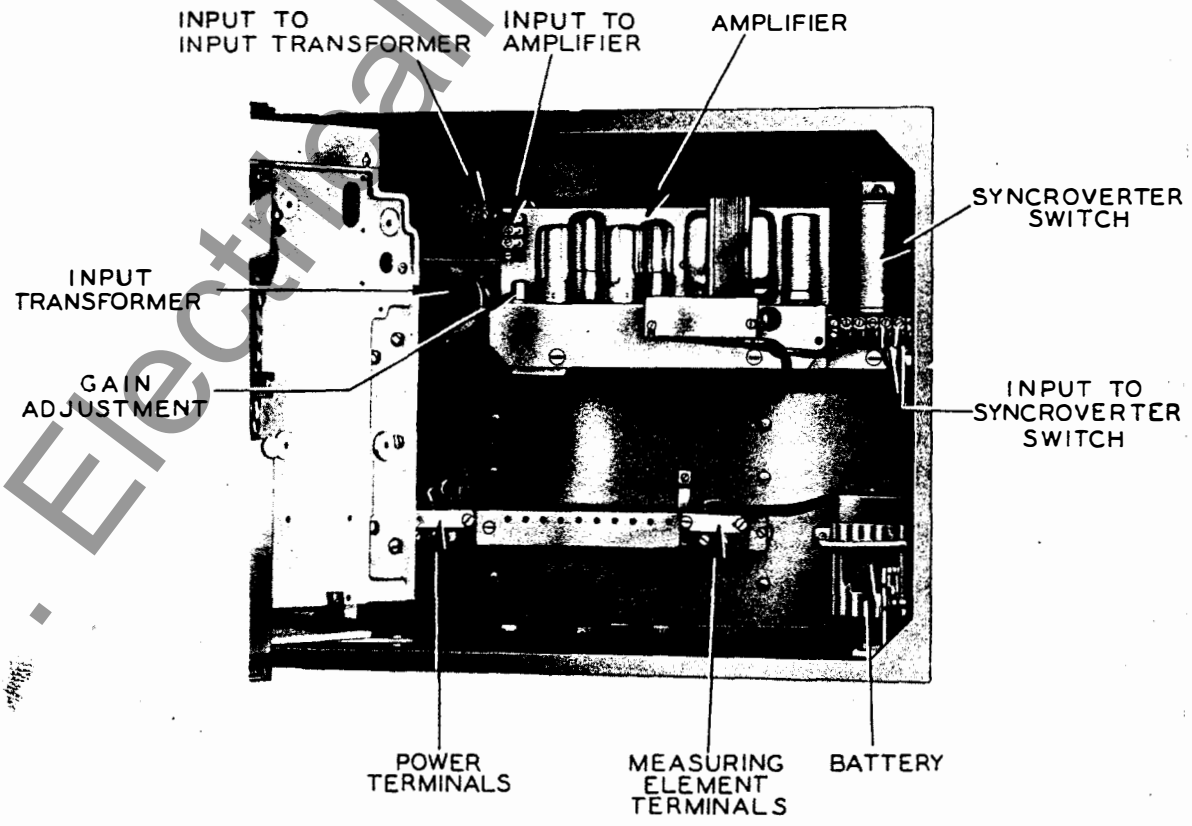

FIGURE 7. INTERIOR OF CASE

D. Installing the Battery

Note 1: This paragraph applies only to potentiometer-type instruments.

Note 2: Some Dynamasters are equipped with a continuous standardization unit which takes the place of the battery and standardizing unit ordinarily furnished. See paragraph C3 Part III if your instrument is equipped with continuous standardization.

A dry cell is shipped separately with each Dynamaster Potentiometer. In most Dynamasters it is a 1½-volt dry cell but on certain instruments it may be a 6-volt cell. This battery must be installed, wired and standardized by the user. Install battery in lower right-hand side of the case as shown in Figure 7. The yellow wire goes to the positive terminal (center) and the green wire to the negative terminal (outside).

See paragraph C Part III for instructions on how to standardize the battery.

PART III OPERATION

A. Starting the Dynamaster

To start the Dynamaster after it has been completely and correctly wired, simply turn on the instrument on-off switch. Nothing further need be done. If your Dynamaster is equipped with a control unit or other accessory, see separate instructions provided for its operation.

B. Stopping the Dynamaster

To stop the Dynamaster, merely turn off the instrument on-off switch. For a prolonged shutdown, the instrument should be stored in a clean, dry place.

C. Standardization

Three methods of current standardization are furnished in the Bristol Dynamaster Potentiometer. Unless otherwise specified, the manual push-button standardization is furnished as standard with all round chart Dynamasters.

1. Manual Push-button Standardization. To standardize, turn instrument power switch on. Allow 30 seconds for tubes to warm up. Press standardizing button and hold it down until the pen becomes stationary. Standardization is required when starting up for the first time, after installing a new battery and once a day thereafter.

2. Intermittent Automatic Standardization. This method utilizes a push button as well as a timer which periodically standardizes the current. To standardize, turn instrument power switch on. Allow 30 seconds for tubes to warm up. Press the manual standardizing button and hold it down until the pen becomes stationary. Manual standardization is required only when starting up for the first time or after installing a new battery. Standardization thereafter is taken care of automatically.

3. Continuous Standardization. Continuous standardization may be supplied with any Bristol D-C Potentiometer-type Dynamaster. Continuous standardization takes the place of the battery and the manual or automatic standardization ordinarily furnished.

Continuous standardization requires the use of a constant voltage source, a push-button switch and a rheostat. The constant voltage source is located in the lower-right-rear corner of the case where the battery is normally located. The push-button switch and rheostat are located on the resistance-spool card which is mounted below the slide-wire on the back of the hinged panel.

a. Adjustment. When the Dynamaster is first installed, the constant voltage source should be adjusted for the optimum voltage conditions under which it will operate. To do this, turn on the instrument and allow it to warm up for at least 30 minutes. Pen should be at some steady value on the chart and away from either extremity of the chart range. Remove cover from spool card. Press pusn-button switch and turn rheostat with a screw driver until there is no movement of the pen. This adjustment is not critical and need only be checked about twice a year.

D. Amplifier Gain Adjustment

The only time the amplifier gain adjustment need be checked is after chang-

ing tubes or doing other service work on the amplifier, and about once every 3 to 6 months thereafter. The reason for the periodic check is because the vacuum tubes age with use. While this check is being made, the measured variable should be at a steady value.

To check amplifier gain, proceed as follows:

Allow amplifier to warm up for at least 2 minutes. Remove the cap on the gain adjusting screw (see Figure 7 or 11). Turn the balancing-motor pinion (drive gear) manually to the right and release it. Then turn pinion to the left and release it. The pen should return quickly to its original position each time. If it does not return to its original position completely and quickly, it indicates that the amplifier gain (or sensitivity) is too low. To increase the gain, turn gain adjusting screw in a clockwise direction. When the gain adjustment has reached its maximum clockwise direction, the amplifier lacks sensitivity and requires new tubes.

There is an optimum position for the gain control. If the gain is too low, the pen will not return quickly to its proper value when the balancing motor is manually shifted off balance. If the gain is too high, the pen may "hunt" (mechanical oscillation of the pen). On some instruments if an abnormal pickup in the external measuring circuit is present, it is possible to turn the gain high enough to overload the amplifier and cause the balancing motor to act sluggishly. This condition can be corrected by reducing the gain (turning gain adjustment counterclockwise).

E. How to Change Charts

1. To Remove Chart. (See Fig. 4 & 5.) Grasp indicating pointer by the hub and pull gently to release it from the center arbor. Swing pointer to the left out of the way. Move pen lifter down to lift pen from the chart. Slide time index to the right. Grasp chart by its lower edge and pull it off the center arbor.

2. To Replace Chart. Place the new chart on the center arbor, making sure that the left-hand edge is between the pressure roller and the friction-drive wheel. Slide time index to the left over the chart edge. Rotate chart until time index points to the correct time division on the chart. Lower pen back on chart by moving pen lifter upward. Pen lifter should be moved upward as far as its stop. Swing the indicating pointer into position on the center arbor. Press it gently against the center arbor and rotate it until the setscrews in the indicating-pointer hub line up with the slots in the center arbor. Then push indicating-pointer hub firmly into place. A permanent magnet in the indicating-pointer hub holds the pointer in place.

F. Inking the Pen

1. Fountain pen. Add ink to the pen by using the glass dropper which forms the stopper for the 1-ounce bottle of ink furnished with each recorder.

The pen should be kept at least a quarter full of ink. If it clogs or draws a poor record, clean it with the wire pen cleaner provided. If necessary, wash pen with soap and warm water.

2. Reservoir pen feed, Attachment T77 The reservoir for this model is located in back of the chart plate and is readily accessible when the hinged panel is swung out. This reservoir should be filled with ink and adjusted so that the ink level in reservoir does not exceed the height of the pen when the pen is at its lowest position.

Check zero before operating instrument. With power off, run pen to the bottom of the chart by turning motor shaft by hand. When motor gear is against stop, adjust pen to the zero line by means of the micrometer adjustment at the top of the pen arm.

Start the pen by using the pen starter supplied. Squeeze the bulb of the pen starter. Place the pen in the hole on the stem of the starter. Release the bulb and allow the starter to suck the ink into the pen.

When the reservoir needs refilling, empty the reservoir and wash out with warm water before refilling. Do not continue to add to ink supply because ink will eventually thicken and plug the pen. Always wash out reservoir between each filling.

G. Alignment of Pen

To check the alignment of the pen with the zero or low end of chart, turn balanc-

ing-motor pinion (with power off) until the stop at the low end of scale is reached. Use micrometer adjustment on pen arm to reset pen to zero or low end of chart range.

H. Alignment of Indicating Pointer

To check the alignment of the pointer with the zero or low end of scale turn balancing-motor pinion (with power off) until the stop at the low end of scale is reached. If the pointer does not line up properly with the zero or low end of scale, it may be realigned as follows:

Grasp indicating pointer by its hub and pull it out from the center arbor. Swing the indicating pointer to the left as far as possible. Note that the pointer has slotted holes in it and is held in place on its hub by two screws. When these screws are loosened, the pointer may be moved as required to realign the pointer with the low end of scale. Retighten the two screws after alignment is completed.

I. Chart Drive

The chart drive used on the Model 565 is a friction-type chart drive powered by a 3-watt, self-starting synchronous motor which depends for its timing on the frequency of the alternating-current supply. Therefore, the frequency must be exactly as listed on the nameplate in order to obtain accurate chart timing. A supply-voltage variation of plus or minus 10% or less will not affect accuracy of timing. Electric chart drives will restart automatically after power failure, but lost time must be made up by manually advancing the chart until the correct time division is indicated by the time index.

The chart-drive motor is mounted behind the chart plate, and its friction-drive wheel makes contact with the chart thru a slot in the left-hand side of the chart plate. A nylon roller, mounted on the spring bracket which is part of the indicating-pointer assembly, exerts pressure on the front of the chart, forcing the chart against the friction-drive wheel only when the indicating-pointer hub is pushed in against the center arbor. When the indicating pointer is swung out from the center arbor, the chart drive will not rotate the chart.

PART IV SERVICE

Service to the Bristol Dynamaster requires complete familiarity with the instrument. Other than routine preventive maintenance should be done only by a qualified technician, or the instrument should be returned to the Bristol Company for service.

A. Routine Maintenance

1. Lubrication. Balancing motors with enclosed gear trains must have their front and rear bearings oiled at least once every three months with Gulf electric motor oil. An oil cup is provided for the rear bearing. Wipe any excess oil from the overflow hole after oiling.

Balancing motors equipped with an open gear train have ball bearings which require no lubrication.

Put 2 drops of light machine oil in the hole of the center arbor about once every 3 months.

Nothing else should be oiled in the Dynamaster. All other bearings are either dry (and should be kept clean) or are permanently sealed and require no lubrication during their normal lifetime.

2. Replacement of the Battery. This paragraph does not apply to d-c bridge-type instruments or to instruments equipped with a constant-voltage source.

The battery life depends upon operating conditions and usage. Generally it will last 6 to 12 months. It is very desirable to have a regular replacement schedule. When the battery becomes seriously weak, a red signal appears thru an opening in the cover of the standardizing unit. The battery must be changed when this signal appears. Replace the old battery with a $1\frac{1}{2}$-volt dry cell (see note below) and standardize it manually as described in paragraph D, Part II.
Note: Some instruments use a 6-volt battery instead of the usual $1\frac{1}{2}$-volt cell. When replacing a battery, be sure that the new battery has the same voltage rating as the one being replaced.

3. Replacement of Chart Drive. Turn power switch off. Disconnect motor leads from power-supply terminals L_1 and L_2 on back of panel. Remove screws (Item D in Figure 5). This permits the motor and motor mounting bracket to be removed as a unit. Remove old motor from mounting bracket. Install new motor on mounting bracket and mount complete unit on chart plate. After mounting the new motor, connect the motor leads to L_1 and L_2 terminals on back of panel.

4. Replacement of Balancing Motor. Turn power switch off. Refer to Figure 8. In order to replace the balancing motor, it is first necessary to remove the chart plate. Remove screws B and loosen screws A. Loosen slotted screw C on flexible coupling.

Caution: Do not, under any circumstance, loosen the setscrew at the other end of flexible coupling because this will disturb the calibration of the instrument.

After screws A and C have been loosened, the chart plate may be lifted slightly and removed.

Disconnect the motor leads from terminal block and remove the three nuts holding the motor on the panel. After the new motor has been installed, be sure to check the power-circuit wiring diagram so that the motor leads are connected up properly. Also make sure that the motor pinion meshes with the bull gear without binding.

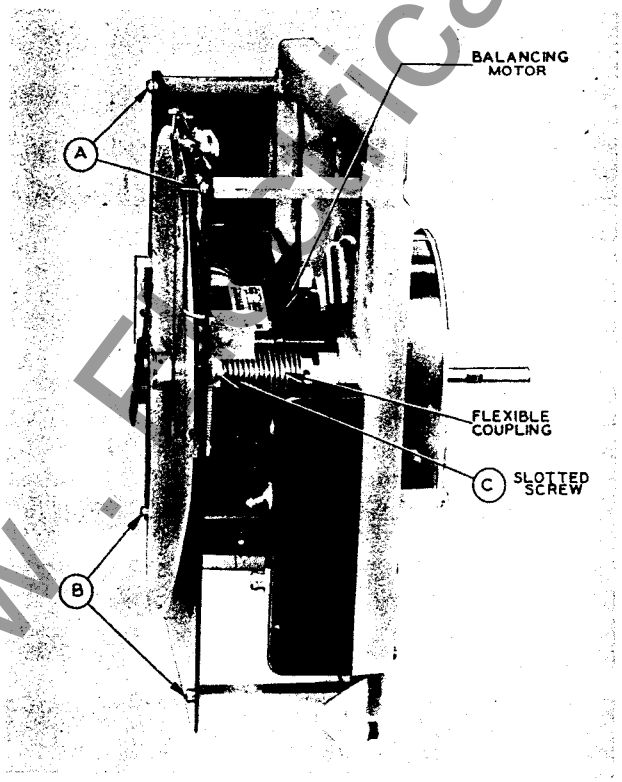

FIGURE 8. END VIEW OF CHART PLATE AND PANEL

B. Suggested Service Equipment

1. Stock of Replacement Parts. It is suggested that the following replacement parts be kept in stock. The vacuum tubes listed below are standard types and are available at any radio supply store:

Type 6X5 rectifier tube

Type 6V6 power amplifier tube

Type 7F7 voltage amplifier tube

Plug-in-type electrolytic filter capacitor with octal base (10-10-10 mfd. 450 volt) **Note:** Electrolytic capacitors deteriorate in storage. Their shelf life should not be over 18 months. Replacement electrolytic capacitors can be kept in usable condition indefinitely by placing them in service in the Dynamaster for an hour or two every six months.

Fuses for amplifier (1-ampere Littlefuse for Series C Amplifier. 1/8-ampere Littlefuse for Series C-1 amplifier)

Dry cell ($1\frac{1}{2}$ or 6 volt as required for potentiometers only)

Amplifier. Where several Dynamasters are in use or where continuous instrument performance is of critical importance, it is recommended that spare replacement amplifiers be kept in stock.

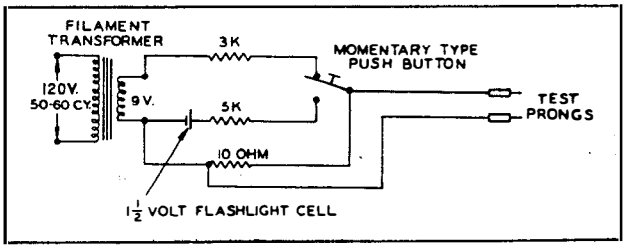

FIGURE 9. WIRING DIAGRAM OF DYNAPROBE

2. Test Equipment

A signal generator, such as Bristol's Dynaprobe Part No. 91054, is highly recommended because it provides a quick means for isolating trouble in the detection circuit of the Dynamaster without having to remove the Dynamaster from service or disconnecting the input circuit or the power to the instrument.

The Dynaprobe consists of a covered metal box connected by 40 inches of flexible wire to a two-prong probe enclosed in a small Bakelite housing. The metal box is fitted with a standard socket to provide 120 volts ac for use of a solder-

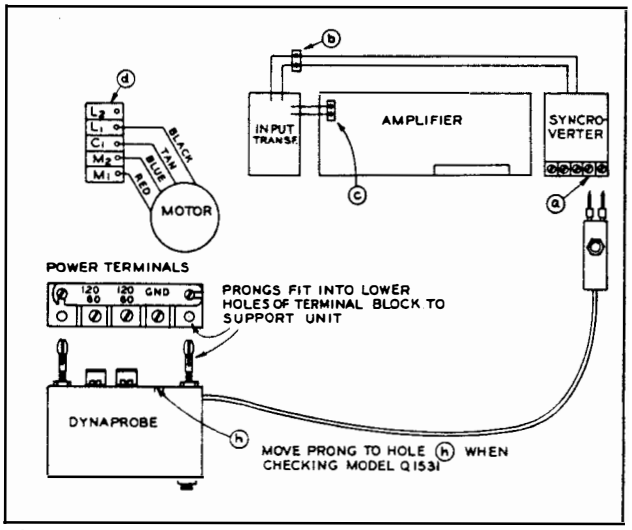

FIGURE 10. SKETCH SHOWING CHECK POINTS IN DYNAMASTER FOR DYNAPROBE.

ing iron. The back of the box is fitted with two prongs and two spring-type connectors. The prongs on the back of the unit plug into the power terminal block of the Dynamaster, allowing the spring connectors to make contact with the 120-volt power circuit.

The probe unit is fitted with a spring push button. When the button is depressed, approximately 3 millivolts dc is available at the test prongs. The battery used is a standard 1.5-volt flashlight battery. The battery should be replaced every 6 months. When the button is released, approximately 30 millivolts ac is available at the test prongs. The proper use of the Dynaprobe is covered in succeeding paragraphs.

An **a-c voltmeter** or **test lamp** is required to perform the power-supply check.

An **ohmmeter** is convenient when checking the continuity of the measuring system.

On potentiometer-type instruments, a **potentiometric test set** is required (one with ranges 0 to 150 millivolts and 0 to 1.5 volts).

On d-c bridge-type instruments, a set of **test resistance spools** is handy for checking resistance measuring instruments. The Bristol Company manufactures a set of very accurate test resistance spools. Spools may be ordered by the set or singly for any value. Ordinary variations in room temperature do not affect their accuracy.

C. Systematic Trouble-shooting Procedure

Should the Dynamaster fail in any way, it is first necessary to determine which part is faulty. The following systematic procedure is suggested in order that repairs may be accomplished with a minimum of lost time and expense.

1. Power-supply Check. Using a 150-volt-range a-c voltmeter (or test lamp), check for line voltage across instrument power terminals, instrument power switch, L_1 and L_2 terminals on back of swinging panel, and also L_1 and L_2 terminals on amplifier.

2. Balancing-motor Check

Caution: Always be sure to turn power switch off before shifting the two control-winding wires because of the high voltage (300 volts) across terminals M_1 and M_2.

a. On instruments with the Series C amplifier. Turn power switch off. Remove the two control-winding wires at terminals M_1 and M_2 (Figure 6) and then put these wires across terminals L_1 and L_2 on the same terminal block. Turn on power switch. The motor should move the pen up or downscale (depending upon phase). Next, reverse these wires from the control winding. The motor should move the pen in the opposite direction. If the balancing motor fails to move the pen up or downscale with the above tests, it could mean that one of the following conditions exists:

1. No power to balancing motor.
2. Balancing motor defective.
3. Mechanical failure between balancing-motor pinion, bull gear and recording-pen shaft.

b. On instruments with the Series C-1 amplifier. Turn off power switch. Remove the two control-winding wires from terminals M_1 and M_2. Connect these wires across terminals L_1 and L_2 with a 1-microfarad capacitor in series with one of the wires. Turn on power switch. The motor should move the pen up or downscale (depending upon phase). Next, reverse these wires from the control winding. The motor should move the pen in the opposite direction. If the balancing motor fails to move the pen up or downscale with the above test, it could mean that one of the following conditions exists:

1. No power to balancing motor.
2. Balancing motor defective.
3. Mechanical failure between balancing-motor pinion, bull gear and recording-pen shaft.

3. The Amplifier. Plug Dynaprobe into terminal block and apply test prongs across the input terminals of the amplifier (see Figure 11). If amplifier is working properly, the balancing motor will move the pen up or downscale (depending upon phase). Reversing the two test prongs will cause the balancing motor to move the pen in the opposite direction. If the balancing motor does not move the pen up or downscale, disconnect the input leads to amplifier and check again with the test prongs across input terminals to amplifier. If the balancing motor still does not move the pen up or downscale, check fuse in amplifier, replace vacuum tubes and filter capacitor in amplifier. If this does not work, replace the amplifier.

Note: The Bristol Company recommends that service work inside the amplifier chassis should not be attempted by the average user. Service work on electronic circuits is a specialized technique requiring special test equipment for efficient results. For users having available an electronic technician and adequate test facilities, The Bristol Company has prepared service instructions for the amplifier which contain a detailed circuit diagram, testing data and procedure for checking the amplifier. A copy of this instruction is furnished with each Dynamaster.

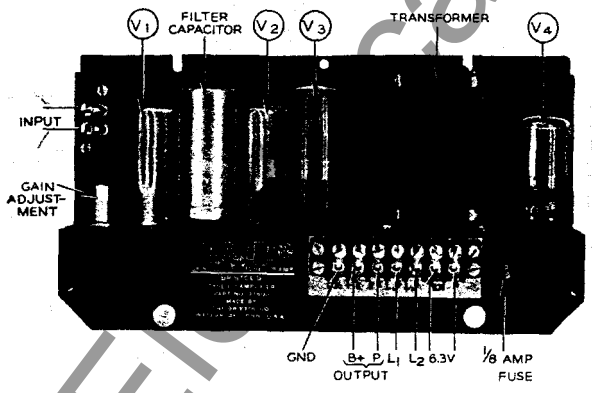

FIGURE 11. SERIES C-I AMPLIFIER

4. Input Transformer or Preamplifier. (See Fig. 7) Apply test prongs from Dynaprobe to input terminals of input transformer or preamplifier (pink and yellow wires). If input transformer is functioning properly, the balancing motor will move the pen up or downscale (depending upon phase). Reversing the test prongs will cause the balancing motor to move the pen in the opposite direction. If the balancing motor does not move the pen up or downscale, disconnect the input leads to transformer or preamplifier and check again with the test prongs across input terminals to transformer or preamplifier. If pen still does not move up or downscale with this test, the input transformer or preamplifier is defective and should be replaced.

5. Syncroverter® Switch. (See Fig. 12) With the push button on Dynaprobe depressed to provide a d-c signal, apply test prongs to input terminals of Syncroverter switch (orange and brown wires). If Syncroverter switch is functioning correctly, the balancing motor will move the pen up or downscale (depending upon phase). Reversing the test prongs will cause the balancing motor to move the pen in the opposite direction. If the balancing motor does not move the pen up or downscale, disconnect the orange and brown wires from Syncroverter switch and check again with the test prongs. If the balancing motor still does not move the pen up or downscale with this test, the Syncroverter switch is defective and should be replaced.

If steps 1 thru 5 above have been performed and all of the components function correctly but the instrument still fails to function, the fault probably lies in the measuring system of the instrument.

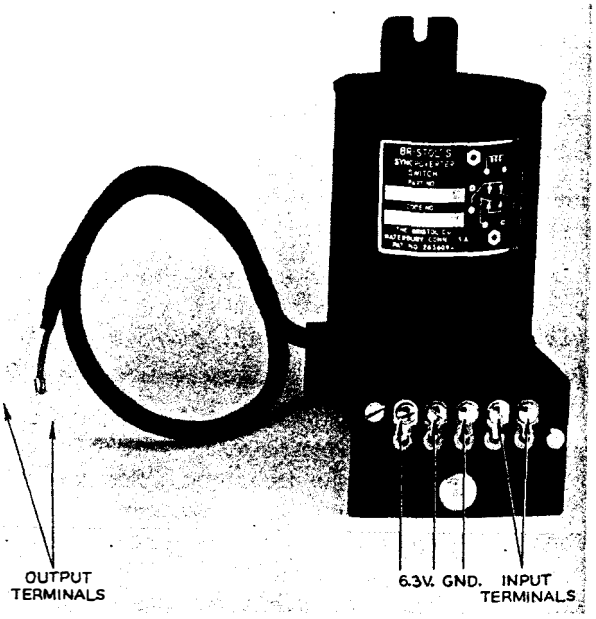

FIGURE 12. SYNCROVERTER SWITCH

Note: This instruction covers the basic balancing, amplifying and recording systems in the Bristol Series 565 Round-chart Dynamaster Potentiometer and D-C Bridge-type Instruments. Separate instructions are provided for the measuring element, controlling system (if one is used) and any special accessories or features.

PART I GENERAL

A. Description

The Dynamaster potentiometer is used with any millivoltage input such as that from thermocouples, photoelectric cells, shunts, magnetos, pH amplifiers, etc.

The Dynamaster d-c bridge is used with any resistance type of measuring element, such as the resistance-thermometer bulb, strain gauge, etc.

A single variable is accurately measured and recorded as a line record on the chart.

The major components of the instrument are:

1. The Potentiometer circuit or bridge circuit
2. The Syncroverter switch
3. The input transformer or preamplifier
4. The amplifier
5. The balancing motor
6. The recording system

B. Explanation of Operation

1. The Dynamaster D-C Potentiometer. (See Figure 2) A millivoltage input from the measuring element is connected in series with the potentiometer circuit and Syncroverter switch. There is a standard voltage in the potentiometer circuit which is automatically adjusted to balance any change in the millivoltage input. Any change in the measuring-element voltage creates a d-c voltage unbalance in the potentiometer circuit. This d-c voltage unbalance is converted to an a-c voltage unbalance by the Syncroverter switch. The Syncroverter a-c unbalance output voltage is then increased by an input transformer or preamplifier before being amplified by the electronic amplifier to a power level sufficient to operate the balancing motor. The balancing motor adjusts the sliding contact on the slide wire to restore electrical balance in the potentiometer circuit and simultaneously moves the pen and pointer to record and indicate, on the chart or scale, the value of the variable being measured.

This balancing action starts with the slightest change in the output voltage of the measuring element. Thus, recording and indicating of the measured quantity are practically instantaneous.

When balance has been restored, the entire potentiometer remains at rest until another change in the measured variable occurs.

2. The Dynamaster D-C Bridge. (See Figure 3) The measuring element forms one leg of the d-c bridge. A d-c power pack supplies 7 to 9 volts d-c to the bridge circuit. When the resistance of the

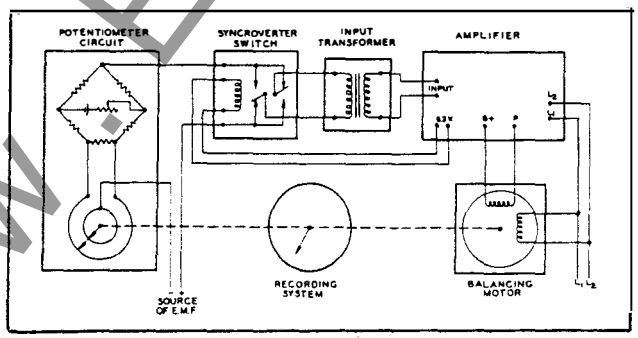

FIGURE 2. SIMPLIFIED SCHEMATIC WIRING DIAGRAM OF DYNAMASTER D-C POTENTIOMETER

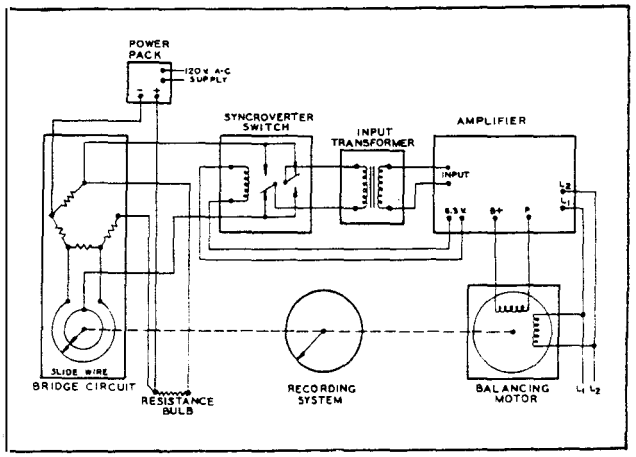

FIGURE 3. SIMPLIFIED SCHEMATIC WIRING DIAGRAM OF DYNAMASTER D-C BRIDGE

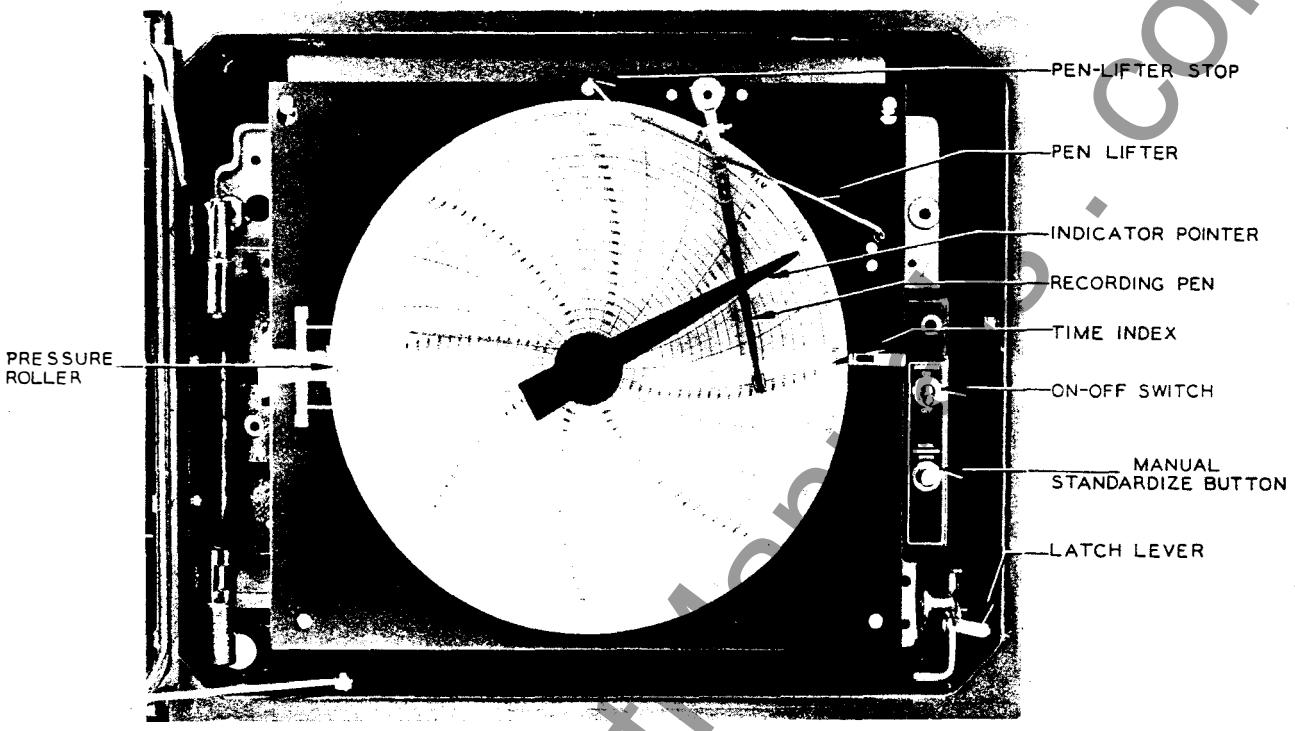

FIGURE 4. FRONT VIEW OF CHART PLATE

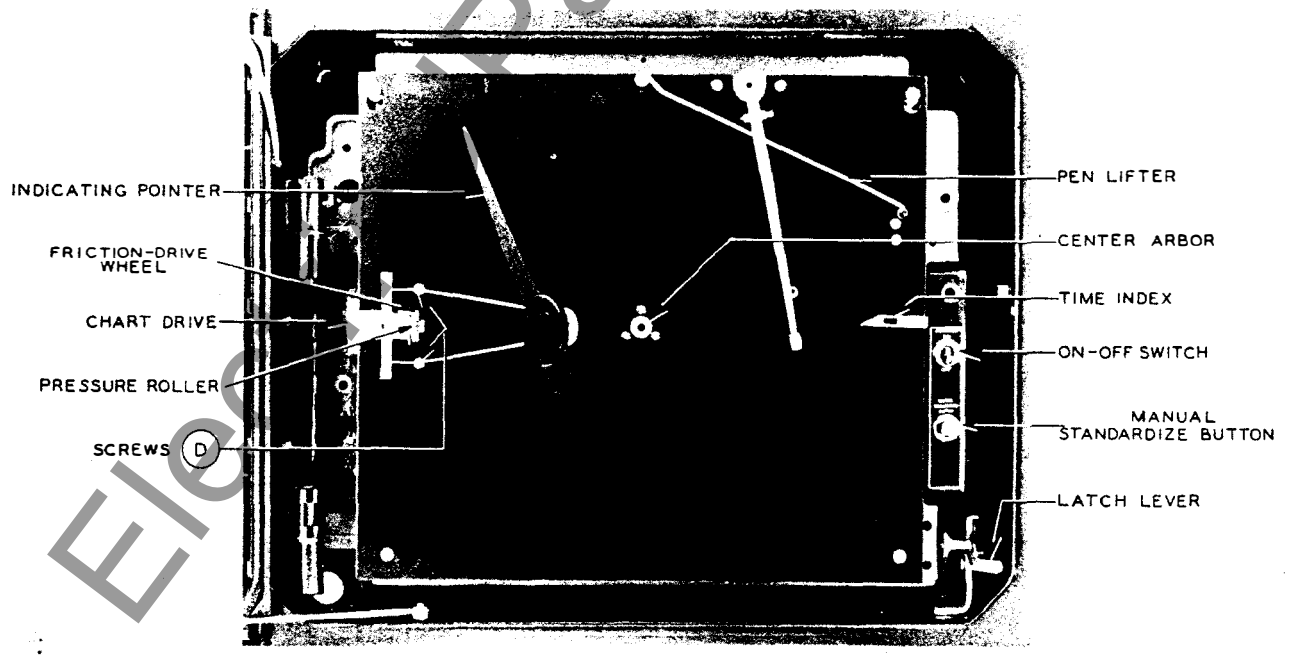

FIGURE 5. FRONT VIEW OF CHART PLATE WITH CHART REMOVED