TOTAL FLOW METER

INSTRUCTION 38248
MARCH 1999

Contents

ILLUSTRATIONS

TABLES

Safety and Equipment Protection

WARNING

ELECTRICAL POWER CAN RESULT IN PERSONNEL INJURY/DEATH OR CAN CAUSE DAMAGE TO EQUIPMENT.

If the instrument is driven by an external power source, disconnect the instrument from its power source before attempting any repairs.

WARNING

BATTERIES ARE DANGEROUS. IF HANDLED IMPROPERLY, THEY CAN RESULT IN PERSONNEL INJURY/ DEATH OR CAN CAUSE DAMAGE TO EQUIPMENT.

Batteries can be hazardous when misused, mishandled, or disposed of improperly. They may explode or omit poisonous substances. Batteries contain potential energy, even when partially discharged,

WARNING

ELECTRICAL SHOCK CAN RESULT IN PERSONNEL INJURY OR DEATH.

Use extreme caution when handling cables, connectors, or terminals; they may yield hazardous currents if inadvertently brought into contact with conductive materials, including water and the human body.

CAUTION

Be aware of protective measures against environmentally caused electric-current surges.

In addition to the previous warnings and cautions, the following safety activities should be carefully observed.

Children- Adolescents

NEVER give batteries to young people who may not be aware of the hazards associated with batteries and their improper

Jewelry, Watches, Metal Tags

To avoid severe burns, NEVER wear rings, necklaces, metal watch bands, bracelets, or metal identification tags near exposed battery terminals.

Heat, Fire

NEVER dispose of batteries in fire or locate them in excessively heated spaces. Observe the temperature limit listed in the Instrument specifications.

Charging

NEVER charge 'dry' cells or lithium batteries that are not designed to be charged.

NEVER charge rechargeable batteries at currents higher than recommended ratings.

NEVER recharge a frozen battery. Thaw it completely at room temperature before connecting charger.

Unvented Container

NEVER store or charge batteries in a gas-tight container. Doing so may lead to pressure buildup and explosive concentrations of hydrogen.

Short Circuits

NEVER short circuit batteries. High current flow may cause internal battery heating and/or explosion.

Damaged Batteries

Personnel injury may result from contact with hazardous materials from a damaged or open battery. NEVER attempt to open a battery enclosure. Wear appropriate protective clothing, and handle damaged batteries carefully.

Disposal

ALWAYS dispose of batteries in a responsible manner. Observe all applicable federal, state, and local regulations for disposal of the specific type of battery involved.

NOTICE

Stevens makes NO claims as to the immunity of its equipment against lightning strikes, either direct or nearby. The following statement is required by the Federal Communications Commission.

WARNING - This equipment generates, uses, and can radiate radio frequency energy and, if not installed in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

USER INFORMATION

Stevens makes no warranty as to the information furnished in these instructions and the reader assumes all risk in the use thereof. No liability is assumed for damages resulting from the use of these instructions. We reserve the right to make changes to products and/or publications without prior notice.

1 Introduction

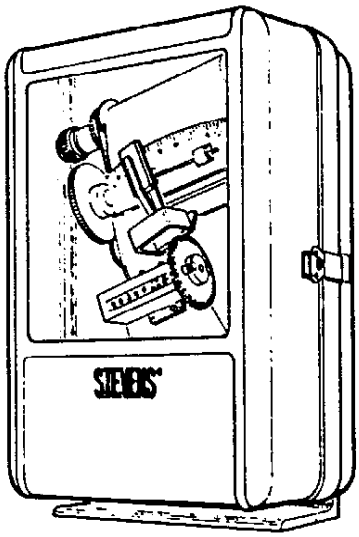


Figure 1. Stevens Model 61R Total Flow Meter

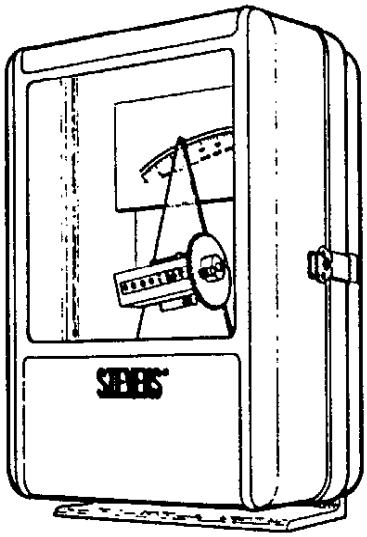


Figure 2. Stevens Model 61M Total Flow Meter

1.1 General Description

The volume of liquid flowing through a primary measuring device, such as a weir or flume, is a function of the height of the surface above a reference point. The Stevens Total Flow Meter uses a float to detect this height and converts it into a reading of instantaneous flow.

Two models are available, the Model 61M and 61R. The Model 61M has no chart. A moveable pointer indicates the instantaneous flow value on a stationary scale. A friction index slides along the scale to indicate the maximum flow registered. The Model 61R records the instantaneous flow on a 4 in./10 cm wide, 50 ft./15 m long strip chart, with a cartridge type pen. The recorder can be ordered with any of four chart speeds. Both instrument models have a 7-digit counter which shows totalized volume.

1.2 Principles of Operation

A change in float level is transferred through a set of flow range gears to a cam whose shape is selected to match the characteristics of the type of weir or flume used. The cam converts the change in level, or head, to an analog motion proportional to flow and moves the pointer, or pen, to indicate the new flow value. Usually this flow or discharge value will be in units of million gallons per day (MGD) although it may also be in units of gallons per minute (GPM); cubic feet per second (CFS); or even in metric units such as million liters per day (MLD). The cam also moves a totalizing wheel across a totalizer disc, rotated at a constant speed by a quartz clock movement or synchronous motor. At zero flow the wheel is positioned exactly at the center of the disc, so no motion is imparted to the counter. As the flow increases, the totalizing wheel is moved away from the center towards the edge of the totalizer disc. This causes the counter to move faster and indicate a greater total volume.

The flow range gears can be field changed to cover a wide range of flow conditions. The flow cam can also be changed in the field if the primary measuring device is changed.

2 Installation & Calibration

2.1 Whenever possible, select a shelter or enclosure with adequate space to service the equipment, and suitable ventilation to keep the instrument as dry as possible. A special weatherproof enclosure is recommended whenever the instrument will be directly exposed to the weather. Such an enclosure is obtainable from the factory. A cartridge type heater accessory is available for AC models and is a wise choice for installations subject to high humidity and dampness.

2.2 Unpack the instrument and inspect for shipping damage.

2.3 Mount solidly on a level surface, high enough to prevent counterweight submergence at maximum head. The float line or tape furnished with the instrument may be shortened to facilitate this. Allow enough space behind the instrument for access to the float pulley.

2.4 On Model 61R, remove all packing material from around the chart drive assembly.

2.5 Install the float pulley between the friction washer and pulley flange. See Figure 3. Mount the pulley with the flat side away from the instrument. Thread the lock disc to within 1/16 inch of the friction washer. Leave the two knurled lock screws loose so that the pulley can be rotated freely on its shaft.

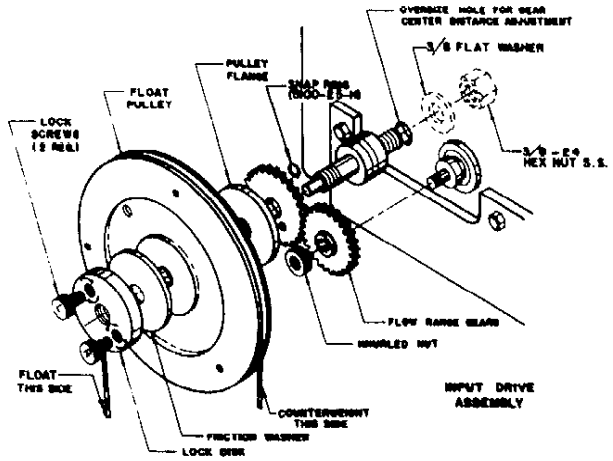


Figure 3. Input Drive Assembly

2.6 Attach the float and counterweight to the float line or tape. Place the float line or tape over the float pulley with the float suspended from the left side of the pulley. (Assuming you are facing the pulley from behind the instrument.) Adjust the length of the line or tape to permit full travel of the counterweight without obstruction, or submergence at maximum head. Check that the holes in the tape, or beads on the cable, engage the pulley properly.

2.7 Check that the float is riding correctly on the fluid surface and is not entangled. For most installations a stilling well placed off to one side of the flow channel is used to confine the float and to dampen out surges and wave actions. This stilling well should be at least 1 inch and preferably 2 inches larger in diameter than the float. If it is not practical to use a stilling well, a scow-type float arrangement can be used so that the float rides directly on the liquid surface in the flow channel.

2.8 Refer to Figure 13. Move the cam locking screw (9) to the hole located approximately one inch up and to the left of its initial position.

2.9 Measure the head in the weir or flume. To do this easily and accurately it is strongly recommended that every installation include a porcelain enameled iron staff gage mounted on the side of the flume or weir box. This permits heads to be determined visually and eliminates the mess and bother of placing a ruler in the flow. A variety of sizes and types of staff gages are available from Leupold & Stevens, Inc. After the head or depth has been determined, find the corresponding flow from the rating curve provided.

2.10 Depending on which model is being calibrated, use the center of the pen tip (2) or the right edge of the pointer (21) as the index. Rotate the cam (10) until the index indicates the flow value determined in the preceding step. While holding the cam in this position, clamp the float pulley by tightening the two knurled lock screws shown in Figure 3. Tighten them evenly.

3 Operation

3.1 General

3.1.1 On battery powered instruments, ensure that batteries are properly installed in the battery holder located in the lower part of the instrument enclosure door. It is recommended the unit be powered by six alkaline "D" cells. However, it can be externally powered by a 12 volt DC source, such as a lead-acid rechargeable battery. Verify that proper connection is made between the battery holder and the timer unit (Figure 13). Select the desired chart speed using the switch on the front of the timer unit.

3.1.2 On AC powered instruments, verify that proper electrical connections have been made to the power input terminal strip (Figure 7). Note that there is no internal circuit protection. The user is responsible for providing fusing or circuit breaker protection for the incoming power to the instrument.

3.1.3 Record the time, date and totalizer reading on the chart for future reference.

3.1.4 On the Model 61M, slide the maximum flow indicator (Figure 13(19)) to the left until it touches the pointer (21). The left side of the indicator will denote maximum flow.

3.1.5 On the Model 61R, see that the pen is marking properly and set the chart to the correct time. See 3.2 and 3.3.

3.2 Pen (Model 61R)

3.2.1 The pen used on the Model 61R is a disposable cartridge type, similar to felt tipped marking pens in common use.

NOTE:

Prior to 1972 the 61R used a capillary pen with Lucite reservoir which required periodic filling from a bottle of ink. These can be easily converted in the field to the current pen design.

3.2.2 Remove the protective cap from the pen tip and make sure the pen is marking properly. Caution: be sure that the pen clip pivot screws are not too tight. If they are too tight the cartridge will not ride freely and improper inking may result.

3.2.3 The life of a pen cartridge will depend on several factors. One obvious factor is the magnitude and frequency of flow variations since this affects the "swing" of the pen back and forth across the chart. Another is the chart speed or time scale—the faster the scale the more ink is used. There are no hard and fast rules and each user has to determine cartridge life by experience. On the average this will usually fall between two and four months.

3.3 Setting the Chart to the Correct Time

(Model 61R)—See Figures 4 and 5

Find the value of chart divisions for the proper time scale from Table 1.

Table 1. Time Scales and the Chart

TIME SCALE		VALUES OF CHART DIVISIONS		CHART LASTS
In./Day	Cm/Day	Major	Minor	
3-1/3	8.4	3 hrs.	30 min.	6 months
5	12.7	2 hrs.	20 min.	4 months
10	25.4	1 hr.	10 min.	2 months
20	50.8	1/2 hr.	5 min.	1 month

Turn the chart supply cylinder gear clockwise to remove the play. Hold the gear in this position and turn the knurled knob on the left end of the take-up cylinder counterclockwise until the chart is taut. While keeping the chart taut, turn the knurled knob and allow the supply cylinder gear to rotate until the correct time is indicated by the pen.

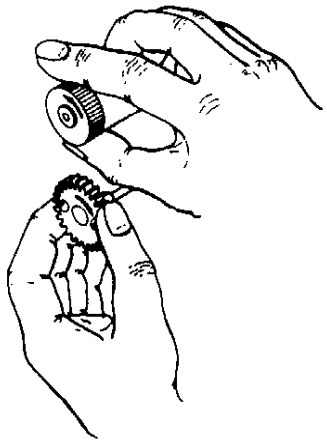


Figure 4. Adjusting the Chart

3 Operation

3.4 Replacing a Chart

(Model 61R)—See Figure 5

3.4.1 Tilt the pen away from the chart.

3.4.2 Turn the knurled knob counterclockwise, advancing the chart about 1 inch.

3.4.3 Cut the chart with a sharp knife. The upper edge of the writing plate can be used as a guide.

3.4.4 Remove the locking screw on the right side of the chart assembly.

3.4.5 Tilt the chart assembly forward.

3.4.6 Remove the supply cylinder assembly.

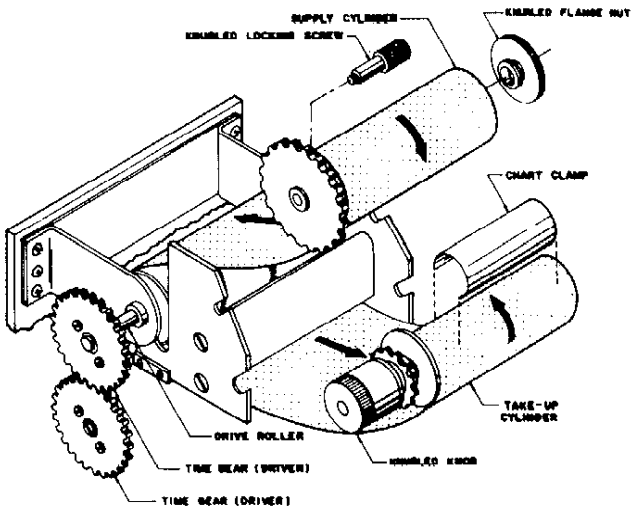


Figure 5. Chart Installation

3.4.7 Remove the knurled flange nut on the right end of the supply cylinder. Replace the old chart with a new supply roll, flush end toward the inside flange.

NOTE:
Some models have a driving pin on the supply cylinder near the inside flange. If this is the case, be sure the notch in the supply roll engages the pin as the flange nut is reinstalled.

3.4.8 Replace the flange nut *tightly*. The chart may not wind properly if the flange nut is loose.

3.4.9 Remove the take-up cylinder assembly.

3.4.10 Slide the old chart from the take-up cylinder and remove the half tube chart clamp from its center.

3.4.11 Reinstall the take-up cylinder assembly.

3.4.12 Reinstall the supply cylinder assembly.

3.4.13 Thread the chart around the drive roller as shown in Figure 5. A diagonal fold across the end of the chart usually facilitates this step. After passing between the friction rollers (Figure 13-(5)) and drive roller, the chart should pass through the separation between the friction roller support plate and writing plate.

3.4.14 Place the left chart edge against the take-up cylinder flange and clamp the chart in place with the half tube chart clamp.

3.4.15 Tilt the chart assembly back into place.

3.4.16 Replace the locking screw on the right side of the chart assembly. The chart may not advance without it.

3.4.17 Check the pen. See 3.2.

3.4.18 Set the chart to the correct time. See 3.3.

3.5 Removing a Portion of a Chart

(Model 61R)

3.5.1 Follow 3.4.1, 3.4.2 and 3.4.3 under "Replacing a Chart."

3.5.2 Advance the chart an additional three inches.

3.5.3 Lift the supply cylinder to clear the take-up cylinder.

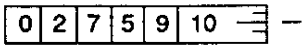
3.5.4 Remove the take-up cylinder assembly.

3.5.5 Slide the chart from the take-up cylinder and remove the half tube chart clamp from inside the chart.

3.5.6 Follow 3.4.13 through 3.4.18.

3.6 Using the Totalizer

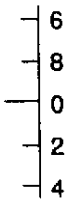
3.6.1 How to read the totalizer —



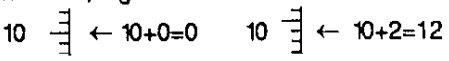
The totalizer consists of six rotating numbered discs. From the left, the first five discs visually display only one digit at a time. The disc on the right shows two digits in

3 Operation

decades plus graduation marks in twos. A mark to the right indicates which graduation line to read, e.g.



The graduation line is added to the decade number, e.g.



The instrument nameplate indicates whether the totalizer is to read in gallons, liters or some other unit and if a multiplier is to be used. The totalizer number in the example above would be 275,910.

3.6.2 To obtain total volume of flow subsequent to a prior reading, first, subtract the old reading from the present reading. Next, multiply the difference by the constant shown on the nameplate for TOTALIZER, under MULTIPLIER. Flow will be in the units shown on the nameplate.

EXAMPLE: Last week the totalizer read 0013520. This week it reads 0027520. Checking the nameplate it is noted that under the heading UNITS and adjacent to TOTALIZER the word GALLONS appears and under the heading MULTIPLIER, is the number 500. The total flow for the week would be (27520 -13520) x 500 = 14000 x 500 = 7 MILLION GALLONS.

3.7 Regarding the Quartz Clock Chart Drive

3.7.1 The Stevens Quartz Multispeed Total Flow chart drive is a DC powered multiple speed drive module. It can be specified for new instruments, or purchased as a separate kit to upgrade older spring driven instruments. It provides chart speeds of 5, 10, and 20 inches per day, as well as standard drive for the totalizer (24 RPD). The "M" position is for use when the instrument has no Chart Recorder (61M).

3.7.2 The Quartz Timer is designed to be powered by 6 alkaline "D" cells, mounted in a holder located in the door. Connection to the timer is made through individual wire connectors (red to red, black to black). In addition, the timer can be powered by any external DC source between 6 and 14 Volts. The DC source must be capable of a peak current of 500 mA.

3.7.3 A fuse is located in the timer (Figure 14, item 6). Replacement fuses are available from Leupold & Stevens.

3.7.4 Typically, batteries should be replaced each time the chart is replaced. However, at operating temperature extremes (outside the range of 0° to 40°C) more frequent battery replacement may be required.

4 Maintenance

4.1 Changing the Time Scale

(Model 61R)

See Table 2 for a listing of time scales and corresponding gear sizes. See Figure 5 for the respective time gear positions. Note that these apply only to AC drive models. Chart speed changes on Quartz Timer units are achieved by using the selector switch on the front of the timer.

4.1.1 Remove the two screws securing each gear to its hub. Remove the gears.

4.1.2 Place the new driver gear and driven gear in their respective positions and replace the screws.

4.1.3 Replace the chart with a new chart whose graduations correspond to the new time scale. Refer to 3.4 and Figure 5.

4.1.4 Note that time scales of 5 in./12.7 cm per day and 20 in./50.8 cm per day can be obtained by interchanging the same gears.

Table 2. Time Gears

TIME SCALE		DRIVER GEAR		DRIVEN GEAR	
In./day	cm/day	Part #	No. of Teeth	Part. #	No. of Teeth
3-1/3	8.4	22120	27	13957	81
5	12.7	13545	36	13891	72
10	25.4	13733	54	13733	54
20	50.8	13891	72	13545	36

4.2 Changing the Flow Range

Altering the flow range involves changing a pair of gears, the indicating scale, the nameplate and in some cases, the cam.

4.2.1 Replace the indicating scale, name-plate, and the cam if required, with new parts corresponding to the new flow range. All parts are held in place with screws.

When installing the indicating scale, line up the centerline of the chart and the center dial graduation. Use the contour of the dial edge against the curved chart lines as a guide.

4.2.2 Rotate the cam to the zero position and secure it with the knurled cam locking screw (Figure 13-(9)).

4.2.3 Loosen the 3/8-24 hex nut (12) inside the case if the total number of teeth on the new flow range gears is different than the old total.

4.2.4 Remove both flow range gears. See Figure 3 for the arrangement of parts on the two gear shafts.

4.2.5 Install the new flow range gears. Relative position of the gears is shown on the new rating curve data sheet provided. Check that the knurled nut holding the driven flow range gear has been firmly tightened. Remove cam locking screw (9).

4.2.6 Adjust the float pulley stud if necessary, so that the gears turn freely through the full range, with a minimum amount of backlash. The stud mounting hole is oversize to allow gear center distance adjustment.

4.2.7 Tighten the 3/8-24 hex nut (12) inside the case if loosened in step 4.2.3.

4.2.8 Follow applicable installation and calibration steps of paragraphs 2.6 through 2.11.

4.3 Clock Maintenance

4.3.1 **General**

On AC drive instruments, no maintenance is necessary for the clock motors. On Quartz drive instruments, battery contacts should be inspected and cleaned each time batteries are replaced. Batteries should always be removed any time the unit is stored or shipped. No oil or other lubrication is needed for the motors, and,there are no electronic circuit adjustments. To replace the fuse, pull the old fuse straight out from its socket. The fuse should protrude about 3/16 inch above the metal case. Replace only with the identical type of fuse, available from Leupold & Stevens.

Leupold & Stevens maintains a clock repair department at the factory, providing prompt and competent servicing of your instrument when required.

4.3.2 **Removing a Clock (Totalizer Drive)**

4.3.2.1 Disconnect power before beginning any servicing of the instrument.

4.3.2.2 Remove the pointer plate assembly (Figure 13-(11)) by removing the screw in the center of the plate's pivot.

4 Maintenance

4.3.2.3 AC Drive — Remove the clock wires from the terminal strip. Remove the two screws securing the clock mounting plate.

Quartz drive—Remove the two screws holding the timer in place.

4.3.2.4 If replacing the clock, remove the totalizer disc (15), for installation of the new clock.

4.3.3 Installing a Clock

4.3.3.1 Put the clock in place. Start the mounting screws.

4.3.3.2 The clock must be accurately positioned. A locating fixture is available from the factory. See Figure 6. Accurate positioning is required to prevent the totalizer from counting while the instrument rests at zero flow.

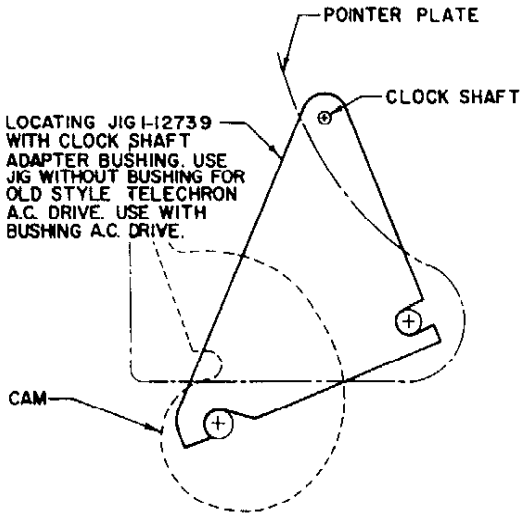


Figure 6. Positioning the Clock Motor

4.3.3.3 Place the fixture over the clock shaft. Use the adapter bushing if necessary. Position the fixture against the pointer plate shaft and cam shaft. Apply pressure from the left to engage both shafts firmly. While holding the fixture in place, the clock may be rotated slightly for proper gear adjustment.

4.3.3.4 Tighten the clock mounting screws securely.

4.3.3.5 Remove the fixture.

4.3.3.6 Install the totalizer disc (Figure 13-(15)) leaving the setscrew loose.

4.3.3.7 If AC drive, connect the wires to the proper terminals. See Figure 7.

4.3.3.8 Install the pointer plate (Figure 13-(11)).

4.3.3.9 Slide the totalizer disc (15) toward the totalizer wheel (13) until there is enough pressure between the disc and wheel for a positive drive. While maintaining this pressure, and with the pointer and cam in their zero flow positions, rotate the totalizer disc. Check that the totalizing wheel does not turn. If it does turn, chances are the clock position slipped while the screws were being tightened. Remove the pointer plate and totalizer disc. Check the clock's position with the locating fixture. Reposition as necessary.

NOTE:

Loosening the setscrew and repositioning the totalizing wheel along the totalizer shaft is generally not recommended except in cases where extreme calibration difficulty is encountered.

When the totalizing wheel and totalizer disc are properly aligned, adjust the totalizer disc for proper driving tension. Slide the disc forward along the clock shaft until the right side of the totalizer mounting bracket is raised off the pointer plate about 1/32 in./0.8 mm. Tighten the totalizer disc setscrew. Tension between the disc and wheel should be about 4 ounces as measured with a spring scale attached to one of the two knurled nuts on the wheel face.

4 Maintenance

4.4 Pen Maintenance

(Model 61R)

The pen should ride approximately 1/32 in./.8 mm above the dial edge.

When removing a pen loosen only one pivot. The remaining pivot will relocate the pen to its original position during reinstallation. The pivots may have to be repositioned when installing a new pen. A pen should have a slight side play between the pivots so that it will ride freely against the chart.

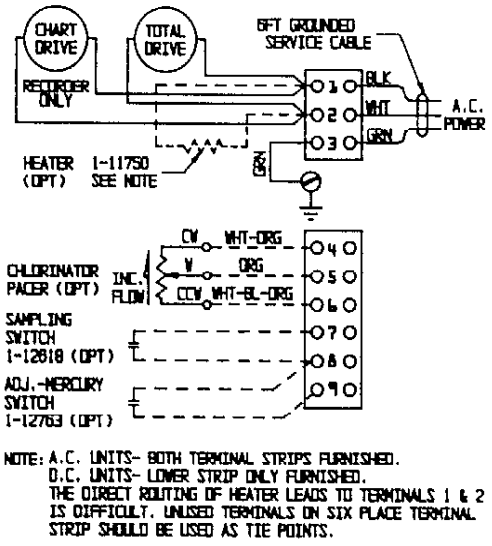


Figure 7. Wiring Diagram, Total Flow Meters, Model 61M and 61R

4.5 FACTORY SERVICE

When contacting the factory about an instrument, include all nameplate data. Before sending a meter to the factory for servicing, immobilize the pointer plate (Figure 13-(11)), by inserting the locking screw (9) through the cam into the tapped hole in the plate. If the meter is a Model 61R, also remove the pen (and any ink in the pen), take-up cylinder, and supply cylinder, and pack separately. Do not return the float pulley, float, float line or counterweight. Failure to properly prepare an instrument for shipping frequently results in extensive damage to the instrument. The factory assumes no responsibility for such damage.

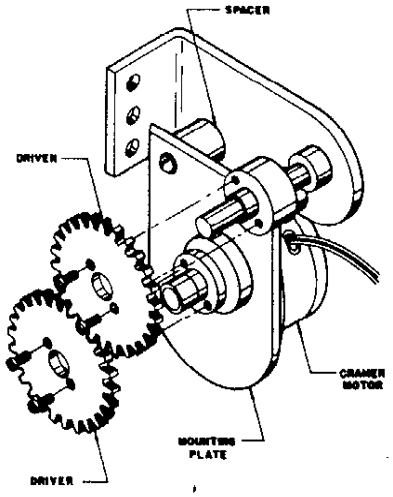


Figure 8. Time Gear Assembly - Electric Driven Total Flow Meter

5 Troubleshooting

	POSSIBLE SOURCE	CORRECTIVE ACTION
Trace on chart does not register correct flow. Maximum flow indicator is too low.	a. Improper initial adjustment. b. Float pulley loose. c. Float pulley not running. d. Interference between float pulley and flow range gear retaining nut. e. Float or counterweight interference. f. Cam follower binding.	a. Recalibrate. b. Recalibrate and tighten lock screws. Figure 3. c. Readjust lock screws. Figure 3. Check calibration. d. Tighten flow range gear nut or reverse pulley on shaft. Check calibration. e. Reposition instrument or add guide pulleys. Recalibrate. f. Adjust or replace parts.
Trace on chart indicates pen movement across chart but chart is not advancing.	a. Drive motor stopped. b. Flange nut on supply cylinder loose. c. Locking screw not in right side of chart assembly.	a. Check power source/batteries. b. Tighten flange nut. Figure 5. c. Install chart mechanism locing screw. Figure 5.
No trace on chart. Time scale is correct.	a. Pen not riding on chart. b. Pen cartridge out of ink.	a. Check that pen point rides flat on chart, or loosen pen pivot screw slightly. b. Replace cartridge.
Slack chart in chart assembly.	Loose flange nut on supply cylinder.	Tighten flange nut. Figure 5.
Totalizer does not indicate flow as high as indicated by chart trace, maximum flow indicator or other knowledge.	a. Not enough tension on totalizing wheel. b. Loose setscrew on totalizer disc assembly. c. Improper totalizer adjustment. d. Water level fluctuation. Frequency and magnitude are excessive.	a. Tighten spring loaded screw on totalizer. b. Reposition totalizer disc and tighten setscrew. c. See 4.3.3.9. d. Reduce orifice size to stilling well, or consult manufacturer.
Pen does not indicate zero at zero flow.	Pivots not adjusted properly.	Adjust pivots to zero pen. (Figure 13-(7)).

6 Accessories

6.1 Sampling Switch

This device provides a 25 millisecond contact closure at preselected intervals of metered volume. (A 50 millisecond contact closure can be provided at special request.) Uses include totalizing volume on a remote indicator, flow sampling, and dosage control. Sampling rates may be varied by changing cams. Cams are available with 10, 20 or 25 lobes.

6.1.1 **To Install a Sampling Switch**

(See Figure 9)

6.1.1.1 Check that the flow meter is mounted on a level surface. Faulty switch operation may result if the instrument is not level.

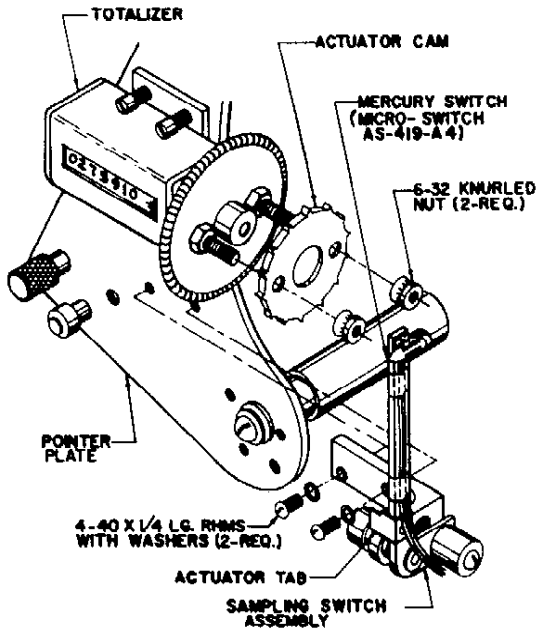


Figure 9. Sampling Switch Installation

6.1.1.2 Secure the actuator cam in place with the knurled nuts.

6.1.1.3 Mount the switch assembly. Holes are provided in the pointer plate below the totalizer counter.

6.1.1.4 Adjust the actuator tab to clear the root diameter of the actuator cam by 1/32 in./.8 mm.

6.1.1.5 Adjust the switch clip to tilt the switch 5°-10° from horizontal with the pointed end down and away from the instrument.

6.1.1.6 Mount the switch in the clip. The long contact wire in the switch should lie directly over the short contact wire when the flow pointer indicates 1/3 of full scale. (Contact wires should lie in a vertical plane at 1/3 maximum flow.) This setting will minimize double pulsing while providing optimum pulse length.

6.1.1.7 Attach the switch leads to the terminal strip as indicated in Figure 7. Be sure the leads are long enough to allow for pointer plate travel.

6.1.2 Switch Specifications

Type— Microswitch #AS419A4; SPST; Differential angle.

Resistive Load—
1.5 amps, 30 VAC and VDC.
0.5 amps, 115 VAC and VDC.

Steady State Inductive Load—
1.2 amps @ 24 VAC.
0.25 amps @ 120 VAC.

Inrush Load—
3.45 amps @ 34 VAC.
1.5 amps @ 120 VAC.

6.2 Chlorinator Pacer Potentiometer

This accessory consists of a simple potentiometer which is gear driven by the rotation of the pointer plate.

The pacer potentiometer usually forms one half of a bridge circuit which controls the rate at which additives are entered into a system. However, it could similarly be used for retransmitting, or other control applications. A typical chlorinator installation might couple a 10,000 ohm pacer potentiometer with a Wallace and Tiernan, Electrically Controlled V-notch Chlorinator.

The resistance value of the potentiometer must be specified by the customer for compatibility with existing or proposed equipment.

To Install a Chlorinator Pacer Potentiometer

(See Figure 10)

6.2.1 Remove the pointer plate and pivot hub by removing the pivot screw in the lower right corner of the pointer plate.

6 Accessories

6.2.2 Remove the screws which hold the pivot hub to the pointer plate.

6.2.3 Mount the sector gear onto the pivot hub. Position as shown in Figure 10, and fasten the gear and hub onto the pointer plate, using the longer #4-40 x 1/4 inch screws provided.

6.2.4 Replace the pointer plate and pivot screw.

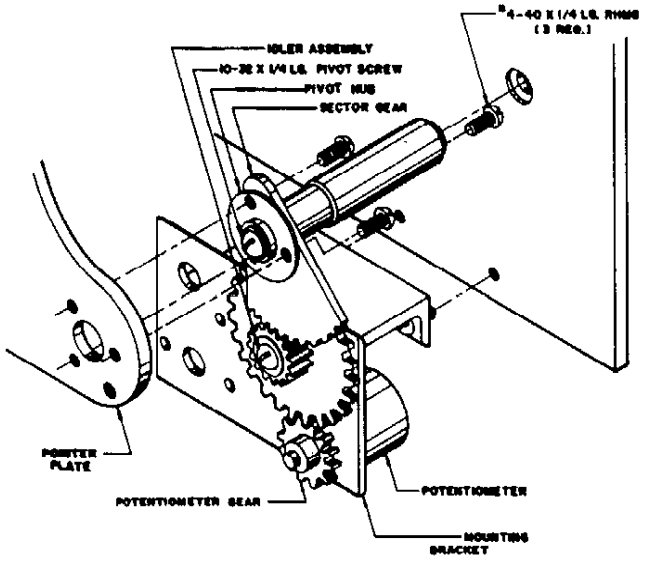


Figure 10. Chlorinator Pacer Attachment

6.2.5 Mount the pacer assembly bracket in the holes provided, with #6-32 x 3/8 inch screws. Allow proper backlash between gears so that they turn freely through the full range.

6.2.6 Connect the wiring to the proper barrier strip terminals as shown on Wiring Diagram Figure 7.

6.2.7 Connect an ohm-meter to barrier strip terminals 5 and 6. Move the flow pointer from zero to maximum flow. The meter should read proportionally increasing ohms. If readings decrease for an increasing flow, switch barrier strip leads 4 and 6.

6.2.8 With the ohm-meter leads connected to terminals 5 and 6, move the pointer through its full range of travel from zero to maximum flow. Adjust the potentiometer shaft with respect to its drive gear until zero resistance occurs at zero flow. It may be desirable to have a resistance reading other than zero flow. If this is the case, check to be sure the slider does not reach the end of the resistance element within the instrument flow range. This will be indicated by an immediate change from high to low resistance.

6.3 Adjustable Mercury Switch

This device provides a contact closure at a preselected flow. A typical application might be to turn on a chlorinator when the flow exceeds 5% of a maximum flow or to turn on a pump when the flow reaches 50% of maximum flow. The switch remains closed for flows above the preselected flow. A small differential angle allows fine positioning of the switch actuation point.

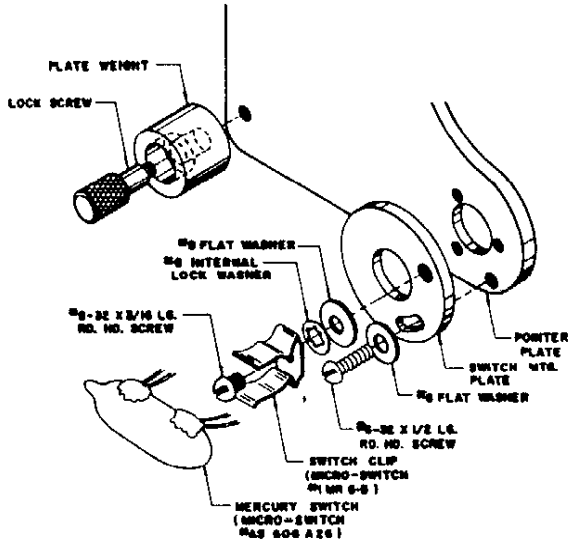


Figure 11. Adjustable Mercury Switch

6.3.1 To Install an Adjustable Mercury Switch (See Figure 11)

6.3.1.1 Place the switch mounting plate in position at the pivot point of the pointer plate. Secure it with the #6-32 screw and washer. The screw should be mid-range of the slot.

6.3.1.2 Attach the switch clip with the #8-32 screw and washers. Do not tighten.

6.3.1.3 Position the pointer index to the desired switch actuation point on the flow indicator dial.

6 Accessories

6.3.1.4 Position the switch clip so that when mounted, the switch will be positioned near the switching point. Secure the switch clip in place.

6.3.1.5 Place the switch in the clip and check that the switch actuates close to the desired value on the flow dial. To 'fine' adjust the switch, loosen the #6-32 screw installed in 6.3.1.1 and rotate the switch mounting plate to the proper position.

6.3.1.6 Unscrew the lock screw (Figure 13-(9)) and attach the cylindrical weight to the pointer plate with it.

6.3.17 Connect the wiring as shown on Wiring Diagram Figure 7.

6.3.2 Switch Specifications

Type—Microswitch #AS606A26; 2 CKT; 0.75° Differential Angle.

Resistive Load—

3 amps @ 30 VAC and VDC.

1 amp @ 115 VAC and VDC.

0.5 amp @ 230 VAC and VDC.

6.4 Heater

A heater assembly is available for special installations where low temperatures may affect operation of the instrument or accessories or where extreme conditions of dampness exist.

6.4.1 To Install a Heater (See Figure 12)

6.4.1.1 Attach the heater to the recorder mounting plate, left of the cam shaft bearing housing as shown in Figure 13. Two #8-32 x 3/4 inch long machine screws are required. Tighten the screws securely.

6.4.1.2 Disconnect AC power to the total flow.

6.4.1.3 Attach the two heater lead terminals to the upper terminal strip as shown in Figure 7.

6.4.1.4 Reconnect AC power to the unit.

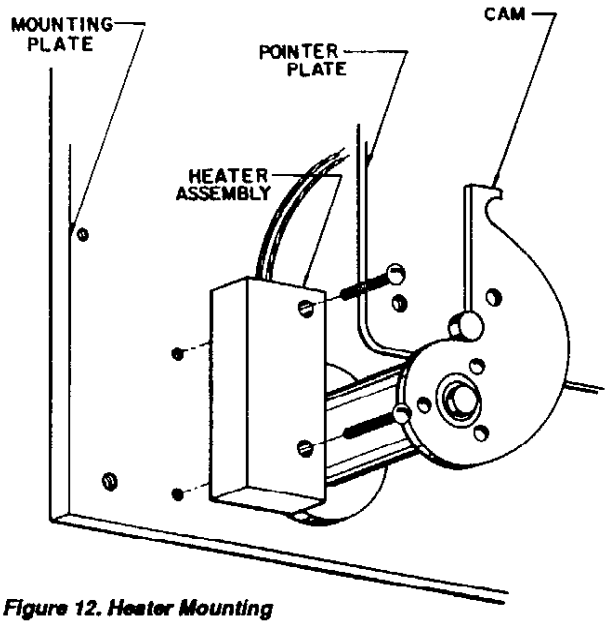


Figure 12. Heater Mounting

6.4.2 Heater Specifications

Type—Indeeco #20-05 (L&S Pt. No. 20124)

Ratings—20 watts @ 110 VAC.

80 watts @ 230 VAC.

Heater is nonadjustable.

7 Installation of Quartz Timer

7.0 Installation of a Quartz Chart Drive Kit on Existing Field Instruments.

The following sections apply to installing the Quartz Total Flow Drive Kit on an existing Total Flow Recorder or Meter.

Tools Required:

Allen wrenches: (1) 5/64" and (1) 1/16"

Flat screwdrivers: (1) small offset, (1) 3/16 blade, (1) 1/4 blade (screw starter is recommended).

1/8" drill bit and drill or 1/8 awl (to mount battery holder to door).

1/4" end wrench or nut driver.

7.1 Remove existing AC or Lux drive from instrument.

CAUTION:

For electrical driven instruments disconnect all power.

7.1.1 Remove the pointer plate and pivot hub by removing the pivot screw in the lower right corner of the pointer plate (Figure 13-(11)).

7.1.2 Remove cam hub and cam shaft collar by loosening set screws and sliding cams and collar from the cam shaft (Figure 13-(10)).

7.1.3 Remove chart supply cylinder and take up cylinder (recorder units, see figure 5).

7.1.4 Remove time gear (driven) and hub from the drive roller shaft by loosening set screw and sliding from shaft (see figure 5). Remove the set collar located inboard of the chart drive gear.

7.1.5 Remove totalizer disk assembly by loosening set screw and sliding from shaft (Figure 13-(15)). Remove the small set collar.

7.1.6A For Lux units: Remove Lux clock by removing four screws located around the perimeter of the clock.

7.1.6B For AC units: Remove power from unit. Remove clock wires from AC terminal block. Disconnect and remove AC power cord wires and remove from the case. Remove AC power terminal block. Plug vacant plastic case hole with the push-in plastic hole plug included with the kit. Remove AC totalizer motor by removing two 6-32x3/8 screws located on the diagonal mounting plate at the base of totalizer motor sub-assembly.

7.1.7A For Lux units: Remove time gear sub-assembly by removing two 6-32x1/4 screws from the flag shaped mounting plate (see figure 8).

7.1.7B For AC units: Remove time gear motor sub-assembly and motor spacers by removing two 6-32x3/4 screws (see figure 8).

7.2 Installation of new chart and totalizer drive

(Figure 14).

7.2.0 Remove totalizer disk from drive unit.

7.2.1 Position the metal drive unit on the stripped down Total Flow back plate. The speed selection switch should be on the right and the totalizer bearing housing should locate where the center of the old totalizer was. With the unit in this position, two screw holes in the back plate should line up with the housing's slotted feet. Mark these holes for later use. Remove chart drive housing from assembly.

7.2.2 Loosely install one 6-32x5/16 pan head screw and large flat washer in the top right hole marked from step 7.2.1. The chart drive housing can now be slipped over the screw and washer. A second 6-32x5/16 pan head screw and large flat washer can now be installed in the lower left position. Tighten the screws so that the drive assembly is free to move but will stay in place.

7.2.3 Position the chart drive. The clock must be accurately positioned. A locating sheet metal L-shaped template has been included in the kit for this purpose. Position the single 3/8" hole on the template to the lower left and push it over the 3/8" cam shaft. Position the upper of the two 1/4" holes (located in the knee of the template) over the 1/4" pivot stud and continue to slip the template over the stud and shaft until the template rests on the cam shaft housing. The entire sheet metal chart drive housing can now be pivoted about the totalizer shaft. Use the totalizer disk shaft as an alignment pin to locate the drive housing to the template.

7 Installation of Quartz Timer

If you are converting a recorder, rotate the entire chart drive housing about the totalizer shaft in a clockwise direction until the stepper motor flange makes contact with the chart drive bracket. (If you are converting a Total Flow Meter—rotate the housing assembly until the 6-32 screws are centered on the housing's feet.)

The drive housing can now be secured in place by tightening the two 6-32 pan head screws marked "A". The totalizer shaft should be free of binding and should be removed at this time.

NOTE:

If there is excessive binding on the totalizer shaft it may be necessary to loosen and retighten the housing mounting screws.

7.2.4 Remove the L-shaped sheet metal template.

7.2.5 Install the totalizer disc shaft into the drive housing. Check the gear mesh of the gear underneath the totalizer disk and the stepper motor.

7.2.6 For Recorder conversions it is necessary to mesh a large 216 tooth gear with the stepper motor located on the side of the chart drive housing. (For meter conversions, this step is not required—proceed to step 7.2.8. The large 216 tooth gear included in the kit will not be used.)

7.2.6.1 Loosen the white plastic knurled thumb nuts that clamp the chart drive stepper motor. The entire motor case should be free to rotate and thereby change the output gear mesh. A small sheet metal pry wrench has been included to help grasp and rotate the motor housing. The pry wrench has two sharp wedging points that are wedged into the metal seam of the stepper motor housing. The pry wrench can then rotate the motor housing and the plastic thumb screws. Retighten to lock the motor in place. Rotate the motor so that the output gear is the greatest distance from the chart drive shaft.

7.2.6.2 Slip 3 teflon washers and then the 216 tooth gear on the chart drive shaft. The gear face should be as close to the chart drive frame as possible. Tighten the set screw locking the gear in place. Install the chart-drive cylinder and chart-take-up cylinder. Rotate the large 216 tooth chart drive gear to ensure that there is no rubbing between other gears or the chart drive frame.

It may be necessary to add or remove spacing washers or respace other gears to provide proper mesh alignment.

7.2.6.3 Check the gear alignment with the stepper motor. The large gear should be .05 inches from the stepper motor clamp. It may be necessary to loosen the metal drive unit and rotate the entire assembly in order to get proper gear alignment. (Repeat steps 7.2.1, 7.2.2 and 7.2.3). Rotate the stepper motor housing so that the gears will come into mesh. Use the pry wrench as described in step 7.2.6.1. The gear mesh should be adjusted for .003 inch gear lash. Tighten the plastic thumb-nuts to lock the stepper motor in place.

7.2.7 Install the pointer plate, cam, cam hub and cam shaft collar removed in step 7.1.1 and 7.1.2.

7.2.8 Install the battery holder and route the battery wires.

7.2.8.1 Position the sheet-metal battery holder in the Total Flow housing door. The battery connectors are located to the hinged side. The battery holder is centered about 2" from the bottom of the housing. Peel the adhesive tape liner from the back to the battery holder and stick the battery holder to the door. Drill two 1/8" holes through the plastic housing. Use the metal battery holder as a positioning guide. Attach with two 4-40x5/16 screws, washers and hex nuts.

7 Installation of Quartz Timer

7.2.8.2 Connect the chart drive wires to the battery holder. The connectors are polarized and can only be assembled one way. With the door in the open position, route the wires so that there is enough loop at the hinge point to allow the door to open and close freely but will not catch on the flow range cam. Secure the wires with the stick-on cable clamps as shown in Figure 14. Peel the paper liner off the backs of the cable clamps and stick in place.

7.2.8.3 Install batteries. Check for proper operation. It is suggested that the instrument be run for a day on the bench to validate proper operation before the unit is put out into the field.

Parts List

(Refer to Illustrated Parts Breakdown Figure 13)

Item No.	DESCRIPTION	PART NO.
1.	Gear, 64T, Supply Cylinder	13824
2.	Pen Assembly	25390
	(Replacement marker pen)	25387
3.	Dial	See Rating Curve
4.	Gear, Time (Driven)	See Table 2
5.	Friction Roller Assembly	12605
6.	Chart Drive Motor (AC only)	31986
7.	Pen Holder	12608
8.	Totalizer Counter	12747
9.	Locking Screw	12726
10.	Cam	See Rating Curve
11.	Pointer Plate	12609
12.	Adjusting Nut	3/8-34
13.	Totalizing Wheel	12563
14.	Float Pulley	Cable-10160
		Tape-10165
15.	Totalizer Disc Assembly	12565
16.	Totalizer Motor AC Drive,	
	115V, 60 Hz	31985
	AC Drive, 230V, 50 Hz	18913
17.	Chart Locking Screw	12726
18.	Flange Nut	12584
19.	Index, Maximum Flow	12574
20.	Dial	See Rating Curve
21.	Pointer	12562
22.	Dial Blanks (61R)	12805
	(61M)	12804
23.	Spring	12575
24.	Screw	11650
25.	Pointer Plate	12561

7 Installation of Quartz Timer

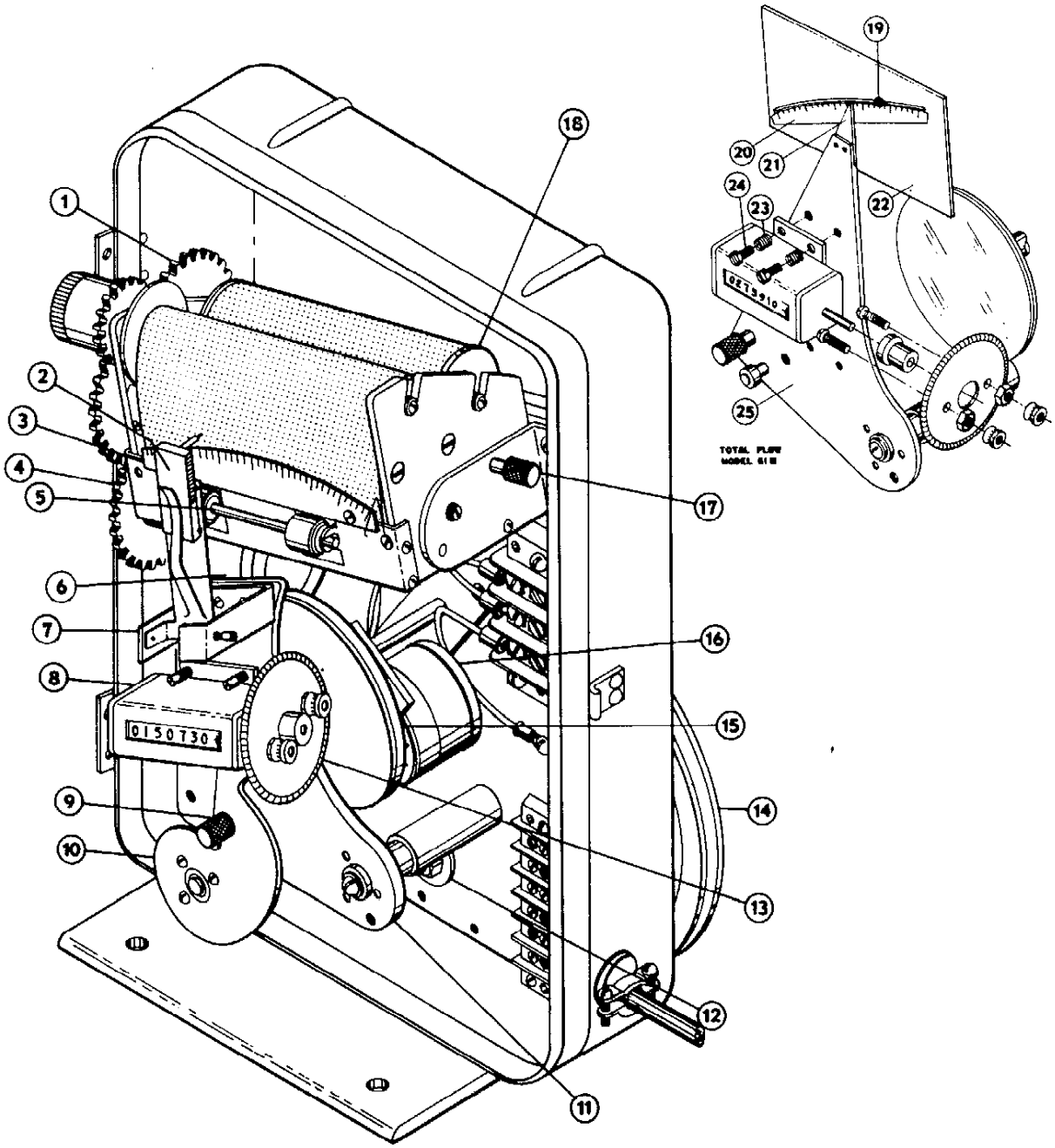


Figure 13. Parts

7 Installation of Quartz Timer

Item Number	Part Number		(Quantity)
1	Enclosure Housing QMTF	40451	(1)
2	Stepper Motor .36°	40449	(1)
3	Stepper Motor 3.6°	41325	(1)
4	Thumb-Nut	41552	(1)
5	Circuit Board QMTF	40452	(1) *
6	Fuse QMTF	40666	(1)
7	Totalizer Assembly	(Call Factory)	(1)
8	216 Tooth Gear Assembly	(Call Factory)	(1) *
9	Battery Holder Assembly	41340	(1)
10	Clock Setting Template	41041	(1)
11	Pry Wrench	41530	(1)
12	QMT Replacement Kit	40465	(1)

* Item not shown.

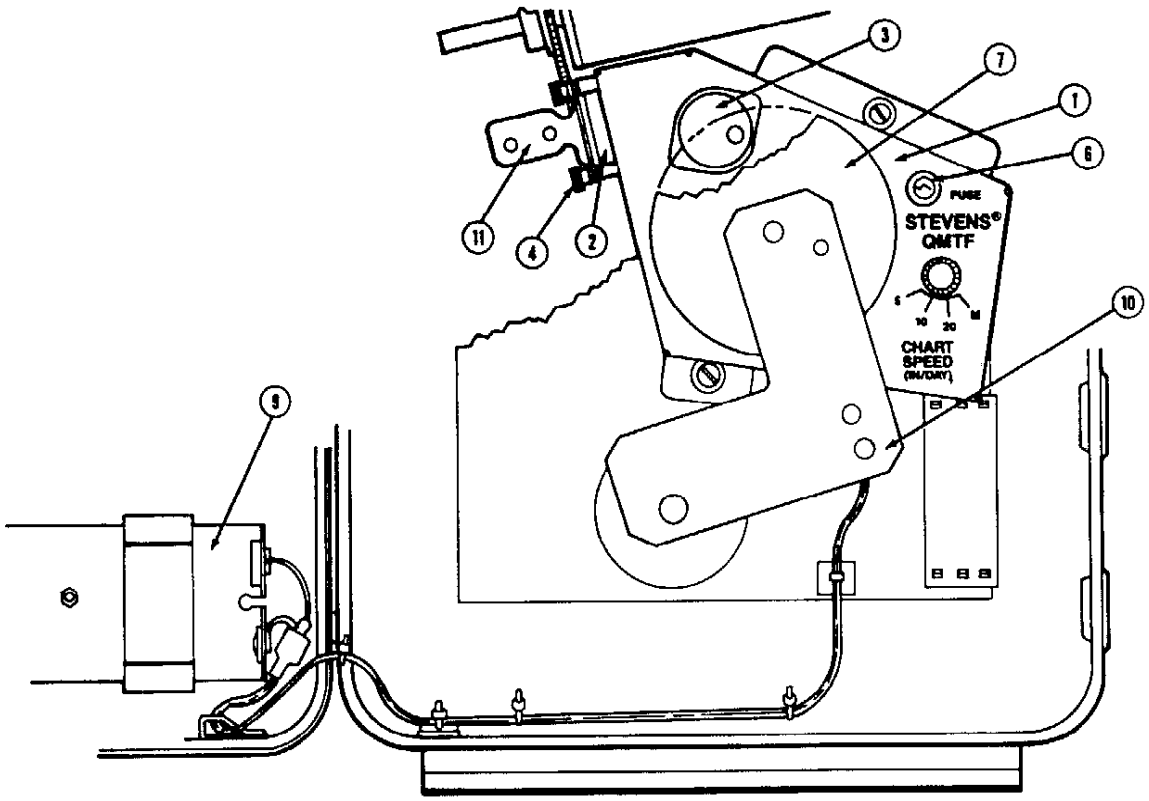


Figure 14. Quartz Drive Unit