

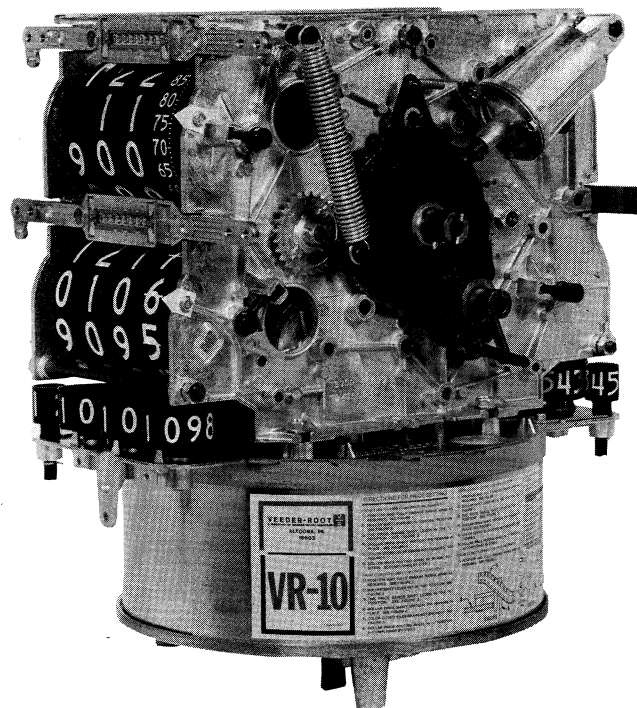


VEEDER-ROOT
SERVICE MANUAL

Technical Manual
1-001
Issued: 10/93
Supersedes: 12/76

VEEDER-ROOT COMPUTER SERVICE MANUAL

Manual Number 231099



VEEDER-ROOT 
Petroleum Products



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INTRODUCTION

Every gasoline pump computer is thoroughly tested at the Veeder-Root factory and by the pump manufacturer when installed in the pump. However, like any precision built mechanism it requires periodic care to ensure maximum service.

This manual has been compiled primarily for the manufacturers of gasoline pumps using the Veeder-Root Mechanical Computer. We would like to bring to the attention of all persons using these instructions a number of very important points to be considered before attempting to correct any computer failures.

COMPUTER WARRANTY

1. **GENERAL.** The Veeder-Root Computer is warranted (to the manufacturer of the pump in which it is installed) to be free from defects in materials and workmanship for a period of twelve months. It will be repaired or replaced at the discretion of its manufacturer without charge if returned, transportation prepaid, to the pump manufacturer within the specified period.
2. **WARRANTY.** We warrant that our products shall be free from defects in material and workmanship for a period of one year from the date of shipment thereof or the product's total rated life, whichever first occurs. Within the warranty period we shall repair or replace such products which are returned to us with shipping charges prepaid and which are determined by us to be defective. This warranty will not apply to any product which has been subjected to misuse, negligence, or accident; or misapplied; or used in violation of product manuals, instructions or warnings; or modified or repaired by unauthorized persons; or improperly installed.
3. **INSPECTION.** You shall inspect the product promptly after receipt and shall notify us in writing at our Simsbury office of any claims, including claims of breach of warranty, within thirty days after you discover or should have discovered the facts upon which the claim is based. Your failure to give written notice of a claim within the time period shall be deemed to be a waiver of such claim.
4. **LIMITATION OF REMEDY AND WARRANTY.** The provisions of Paragraph 2 are our sole obligation and exclude all other remedies or warranties, express or implied, including warranties of MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE, whether or not purposes or specifications are described herein. We further disclaim any responsibility whatsoever to you or to any other person for injury to person or damage to or loss of property or value caused by any product which has been subjected to misuse, negligence, or accident; or misapplied; or used in violation of product manuals, instructions or warnings; or modified or repaired by unauthorized persons; and improperly installed.
5. **LIMITATION OF DAMAGES.** Under no circumstances shall we be liable for any incidental, consequential or special damages, losses or expenses arising from this contract or its performance or in connection with the use of, or inability to use, our product for any purposes whatsoever.
6. **LIMITATION OF ACTIONS:** No action regardless of form arising out of this contract may be commenced more than one year after the cause of action has accrued, except an action for nonpayment.
7. In view of the above, it is important in cases where manufacturer's replacement stocks are available, that no attempt be made to repair any computer within the twelve-month period, as such action might void the warranty referred to above. It is recommended that, when possible, computers of this type be replaced and the defective unit returned to the pump manufacturer.

SECTION 1. USE AND MAINTENANCE



WARNING: IN INSTALLATION AND USE OF THIS PRODUCT, COMPLY WITH THE NATIONAL ELECTRICAL CODE; FEDERAL, STATE, AND LOCAL CODES; AND ALL APPLICABLE SAFETY CODES. IN ADDITION, TURN OFF POWER AND TAKE OTHER NECESSARY PRECAUTIONS TO PREVENT PERSONAL INJURY, PROPERTY LOSS AND EQUIPMENT DAMAGE.

A. EASY TO USE AND OPERATE

At first sight most people are awed at the seemingly complicated construction of the gasoline pump computer. Yet, despite its more than 700 parts, it is amazingly simple to use, set and care for. The computer is a precision-built machine and a product of experience. It is made by Veeder-Root — manufacturer of counting and computing devices.

B. REQUIRES MINIMUM AMOUNT OF CARE

The following pages describe things you should know about this computer — how to care for it — how to set it — its features. Please read the instructions carefully and see that all who will use the pump understands thoroughly the care and operation of the computer.

C. PERIODIC CLEANING AND LUBRICATION



WARNING: IF INSTALLED, THE COMPUTER MUST BE REMOVED FROM PUMP AND RELOCATED TO A NONHAZARDOUS AREA FOR MODIFICATION AND CLEANING. BEFORE REMOVAL, ENSURE THAT ALL CIRCUIT BREAKERS THAT CONTROL POWER TO THE DISPENSER ARE IN THE OFF POSITION. TAKE NECESSARY PRECAUTIONS TO PREVENT CIRCUIT BREAKERS FROM BEING TURNED ON UNTIL ALL WORK IS COMPLETED. MORE THAN ONE BREAKER MAY HAVE TO BE TURNED OFF TO OBTAIN A COMPLETE SHUTDOWN OF POWER TO THE SELECTED POSITION. FAILURE TO COMPLY WITH THIS WARNING MAY RESULT IN PERSONAL INJURY, PROPERTY LOSS AND EQUIPMENT DAMAGE.

The computer, when manufactured, is so well adjusted and lubricated that it requires a minimum of attention. It does require **periodic cleaning and lubrication** to give maximum service. Judgment of the intervals at which the computer requires such service must necessarily be left to individual users, due to varying conditions of service. Generally, under normal conditions, this will be necessary only **once a year or after each 250,000 units of measure delivered**, whichever occurs first.



Mechanical Petroleum Pump Computer Service Manual

1. Cleaning

a. Counter Section

1. Remove Wheels (see Section 3C, page 6).
2. Flush with mineral spirits or solvent. Blow out excess solvent with compressed air.

b. Wheels

With wheels removed from counter section, clean with small brush dipped in mild soap and water and dry with compressed air.

c. Variator Section

Rinse thoroughly with solvent and blow dry with compressed air.

2. Lubrication

For increased mechanical computer life, the following lubrication procedure should be performed every 250,000 gallons or liters pumped. This preventive maintenance can be accomplished without removing the computer from the dispenser.

a. Recommended Lubricants

Oil: Temperature Range -65°F to +400°F
Chemlube 201 Synthetic Oil
also

Exxon Instrument Oil
Aeroshell Fluid No. 12
Mobil 1
or equivalent

Grease: Temperature Range -40°F to +300°F
Vischem 352
also

Beacon 325
Aeroshell No. 14
or equivalent

Chemlube and Vischem products are manufactured by:

Ultrachem Inc.
1400 N. Walnut Street
P.O. Box 2053
Wilmington, DE 19899

b. Lubrication Procedure

1. Oil the pinion shafts and horizontal money and quantity shafts on both sides of the counter section (Figures 1 and 2).
2. Oil the sliding gear bearing and the idler gear bearing in each of the three range arm groups in the variator section (Figure 3).
3. Oil the surface where the 1/10¢ integrator gear contacts the top of the cone gear in the variator section (Figure 3).
4. Apply a light film of grease to all gear teeth in the variator section.

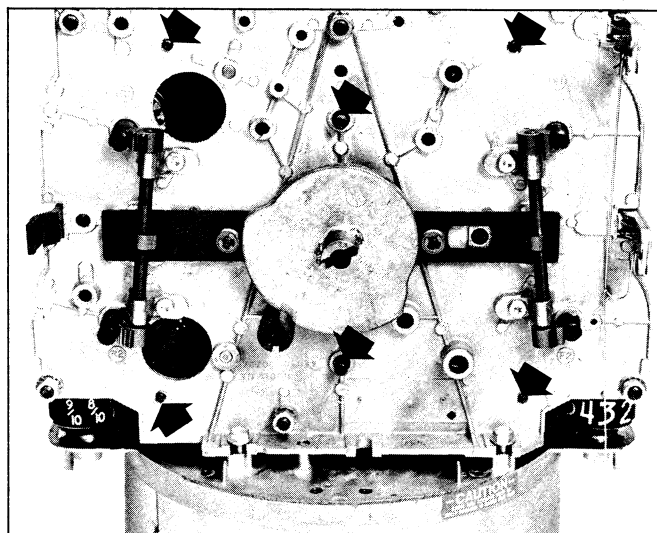


Figure 1. Counter Section Lubrication Points. (Left Side)

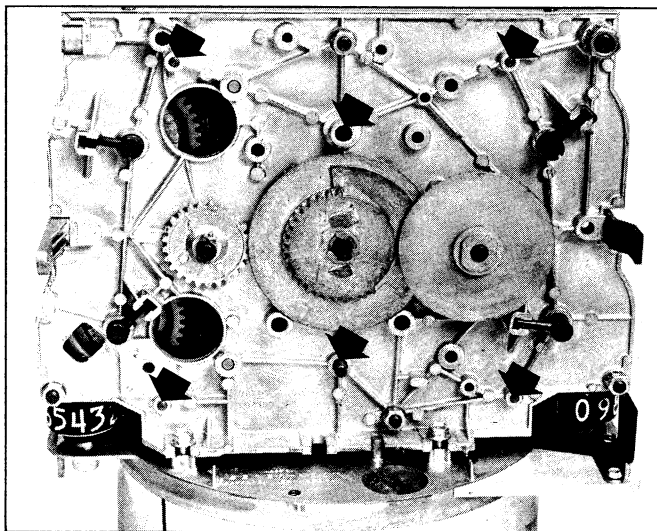


Figure 2. Counter Section Lubrication Points. (Right Side)

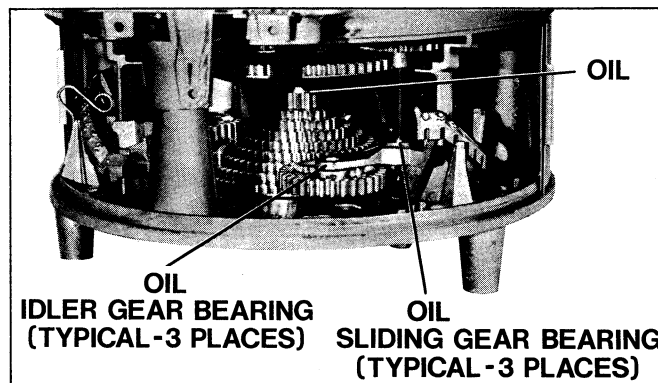


Figure 3. Variator Section Lubrication Points.

SECTION 2. OPERATION OF THE COMPUTER

The Computer is a gear driven device used in gasoline pumps to indicate the amount of delivery and compute the total sale for each delivery.

There are two main parts to the computer: The **counter section** where the quantity and money wheels that appear at the pump face are located and all resetting and switch linkages are connected; and the **variator section** where the pump meter is connected and the manual price setting and automatic selling price integration take place.

A. DRIVE

1. Quantity Drive (Figure 4)(Figure 4a)

The drive shaft (4) driven by the pump meter in a counter-clockwise direction runs through the variator section of the computer and drives the quantity wheels (1) through the quantity bevel gears (3) and the spur idler gears (2). The number of revolutions of the drive shaft (4) required to produce one revolution of the right-hand quantity wheel will be determined by the ratio of the computer. Computers are built with both a 2:1 and a 4:1 ratio. This means that either two revolutions of the drive shaft or four revolutions of the drive are required to produce one revolution of the right hand quantity wheel. These ratios are determined by the pump meter output shaft. Some pump meter output shafts will rotate twice for each unit of fluid delivered, while others will rotate four times for each unit of fluid delivered. When ordering a replacement computer it is important that the correct ratio be ordered. A 2:1 ratio computer placed on a four revolution per unit meter will record twice as many units as have actually been delivered while a 4:1 ratio computer placed on a two revolution per unit meter will record only half the quantity actually delivered. A 2:1 ratio or two revolutions of the meter output shaft per unit delivered is common in meters which deliver liters, while the 4:1 ratio computer and the four revolutions per unit delivered meter are common in meters designed to deliver either U.S. or Imperial gallons.

2. Money Drive (Figure 4)(Figure 4a)

Price Setting: The range arm (6) is set in a desired location on the cone gear (5) by manipulating the range arm (6) to the desired slot in the arm. There are three range arms situated around the cone gear. On the models 2002E and VR10 these range arms control the three right-hand price posting wheels. The left hand, or highest order, price posting wheel is controlled by a lever on top of the variator section. Instructions for setting the highest order price posting wheel on the VR10 are contained on the variator band. Instructions for setting the 2002E highest order price posting wheel to "3" are included in the Kit No. 312020-595.

When the operator has selected the desired slot in the range arm (6), he has his new price setting. The price wheels (22) are synchronized with the range arm through a rack system so that they are automatically set at the correct price.



NOTE: Be sure the range arm is properly seated in its slot and that the drive gear is fully engaged with the teeth on the cone gear. It may be necessary to rotate the cone gear both clockwise and counter-clockwise to ensure that this is properly engaged. Check both the front and the back of the computer to see that the correct figures for the price per unit appear in the lower dial openings. Check the money readings after the first delivery to be sure that you have made the setting correctly and that the computation is correct.

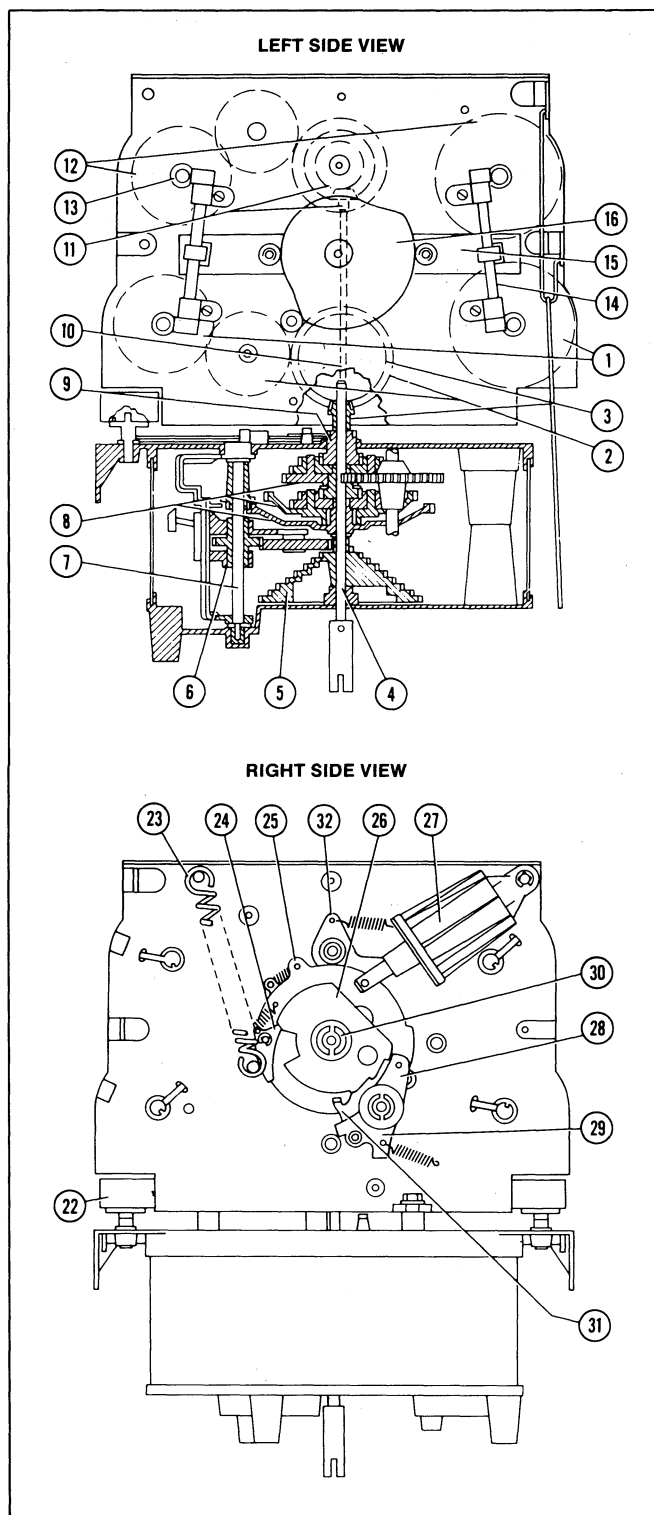


Figure 4. Left & Right Side Views. (Two Handle Reset)

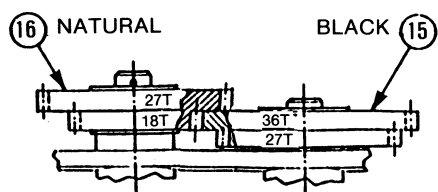
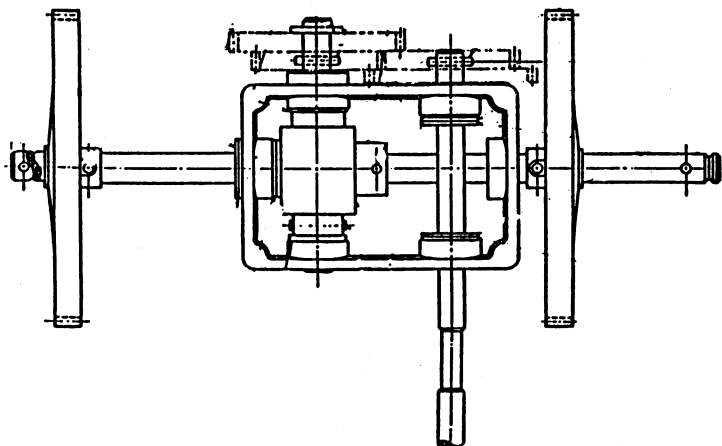
3. Money Wheel Variations

Various money wheel figure layouts are achieved by using single transfer, double transfer, and four transfer wheels in the right hand money position.

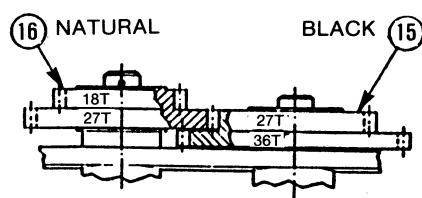
Two and four transfer wheels are used to lower the right hand wheel speed by one half (2 transfer) or one fourth (4 transfer) without making any other changes in the price posting display.

Correct computation is maintained by adjusting the gear ratio in the money drive group. This is accomplished at the factory when the computer is manufactured.

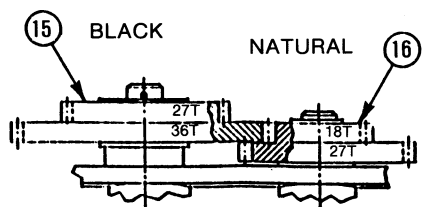
The money drive group is shown below with the various gear configurations required when using single, double, or four transfer wheels.



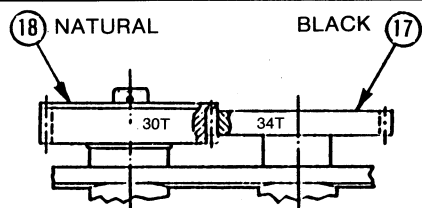
VIEW A
SINGLE TRANSFER R.H. MONEY WHEEL
(36T - 18T)



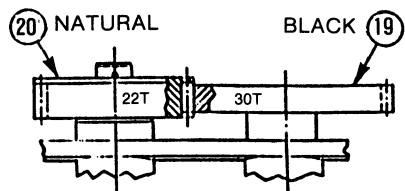
VIEW B
TWO TRANSFER R.H. MONEY WHEEL
(27T - 27T)



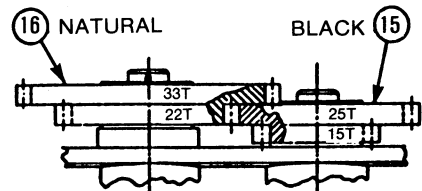
VIEW C
FOUR TRANSFER R.H. MONEY WHEEL
(18T - 36T)



VIEW D
SINGLE TRANSFER R.H. MONEY WHEEL
METRIC: U.S. GALLONS TO LITERS
(34T - 30T)



VIEW E
SINGLE TRANSFER R.H. MONEY WHEEL
METRIC: IMPERIAL GALLONS TO LITERS
(30T - 22T)



VIEW F
FOUR TRANSFER R.H. MONEY WHEEL
METRIC: IMPERIAL GALLONS TO LITERS
(25T - 22T)

B. RESET (Refer to Figure 4)

Resetting wheels and a means of actuating the pump motor switch have been incorporated into one mechanism in this computer. It has been designed in such a way that the money wheels (12) and quantity wheels (1) must be reset to zero before the motor switch can be turned on. A full cycle of the Two Handle Reset and Single Handle Reset mechanism is as follows:

TWO HANDLE RESET:

1. Resetting Wheels (Refer to Figures 4 through 7)

Before resetting, the wheels (12) and (1) are in position (E) and the reset elements are in position (B). By means set up in the pump, the operator actuates the trip lever (29) and causes Pawl "A" (24) to disengage with the shaft cam (26), thus allowing the main spring (23) to turn the reset driven gear assembly (25) in a clockwise direction. Refer to position (C). The speed of this motion is controlled by the dashpot (27). As the reset driven gear assembly (25) turns, it carries with it by means of a unidirectional drive pawl, a large spur gear which in turn, through idler spur gears, drives the reset discs (17) which are engaged with the wheel through the reset plungers (18). The reset discs (17) rotate the wheels until zeros appear in the reading line of the computer. At that time the reset pawls (19) fall into a slot in the wheel shafts (13) and stop the rotation of the wheels. They also, simultaneously, pull the reset plungers (18) back into the wheel hub and out of engagement with the reset discs (17), allowing the discs to continue to rotate until the reset driven gear assembly (25) has revolved to a point where it cams Pawl "B" (28) out of engagement with the shaft cam (26). This action is completed before the shaft cam (26) is stopped by the reset stop pawl (32).

2. Going to Motor On (Refer to Figures 4 through 7)

When Pawl "B" (28) disengages with the shaft cam (26) the disc is free and by means set up in the pump, the operator turns the shaft cam (26) with center shaft (30) in a clockwise direction. As it moves it also rotates the shaft cam (16), which in turn moves the slide bar (15). This motion, through a linkage arrangement, causes the rocker arms (14) to rotate and slide the wheel shafts (13) over until the annuli (13A) are in the position as depicted in (D). By shifting the wheel shafts' annuli (13A) over, the reset pawls (19), (32), (33) have cleared the slots and the drive pawls (21) have pivoted and engaged the drive gears (20) through serrations on the right hand wheels and slots in the other wheels. The pump motor has by now been turned on through a remote linkage connected to the center shaft (30) and the pump is now ready to deliver the gas. Refer to position (A). The quantity and money wheels rotate in an opposite direction when resetting relative to their rotation when operated by the drive shaft (4).

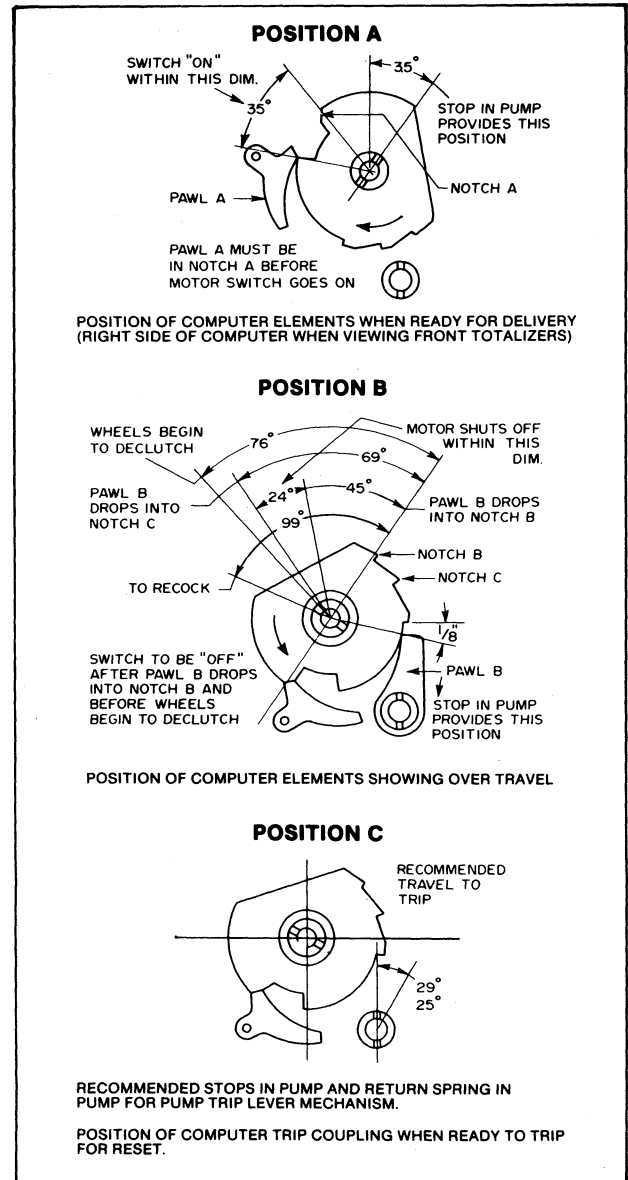


Figure 5. Reset timing positions of shafts. (Two Handle Reset)

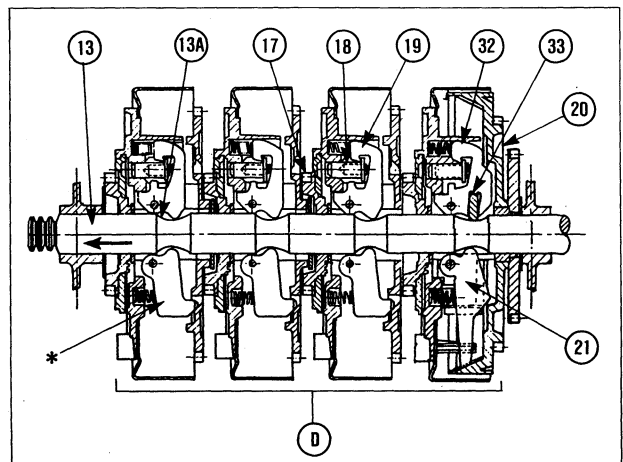


Figure 6. Annuli Position D.

3. Going to Motor Off (Refer to Figures 4 through 7)

After the delivery is completed, the operator shuts the pump off by turning the shaft cam (26) with center shaft (30) in a counter-clockwise direction until the last notch engages Pawl "B" (28). This action also relocks the reset driven gear assembly (25) by virtue of Pawl "A" (24) and shifts the wheel shafts (13) back to position (E), through the rocker arms (14), slide bar (15) etc. Refer to position (B). When wheels (1) and (12) are in the resetting position (E), the drive pawls (21) are disengaged from the drive gears (20). It is mandatory to have Pawl "B" (28) engage the last notch of shaft cam (26) so as to release the quantity (1) and money (12) wheels resetting mechanism interlock. In order to assure that the last notch in shaft cam (26) is always reached, the trip lever lock pawl (31) prevents premature releases of Pawl "A" (24) from reset shaft cam (25).

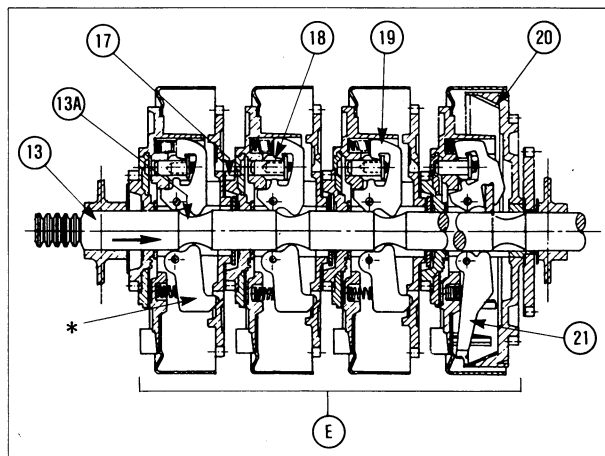


Figure 7. Annuli Position E.

SINGLE HANDLE RESET:

1. Resetting Wheels (Refer to Figures 4a, 5a, 6, & 7 and Positions F, G, H, J, K, L, M, & N)

As the operator approaches the unit it will have been cocked from the previous transaction, but before resetting, the wheels (12) and (1) are in position (E) and the reset elements are in position (F). By means set up in the pump, the operator actuates the center shaft (30) in a clockwise direction. This motion moves the trip pawl (29) so that it moves pawl (24) and Pawl "B" which releases disc (26) moving it in a clockwise direction due to spring (23) & (34) pulling it. (Positions F, G, H, J, K) The speed of this motion is controlled by the dashpot (27). The disc (26) carries with it the reset gear assembly (25) by means of a unidirectional drive pawl, a large spur gear which in turn, through idler spur gears, drives the reset discs (17) which are engaged with the wheel through the reset plungers (18). The reset discs (17) rotate the wheels until zero appears in the reading line of the computer. At that time the reset pawls (19, 32, & 33) fall into a slot in the wheel shafts (13) and stop the rotation of the wheels. They also, simultaneously, pull the reset plungers (18) back into the wheel hub and out of engagement with the reset discs (17). Spring (34) has rotated reset disc (26) against bumper (35).

The unit is now in "Motor On" position and ready for delivery of product, (Position K)

After product has been delivered the operator must turn the center shaft (30) in a counterclockwise direction (Positions L, M, & N). This action causes center shaft (30) to drive disc (26) in a counter-clockwise direction contacting pawl (24) which causes reset driver gear assembly (25) to move counterclockwise to Position M, the maximum "Motor Off" position, and the on to Position N. When the operator releases the center shaft (30), it moves a short distance clockwise and pawl "B" resets in notch "C" (Position F). This is the fully cocked position ready for the next reset cycle.

2. Going to Motor On (Refer to Figures 4a, 5a, 6, & 7)

When Pawl "B" (28) disengages with the shaft cam (26) the disc is free and by means set up in the pump, the operator turns the shaft cam (26) with center shaft (30) in a clockwise direction. As it moves it also rotates the shaft cam (16), which in turn moves the slide bar (15). This motion, through a linkage arrangement, causes the rocker arms (14) to rotate and slide the wheel shafts (13) over until the annuli (13A) are in the position as depicted in (D). By shifting the wheel shafts' annuli (13A) over, the reset pawls (19), (32), (33) have cleared the slots and the drive pawls (21) have pivoted and engaged the drive gears (20) through serrations on the right hand wheels and slots in the other wheels. The pump motor has by now been turned on through a remote linkage connected to the center shaft (30) and the pump is now ready to deliver the gas. Refer to position (K). The quantity and money wheels rotate in an opposite direction when resetting relative to their rotation when operated by the drive shaft (4).

3. Going to Motor Off (Refer to Figures 4a, 5a, 6, & 7)

After the delivery is completed, the operator shuts the pump off by turning the shaft cam (26) with center shaft (30) in a counter-clockwise direction until the last notch engages Pawl "B" (28). This action also relocks the reset driven gear assembly (25) by virtue of Pawl "A" (24) and shifts the wheel shafts (13) back to position (E), through the rocker arms (14), slide bar (15) etc. Refer to position (F). When wheels (1) and (12) are in the resetting position (E), the drive pawls (21) are disengaged from the drive gears (20). It is mandatory to have Pawl "B" (28) engage the last notch of shaft cam (26) so as to release the quantity (1) and money (12) wheels resetting mechanism interlock.

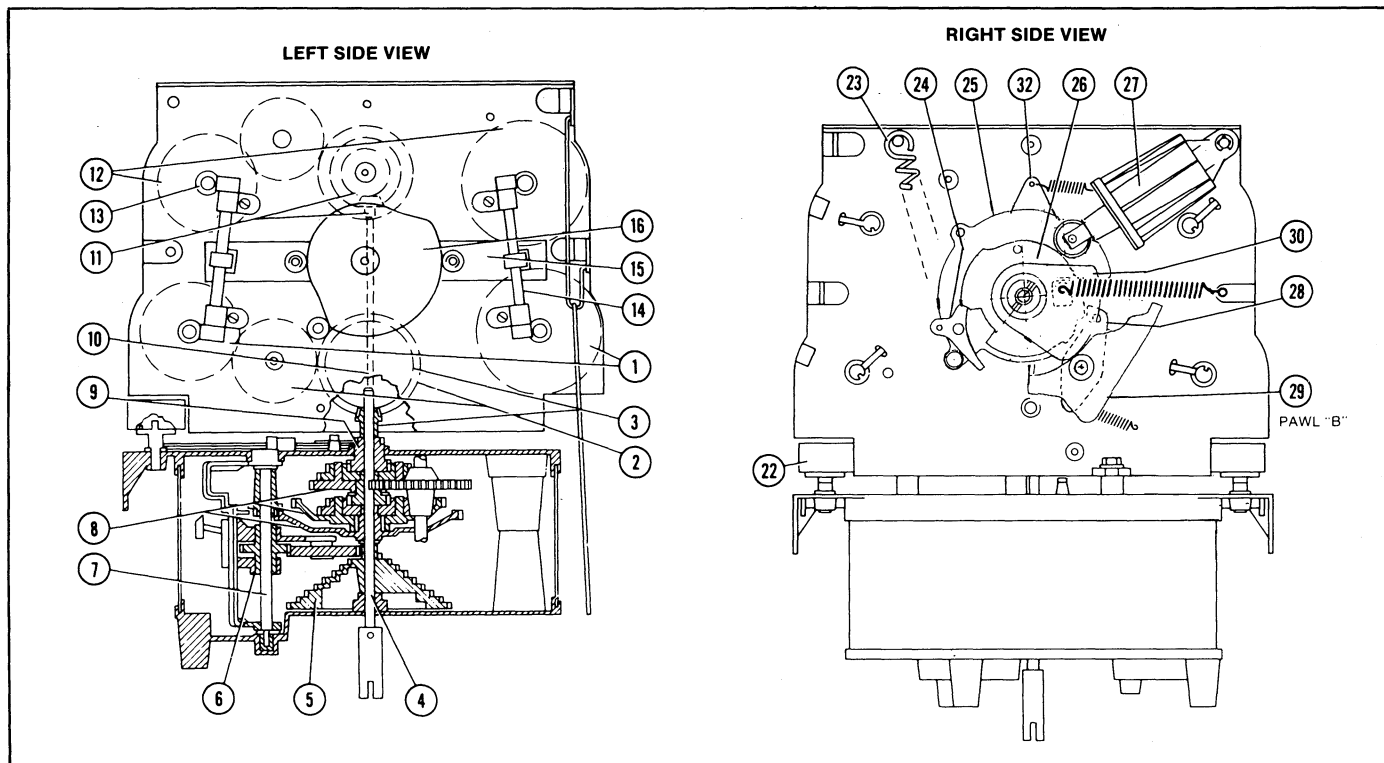


Figure 4a. Left & Right Side Views. (Single Handle Reset)

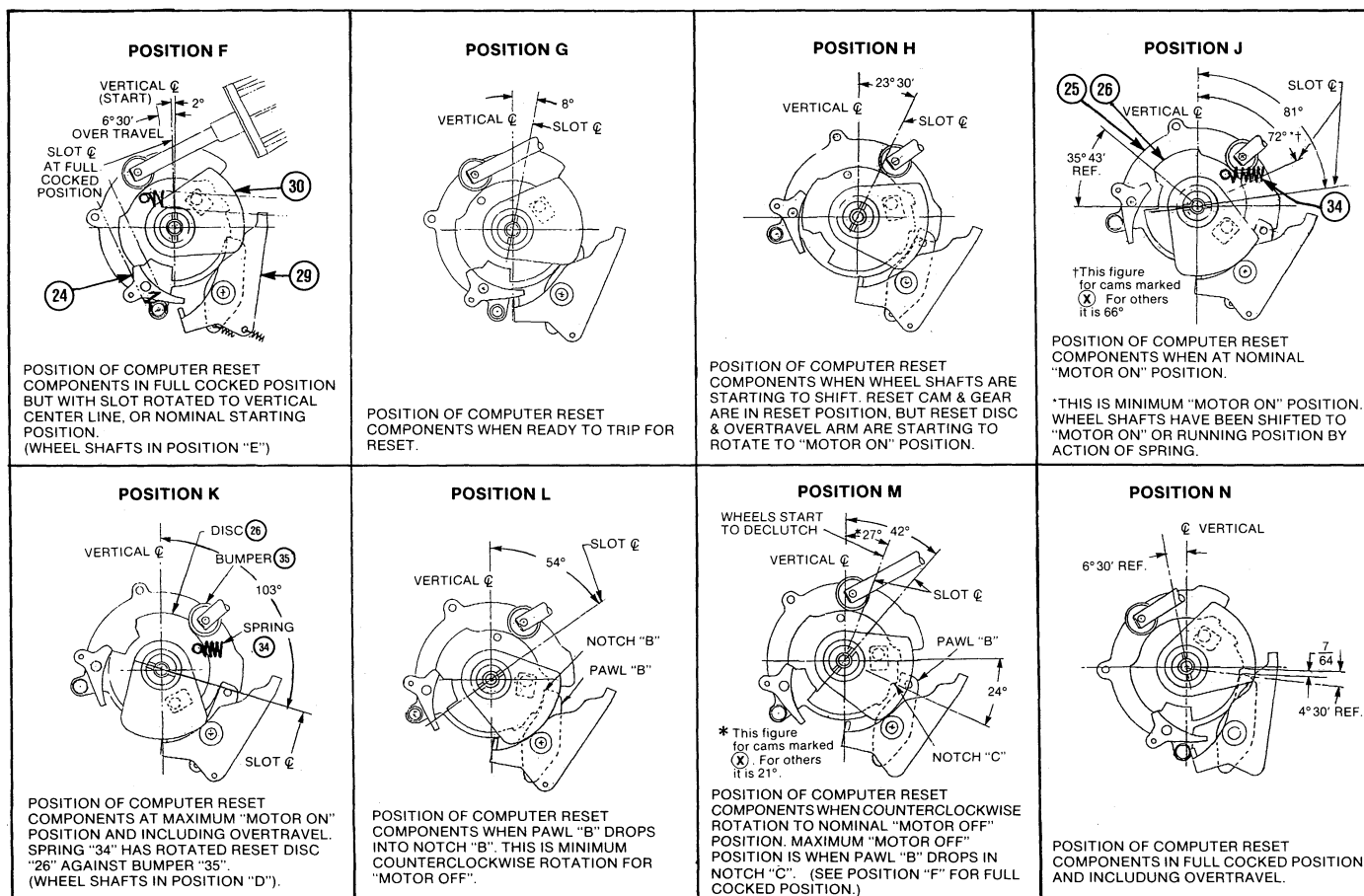


Figure 5a. Reset Timing Positions of Shafts. (Single Handle Reset)



Mechanical Petroleum Pump Computer Service Manual

C. TOTALIZERS

A money totalizer and a quantity totalizer have been built into the Computer. These totalizers have a cover and plastic crystal. They cannot be reset. They run in conjunction with their respective wheel sections and indicate the total amount of fuel delivered and the total amount of money charged. Their main function is for inventory and bookkeeping purposes. For units with shutters, the registrations on the totalizers are not visible from the outside of the pump until the shutterlinks are pulled down exposing the totalizer readings.

D. FIGURE WHEELS (Refer to Figures 4 through 7)

- The design of quantity (1) and money (12) wheels is such that drive pawls (21) engage drive gears (2) and a positive coupling of elements takes place which tends to prevent overthrowing during operation. This scheme, in effect, simulates a nonreset wheel. Quantity (1) and money (12) wheel figures are 13/16" high by 1/2" wide; all wheels have white figures on a black background.
- Price setting wheel (22) figures are 9/16" high by 1/4" wide. All price setting wheels (22) have white figures on a black background.
- The quantity and money totalizer wheel figures are 3/16" high by 3/32" wide.

SECTION 3. FIELD SERVICE

Besides common hand tools such as hammer, screw driver, and punch, etc., a few simple special tools are absolutely necessary in working on the computer. See Figure 8.

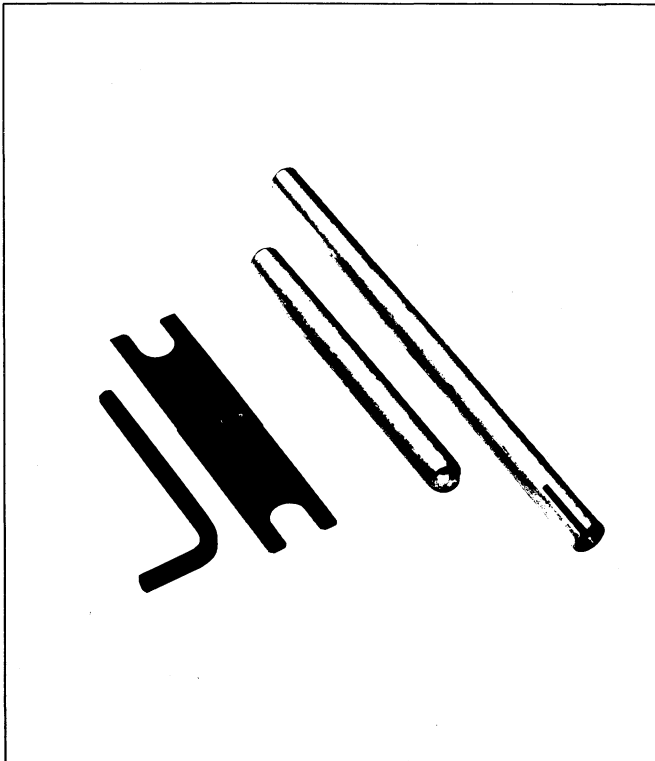


Figure 8. Computer Repair Tools — Kit No. 89657-1-005

A. INSTALLATION OF COMPUTER

When installing the Computer in a pump, it is of vital importance that it can be properly adjusted with relation to the pump handle and switch linkage.

1. Motor "ON" Position (Figure 9)

The linkage connecting the switch actuating mechanism to the computer should be so adjusted, that the pump motor does not turn on until the reset latch pawl (A) fully engages the deep notch in shaft cam (B), thus making sure that the computer reset mechanism is in proper position to function when released.

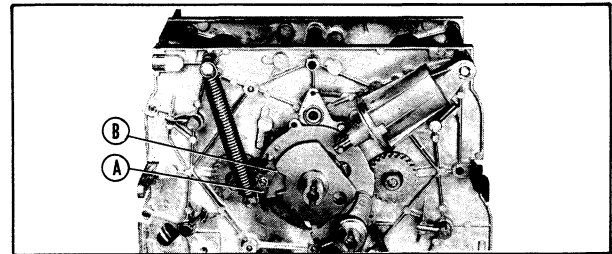


Figure 9. Motor "ON" Position.

2. Motor Switch "OFF" Position (Figure 10)

The operating linkage must also be adjusted so that the motor turns off after pawl (C) engages notch (D) in shaft cam (B) and before second notch (E) is engaged. This assures proper function of the interlock mechanism. Also stop adjustment should be such that approximately 1/8" (3.2 mm) overtravel is allowed after pawl (C) engages third notch (F).

Make sure that all rods or connecting links attached to computer are free and do not exert thrust against computer or introduce binds when being operated.

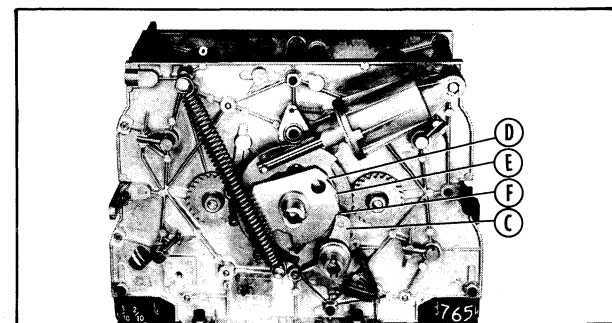


Figure 10. Motor Switch "OFF" Position.

B. INSPECTION OF COMPUTER

If the trouble is unknown it is necessary to check the entire computer making sure that it functions correctly, parts are in place, and end play is to specification. A check list on such procedure follows:

1. Check each bank of wheels for end play (0.015 to 0.022 in.; 0.38 to 0.56 mm).
2. Check end play of:
 - a. Upper and lower drive shaft groups
 - b. Four idler gears
 - c. Four wheel shafts
 - d. Two reset shafts (containing the large Zamak gears inside, and the Zamak gear outside)
 - e. Center shaft (with spring removed) (0.005 to 0.030 in.; 0.13 to 0.76 mm)
 - f. Reset trip shaft (with spring removed) (0.005 to 0.020 in.; 0.13 to 0.51 mm)
 - g. Two rocker shafts



NOTE: All shafts and gears should be free and have perceptible end play.

3. While resetting the computer, check wobble of 8 large Zamak reset gears, making sure they do not interfere with sides of wheels.
4. With main spring off, take hold of stud to which spring was attached and rotate cam back and forth to make sure parts work freely.
5. Hold trip pawl out and rotate center shaft back and forth to see that shaft-shifting mechanism works freely. Do this with all wheels at zero. Repeat, with all wheels at a position other than zero, to sense the added load of the reset pawls within the wheels.
6. Check all wheels to make sure they spin freely. Do this by turning the center shaft with light finger pressure on the wheels, to a position where wheels are free and can be turned independently by hand even through the zero position. All wheels may not be free at the same time, so it might be necessary to turn center shaft a bit in either direction to free some wheels. While spinning the wheels, watch the gear on each wheel to make sure that it does not weave back and forth excessively.
7. Replace spring and back off variator to locate all wheels between 9 and 0. Reset from this position, making sure all wheels reset to zero without sluggishness.
8. Back off the variator to locate all wheels between 9 and 0. Hold out the trip pawl and turn the center shaft counter-clockwise to the reset position. Then push each wheel separately by finger in the subtracting direction to zero. In so doing, determine if any of the wheels feel too weak or too stiff.
9. Make sure that trip lever lock pawl prevents tripping before stop pawl falls into last notch of shaft cam.

C. USE OF VEEDER-ROOT SPECIAL COMPUTER TOOLS

These essential tools, in Figure 8, remain substantially the same as they were when they were introduced with the M56 computer in 1956. They are not expensive, but **they are**

absolutely essential when it comes to replacing wheels and reset discs, etc. **To avoid damage to the reset discs and wheel pawls, the long and short dummy shafts must be used whenever wheels are removed.**

Without these dummy shafts, the only way in which the wheels can be removed and reassembled is by using the wheel shaft. This results in the blunt end of the wheel shaft and its collar striking against the flat edge of the sintered metal "hooker" pawl and also the inner edge of the reset disc. **Under these circumstances, if pressure is applied on the wheel shaft to push it "home," it is almost certain that damage will occur to the "hooker" pawl and the reset disc.**

It is extremely important that any one who services the Veeder-Root computer and non-computer read this manual and obtain/use the Veeder-Root special tools in the future.

1. Removal of Wheels



NOTE: Computer should be in "pump motor on" (ready to count) position before starting wheel removal. See Figures 32, 33, 34 and 35 for ways of identifying this position when the computer has been removed from the pump.

- a. For rear wheel removal, remove dial bracket (B), Figure 11. If front wheels are to be removed, detach wire totalizer operating link if totalizers are equipped with shutters and remove only the **volume** totalizer (C), Figure 11 and Figure 13. The totalizer is held in place by two Torx head screws (earlier models used hexagon or slotted head screws) covered by metal seal caps. Seal caps may be removed by piercing in the center with a sharp punch and prying out, Figure 12.
- b. Remove pointer (A) adjacent to wheel bank being removed, Figure 11 and Figure 14.
- c. Remove rocker shaft group by taking out screws, Figure 15. If only one bank of wheels is to be removed, it is not necessary to completely remove rocker shaft group. Remove one screw and loosen the other screw to permit disengagement of the rocker shaft group from the wheel shaft being removed.
- d. Place **open slotted end** of long dummy shaft over grooved end of wheel on **rocker shaft side** of computer. Be certain slot in open end of long dummy shaft is aligned with slot in wheel shaft. Gently push wheel shaft out of computer, Figure 16 through 19.



CAUTION: DO NOT FORCE LONG DUMMY SHAFT THROUGH THE WHEEL BANK OR DAMAGE TO THE WHEEL RESET MECHANISM MAY OCCUR. NEVER HIT THE LONG DUMMY SHAFT WITH A HAMMER OR OTHER TOOL. IT MAY BE NECESSARY TO MOVE THE LONG DUMMY SHAFT AND WHEEL SHAFT, TOGETHER, VERY SLIGHTLY TO THE RIGHT AND LEFT TO ASSIST IN A SMOOTH DISASSEMBLY.

With long dummy shaft still inserted in wheel bank, slide the shaft to the left far enough to remove the right side end-play washers. Slide the shaft to the right far enough to remove the left side end-play washers.

- e. Insert the short dummy shaft into the **open slotted end** of the long dummy shaft and push the long dummy shaft out, Figure 20.
- f. Remove entire wheel bank from computer taking care not to drop reset disc from left wheel, Figure 21.

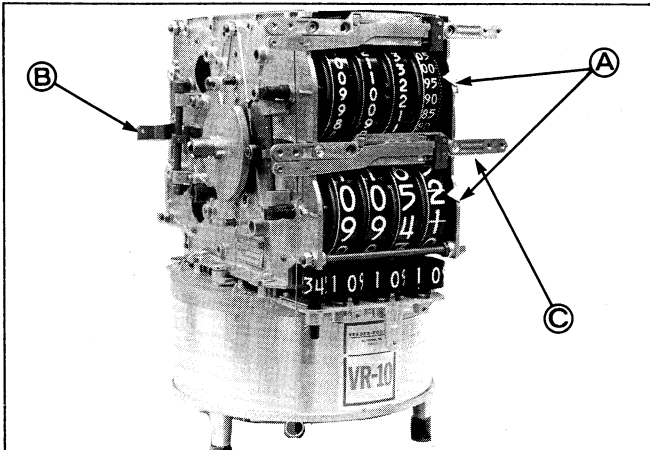


Figure 11. View of computer showing pointers (A), rear dial bracket (B), and volume totalizer (C).

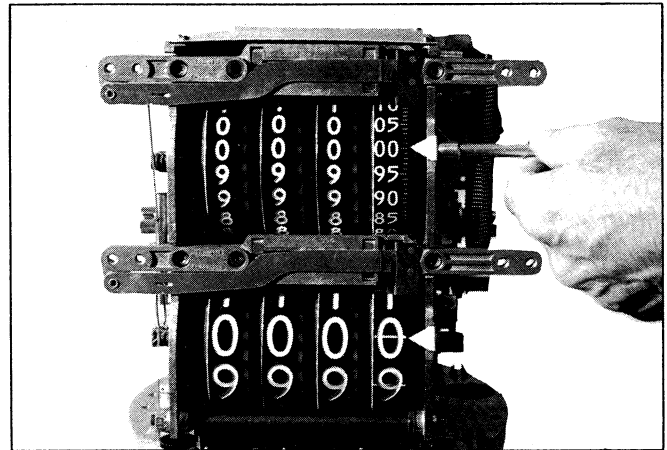


Figure 14. Removal of pointer.

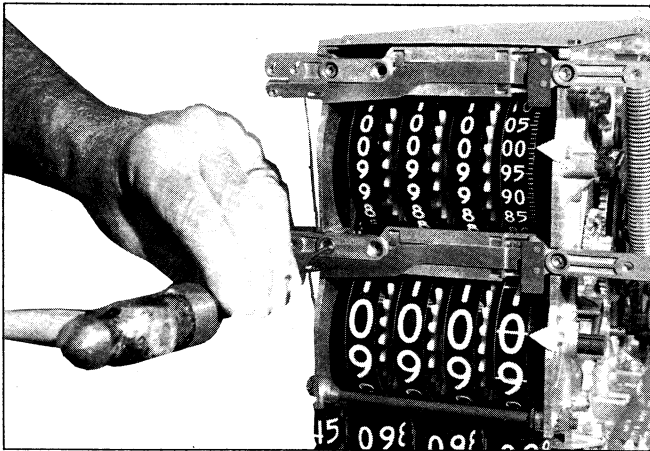


Figure 12. Removal of totalizer seal caps.

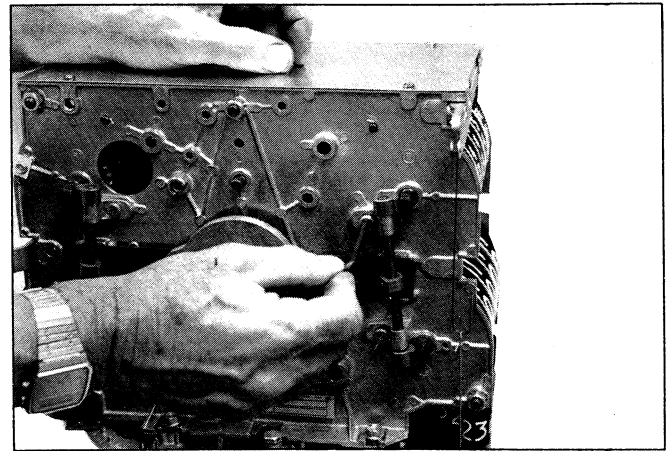


Figure 15. Removal of rocker shaft group screws.

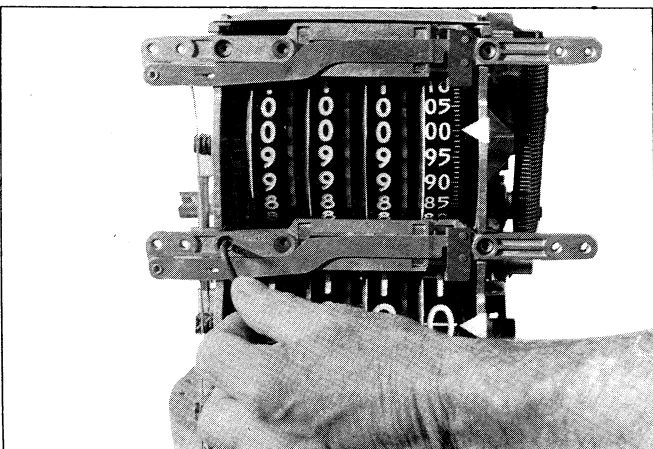


Figure 13. Removal of totalizer screws.

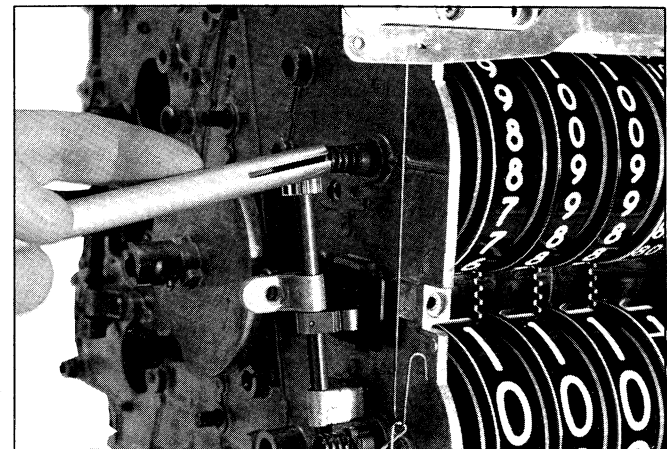


Figure 16. Placing open slotted end of long dummy shaft over grooved end of wheel shaft.

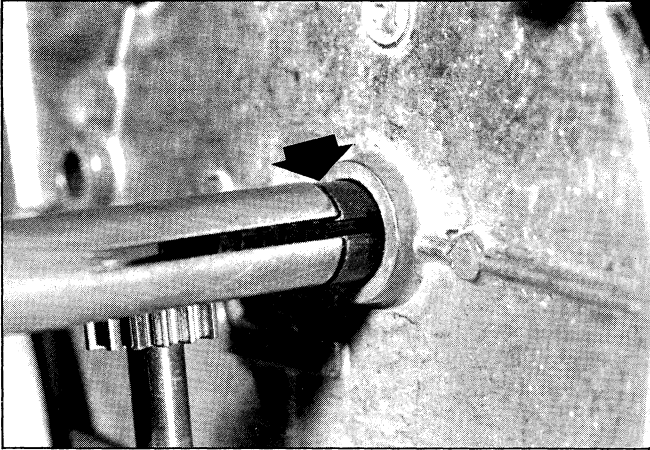


Figure 17. Aligning slot in open end of long dummy shaft with slot in wheel shaft.

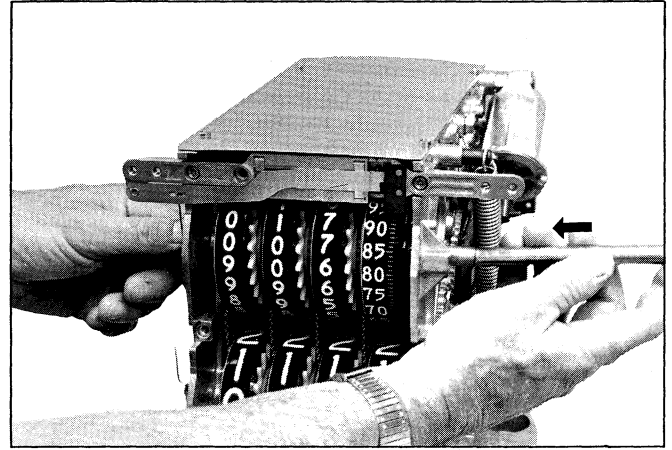


Figure 20. Inserting short dummy shaft into open end of long dummy shaft.

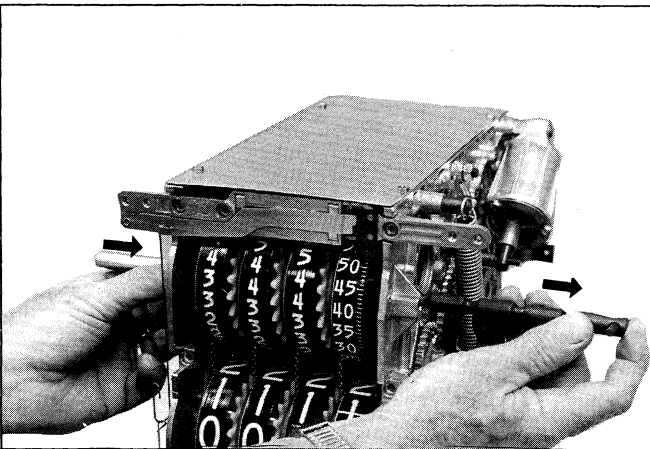


Figure 18. Pushing wheel shaft out of computer with long dummy shaft.

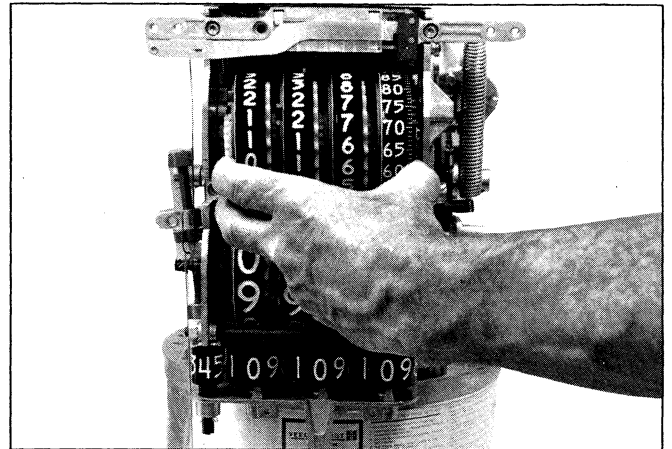


Figure 21. Removal of wheel bank.

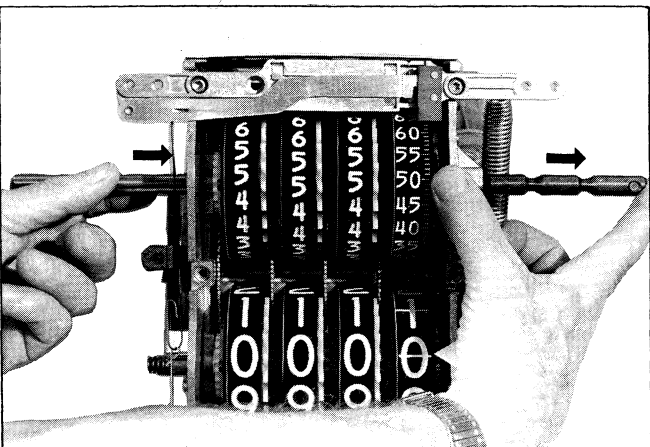


Figure 19. Pushing wheel shaft out of computer with long dummy shaft.

2. Inspection of Wheels

After removal, those wheels which are not obviously damaged or worn should be checked for correct operation. First ensure that the wheels are free from dirt and other foreign matter. This may interfere with the operation of the pawls. With wheels on short dummy shaft, the drive gear, Figure 22, should spin free and the reset plunger, Figure 23, should be projecting from the side of the wheel hub. Push the plunger in to check that it is free and has a snappy spring action.

With the dummy shaft removed, drive gear, Figure 22, should be locked. The end of the reset plunger, Figure 23, should be flush or below the surface of the wheel hub.

Lubricate the wheel pawls.

Visually inspect the reset disc. If the wire spring, Figure 24, is missing (probably due to non-use of the special computer tools in a previous service repair), the reset disc must be replaced.



NOTE: Although not mandatory, it is good practice whenever a new wheel is installed in the computer to also change the reset disc for a new one if possible. The reset disc part number is G77481-1-006.

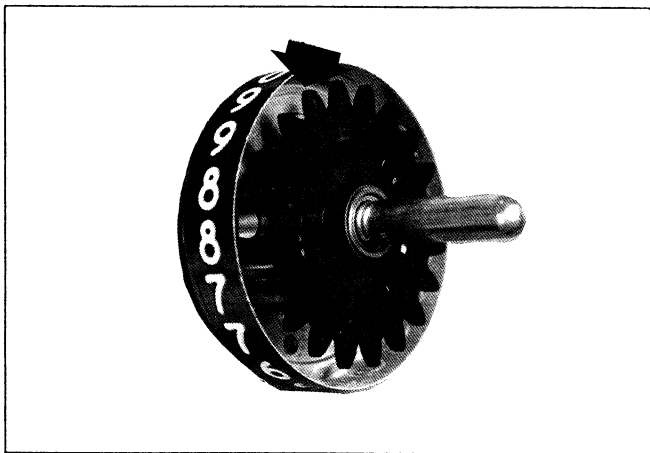


Figure 22. Drive gear.

3. Installation of Wheels

- Place wheels on short dummy shaft with reset discs inserted in place on each wheel. With the short dummy shaft still inserted in the wheel bank, hold the assembly in front of the pinion shaft and space pinions as shown, Figure 25. Then install the wheel bank in the computer.



CAUTION: WHEN INSTALLING WHEEL BANK IN COMPUTER, WHEELS **SHOULD NOT** BE SET WITH "0" OR "9" ON THE READING LINE SINCE JAMMING OF WHEELS COULD OCCUR. IT IS BEST TO HAVE ALL 5'S ON THE READING LINE.

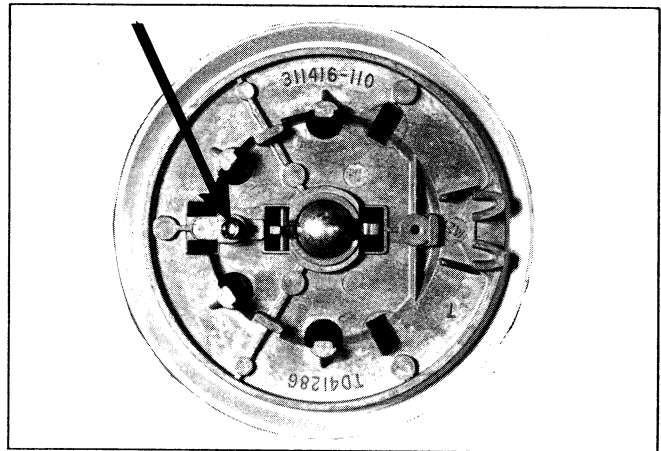


Figure 23. Reset plunger projecting when dummy shaft is inserted in wheel.

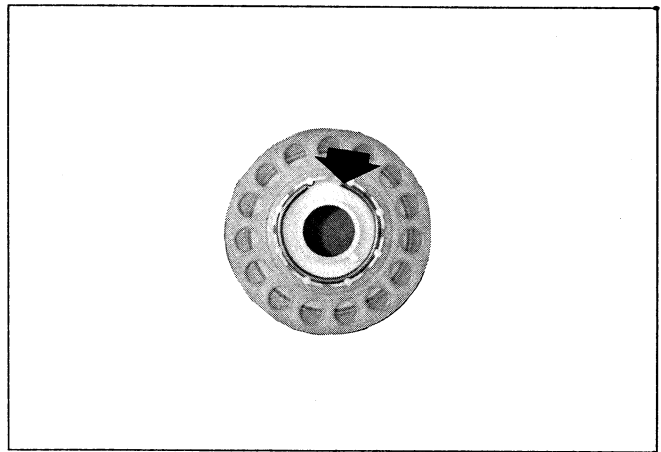


Figure 24. Reset disc wire spring.

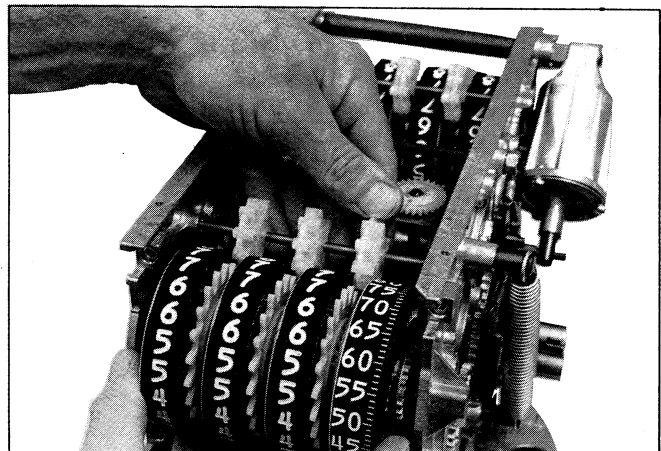


Figure 25. Spacing pinions for wheel bank installation.

- b. Insert long dummy shaft, **open slotted end** first, from **rocker arm side** of computer pushing out short dummy shaft, Figure 26.

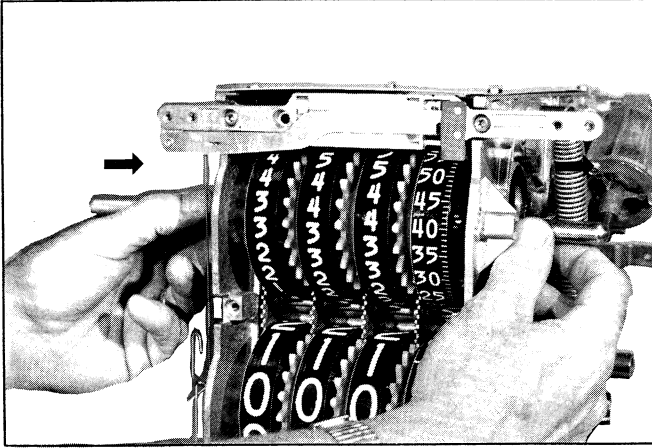


Figure 26. Pushing out short dummy shaft with long dummy shaft.

- c. Insert one 0.010 inch (0.25 mm) end-play washer between **right-hand** wheel and frame by withdrawing long dummy shaft far enough to permit insertion, Figure 27. Small flat-nose pliers or tweezers are best suited for use in inserting end-play washers.

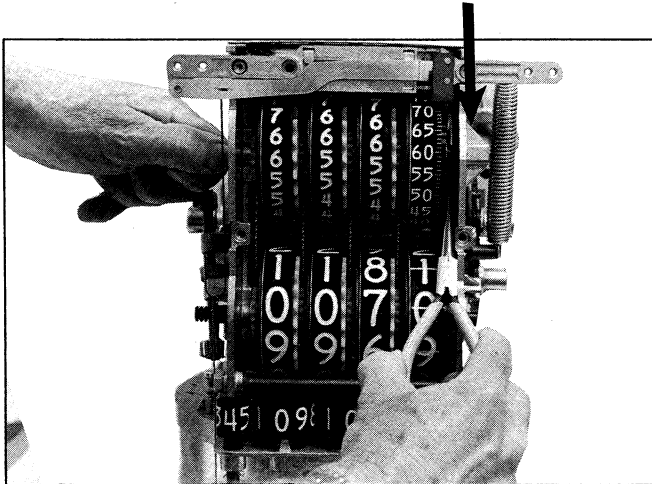


Figure 27. Installing end-play washer (one only) on right side.

- d. Shim washers are then inserted on **left-hand** side between reset disc and frame using same method as above, Figure 28.

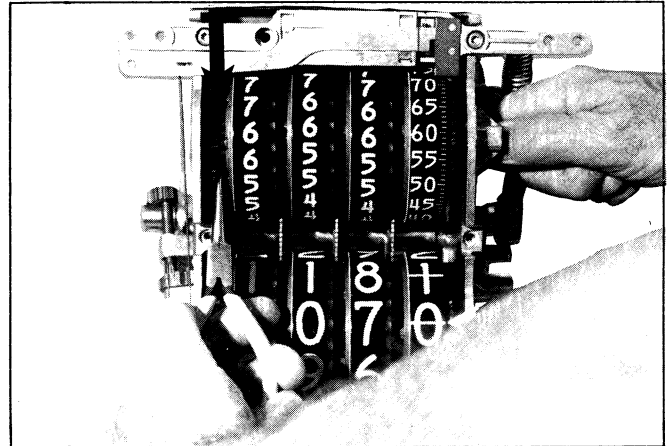


Figure 28. Installing end-play washer (as required) on left side.

- e. After insertion of adequate washers, check end-play with double end feeler gauge 0.015 inch (0.38 mm) to 0.022 inch (0.56 mm). Feeler gauge is inserted between 0.015 inch (0.38 mm) washer and **right** frame. If end-play is correct, 0.015 inch (0.38 mm) end should be free (drop), Figure 29, and 0.022 inch (0.56 mm) end should remain held (horizontal), Figure 30.

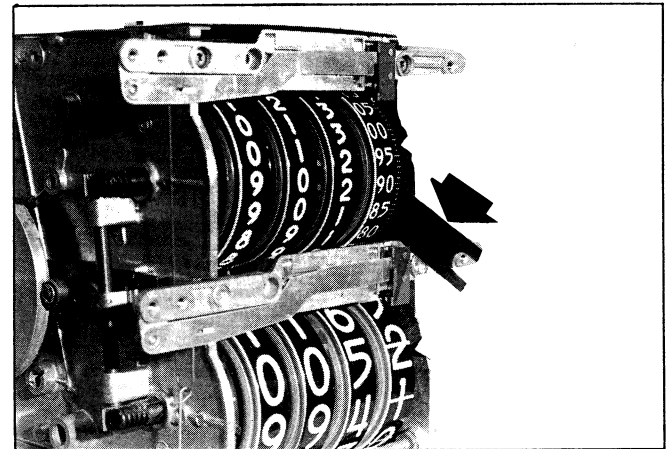


Figure 29. 0.015 inch (0.38 mm) feeler gauge in right side of wheel bank.

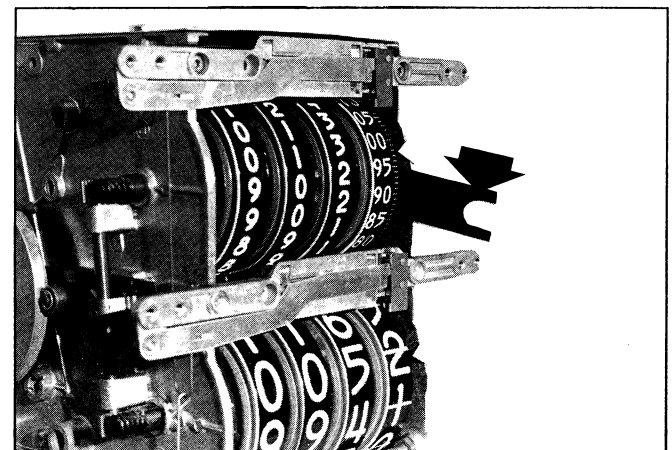


Figure 30. 0.022 inch (0.56 mm) feeler gauge in right side of wheel bank.

- f. Insert wheel shaft into open slotted end of long dummy shaft from dashpot side of computer and gently push out long dummy shaft, Figure 31. Be certain the wheel shaft pin is resting in the slot on the dashpot side of the computer.



NOTE: Wheel shafts are marked on the grooved end with "F" for front (totalizer side) and "R" for rear. Only "F" shafts can be installed in the computer **front** wheel banks and only "R" shafts can be installed in the computer **rear** wheel banks. The computer will not function properly if the shafts are mixed.



CAUTION: DO NOT FORCE WHEEL SHAFT THROUGH THE WHEEL BANK OR DAMAGE TO THE WHEEL RESET MECHANISM MAY OCCUR. NEVER HIT THE WHEEL SHAFT WITH A HAMMER OR OTHER TOOL. IT MAY BE NECESSARY TO MOVE THE LONG DUMMY SHAFT AND WHEEL SHAFT, TOGETHER, VERY SLIGHTLY TO THE RIGHT AND LEFT TO ASSIST IN A SMOOTH ASSEMBLY. A LIGHT COAT OF OIL ON THE WHEEL SHAFT IS ALSO HELPFUL.

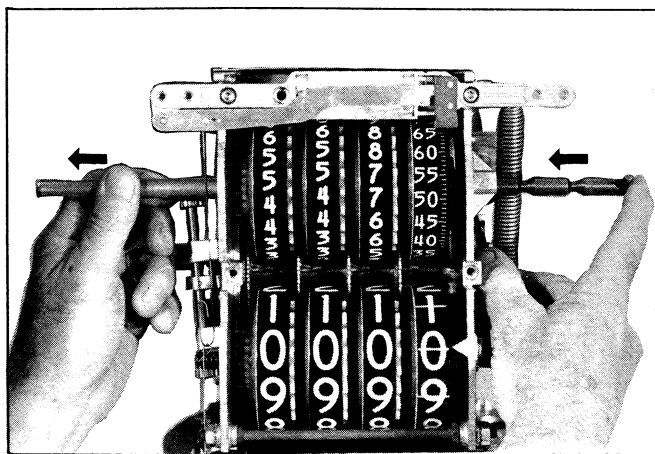


Figure 31. Pushing out long dummy shaft with wheel shaft.



NOTE: To correctly check wheel end-play after the wheel shaft has been assembled to the computer, be certain that the computer is in the "pump motor on" (ready to count) position. Because there are different reset versions of the computer; i.e., single handle, two handle and electric, the best way to be certain that the computer is in the correct position is to check the slide bar on the left side of the computer. It should be positioned completely toward the front (totalizer side) of the computer, Figure 32. If it is positioned toward the rear (dial bracket side) of the computer, Figure 33, operate the computer reset mechanism to move the slide bar to the front.

After the slide bar has been correctly positioned, the **front** wheel shaft pins should be completely inside and resting on the bottom of their slots on the dashpot side of the computer, Figure 34. The rear wheel shaft pins should be inside, but approximately even with the edge of their slots on the dashpot side of the computer, Figure 35.

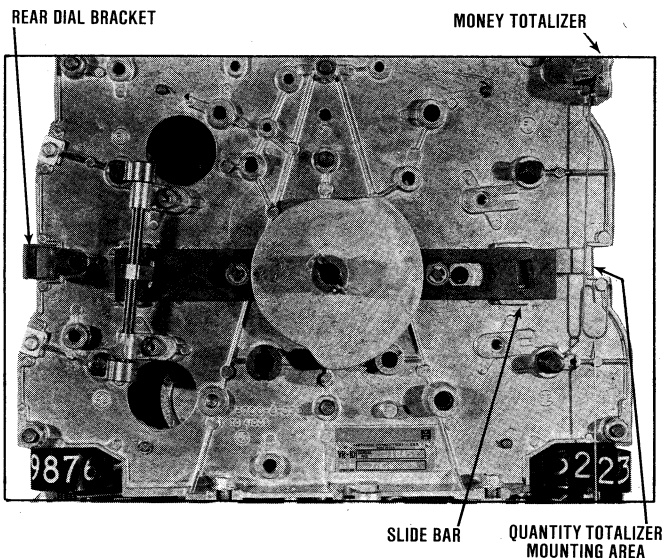


Figure 32. Slide bar positioned completely toward the **front** of the computer. Note position of slide bar in relation to quantity totalizer mounting area. This is the "pump motor on" position (ready to count) and is the correct position for checking wheel end-play.

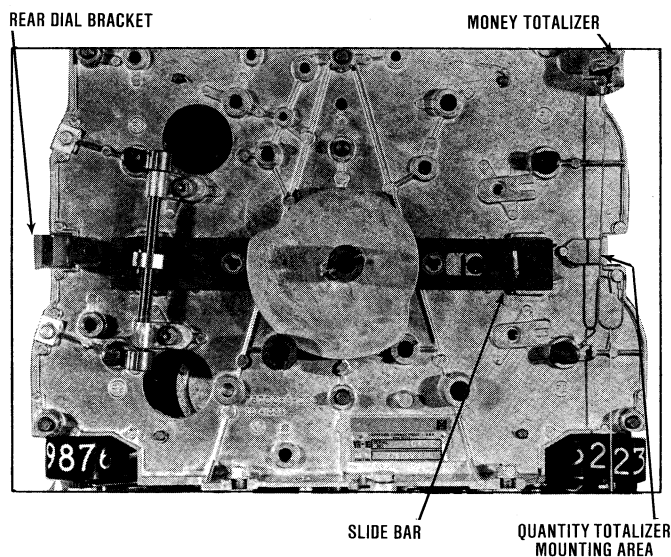


Figure 33. Slide bar positioned completely toward the **rear** of the computer. Note position of slide bar in relation to quantity totalizer mounting area. This is **not** the correct position for checking wheel end-play. See Figure 52 for correct position.

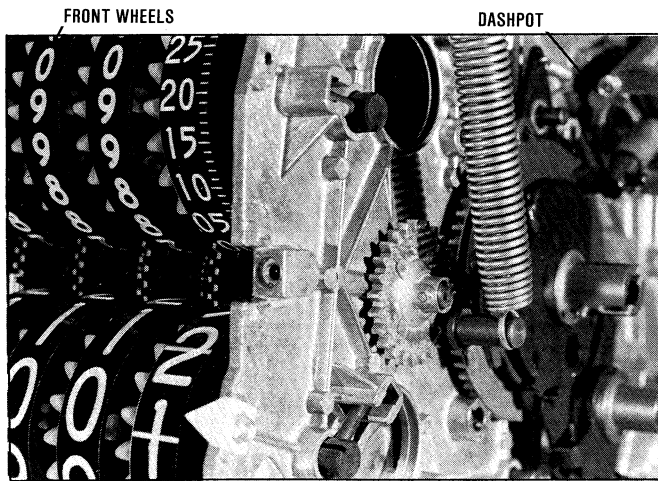


Figure 34. Front wheel shaft pins resting on the bottom of their slots.

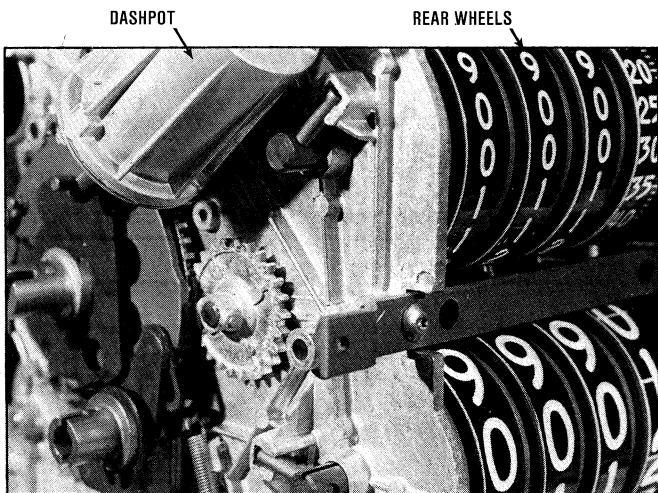


Figure 35. Rear wheel shaft pins inside but approximately even with the edge of their slots.

- g. After wheel shaft is assembled to computer, check wheel end-play again using double end feeler gauge, Figures 29 and 30. If wheel end-play is correct, proceed with the rocker shaft assembly. If wheel end-play is not correct, remove wheel shaft, Paragraph c.1.d, Figures 16 through 19, using long dummy shaft and add or remove washers at left side of computer. Install wheel shaft and check end-play again. If necessary, repeat above process until correct end-play is obtained.
- h. Assemble rocker shaft group into place so the outer tooth on the segment overlaps the end of the **rear wheel shaft**, Figure 36, or the inner tooth of the segment gear enters the innermost groove in the **front wheel shaft**, Figure 37. It is best to engage rocker shaft group lever into slot and bar before aligning teeth, Figure 38.
- i. After the rocker shaft group is in place, the pointer setting can be made. It is advisable to make a few resets first. Then, adjust pointer so that it lines up with the zero graduation of the right-hand wheel.

- j. Connect wire totalizer operating link to volume totalizer and install volume totalizer. Install rear dial bracket if rear wheels were replaced.



NOTE: Whenever a totalizer is installed, new totalizer seal caps, U.S. Part Number 28698-060 (U.K. Part Number 1705-1), should also be installed to prevent totalizer tampering.

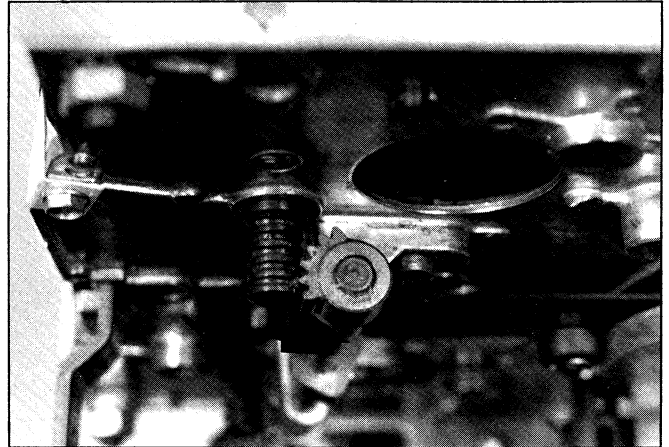


Figure 36. Segment gear outer tooth overlapping end of rear wheel shafts.

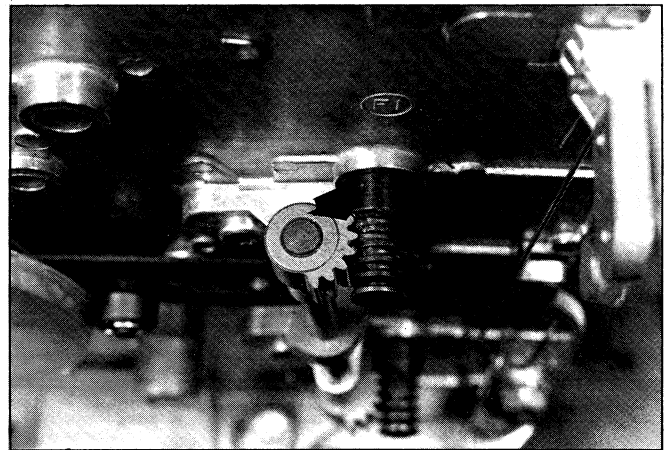


Figure 37. Segment gear inner tooth meshing with innermost groove in front wheel shafts.

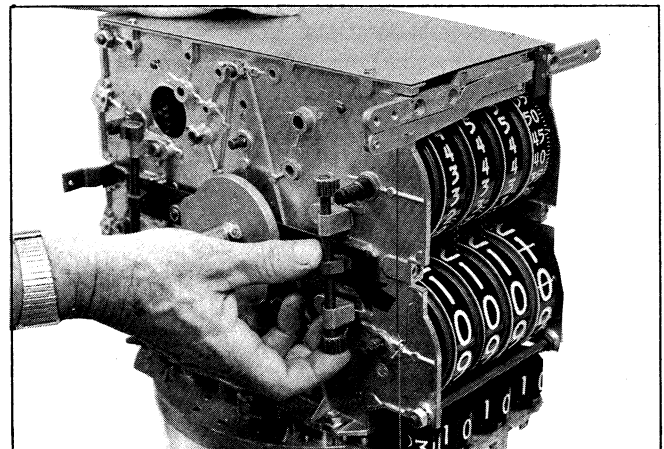


Figure 38. Engaging rocker shaft group lever into slot and bar.

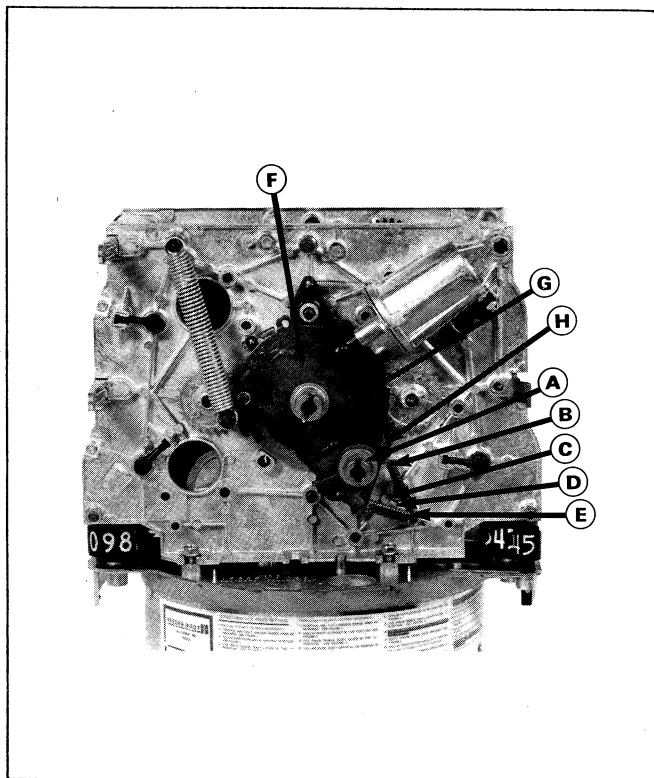


Figure 39. Removal and installation of trip lever group.

D. REMOVAL AND INSTALLATION OF TRIP LEVER GROUP

1. Remove Truarc retaining ring or coupling from other end of shaft (A). To remove the coupling on the opposite side, it is necessary to separate the computer head from the variator. It will then be possible to remove the groove pin with a punch.
2. Unhook three springs (B, C, and D) from stud (E).
3. Drive pin from shaft cam on right side.
4. Rotate reset shaft cam group (F) until flat (G) is at 4 o'clock. Drive pin from shaft cam (F) and remove.
5. Slide out trip lever group making sure pawl (H) is free.
6. Trip lever is installed by reversing above procedure. The only special care necessary is to make sure that pawl (H) is not allowed to reverse itself, since computer reset mechanism will not operate without this part in proper position.
7. Group should operate freely with 0.005 to 0.020 end play in shaft.

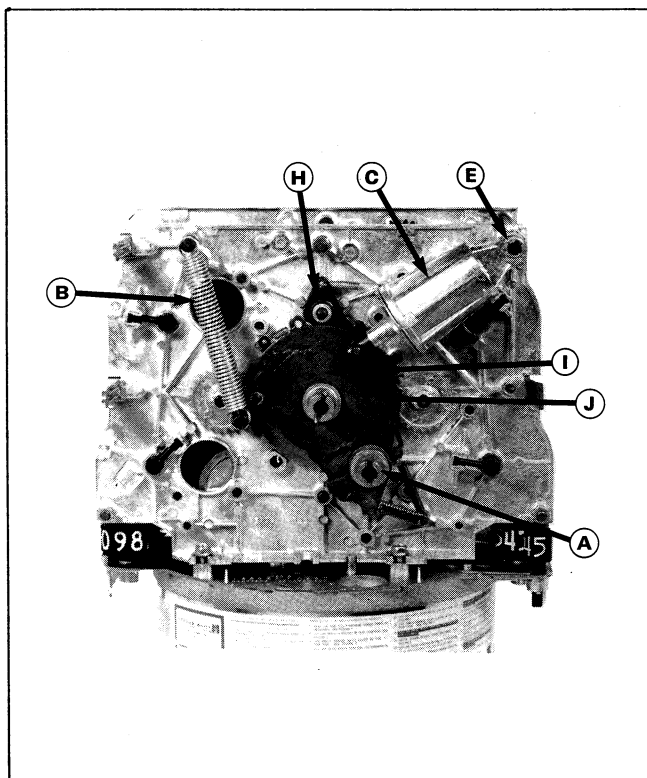


Figure 40. Removal of reset disc and cam assembly.

E. REMOVAL OF RESET DISC AND CAM ASSEMBLY

1. Remove trip lever assembly (A) as described above.
2. Disconnect main spring (B).
3. Remove dashpot (C) by taking off Truarc ring (E).
4. Remove cam (I) from right side by taking out groove pin.
5. Lift upper pawl (H) and slide reset disc group (J) from computer.
6. Replace reset disc group (J) and cam group (I) taking care to hold upper pawl out of engagement until reset cam group contacts frame.
7. Replace dashpot and replace trip lever assembly.
8. Replace pin in shaft cam.
9. Replace main spring and test. Assembly should operate freely with approximately .010 and .030 end play.

F. INCORRECT REGISTRATION AND FAILURE TO RESET

The following pictures have been prepared for the assistance of those who find it necessary to perform minor repair and adjustments in the field. Note that few attempts have been made on our part to give positive remedies for any one cause of failure. The reason for this is that in some cases similar defects are produced by several causes of entirely different natures. It will be necessary for the service man to diagnose the cause of trouble and determine the most probable remedy to be applied.

1. Erratic Operation of Wheels (Figure 41).

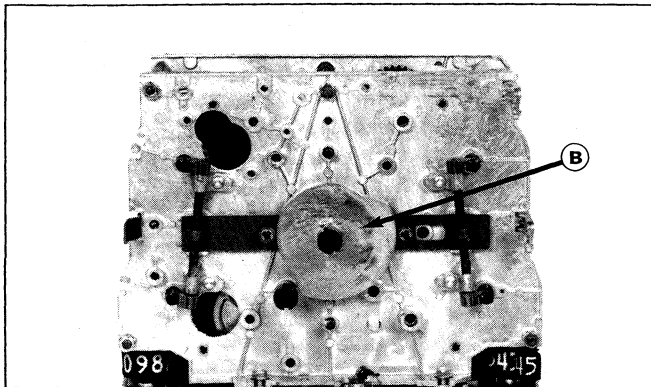


Figure 41.

Subject: Incorrect registration.

Complaint: All wheels are erratic in operation and do not drive at times.

Possible Cause: Pin sheared or missing from large shift cam (B). Or roller missing from slide bar.

Correction: Replace pin and check computer to make sure that roller bar and rocker arms operate freely.

2. Wheels Do Not Reset (Figure 42).

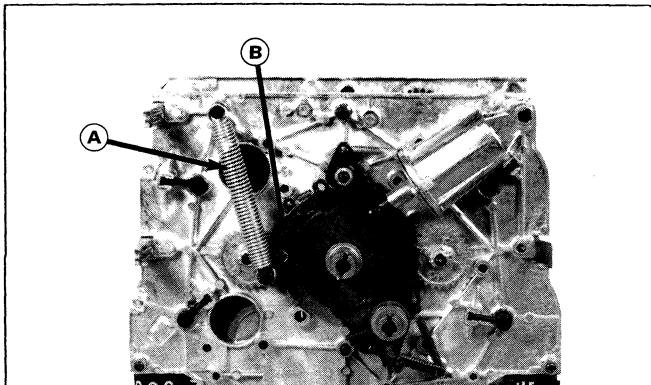


Figure 42.

Subject: Failure to reset.

Complaint: All wheels do not reset or reset mechanism inoperative.

Possible Cause: Spring A or B broken or disconnected.

Correction: Replace or reconnect spring. Spring (A) — Part No. 14427-MG-598. Spring (B) — Part No. 32858-K-100.

3. Wheels in Same Bank Do Not Drive (Figures 43 & 44).

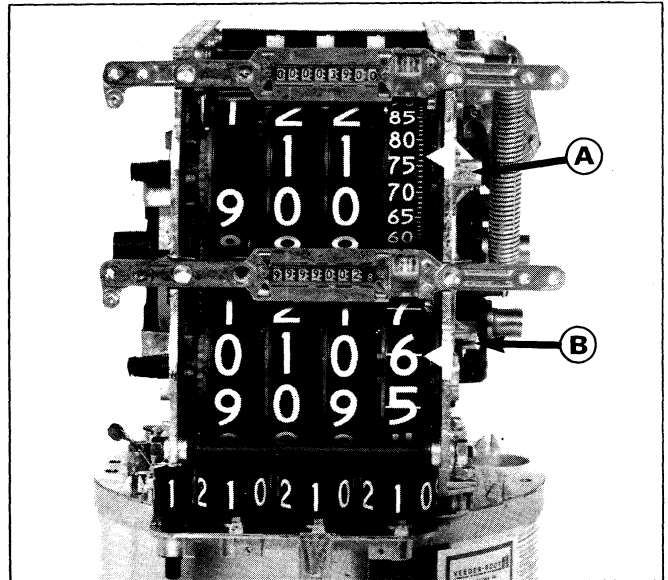


Figure 43.

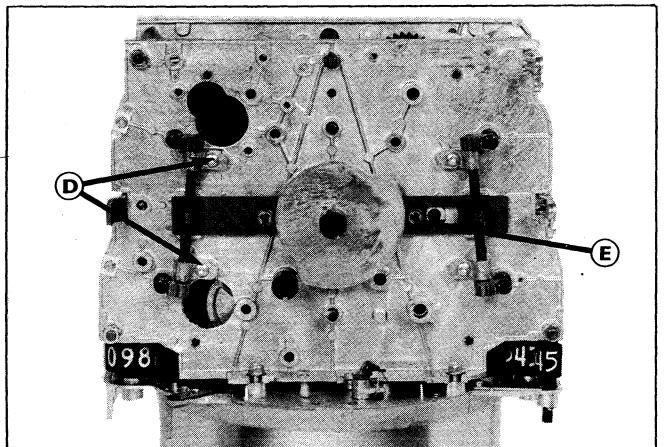


Figure 44.

Subject: Incorrect registration.

Complaint: One or more wheels in same bank (money or gallon section) do not drive or skip and lose count when computer is in running cycle.

Possible Cause: It is important that as computer is shifted into running cycle the wheel shafts (A and B) travel the proper distance to fully engage the drive pawls.

If wheel shafts do not have sufficient travel to fully lock drive pawls in wheels, the following may be the cause:

- A. Screws holding rocker arm brackets (D) to frame loose.
- B. Excessive end play in wheels.
- C. Front roller (E) missing from slide bar.
- D. Defective wheels.

Correction:

- A. Tighten rocker arm bracket screws.
- B. Check and adjust wheel end play to 0.015 and 0.022.
- C. Replace roller (E) and make sure it is retained by Truarc.
- D. Replace wheel.

4. Reset Gears Do Not Turn (Figure 45).

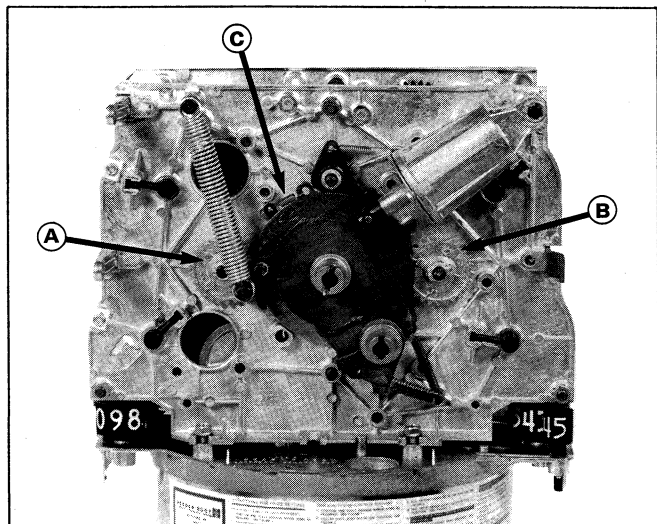


Figure 45.

Subject: Failure to reset.

Complaint: Reset mechanism functions when trip is released but reset gears (A) and (B) do not turn and wheels do not reset.

Possible Cause: Spring (C) broken or disconnected.

Correction: Replace or reconnect spring (Part No. 310300-257).

2. Reset Mechanism Stalls (Figure 47).

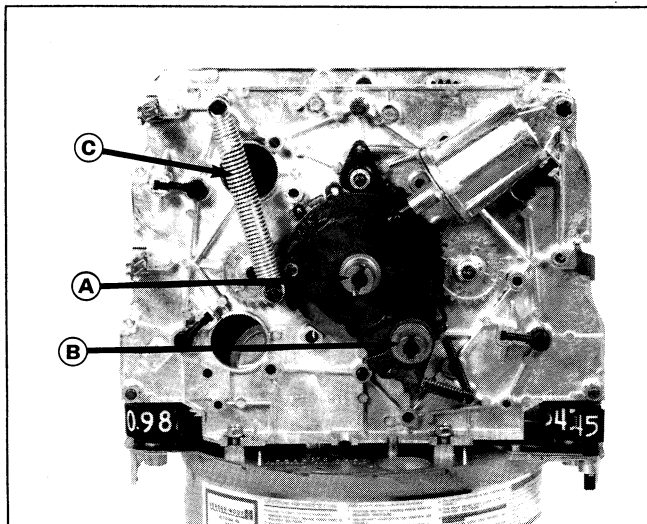


Figure 47.

Subject: Faulty reset.

Complaint: Reset mechanism stalls when reset cycle is partially completed preventing all wheels from fully returning to zero.

Possible Cause: Lack of adequate end play in center shaft (A) or trip lever shaft (B) or defective dashpot.

Correction: Remove large reset spring (C) and check for proper end play in shafts (A and B). Center shaft (A) should have 0.010 to 0.030 and trip lever shaft (B) 0.005 to 0.020. Also make sure that shafts connecting these parts with pump handles are free and without binds. Remove dashpot and check for proper operation.

G. FAILURE OF, AND FAULTY RESET

1. Banks of Wheels Fail to Rest (Figure 46).

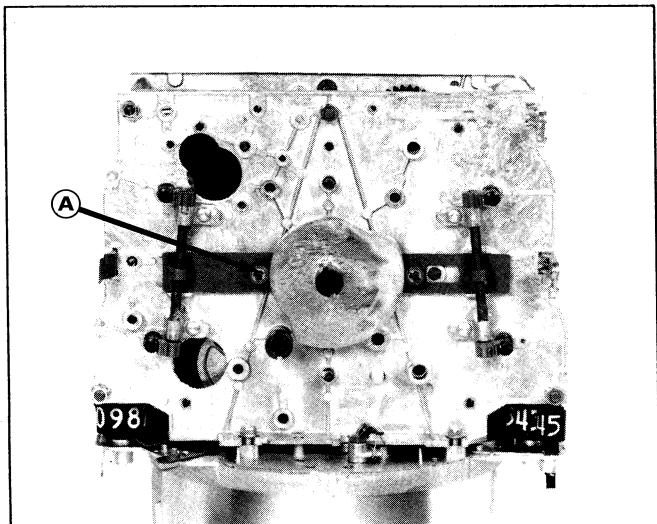


Figure 46.

Subject: Failure to reset.

Complaint: All banks of wheels fail to reset properly.

Possible Cause: Rear roller (A) missing from slide bar.

Correction: Replace roller and make sure it is retained by Truarc.

3. Wheels Partially Reset or Reset Mechanism will not Lock (Figure 48).

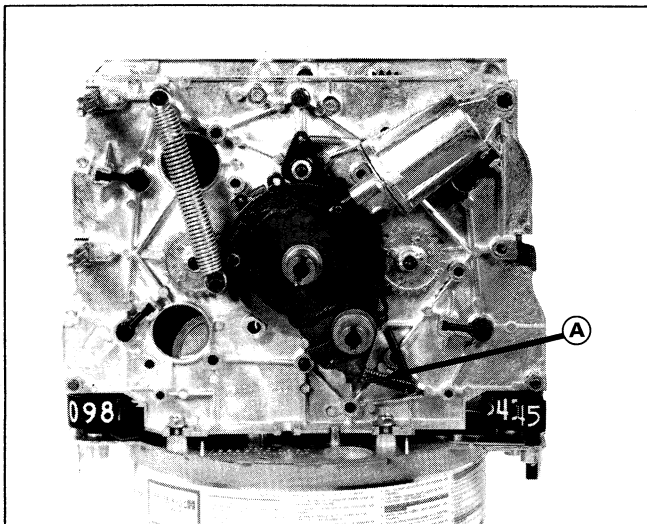


Figure 48.

Subject: Faulty reset.

Complaint: All wheels partially reset or reset mechanism will not lock in position when pump is turned off.

Possible Cause: Stop pawl spring (A) broken or disconnected.

Correction: Replace or reconnect spring (Part No. 14427-673).

4. One or More Wheels in Same Bank do not Always Reset to Zero (Figure 49).

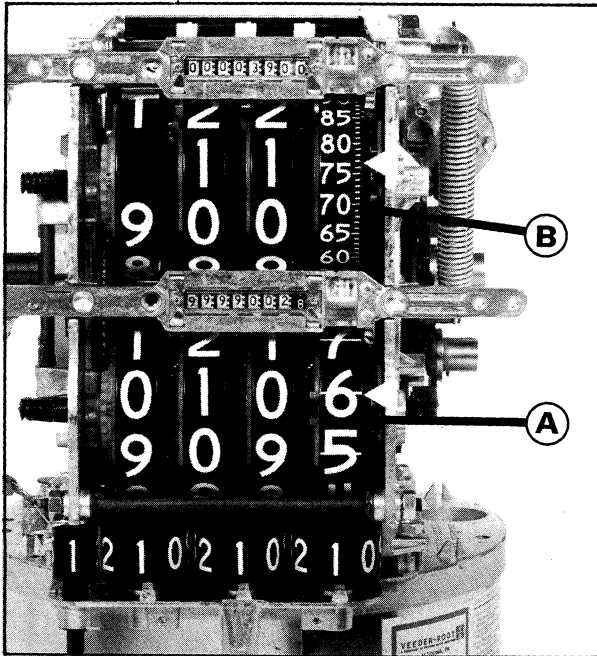


Figure 49.

Subject: Faulty reset.

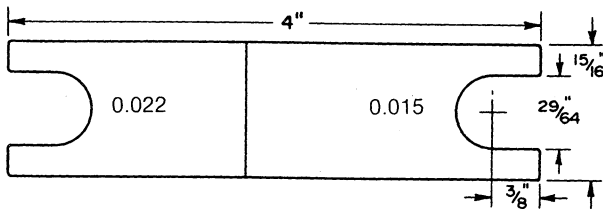
Complaint: One or more wheels in the same bank do not always reset to zero.

Possible Cause: Insufficient end play in wheels. (Check at points A or B).

Correction: Check as described on Page 13 to make sure that end play in wheel bank is between 0.015 and 0.022. Feeler gauge should be free at 0.015 and snug at 0.022.



NOTE: Feeler gauge TD-20259-4-020 used for this purpose is contained in Kit No. 89657-1-005. (See Figure 8).



5. One Wheel in Bank Fails to Reset (Figure 50).

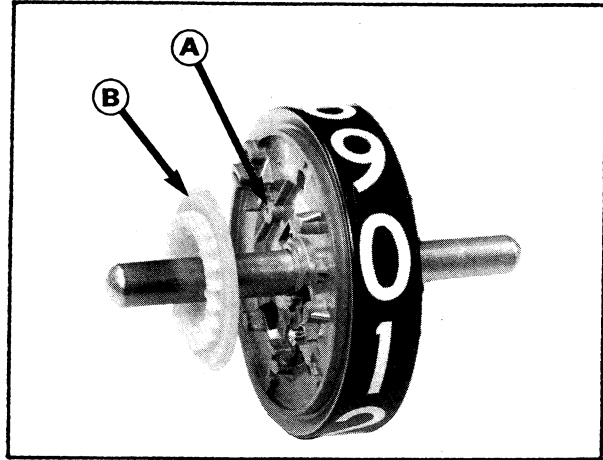


Figure 50.

Subject: Faulty reset.

Complaint: One wheel in bank fails to reset.

Possible Cause:

A. Sticky reset plunger (A) in wheel.

B. Weak reset disc pinion (B).

Correction:

A. Clean plunger (A) or if this does not correct condition, replace wheel.

B. Replace defective reset disc pinion.

6. Pump Actuating Handle Cannot be Turned "On" (Figure 51).

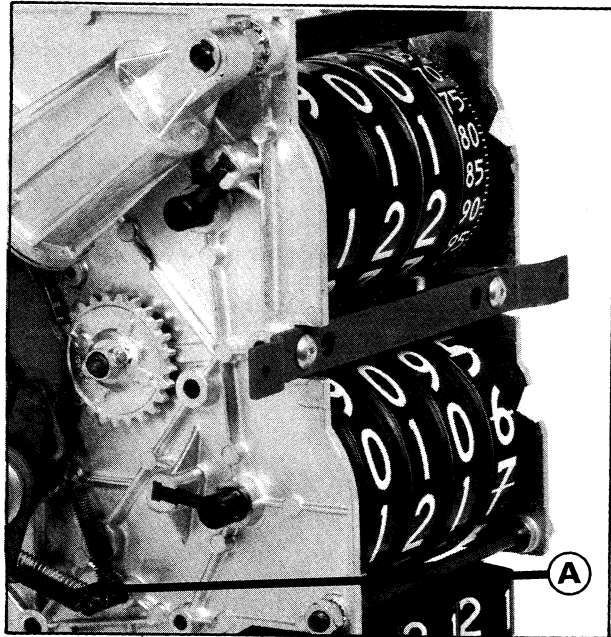


Figure 51.

Subject: Computer reset mechanism inoperative.

Complaint: Pump actuating handle cannot be turned to "On" position.

Possible Cause: Trip lever spring (A) broken or disconnected.

Correction: Replace or reconnect spring (A) (Part No. 14427-714).



H. TOTALIZER INOPERATIVE

1. Money or Quantity Totalizers do not Record (Figure 52).

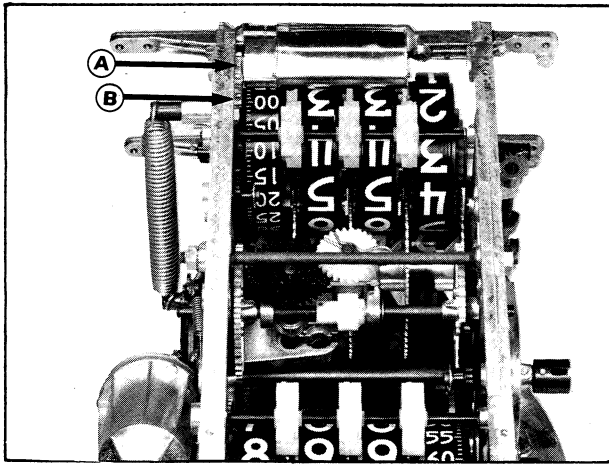


Figure 52.

Subject: Totalizer inoperative.

Complaint: Money or quantity totalizer does not record.

Possible Cause:

- A. Improper engagement of drive gear (A) with mating gear (B).
- B. Defective totalizer assembly.
- C. Excessive wheel end play.

Correction: Remove totalizer in question from pump and check manually for operation by rotating drive gear (A). If unit does not record, replace totalizer assembly. If totalizer operates properly re-install checking carefully to be sure drive gear (A) engages fully with gear (B) throughout its complete rotation.

I. DASHPOT MAINTENANCE AND ADJUSTMENT OF PUMP "STOPS"

1. Dashpot

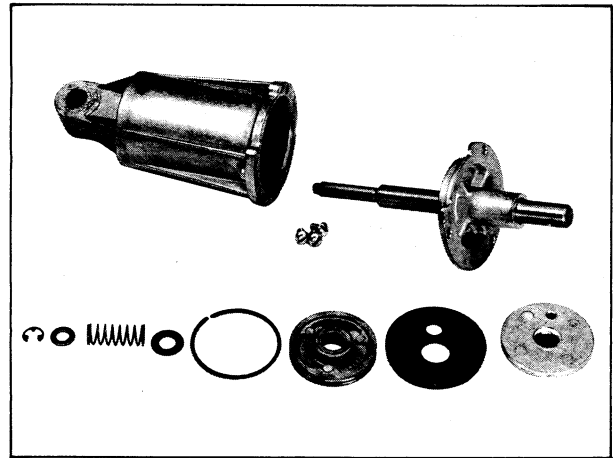


Figure 53. Dashpot Components

The dashpot assembly on the side of the computer/non-computer is designed to control the speed of the reset cycle and to cushion the shock of the main spring in the reset system (See Figure 53).

The internal mechanism is similar to any piston-type pump. In operation, when the main reset spring is tripped (by action of the pump on/off handle), the spring imposes a load on the dashpot shaft forcing the piston along the cylinder. The speed with which the piston travels is governed by three main factors:

- a. The passage of air through a small orifice in the piston.
- b. The adhesion to the cylinder wall of the lubricated piston "leather."
- c. The strength of the main spring.

All these factors are combined to produce a reset cycle of between 0.75 to 1.05 seconds.

The speed of the reset is critical in that it allows the wheels to smoothly return to zero and the reset pawls/hooker pawls to disengage. If the reset cycle is **too fast**, the following damage can occur:

- Reset discs become badly worn and fall.
- Reset pawls and plungers of wheels get broken by insufficient disengagement time and overshooting the wheel shaft slot.
- Depending on the speed of the reset (if an extremely "fast" reset is effected), shock and wear damage can occur to all the reset components of the computer.

It is essential that the piston leather is well lubricated in periodic maintenance and, in the case of countries where high ambient temperatures are experienced, the leather should be lubricated at least once a year.

Lubrication of the leather is very quick and simple. First, remove the dashpot by removing its Truarc and test the dashpot resistance by hand. If its resistance feels normal, merely add some oil onto the dashpot shaft and work the shaft to feed the oil inside and replenish the piston leather.

If the resistance pressure is low, undo the three screws to allow the piston to be removed. It is almost certain that the problem is a drying out leather, so "bathe" the leather in lubricant and squeeze it into the leather by hand. Reassemble the piston and the improvement will appear immediately.

This procedure takes only about five minutes, and the avoidance of component failure is considerable and cannot be too strongly emphasized.

As indicated, above, this spring is essential to the correct operation of the reset cycle and is manufactured to very close tolerances. If during service a stronger local spring is fitted, this will have the effect of speeding up the reset cycle and incurring the damage previously mentioned.

2. Pump "Stops"

Depending on the make and model of the pump, the "stops" vary in their location, but they all have one aim in common—to take the switch-on/switch-off load to the frame of the pump and not load the shock onto the computer/non-computer.

At the end of the switch-on or switch-off movement to the computer, there are 15 degrees of overtravel available before the shift cam/side frame stud is reached. These stop positions, determined by the shift cam/side frame stud, are only there so that the computer can be manufactured. **They are not intended to be used as stops for the operation of the pump on/off handle.**

The pump manufacturer uses the 15 degrees of overtravel we provide to set special stops located in the area of the pump handles.

These stops must be set so that when the pump handle is moved to its extreme right or left, **the pump stops are contacted** and the handle is not being stopped by the computer shift cam.

A very easy way to check the satisfactory operation of the pump stops is to insert a piece of paper between the handle shaft and the stop. Take the handle to the right as far as it will go. If the pump stop is operating, the paper should be held firm. If the paper can be withdrawn, the load is not on the pump stop but on the computer cam, and the pump stop has to be adjusted.

Repeat the test on the left stop and adjust as required.

Once again, it is a very simple and quick test/adjustment to carry out, and is sure to save numerous problems of pin and reset component breakage in the field.

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