

**Vendo<sup>®</sup>**

# **SERVICE SECTION**

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NOTES: CIRCLED NUMBERS INDICATE FIGURE NUMBER,

## INITIAL SET UP

### 1. UNPACK

Remove all shrink film, cardboard and tape from the exterior of the vender. Also loosen any shipping devices used to secure interior parts during shipment (backspacers and or shims or spacers).

\*\*\* Remove shipping boards from base, by spreading the slotted boards with a pinch bar or heavy screwdriver and hammer. Adjust levelers.

### 2. POSITION AND LEVEL VENDER

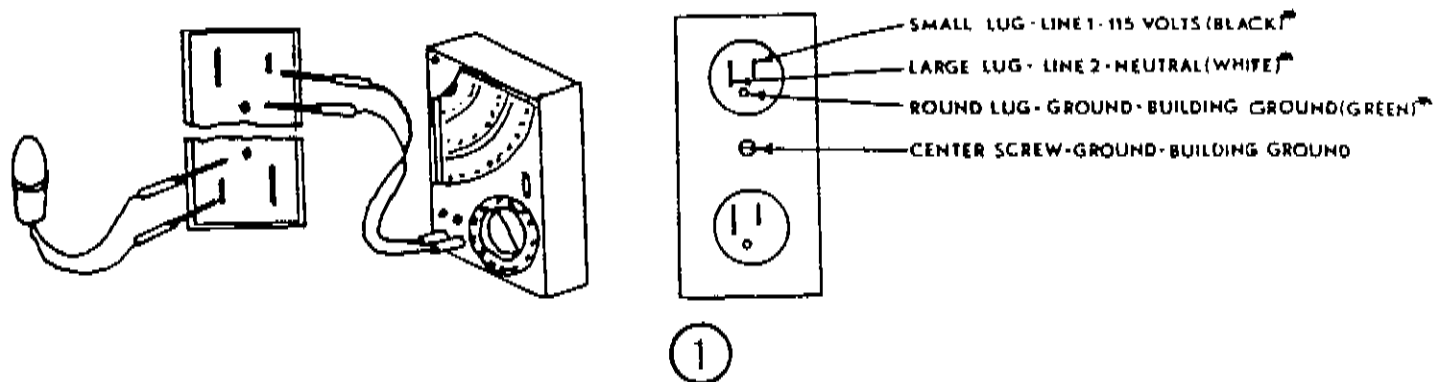
IMPORTANT: Place the vender (in desired location) at least 3 - 4 inches away from any rear obstruction. This is for proper air flow through the refrigeration compartment. Air circulation, front to rear, is essential for proper operation of the refrigeration system.

### 3. CONNECT TO POWER SUPPLY (See Figure 1)

This vender requires a 115 volt ac 60 hertz power supply. Check power supply before connecting vender. Any power supply under 103 volts or over 126 volts may cause vender to malfunction.

CAUTION: DO NOT USE AN EXTENSION CORD!

To insure safe operation of an electrical device, it must be properly grounded and the power supply polarization must match that of the electrical device. For the following test refer to FIGURE 1. With one probe of the test device, (test light or volt meter), connected to the center screw of power fixture and the other inserted into the large (neutral) orifice, you should get no reaction. When probe is inserted in small (power) orifice, you should get a reaction. (NOTE: If you get no reaction with either test, the outlet is not properly grounded. If the reaction occurs between the center screw and large orifice, the power source is not properly polarized.) If either of the above requirements are not met properly, you should contact a licensed electrician to obtain the correct power supply and grounding.



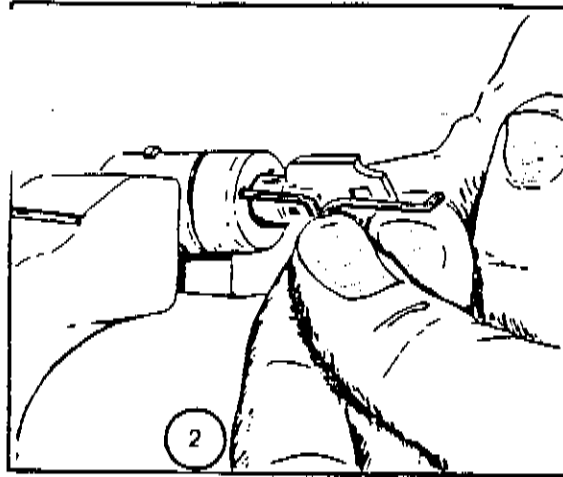
\*\*\* SPECIAL NOTE !!! BEFORE ATTEMPTING TO REMOVE THE SHIPPING BOARDS FROM THE BASE OF THE VENDER, RAISE THE VENDER UP ON A WELL STABILIZED LIFTING DEVICE TO GAIN ACCESS TO THE BOLT HEADS OF THE LEVELING BOLTS. REMOVE THE BOLTS WHICH HOLD THE BOARDS IN PLACE, AND REINSERT THEM INTO THEIR PROPER THREADED HOLES, AND LOWER THE VENDER AND BRING UNIT UP TO LEVEL.

## 4. INSTALL COIN MECHANISM

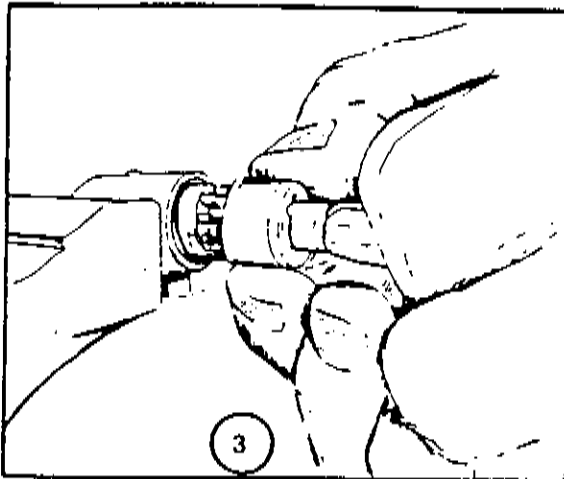
The coin mechanism mounts on the hinged coinage panel assembly. Remove the acceptor (where applicable) from the coin mechanism. Then slip the key holes in the back of the mechanism over the three mounting screws of coinage panel and tighten. Replace the acceptor (where applicable).

## 5. CODE YOUR LOCK (See Figures 2 thru 10)

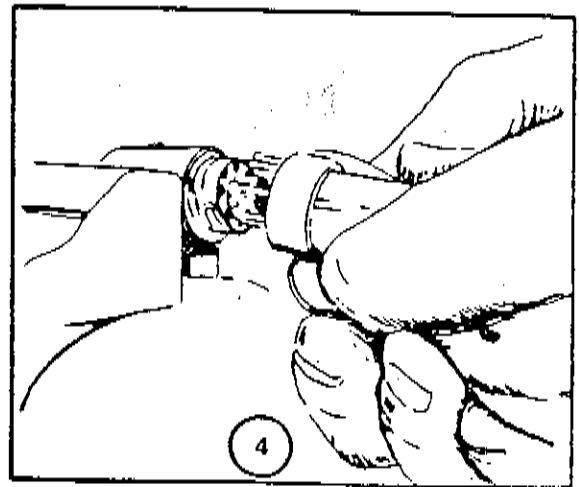
Locks may be recoded while in the handle or outside the vender. Recoding is illustrated with the lock outside of the vender, and is probably the easiest and safest way and will insure that the lock has been recoded properly. NOTE: Place the lock in a vise and it will help to maintain the lock while recoding it.



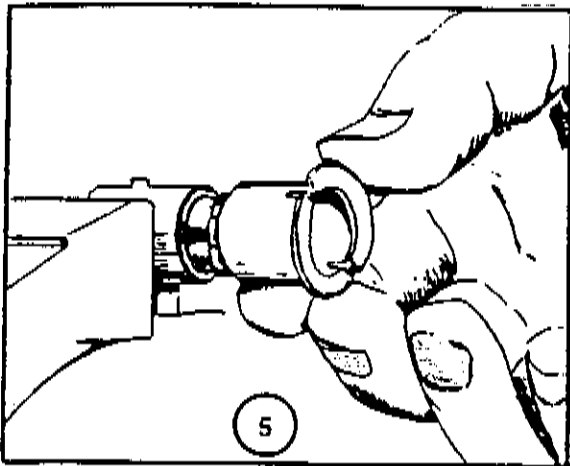
2. Insert release pin into hole in cap. Push pin firmly and rotate key to release at the slot position.



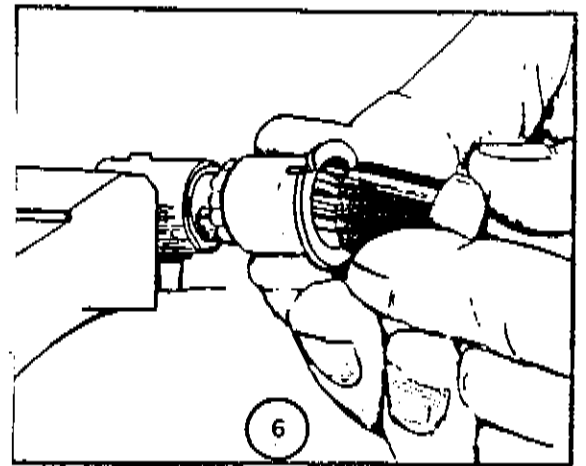
3. Remove cap with key as one unit.



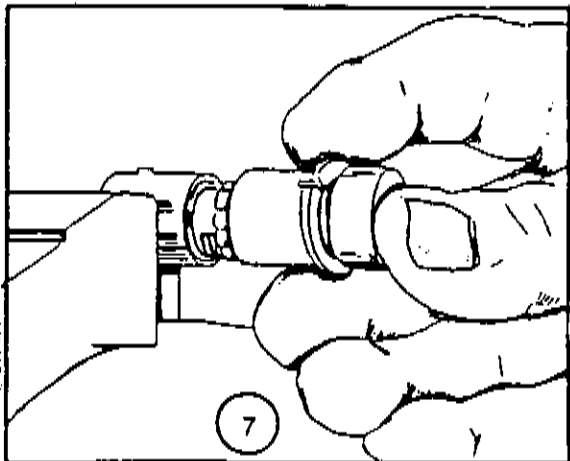
4. Using magnet end of loader tool, remove all seven (7) tumblers



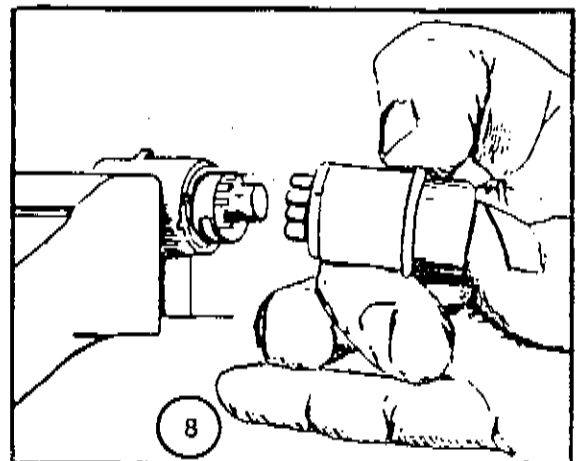
5. Place the pre-loaded coder into lock. It is slotted to go on the center shaft one way only.



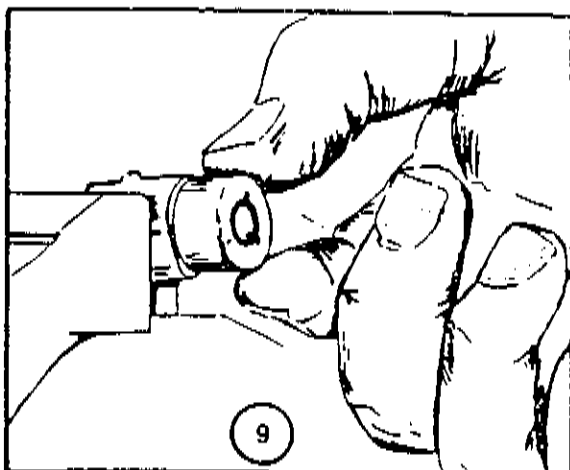
6. Place the loading tool into the coder. (it is slotted to fit one way only.)



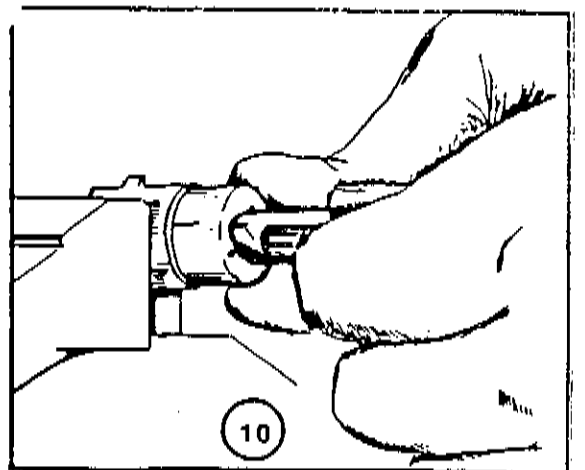
7. Press the new tumblers firmly into place.



8. While holding loading tool into coder, carefully remove both at one time. Be certain all seven (7) tumblers are in place.



9. Replace the lock cap as removed.



10. Insert new key. Press cap in firmly and rotate key to locked position.

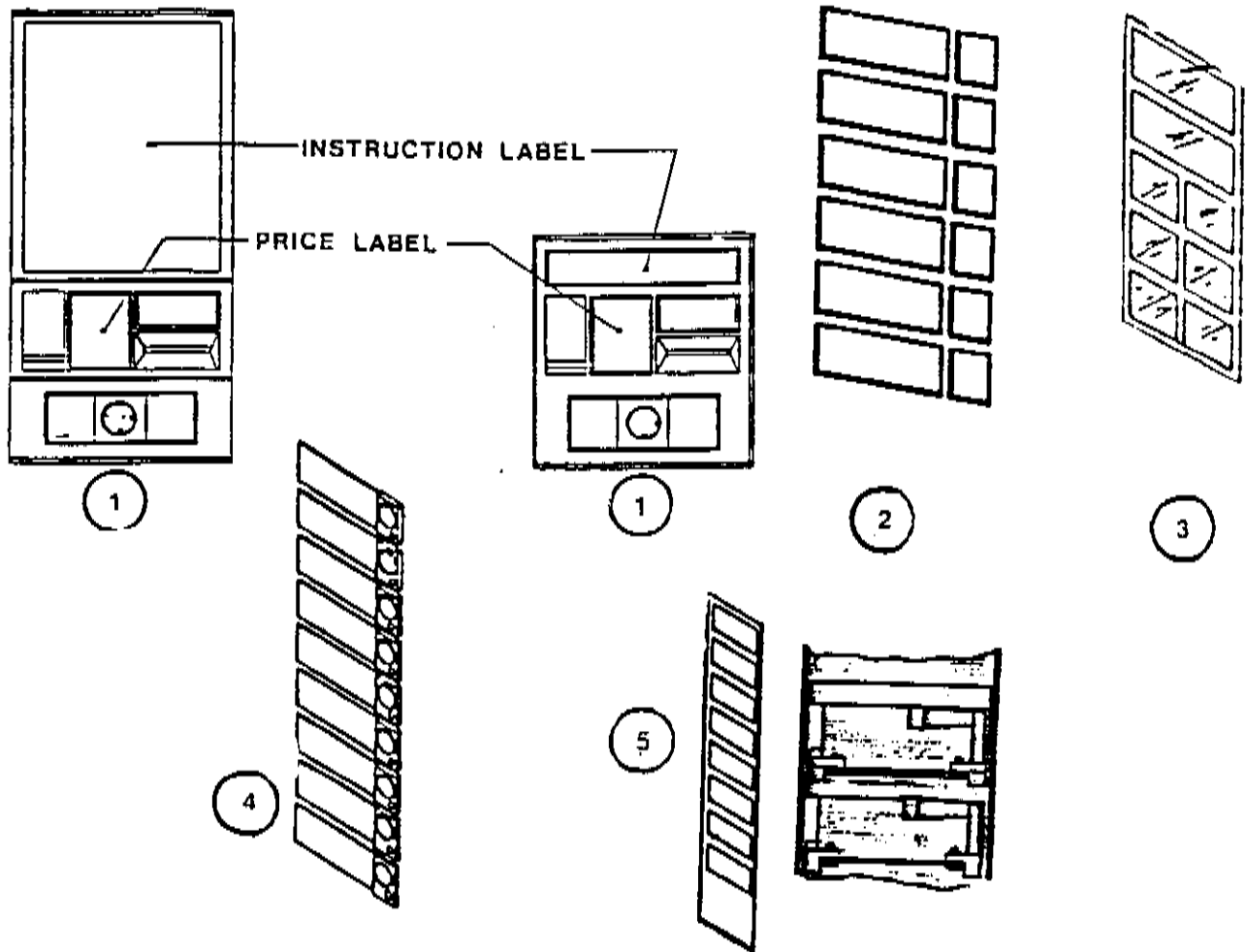
## 6. INSTALLATION INSTRUCTIONS FOR THE PRICE LABEL AND FLAVOR LABELS

### A) COIN INSTRUCTION LABEL

- 1) For venders with the validator opening built into the casting, be sure the surface of the cover over this opening is clean and dry before trying to apply the label. Peel the backing from the label and apply it to the plate with a firm even pressure. (See Illustration Figure 1)
- 2) For venders with a separate validator opening above the coin casting, apply to a clean and dry surface on the casting (See Figure 1).

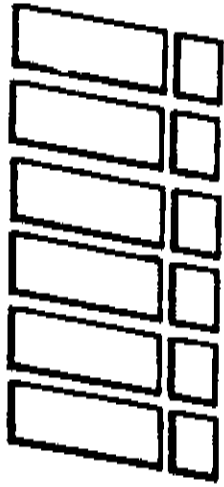
### B) PRICE LABEL

Be sure coin insert casting is clean and dry. Peel off backing paper and apply with firm pressure in position shown in Figure 1.

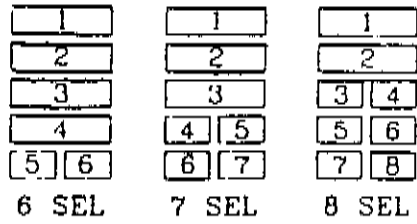


### C) FLAVOR LABEL(S)

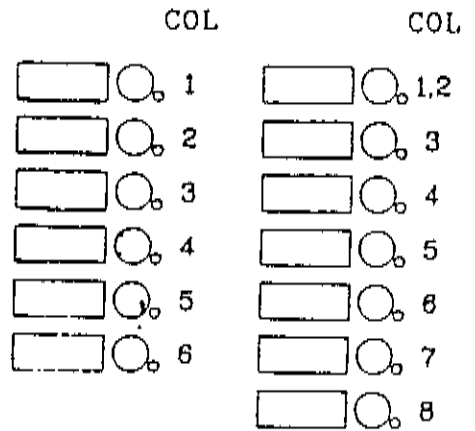
- 1) For venders with rectangular selection windows. Open inner door then open coinage mounting door. Insert labels into top of selection window. See Figure 2 - 3.
- 2) For venders with rectangular/square selection buttons. Open inner door, then open coinage mounting door. Insert labels into selection buttons from the left side of button as facing back of open outer door. See Figure 4 - 5.
- 3) NOTE: Be sure that labels in selection buttons or windows properly identify product as related to stack column. Refer to Figures 2 - 3 - 4 - 5 - 6 - 7 - 8 & 9 for selection button to column relationship. (Match your style and number selection buttons to appropriate number of columns.) 5



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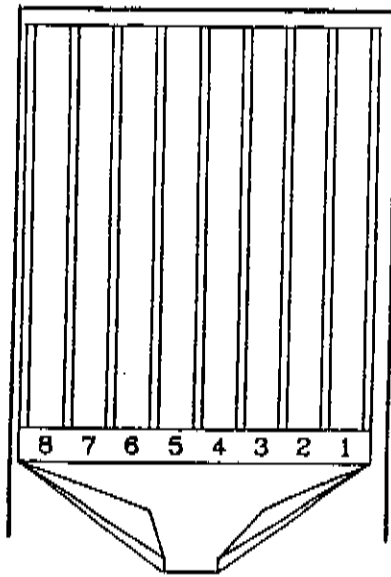
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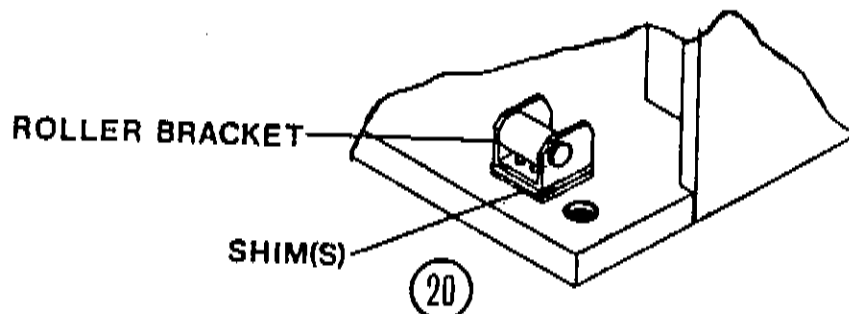


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NOTE!! WE HAVE NOT SHOWN ALL POSSIBLE CONFIGURATIONS OF THE PUSH BUTTONS, YOU MAY HAVE TO ADD A COUPLE TO MATCH YOUR STYLE VENDER.

## 7. CHECK DOOR SUPPORT (See Figure 20)

The door support may be raised or lowered (by adding or removing shims), to insure that the outer door closes squarely to the cabinet. Raising or lowering the door support can also help insure proper alignment of door latch.

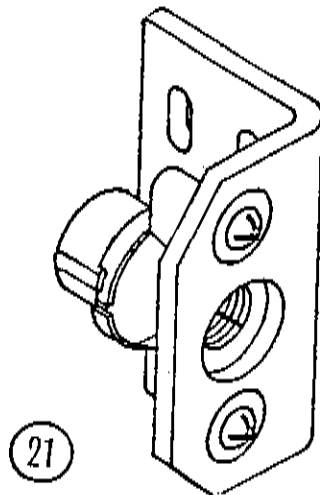


## 8. CHECK DELIVERY CHUTE ALIGNMENT

The delivery chute may be raised or lowered to insure proper product delivery through the inner door eyelet to delivery hopper.

## 9. CHECK THE DOOR LATCH ALIGNMENT (See Figure 21)

After any door adjustment The Quick Lock should align itself automatically, due to the way it is mounted. The latch is also adjustable up or down by loosening the four screws and raising or lowering the latch into position.



## 10. CHECK REFRIGERATION AREA

A) CONDENSATE PAN: Check to make certain that the condensate pan is in its proper position. Check the drain tubing leading to the pan seeing that it is secured with a clip and free of kinks. See Figure 22.

NOTE: Loop must be maintained in tubing for air "trap" purposes.



## OPERATING PRINCIPLES

The following section deals with how the vender operates. This information is provided to show how the vender should operate when all the parts function properly.

This section is divided into three parts:

- (I) Mechanical Parts Description and Vend Cycle for Wide and Narrow Columns.
- (II) Electrical Parts and Electrical Vend Cycle for Wide and Narrow Columns.
- (III) Electrical Vend Cycle in a Step by Step of the cycles slowed down for more clarity in trouble shooting the vender.

## PARTS DESCRIPTION 3D

1. MOTOR, P/N 388627 This motor is a thermal protected 115 volt, 60 HZ, shaded pole type (domestic). It has an externally mounted, spring-loaded, mechanical brake. This motor is interchangeable in all columns, and is able to be used in the 1D/2D Univendor also. The motor is held in place by three screws, and is in direct alignment to drive end of the vend bucket.
2. MOTOR CAM, P/N 389400 (3D) The motor cam assembled is made up of (2) parts, the inner cam, and the second outer retainer cam, P/N 389401 (3). These two cams control the motors on and off electrical cycles during a vend and is adjustable to control the vending of product in single, double, or triple operation.
3. MOTOR CARRIER SWITCH P/N 388687 This is the outside switch of the two switches at the cams on each column. This switch controls the run time of the motor during a vend cycle, and is also in the sold out light circuit.
4. START/BYPASS SWITCH P/N 388688 This switch is in the base circuit of the vender and is the inner switch of the two switch cluster. It is in the motor start, C.R.E.M.S., and the credit relay circuit.
5. SOLD OUT SWITCHES P/N 368299 These switches work in conjunction with all columns, and each column has two, one transfers the circuit to another available column, if the column chosen is on sold-out, the second switch operates the sold-out light when column is empty.
6. VEND BUCKET (3D) P/N 390152 The bucket holds the product in a ready-to-vend position in each column, and they are interchangeable to all columns.
7. GAUGE BAR P/N 389399 (3D) This bar controls and maintains the products in the next-to-vend position on all columns. The bar is removable, and is put into other positions for different products - (See set-up guide).
8. GATE P/N 389398-3D The gate works in conjunction with the gate link, and helps to maintain the products in the columns above the bucket in a ready-to-refill the bucket, as soon as the bucket vends its last product.
9. GATE LINK P/N 388632 The gate link is controlled by the action of embossed area on the end of the bucket, and it is attached to the end of the gate, which it raises and lowers through the action of the embossed area on the face of the bucket.

continuation...

10. ANTI-THEFT CLIP P/N 389712 (3D) All of the buckets are equipped with this device, and the purpose is to prevent a product from being dispensed from the bucket by pilferage, or tilting of the vender.
11. SELECTION SWITCHES, COKE P/N 388287, PEPSI P/N 337575, TRADE P/N 385440, DR PEPPER AND SEVEN-UP P/N 368299 The reason for all the different part numbers is due to the difference in the way the switches are mounted and are used in their assemblies. The main purpose of these switches is to direct a circuit to the proper motor selected, to start its vend cycle.

## B. MECHANICAL VEND CYCLE:

The vend cycles of the narrow and the wide columns are mechanically and electrically the same in the single, double, or triple depth mode. All the column parts are interchangeable, either the electrical, or the mechanical.

### 1. TRIPLE DEPTH MODE With the motor cams set for triple depth mode, (See Figure 2, PAGE 14) The three valleys of the cams are used to vend the columns.

- A. With the bucket loaded, the changer has sufficient coins in the tubes, and the buckets have been primed with products, the motor receives a pulse to start. As the motor rotates its cam, one product is dispensed from the bucket as it moves the product past the gauge bar far enough to clear the bar. The vender is then returned to standby position by the action of the Start/Bypass switch and the Motor Carrier switch as they are actuated and de-actuated by the peaks and valleys of the cams.
- B. On the second operation to vend another product, follow the steps in the (1 A.) portion.
- C. The third operation to vend another product is the same action as in (1.A, and 1.B), but at this time the gate, gate link and spring come into play. The gate is moved into an up position by the action of the gate link as it travels in the groove on the front of the bucket, and is raised off its rest position on the front and rear mech. plates cut-out areas. As the bucket continues to rotate a little over 45 degrees of its 360 degree rotation in a counter-clockwise direction, (3) products that have been held up by the gate, and gate link, are dropped into the bucket as the bucket continues to rotate to fill the empty cavity ready to make another vend.
- D. The vend motor continues to rotate past the halfway point, the gate link and the gate start to move, allowing the product that has been held, to lower into position above the bucket ready to refill the bucket after the third vend again. The gate link is returned to the open area on the end of the bucket ready for the next vend.

continuation...

- E. In all three modes, paragraphs (1 C, & D) should be used after the end of the first two vend operations, as this action takes place after every single depth operation, double depth operation or triple depth operation, and this would depend on what mode you are set.

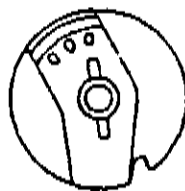
TO HELP TO CLARIFY THE PARTS OPERATION CHECK THE ILLUSTRATIONS AS NOTED!

### SPECIAL NOTE!!!

IF A JAM OCCURS FOR ANY REASON, THE FOLLOWING PROCEDURE SHOULD BE FOLLOWED:

1. Unplug the vender or disconnect the motor leads to the motor of the column that is to be worked on, this is for safety's sake to prevent the motor from operating while you are releasing the jammed product.
2. On the motor field, you will find a spring loaded brake that mechanically is actuated by the action of the motor. Press the brake in and hold it so that you relieve the pressure on the product and allows the bucket to be free wheeling.
3. Keep the brake in a released position, and you will note the bucket will back off slightly. Rotate the bucket in a clockwise direction, and you may hear an audible click, this is the gate link being released. You may now reach up and return the products into their normal position in the bucket. (See Figure #3)
4. All of the above can be done without removing any of the product from the column. In some cases, the jam would be the type that you would have to take all the products from the column to be able to get at the jammed product. In most cases, paragraph 3 should be followed.
5. Once you have relieved the jam, reconnect the motor leads, or plug the vender back into its receptacle, and test the column several times to ensure that it operates correctly.

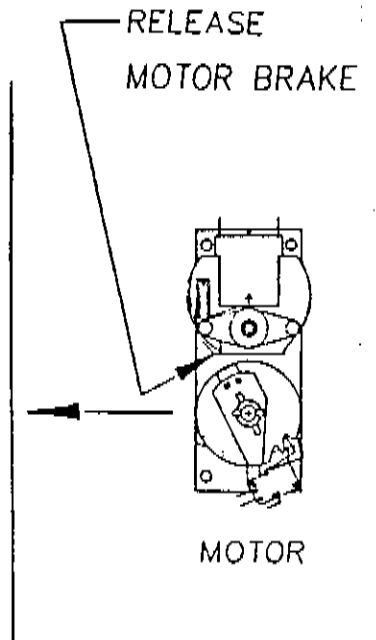
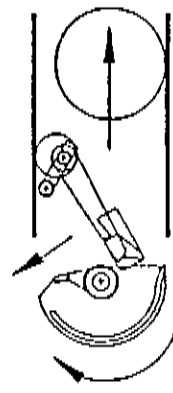
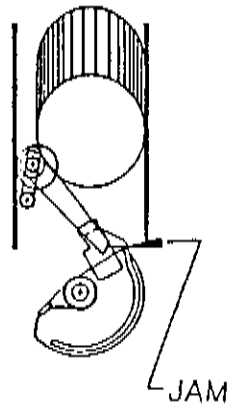
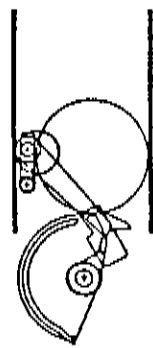
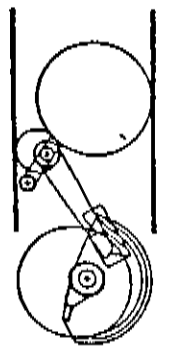
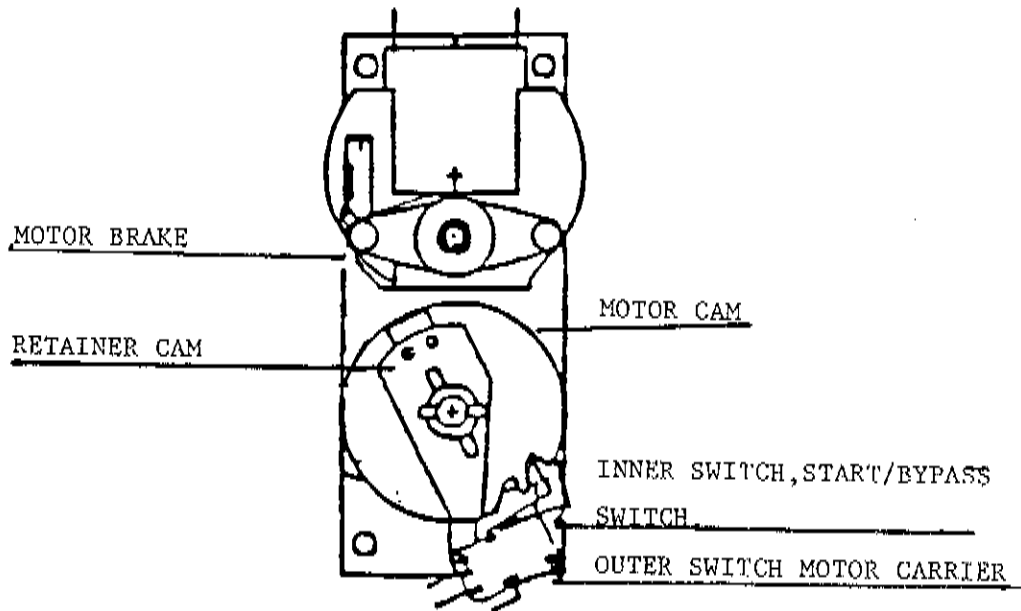
FIGURE 2.

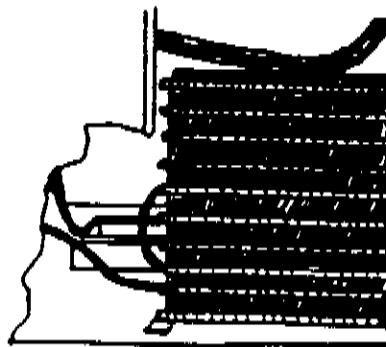


SINGLE DEPTH    DOUBLE DEPTH    TRIPLE DEPTH

# Vendo®

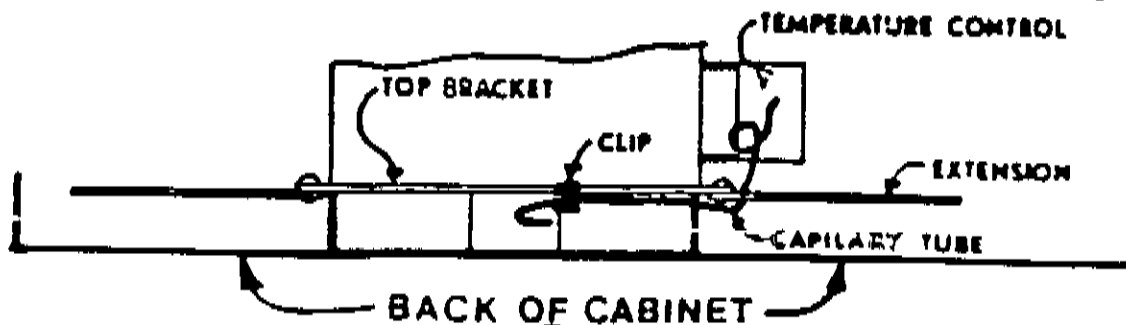
NOTE: As it has previously been stated, all the electrical parts and the mechanical parts in this vender are completely interchangeable.





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- B) THERMOSTAT FEELER BULB POSITION: In new production, as well as when replacing a refrigeration unit, it is possible to "distort" the position of the thermostat feeler tube. The feeler tube should be positioned as shown in Figure 23. It must not touch the rear cabinet wall or evaporator shield except at the retainer clip. The clip should be near the center of the evaporator.

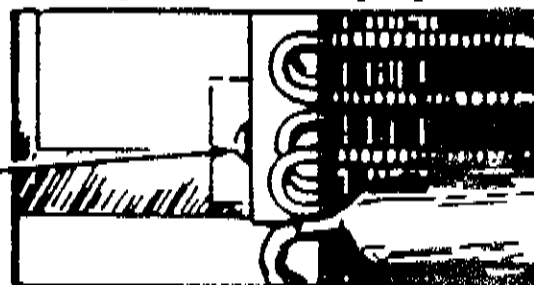


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- C) TEMPERATURE CONTROL SETTING: See Figure 24. The temperature inside the cabinet is regulated by the temperature control located on the left side of the evaporator. On some vendos you will have to remove a metal cover over this area to get to the control. Before adjusting the control, make sure that all components of the refrigeration system are working properly and that the door seal is tight. The factory setting will normally be with "knob" at the center range. The Air Temperature at the feeler bulb should cut system in at 39 degrees fahrenheit. To increase the temperature turn the control counter clockwise. To decrease the temperature turn the control clockwise. NOTE: For every 1/12 turn of control knob the temperature will change approximately two (2) degrees.
- D) Check to make sure that all fans run freely and are free of excessive noise and obstructions.
- E) Check compressor vanes to make sure that they are free of any obstructions. (Air flow over vanes is important to proper operation of refrigeration unit.)



TEMPERATURE CONTROL



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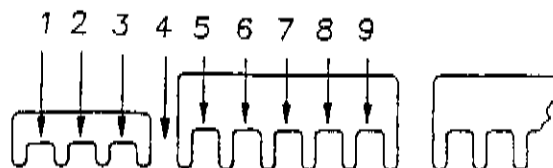
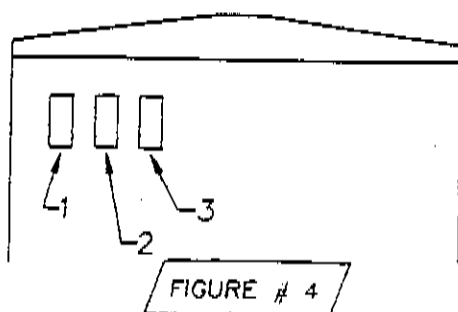
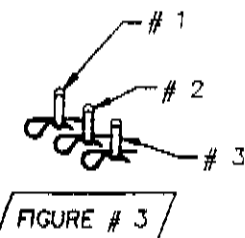
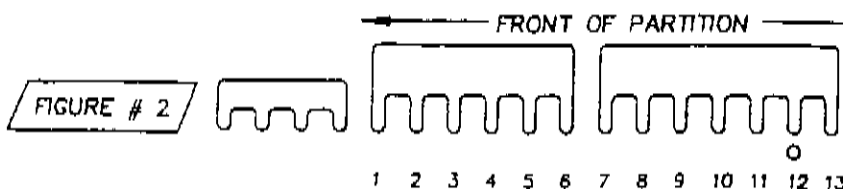
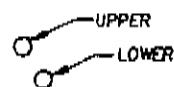
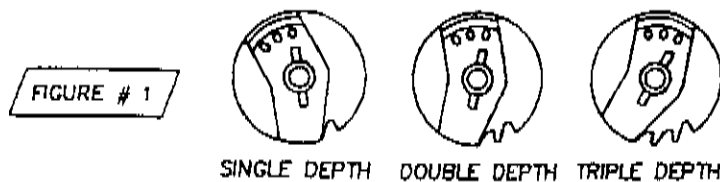
## "3D UNIVENDOR" DOMESTIC KIT SETUP GUIDE

THE FOLLOWING IS A BASIC GUIDE FOR SET-UP OF VARIOUS PRODUCTS THAT CAN BE VENDIED IN THIS MACHINE. REFER TO CHART AND FIGURES FOR EACH PRODUCT. SPECIFIC INSTRUCTIONS FOR PRODUCTS REQUIRING KITS ARE INCLUDED WITH EACH KIT OR CAN BE FOUND IN THE 3D-UNIVENDOR SERVICE MANUAL (390150).

CONTAINER			CAM SETTING	BACK SPACER	GAGE BAR	THEFT ROD	FRONT GUIDE	REAR GUIDE	KIT REQ. SING'L COL.	HEIGHT (IN.)	KIT REQ. STAG'R COL.	HEIGHT (IN.)
TYPE	SIZE (IN.) DIA. X HT.		FIG. 1	FIG. 2	FIG. 3	FIG. 3	FIG. 4	FIG. 5				
12 OZ. CAN	2.60	4.84	TRIPLE	# 12	# 2	LOWER	~	~	134451-21	79 72	134451-22	79 72
10 OZ. CAN	2.36	4.68	TRIPLE	# 11	# 3	LOWER*	~	~	134451-11	79 72	134451-12	79 72
16 OZ. POLYLAB'L	2.97	7.00	DOUBLE	# 12	# 1	UPPER	~	~	~	79 72	134451-20	79 72
10 OZ. POLYLAB'L	2.66	5.97	DOUBLE	# 7	# 2	LOWER	~	~	134451-21	79 72	134451-22	79 72
16 OZ. RET. BOT'L	2.65	11.20	SINGLE	# 7	# 2	LOWER	# 2	# 6	134451-17	79 72	134451-18 134451-19	79 72
12 OZ. RET. BOT'L	2.57	9.70	SINGLE	# 4	# 2	LOWER	# 2	# 4	134451-17	79 72	134451-18 134451-19	79 72
10 OZ. RET. BOT'L	2.39	9.74	SINGLE	# 4	# 3	LOWER*	# 1	# 4	134451-13 134451-14	79 72	134451-15 134451-16	79 72

NOTE: EACH KIT CONVERTS ONE COLUMN ONLY. ABOVE KITS DO NOT CONTAIN CROWN PULLER OR BOX. SEE 3D-UNIVENDOR SERVICE MANUAL (390150) FOR SPECIFIC CROWN PULLER KIT NUMBERS. ALWAYS LOAD PRODUCT EVENLY. PRODUCT SHOULD ALWAYS LIE BEHIND PRODUCT RETAINERS AT FRONT OF COLUMN. ALWAYS LOAD BOTTLES WITH CROWNS TOWARD BACK OF COLUMN. FOR INITIAL LOADING, ADVANCE PRODUCT INTO BUCKET TO PRIME MACHINE. FOR ANY PRODUCT PLACED SINGLE DEPTH INTO COLUMNS (TALL CANS OR BOTTLES OVER 6" IN HEIGHT), SET CAM FOR SINGLE DEPTH POSITION AND PLACE BACK SPACER SUCH THAT APPROX. 1/2" TO 1/4" OF SPACE IS BETWEEN END OF PRODUCT AND FRONT RETAINER. DUE TO THE VARIOUS SHAPES OF RETURNABLE BOTTLES, FRONT & REAR GUIDE POSITIONS MAY VARY.

\* FOR 10 OZ. (SMALL DIA) PRODUCTS, THE FAR LEFT COLUMN MUST HAVE A THEFT ROD (389693) AND CLIP (387450) IF HOLE IS PRESENT IN FRONT AND REAR PLATES. REMOVE THIS ROD TO VEND LARGE DIA PRODUCTS SUCH AS 16 OZ. PLB.





## II ELECTRICAL OPERATIONS

- A) The only other electrical parts that have not been included in the previous parts description are:
1. COIN MECHANISM (SINGLE PRICE) Which is purchased separately. This mechanism is used to verify good coins that are inserted and to make change for the customer. It is mounted onto the changer door by three screws. After the coin mechanism verifies the coins that have been inserted, it makes change as needed and is in the holding circuit in line 1 to C.R.E.M. coils and the credit relay circuit through pins 7 and 1 of the credit relay to the C.R.E.M.S. and through pins 7 and 4 of the credit relay to the energize the relay coil.
  2. CREDIT RELAY - P/N 353343 The credit relay is mounted to the control on the inside above the coin mechanism. The credit relay is de-energized in the standby position, but maintains a circuit through pins 7 and 1 of the relay, and pin 6 of the changer plug to keep a circuit to the C.R.E.M.'s.
  3. With the vender loaded with product, in at least one column and the changer filled with change, the vender is ready to accept money and vend.
  4. A customer inserts money, the coin passes over a switch or passed a sensor to register a credit. This sends a pulse to the credit relays holding circuit, by creating this circuit, line 1 (black) from its source passes through the common to normally open side of the start bypass switch of the last switch in the circuit, and in series through the remaining switches to the number 1 sold out switch in the circuit, from common to normally closed side of the switch (these have a yellow wire to the common and blue wire to the N.C. side), it continues the circuit through all the remaining switches in the sold out circuit. The circuit then goes to pin 7 of the credit relay socket, and the circuit is transferred from pin 1 to pin 4 of the relay socket to energize the relay coin, and to de-energize the C.R.E.M. coils. The vender is now ready to receive a pulse from the selection switch of the customers choice.
  5. The customer pushes the selection button of their choice, the switch changes from common to normally closed, to common to normally open.
  6. As the circuit moves through the normally open position of the selection switch, it travels to the selected motor, through the second sold out switch to start the motor. At this time the sold out will light momentarily.
  7. As the motor starts to rotate its cam, the start/bypass switch is actuated from common to normally open, to common normally closed, the motor carrier is also in a common to normally closed position, to keep the vend motor running. The circuit to the credit relay is canceled and the C.R.E.M.'s are energized through pins 1 and 7 of the credit relay and pins 6 and 2 of the changer socket. This will allow the insertion money to re-establish credit if the motor fails to continue its cycle for any reason.

## II ELECTRICAL OPERATIONS cont.

8. The motor carrier switch is returned to its common to normally closed position, the start/bypass switch is still in a common normally closed position until the cam rotates far enough for the action of the valley of the cam and the peak of the cam to actuate the switch again, which stops the vend motor and returns the vender to standby. The C.R.E.M.'s are then re-energized at this time ready to accept money for the next vend.

## III ELECTRICAL VEND. CYCLE








1. The following cycle is the step by step of the electrical operation of the vend cycle. this operation happens if the vender is in a ready position, at least one column has product in it, the changer has adequate change in it and the vender is plugged into a proper electrical outlet.
2. Please use the reference guide which will give you the symbols that are in the diagrams.

### REFERENCE GUIDE

#### COMMON SYMBOLS AND TEXT

Coin return electromagnet.....	C.R.E.M
Normally Open.....	N.O.
Normally Closed.....	N.C
Common.....	C.
Correct Change.....	C.C

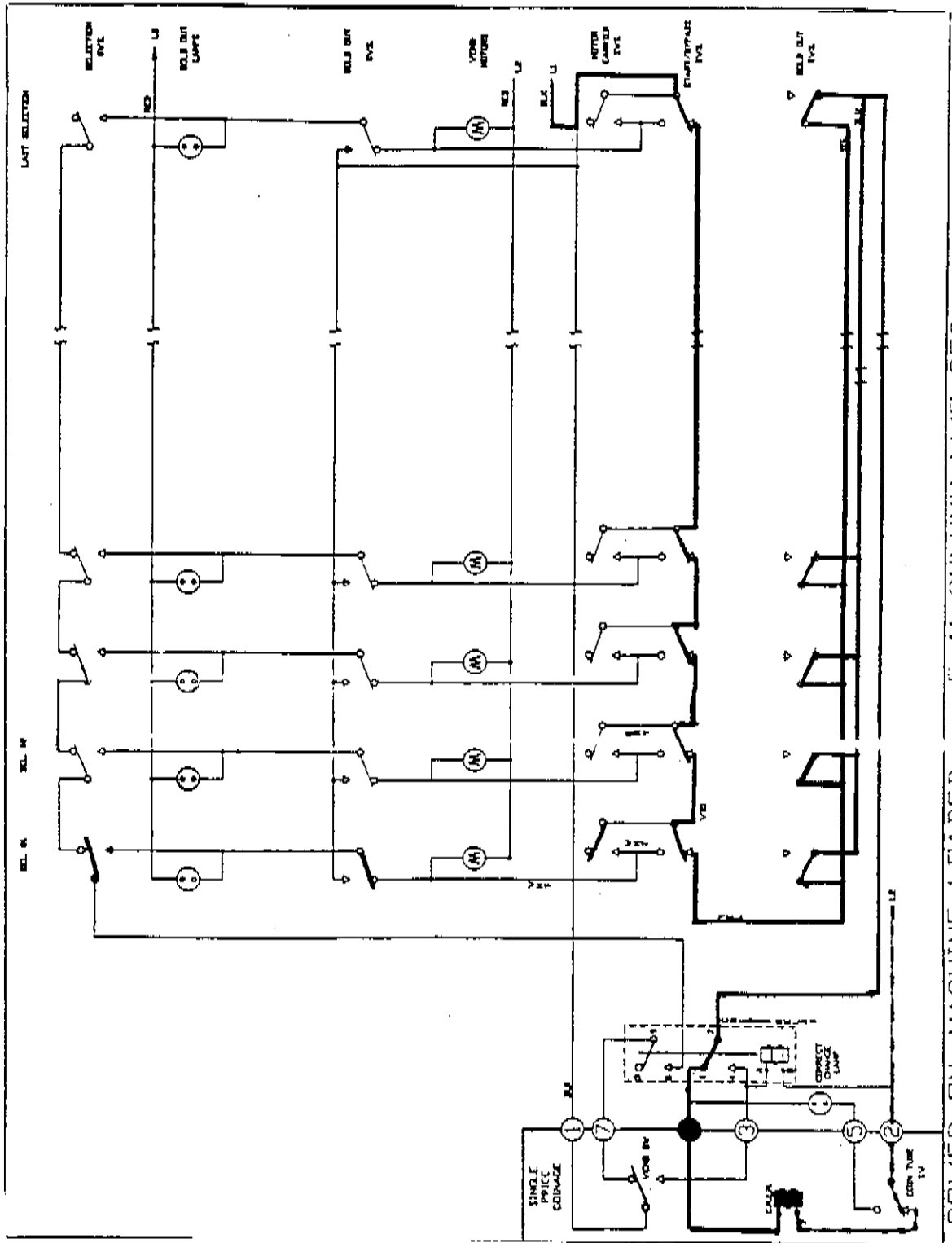
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Switch.....	
Service Cord Plug.....	
Neon Lamp.....	
Coil.....	
Electrical Wire Junction.....	
Motor.....	
Changer Receptacle Junction.....	

Note: The following pages have the step by step operation of the electrical circuit shown in a slower than normal operation for more clarity to trouble shoot most problems in the vender. If you follow each step by step and stop at the position where the vender did not operate as shown, you can save a lot of wasted time.

1. STANDBY

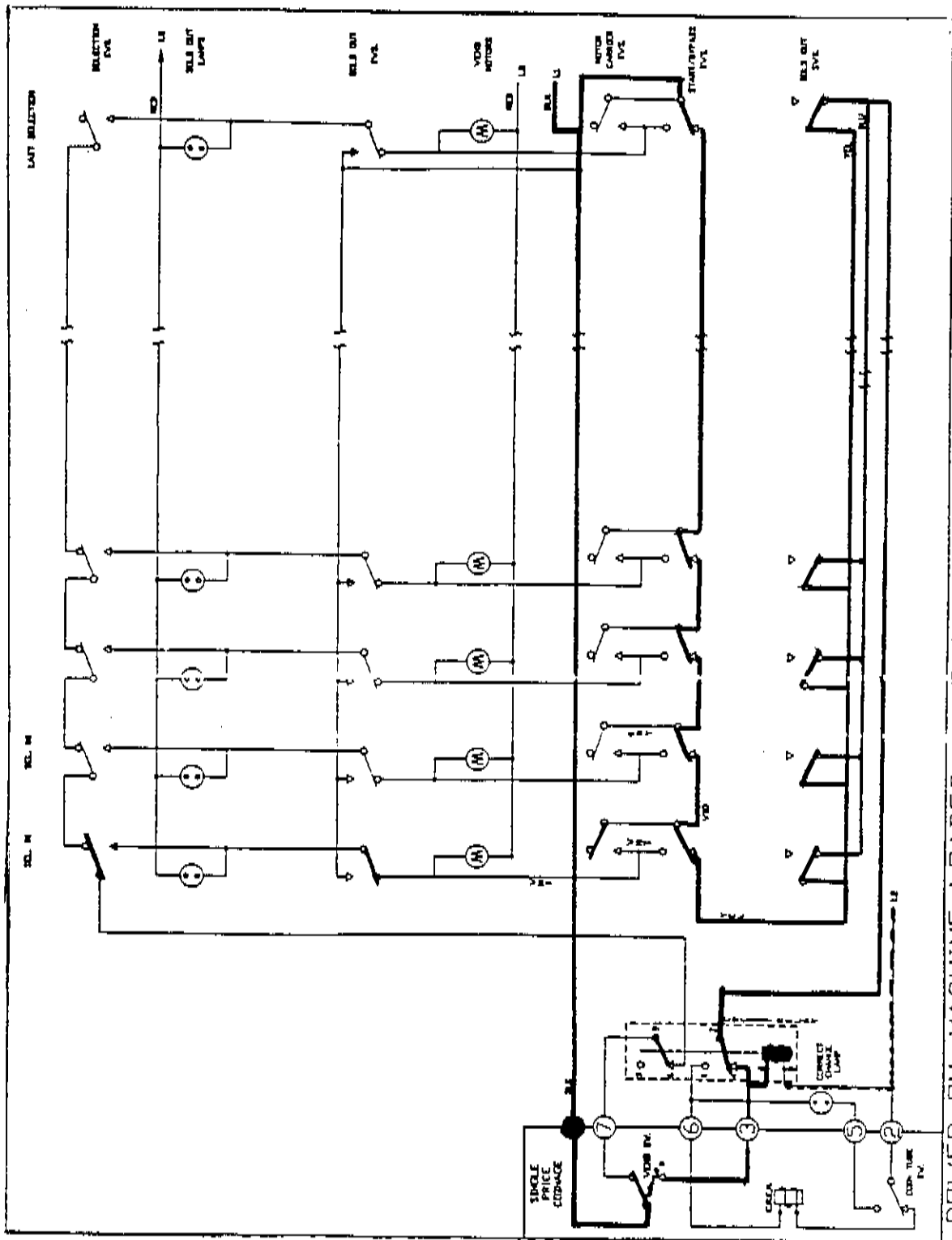
Line 1 power is supplied to the C.R.E.M coils through the last Start/Bypass switch in the circuit, from common to the normally open of the switch, it then travels through the common of the first soldout switch to the normally closed side of the switch. (Yellow to Blue wire). The circuit then travels to the common (pin 7) of the credit relay, and then to the normally closed of the credit relay (pin 1). The circuit then travels to pin 6 of the coinage receptacle, and then to one side of the C.R.E.M.S. to energize the coil. (the credit relay is de-energized at this time)



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2. CREDIT ESTABLISHED

When the proper amount of money is inserted, the vend switch of the changer has sent a pulse momentarily to the credit relay coil to energize it. This is done through the common to the normally open side of the vend switch of the changer, and through pin (6) of the changer receptacle to the "A" side of the relay coil. (Line 2 is always available to one side of the circuit until asked for it to be in circuit). A holding circuit is then created from Line 1 through the Start/Bypass switches and the sold out switches through pin 7 to pin 4 of the credit relay, and to the "A" side of the relay coil.

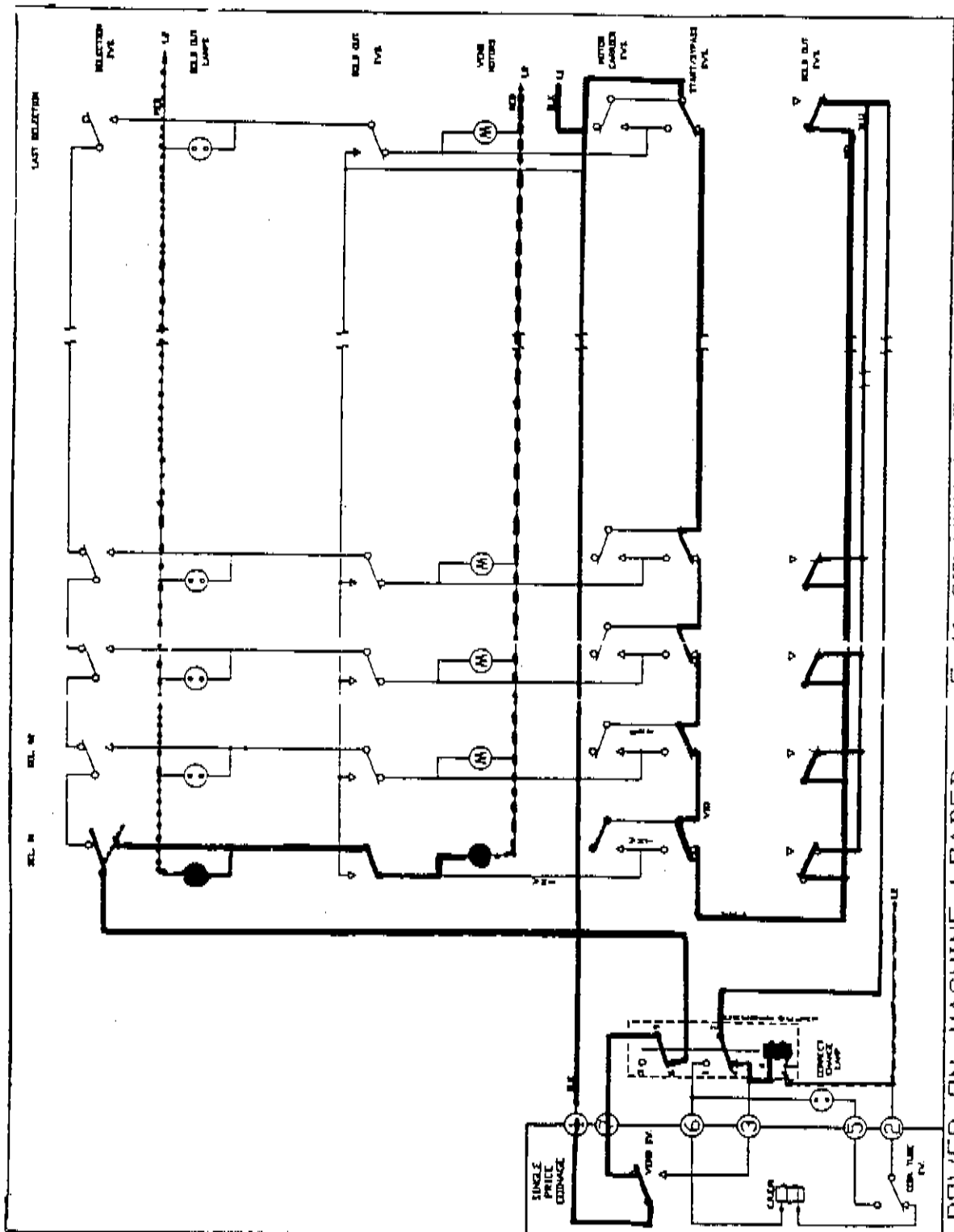


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3. SELECTION MADE, MOTOR START CIRCUIT

When the customer makes a selection, the circuit is passed from the common of the selection switch through to the normally open side of the switch, and then to the selected motor through the sold out switch. The sold out light will light momentarily at this time.

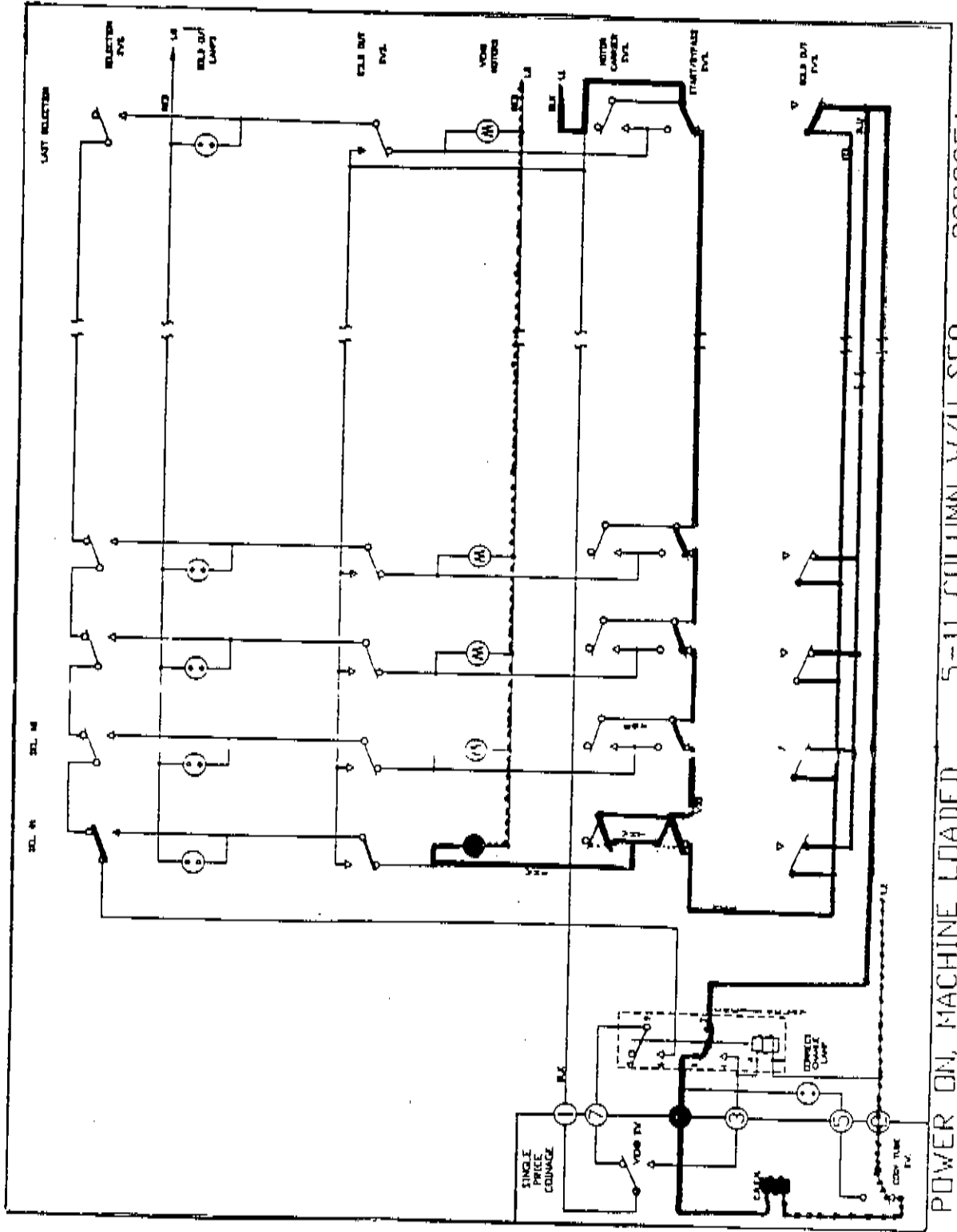




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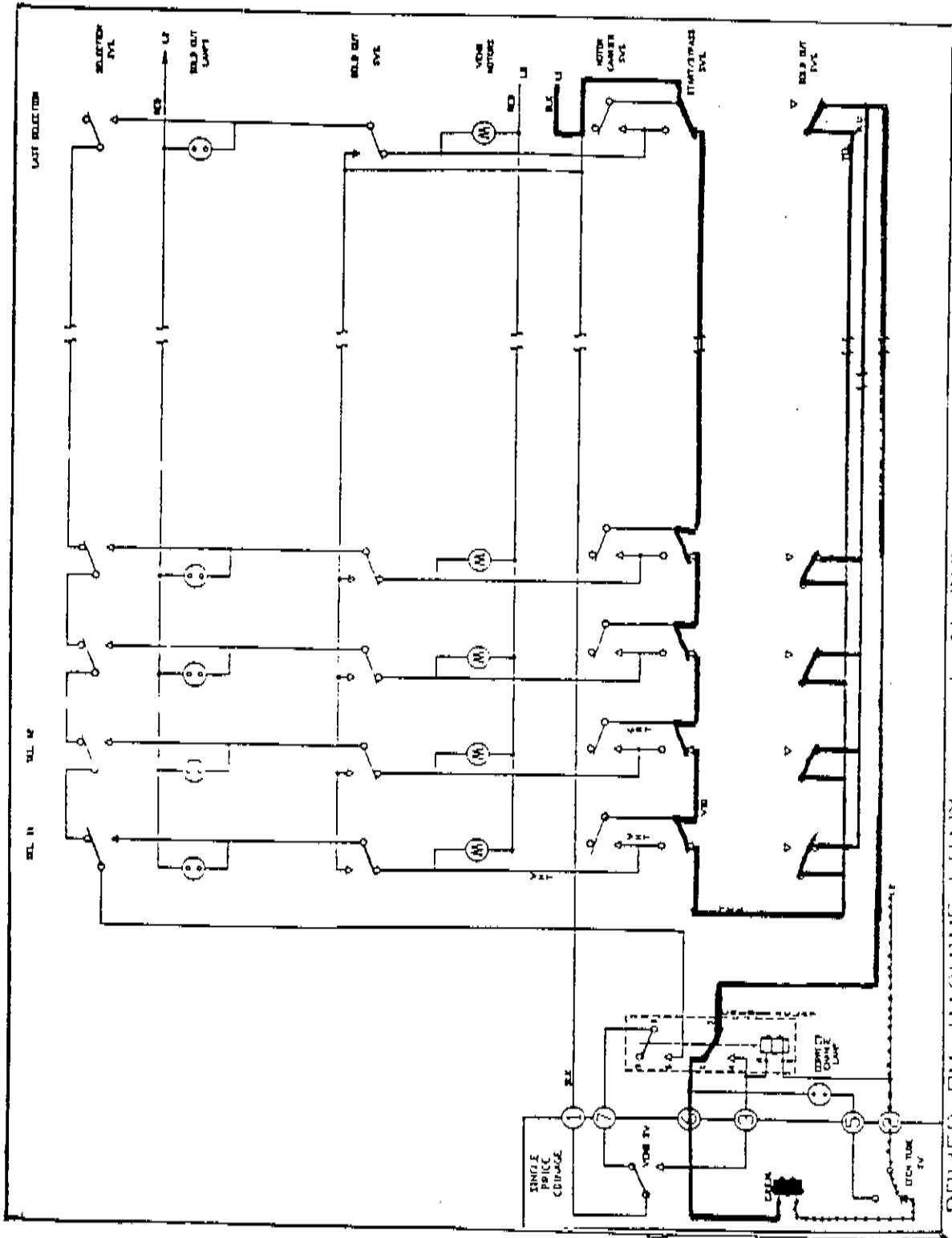
#### 4. MOTOR RUN CIRCUIT

As the motor starts its run, the motor cam rotates and actuates the start/bypass switch from common to the normally open side of the switch, to common to normally closed side, the motor carrier switch is also in a common to normally closed position to keep the motor running. The circuit to the C.R.E.M.'s is activated to allow the insertion of money if the motor fails to complete its cycle at this time. This circuit is through pins 1 and 7 of the credit relay and through pins 6 and 2 of the changer socket. The credit relay circuit is canceled and is also de-energized at this time by this action.



5. RETURN TO STANDBY

As the motor continues to operate, the motor carrier switch is returned to its common to normally closed position, the start/bypass switch is still in a common to normally closed position until the peak of the cam actuates the switch to its common to normally open position, which stops the motor and returns the vender to standby position. The C.R.E.M.'s are energized, the credit relay is de-energized, and the vender is ready to accept money for the next vend.



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## REFRIGERATION OPERATION

- A. Basic Refrigeration Principle
- B. Detailed Refrigeration Cycle
- C. Parts Description  
Parts Location and Freon Flow Chart (last page)

### A. BASIC REFRIGERATION PRINCIPLE

What a refrigeration system really accomplishes is the transfer of heat. The refrigeration system removes the heat from product area and then transfers it to the condenser where it is dissipated. In the vending machine application of this process, large quantities of the heat have to be transferred economically, efficiently, and that can be repeated continuously without loss of refrigerant over an extended period of time. The most common system used in the vending industry is the vapor compression (or simple compression) cycle system. It consists basically of three elements: an evaporator, a compressor, and a condenser, (all part of a "sealed system").

In the compression system there are two existing pressures, the low (evaporating) pressure and the high (condensing) pressure. The refrigerant acts as the transportation medium in which heat is moved from the evaporator to the condenser, where this heat is dissipated (into ambient air). A change of state from liquid to vapor and back to liquid allows a refrigerant to absorb and discharge large quantities of heat efficiently.

The basic vapor compression system cycle is described below.

In the evaporator the refrigerant boils (evaporates to a vapor) at a temperature sufficiently low enough to absorb heat from a space which is being cooled. The boiling temperature is controlled by the pressure maintained in the evaporator (the higher the pressure, the higher the boiling point). The compressor removes the vapor (via suction lines) from the evaporator as it is formed at a rate sufficiently rapid enough to help maintain desired pressure. The compressor takes the low pressure vapor and compresses it, increasing both the pressure and temperature. The hot, high pressure gas is forced out the compressor discharge valve and into the condenser. The condenser dissipates the heat of the refrigerant vapor. As the temperature of the vapor decreases it is condensed into a liquid. This liquid flows from the condenser to the evaporator. This process in which the refrigerant absorbs heat at a low pressure and then under action of the compressor, is compressed and raised to a sufficiently high enough temperature to permit rejection of this heat is continuous as long as the compressor runs.

### B. DETAILED REFRIGERATION CYCLE

The following cycle is a detailed description of a complete refrigeration cycle as it pertains to the refrigeration system as installed in Vendo equipment.

As the temperature in the cabinet rises the liquid in the thermostat feeler bulb also rises in temperature. As this liquid becomes warmer it expands. This expanding liquid pushes against the temperature control bellows and actuates the temperature control switch. The temperature control switch turns both the compressor and condenser

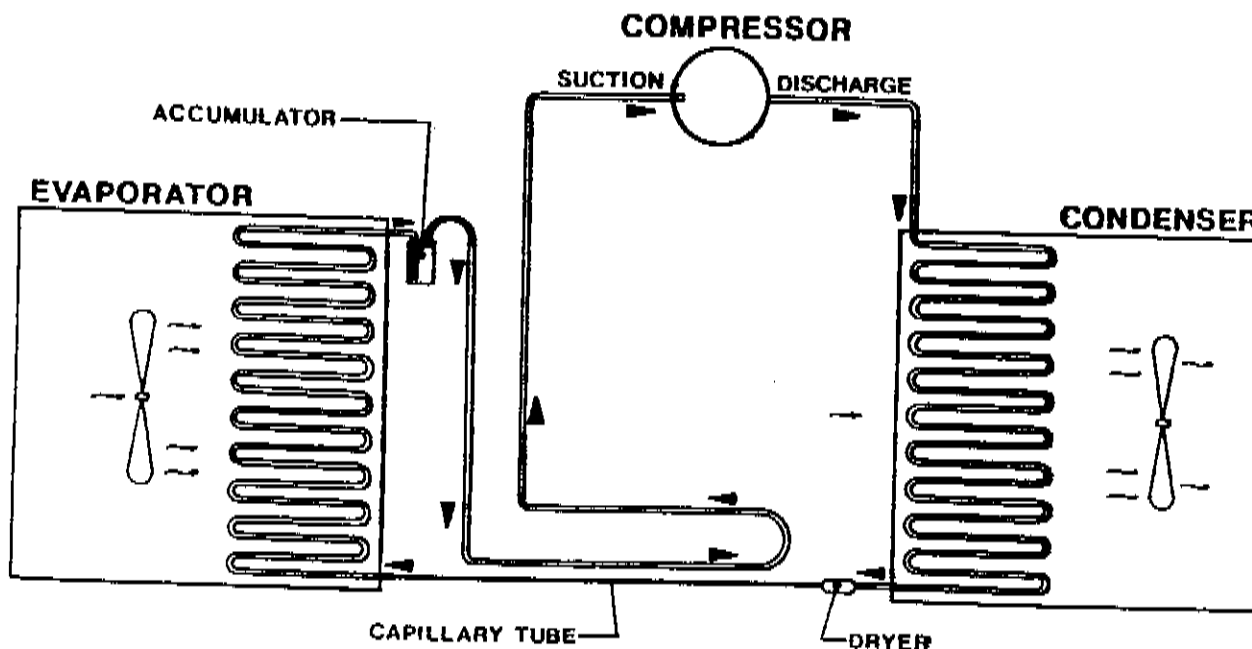
## B. SECTION (CONT.)

fans on. The condenser fan sucks air through the condenser, removing heat from the refrigerant in the condenser. The compressor sucks low pressure refrigerant vapors from the evaporator, compresses it and pumps it to the condenser (where excess heat is removed). The cooled gas in the condenser turns into a liquid. The high pressure from the compressor pumps this liquid through the drier (which removes any moisture and solid particles from the liquid) and capillary tube (which controls flow of liquid) to the evaporator. At the evaporator the fan(s) blow the air of the cabinet over the evaporator, removing excess heat from the air. The liquid is heated up and boils turning into vapor, which is sucked into the compressor through the accumulator (which traps and allows evaporation of any liquid refrigerant after leaving evaporator) and suction line. The now falling temperature in the cabinet cools the liquid in the thermostat feeler bulb condensing it. As this liquid condenses, it releases the pressure against the temperature control bellows, de-actuating the temperature control switch. The de-actuated control switch turns off the compressor and condenser fan(s).

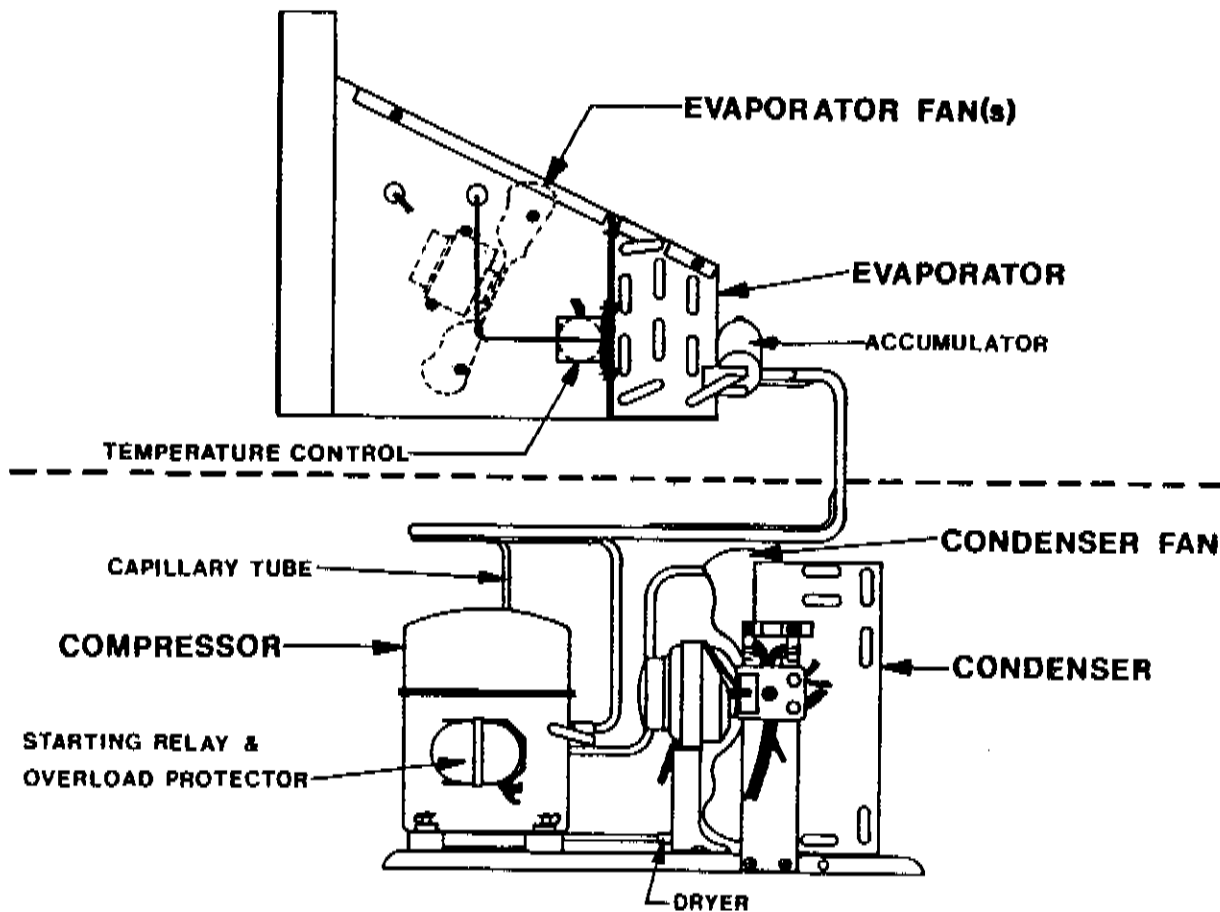
## C. PARTS DESCRIPTION

1. COMPRESSOR (Part of a Sealed System - see Parts Section for part numbers) The compressor sucks in low pressure vapor from the evaporator and pumps out high pressure vapor to the condenser. The motor that drives the compressor is sealed inside a housing along with the compressor. The compressor is mounted to the refrigeration base, which is mounted in the bottom of the vender - outside the "sealed" refrigeration space.
2. CONDENSER (Part of a Sealed System) The condenser takes heat out of the high pressure vapor that has come from the compressor. As this vapor passes through the condenser it is changed into a liquid because it loses heat while remaining under high pressure. The condenser is mounted to the refrigeration base towards the front of the vender.
3. CONDENSER FAN ASSEMBLY (Various part numbers - see Parts Section) The condenser fan pulls "cool" air from outside the vender, through the condenser and blows it out the back of the vender (and over the compressor). This "cool" air removes excess heat from refrigerant in the condenser. The condenser fan runs when the compressor runs. This fan assembly is mounted on the refrigeration base between the condenser and compressor.
4. DRIER (Part of a Sealed System) The drier is a molecular sieve strainer drier. It removes water from refrigerant liquid. It is mounted in the discharge line of condenser before capillary tube. If the system is tapped, this drier should be replaced to keep the system maintained.
5. CAPILLARY TUBE (Part of a Sealed System) The capillary tube has a very small inside diameter to help keep pressure in the evaporator low and pressure built up in condenser. It also controls, but at a steady rate, the flow of refrigerant liquid to the evaporator. It is the connecting line between the condenser and evaporator.
6. EVAPORATOR (Part of a Sealed System) The evaporator removes the heat from the air in a refrigerated space and transfers it to the refrigerant liquid. This liquid is evaporated into a vapor and is sucked out by the compressor. The evaporator is mounted inside the refrigerated space directly below the delivery chute.
- ACCUMULATOR (Part of a Sealed System) The accumulator traps any refrigerant liquid that did not boil off into a vapor before it reaches the compressor. It allows any refrigerant liquid to boil off as a vapor to prevent damage to compressor. It is mounted in the suction line on the discharge side of the evaporator.

8. EVAPORATOR FAN ASSEMBLY (Various Part Numbers - see Parts Section) The evaporator fan blows air of refrigerated space over the evaporator + remove excess heat from air. The air is then used to removed excess heat from product. The evaporator fan assembly is mounted to the evaporator mounting housing and pulls air from front of refrigerated space over evaporator, up rear of refrigerated space to vend stack. (NOTE: There are two evaporator fans on the 1/3 HP and the Super 1/3 HP units. One fan is running at all times.)
9. TEMPERATURE CONTROL (Various Part Numbers - see Parts Section) The temperature control is made of two main parts: the thermostat feeler bulb and the temperature control box. The feeler bulb is a very narrow tube with a refrigerant liquid inside. It is mounted to the evaporator (above air flow of fan) and to the control box. As the liquid in the feeler bulb expands (warms up) it expands against a bellows in the control box, which actuates a temperature control switch (also located in the control box). As the liquid in the feeler bulb cools off it contracts to turn the switch off. This switch turns the compressor and condenser fans on and off. The temperature control box is mounted to the side of the evaporator and is adjustable to control temperature of refrigerated space.
10. STARTING RELAY (Various Part Numbers - see Parts Section) The starting relay is mounted in the terminal box on the side of the compressor housing. When the compressor first starts up the starting relay closes and completes a starting circuit. When the compressor motor gets up to speed, the starting relay opens and brakes the starting circuit.
11. THERMAL OVERLOAD SWITCH (Various Part Numbers - see Parts Section) The thermal overload switch is mounted in the terminal box on the side of the compressor housing. If the compressor motor gets hot or draws too much current, the thermal overload opens and breaks the starting and running circuits of the motor. When the compressor cools off the thermal overload closes to allow the compressor to run.







## MAINTENANCE

The following section deals with general maintenance and servicing of the vender. It is intended as a basic guide only.

This section is divided into five parts: (I) Preventative Maintenance Suggestions; (II) Lubrication Guide; (III) Care and Cleaning; (IV) General Overview and Service Suggestions; (V) Basic Trouble Shooting

### I. PREVENTATIVE MAINTENANCE SUGGESTIONS

The following service call suggestions are given as steps to be taken whenever a vender is visited on site. They are provided as a "preventative maintenance" i.e. to help "prevent" major problems with the vender.

- A. Observe vender and surrounding area for any unusual indications of problems. (Such as rust on cabinet, obstructions of air flow, dark spots on sign face, etc.)
- B. Open door and visually check inside of vender. (Such as water accumulation, rust marks, moisture around edges of inner door, etc.)
- C. Check fluorescent lamps (replace as necessary\*\*).
- D. Check product temperature for proper cooling.
- E. Check evaporator drain for obstruction. (Water in evaporator area must drain to condensate pan.)

## I. PREVENTITIVE MAINTENANCE (CONT.)

- F. Empty condensate pan.
- G. Clean condenser (Vanes free of dirt, lint,
- H. Evaporator fan(s) run normally.
- I. Compressor and condensate fan run normally.
- J. Investigate any unusual sounds (Such as fan blades hitting something, refrigeration lines rattling, etc.)
- K. Clean coin acceptor.
- L. Deposit coin (\$.05, \$.10, \$.25) to check for proper operation of coinage.
- M. Test vend all selections.
- N. Correct all problems (as necessary).
- O. Test vender and make a report on problems.

\*\* CAUTION NOTE: It will be necessary to replace single pin ("Slimline") lamps immediately (within 24 - 48 hours of burning out) to prevent ballast from also burning out.

## II. LUBRICATION GUIDE (SEE CHART BELOW)

Lubricate indicate areas at intervals shown on chart.

<u>INTERVAL</u>	<u>PARTS</u>	<u>LUBRICANT</u>
Every 6 months	Top hinge of door Door hinge pin at base of cabinet Door latch cam to cabinet strike	Grade 2 High Low Temperature Grease
Whenever Necessary	Pivot areas of the bucket, and the gate	Grade 2 High Low Temperature Grease

## III. CARE AND CLEANING

- A. GENERAL PROCEDURE (Painted metal areas)  
Wash vender with soap and water. The exterior may be waxed with any good automobile wax.  
**NOTE:** Interior corrosion may be removed with a fine grade of steel wool and then painted.
- B. FRESH PAINT SPLASHES, GREASE, AND GLAZING COMPOUND REMOVAL.  
Before drying these conditions may be easily removed by rubbing lightly with VM&P grade Naptha (or equivalent grade solvent). After removal, use general cleaning procedure ("A" above).  
**NOTE:** Almost all organic solvents or alcohols are NOT compatible cleaning materials for Lexan signs. Care must be taken to use these materials only on painted surfaces.
- C. LABELS AND STICKER REMOVAL  
The use of kerosene, VM&P grade Naptha, or petroleum spirits are generally effective against these conditions. **IMPORTANT:** See note in Section "B" above.

In cases where the label material does not allow penetration of solvent (such as vinyl) the application of heat (example: hair dryer) will soften the adhesive and promote removal. **CAUTION:** Excessive heat can cause surface damage.

After label material is removed, use general cleaning procedure ("A" above).

## D. SCRATCH REMOVAL

Hairline scratches and minor abrasions can be removed (or minimized) by using any good quality automobile polish. Prior to general use, it is suggested that a sample product be tested first.

## E. LEXAN SIGNS

When cleaning the Lexan sign faces the following cleaning procedure is recommended:

- 1) Wash sign with a mild soap or detergent and lukewarm water.
- 2) Using soft cloth or sponge, gently wash the sign. DO NOT SCRUB!
- 3) Rinse well with clean lukewarm water.
- 4) Dry thoroughly with a chamois or cellulose sponge (to prevent water spotting). DO NOT USE SQUEEGEE!

NOTE: Almost all organic solvents, petroleum, spirits, or alcohol are NOT compatible cleaning materials for Lexan signs. Usage of any of these materials on Lexan signs could permanently damage sign.

## F. REFRIGERATION AREA

The condenser and evaporator must be kept clean for efficient operation. You must be sure that all vanes and tubing are clean and clear of obstruction to allow free air passage. Clean with a brush, a vacuum cleaner or compressed air. Cabinet drain must be kept open, clean a necessary.

## IV. TROUBLE SHOOTING GUIDE

This guide is only a general list of probable causes, and should be used with that in mind.

The trouble shooting guide is done in three columns, Column One (1) - Problem, Column two (2) Possible Cause, Column Three (3) Suggested Cure.

If this doesn't show a particular problem, contact The Field Service Department at Vendo, 7209 N. Ingram Ave., Fresno, CA 93650 or call 1-800-341-7216, or in California 1-800-742-1815. Be sure to have the serial number and model number of the vender when you call.

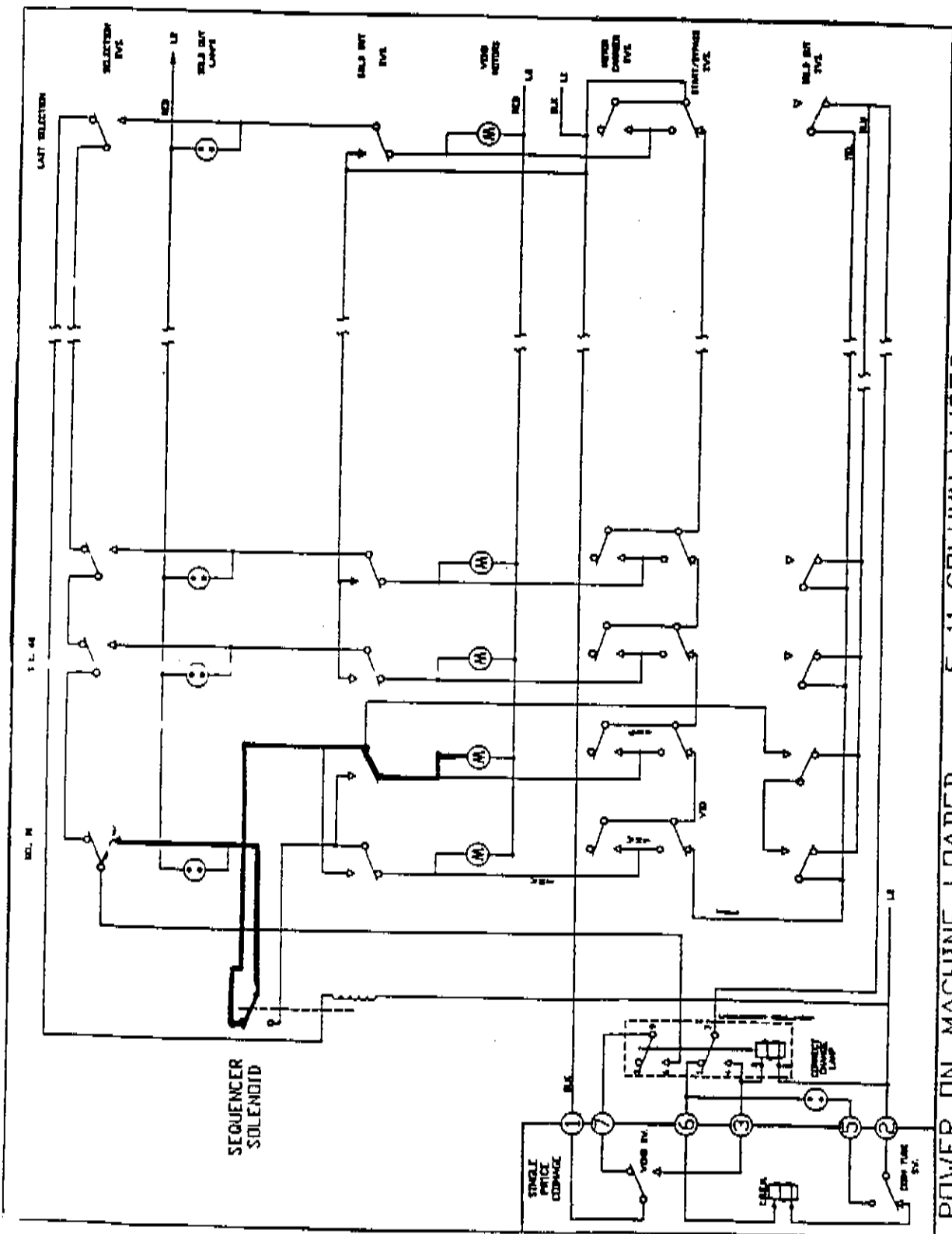
POSSIBLE PROBLEM	POSSIBLE CAUSE	SERVICE SUGGESTION
RETURNS ALL GOOD COINS	<p>NO POWER TO VENDER</p> <p>NO POWER TO CHANGER</p> <p>ACCEPTOR IS OUT OF ADJUSTMENT OR COIN GATE IS NOT CLOSED.</p> <p>BLOCKING FINGERS REMAIN IN COIN PATH DUE TO: 1) DEFECTIVE COIN RETURN ELECTRO-MAGNETIC (C.R.E.M.) OR 2) BENT BLOCKING FINGERS.</p> <p>COIN PATHS ARE DIRTY</p> <p>CONTACTS OF CREDIT RELAY OPEN</p> <p>OPEN MOTOR CARRIER CIRCUIT OR START BYPASS CIRCUIT.</p>	<p>CHECK POWER SUPPLY</p> <p>CHECK COIN MECHANISM PLUGS CHECK FOR FAULTY HARNESS WIRING (SEE WIRING DIAGRAM FOR CIRCUIT)</p> <p>CHECK COIN MECHANISM</p> <p>1. CHECK C.R.E.M. REPLACE</p> <p>2. REFORM BLOCKING FINGERS</p> <p>CLEAN ACCEPTOR WITH APPROVED CLEANER. <u>DRY VERY THOROUGHLY.</u></p> <p>CHECK CONTINUITY OF RELAY. CLEAN CONTACTS WITH APPROVED ELECTRICAL CLEANER. IF STILL OPEN - REPLACE RELAY.</p> <p>CHECK TO SEE THAT MOTOR CARRIER AND BYPASS SWITCHES HAVE RETURNED TO STANDBY</p>

<p>MONEY ACCEPTED NO PRODUCT VENDED</p> <p>NO SELECTIONS WORK</p> <p>#1 SELECTION WORKS 2 THRU LAST DOES NOT</p> <p>SOLD OUT SWITCH "A" INOPERATIVE</p> <p>MOTOR DOES NOT START</p> <p>MOTOR STARTS, DOES NOT RUN</p>	<p>CREDIT RELAY DOES NOT ENERGIZE</p> <p>#1 SELECTION WORKS 2 THRU LAST DOES NOT</p> <p>SOLD OUT SWITCH "A" INOPERATIVE</p> <p>MOTOR DOES NOT START</p> <p>MOTOR STARTS, DOES NOT RUN</p>	<p>CHECK RELAY, REPLACE RELAY</p> <p>CHECK #1 SELECTION SWITCH, REPLACE IF NECESSARY</p> <p>CHECK #2 SELECTION SWITCH, REPLACE IF NECESSARY. THIS PATTERN CAN CONTINUE THRU LAST SELECTION SWITCH AS SELECTION CIRCUIT GOES FROM 1 TO 2 TO 3, ETC., TO LAST.</p> <p>CHECK SWITCH, REPLACE</p> <p>CHECK START/BYPASS SWITCH, REPLACE SWITCH</p> <p>CHECK MOTOR CARRIER SWITCH, REPLACE SWITCH</p>
POSSIBLE PROBLEM	POSSIBLE CAUSE	SERVICE SUGGESTION
<p>VEND MOTOR RUNS UNTIL TWO OR THREE PRODUCTS ARE VENDED OR VEND M O T O R S R U N CONTINUOUSLY</p>	<p>IMPROPER CAM LOBE ADJUSTMENT</p>	<p>CHECK CAM FOR PROPER ARRANGEMENT OF CAM LOBES (SEE PRODUCT SET UP GUIDE)</p>
<p>MOTOR CARRIER SWITCH NOT MAKING CONTACT WITH CAM LOBE OR SWITCH</p>	<p>MOTOR CARRIER SWITCH NOT MAKING CONTACT WITH CAM LOBE OR SWITCH</p>	<p>CHECK LEVER FOR PROPER LEVER POSITIONING AND FREEDOM OF MOVEMENT</p>
POSSIBLE PROBLEM	POSSIBLE CAUSE	SERVICE SUGGESTION
<p>REFRIGERATION UNIT WILL NOT RUN AT ALL</p>	<p>NO POWER TO VENDER</p> <p>THERMOSTAT OPEN (TEMPERATURE CONTROL)</p> <p>TEMPERATURE CONTROL BULB OUT OF POSITION</p>	<p>CHECK POWER SUPPLY. ALSO CHECK SERVICE CORD CONNECTIONS</p> <p>CHECK THERMOSTAT (APPLY INSULATED JUMPER ACROSS TERMINALS IF COMPRESSOR STARTS, REPLACE THERMOSTAT).</p> <p>CHECK THAT BULB IS IN AIR FLOW</p>
<p>COMPRESSOR WILL NOT START CONDENSER FAN MOTOR RUNNING, UNIT COOL (NO POWER TO COMPRESSOR)</p>	<p>OVERLOAD PROTECTOR INOPERATIVE</p>	<p>CHECK OVERLOAD (APPLY INSULATED JUMPER ACROSS TERMINAL, IF COMPRESSOR STARTS, REPLACE OVERLOAD)</p>

<p>COMPRESSOR WILL NOT START, CONDENSER FAN MOTOR RUNNING - UNIT HOT (POWER TO COMPRESSOR)</p>	<p>STARTING RELAY INOPERATIVE</p> <p>COMPRESSOR INOPERATIVE</p>	<p>CHECK RELAY, REPLACE</p> <p>DISCONNECT POWER TO VENDER, REMOVE ALL LEADS FROM COMPRESSOR, CHECK CONTINUITY FROM "COMMON", "START" AND "RUN" TO COMPRESSOR CASE. IF CONTINUITY SHOWS, REPLACE COMPRESSOR. ALSO CHECK FROM "COMMON" TO "RUN" AND FROM "COMMON" TO "START". (USING CONTINUITY OR OHMS.) IF METER FAILS TO SHOW READING REPLACE COMPRESSOR.</p>
<p>COMPRESSOR STARTS BUT DOES NOT RUN</p>	<p>WILL NOT CYCLE</p> <p>STARTING RELAY STAYS CLOSED</p> <p>THERMOSTAT INOPERATIVE</p> <p>COMPRESSOR MOTOR PROBLEM</p>	<p>CHECK OVERLOAD AND CONTACTS, REPLACE OVERLOAD IF NECESSARY</p> <p>REPLACE RELAY</p> <p>CHECK THERMOSTAT, CLEAN CONTACTS WITH APPROVED ELECTRICAL CLEANER. REPLACE THERMOSTAT IF NECESSARY</p> <p>CHECK, REPLACE</p>
<p>COMPRESSOR RUNS BUT CABINET TEMPERATURE WARM</p>	<p>COMPRESSOR FAILURE</p> <p>LOSS OF REFRIGERANT</p> <p>CONDENSER FAN NOT WORKING</p> <p>BLOCKED OR DIRTY CONDENSER</p> <p>(REFER TO INITIAL INSTALLATION IN THE SERVICE MANUAL.)</p>	<p>REPLACE COMPRESSOR</p> <p>REPLACE REFRIGERATION UNIT (NOTE: ANY WORK OF THIS NATURE DONE WITHOUT EXPRESS PERMISSION FROM THE VENDO COMPANY CAN VOID WARRANTY ON THE REFRIGERATION UNIT.)</p> <p>CHECK CIRCUIT TO RUN MOTOR. REPLACE MOTOR. CHECK FOR OBSTRUCTION OF FAN BLADE</p> <p>CHECK CONDENSER VANES FOR OBSTRUCTION, LIME OR DIRT. CLEAN. ALSO CHECK FOR PROPER AIR FLOW THROUGH REFRIGERATION AREA.</p>

COMPRESSOR RUNS BUT  
CABINET TEMP. WARM (CONT.)

	<p>EVAPORATOR FAN NOT WORKING</p> <p>BAD INNER DOOR SEAL</p>	<p>CHECK CIRCUIT TO FAN MOTOR. REPLACE MOTOR ALSO CHECK FOR OBSTRUCTION OF FAN BLADE.</p> <p>CHECK FOR MOISTURE ON SEAL. ADJUST INNER DOOR AS NECESSARY (SEE INITIAL SETUP OF SERVICE MANUAL). REPLACE DOOR SEAL.</p>
<p>COMPRESSOR RUNS, BUT CABINET TEMPERATURE WARM</p>	<p>THERMOSTAT SET TOO HIGH</p>	<p>ADJUST THERMOSTAT (SEE INITIAL SET UP OF SERVICE MANUAL)</p>
<p>COMPRESSOR RUNS CONTINUOUSLY</p>	<p>THERMOSTAT INOPERATIVE</p>	<p>CHECK THERMOSTAT</p>
<p>EVAPORATOR FROSTED OVER</p>	<p>WATER AT BASE OF EVAPORATOR UNIT</p>	<p>CHECK FOR PROPER DRAINAGE (SUCH AS PLUGGED DRAIN, KINK IN DRAIN TUBE, ETC.) CHECK DOOR SEAL</p>
<p>PRODUCT FREEZING UP - TOO COLD</p>	<p>THERMOSTAT SET TOO LOW</p> <p>THERMOSTAT INOPERATIVE (COMPRESSOR RUNS CONTINUOUSLY)</p> <p>THERMOSTAT FEELER BULB OUT OF POSITION</p>	<p>ADJUST THERMOSTAT (SEE INITIAL SET UP OF SERVICE MANUAL)</p> <p>CHECK THERMOSTAT. REPLACE IF NECESSARY</p> <p>ADJUST FEELER BULB (SEE INITIAL SET UP OF SERVICE MANUAL)</p>
<p>EXCESSIVE NOISE</p>	<p>FAN BLADES BENT OR HITTING SHROUD</p> <p>FAN MOTOR NOISY</p> <p>REFRIGERATION BASE LOOSE OR BENT</p>	<p>STRAIGHTEN, RELOCATE SHROUD POSITION, OR REMOVE SHROUD.</p> <p>TIGHTEN BOLTS OR REPLACE</p> <p>TIGHTEN OR STRAIGHTEN BASE</p>



POWER ON, MACHINE LOADED 5-11 COLUMN W/SEQ. 388884A  
 SEQUENCE CONTROL RELAY

As the diagram shows, either the first of second motor will operate, depending on which position the switch on the relay is in. In this example the switch is in position to operate the #2 motor.



