Advanced design...increased profits:
your return on our investment.

Customer Services Tech Aid-800-631-8084
SPECIFICATIONS

MODEL BC-20 BILL AND COIN CHANGER

POWER REQUIREMENTS
- 120 VAC
- 60 Hz.
- 400 Watts
- 8 Amps

CIRCUIT BREAKER REQUIREMENTS
- 5 Amp (2)
- 7 Amp
- 2 Amp

HOPPER CAPACITY
- Nickel Hopper: 2400, $120.00
- Dime Hopper: 6000, $600.00
- Quarter Hopper: 2100, $525.00

DIMENSIONS
- Depth: 19-1/4" 48.9 cm
- Width: 27-7/8" 70.8 cm
- Height: 48-1/4" 122.6 cm
- Net Weight: 265 lbs. 120.2 kg
IMPORTANT

THIS IS A MODULAR SERVICE MANUAL - PLEASE TAKE THE TIME TO READ THIS PAGE AND REVIEW THE TABLE OF CONTENTS ON THE FRONT OF THE DIVIDER PAGE FOR EACH PART TO GET THE MAXIMUM BENEFIT FROM THIS TEXT.

This publication is divided into two parts to fully utilize the service features engineered into each Bill and Coin Changer.

PART 1 - Field Service Manual provides familiarization with bill changer components and accessories. Included are installation and routine service procedures. The troubleshooting information in this part is intended for personnel with enough skill, experience, general knowledge of the equipment to isolate a problem to a plug-in electronic circuit board or mechanical adjustment. The trouble isolation procedure is based on observing the operation of the equipment and the use of an optional Rowe Diagnostic kit.

PART 2 - Parts Catalog contains a complete listing of procurable replacement parts except for electronic components which are listed directly on the schematic diagrams.

Operational Sequence and Schematics elaborates on Part 1 to provide information for the repair of circuit boards and the replacement of electronic components. The information and procedures in this part are intended for an advanced level of maintenance where test equipment is available and service personnel have had electronics training.

This is a separate publication available from your distributor. Please order Part No. 3-65355-01.

WARNING: This equipment generates, uses, and can radiate radio frequency energy. Operation of this equipment in a residential area could cause interference to radio communications. If this should happen contact your distributor or Rowe International, Inc. directly. As permitted by regulation it has not been tested for compliance pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference.

warranty

Rowe extends to the original operator of this equipment the following warranty:

All parts are guaranteed to be free of defects in material and workmanship for the specific periods which follow. Rowe agrees to repair without charge during such period any part which proves defective upon examination by Rowe. All costs of shipping an allegedly defective part to or from Rowe's offices shall be borne by the original operator.

Electronic Circuit Board Assemblies 2 years
Electrical and Mechanical Moving Parts 1 year
Lamps 90 days

In the case of parts supplied to Rowe as components, Rowe extends the same warranty period as extended by the original manufacturer.

The above warranty applies provided that all parts of the machine have been serviced properly as directed in the service manual, and provided the alleged defective part, upon examination by Rowe, shall prove to be thus defective.

This warranty will not apply to any machine or any part which has been subjected to any accident, abuse, or misuse.

ROWE INTERNATIONAL, INC. EXTENDS NO WARRANTY, EXPRESSED OR IMPLIED, TO PURCHASERS OR USERS OF ITS PRODUCTS EXCEPT AS HEREBIN SET FORTH, WHETHER BY OPERATION OF LAW OR OTHERWISE.
## PART ONE
### FIELD SERVICE

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Warranty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</table>

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- Coin Acceptor
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- Dispenser
- Hoppers
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INTRODUCTION

The Rowe Model BC-20 Bill and Coin Changer accepts and dispenses change for quarters and half-dollar coins as well as for dollar bills of United States currency. The machine can be easily modified to change the Susan B. Anthony Dollar Coin if desired. A monitor alarm system and high security cabinet provide theft protection. A microcomputer selectively discriminates against and returns, bogus bills and coins and controls the change dispensing functions. Plug in circuits and assemblies are featured for fast field substitution. Coin combination programming is easily changed using switches. The coin hopper feature permits rapid bulk loading of coins. Figure 1, shows major components.

Though greatly simplified in this explanation, the entire validation and payout sequence is controlled by a micro computer to insure the maximum security against bogus currency and jackpotting. Refer to the sequence of operation diagrams for a complete explanation of how the machine works. See manual 3-65355-01.

Inserting a dollar bill in the transport starts a motor which moves the bill along the acceptor track. While in motion, the bill is examined both optically and magnetically to determine whether or not it is valid. If the bill is valid, a vend signal is transmitted to the dispenser and the bill drops into the bill stacker where it is stacked flat against other valid bills. If the bill is not valid, the bill transport motor reverses, returning the bill to the customer.

The one dollar change bucket opens, and a dollar's worth of change drops into the coin cup. The coin hopper motors then operate, loading the correct number of coins from the nickel, dime, and quarter coin hoppers into the change bucket for the next payout.

Quarter and half-dollar coins pass through a coin acceptor. Solid state coin sensors are used to start the payout cycle for these coins.

When emptying change buckets using the test switches located on power control center, the machine must be turned off and back on between each operation of the test switch. An alternate method is to allow the unit to run to shutdown and then press the reset switch between test switch operations. The reset switch is located on the computer control center.

A functional description of the main components of the Bill Changer follows. This information can be used to gain an overall understanding of the equipment and its operation.

- **COIN HOPPERS** - Hold nickels, dimes and quarters. Could hold pennies if desired.
- **COIN DISPENSER** - (Behind hoppers) - contains drive motors, coin counting photocells, and escrow buckets for dispensing change.
- **BILL STACKER** - Receives and stacks accepted bills, includes removable bill box.
- **POWER CONTROL CENTER** - Contains test vends switches, counters to record dollar, half dollar, and quarter vends, power circuit breakers, on-off switch, EMI Filter, stepdown transformer, power relay, voltage regulator, power transistor, bill acceptor motor capacitor, and power supply circuit board.
- **COIN ACCEPTOR** - Accepts valid coins which operate solid state switches to vend change.
- **COMPUTER CONTROL CENTER** - Controls validation and change making functions. Contains change programming switches and all electronic adjustments and reset switch.
- **MONITOR ALARM** - Makes an incredibly loud noise if an attempt at forced entry is made. Consists of a horn operated by a replaceable Freon Aerosol can. Because the alarm is not electrically operated and not accessible without a key, it cannot be disarmed.

FIGURE 1. MAJOR COMPONENTS LOCATION
BILL TRANSPORT DEVICE (See Figures 2 and 3)

The Bill Transport Device receives bills inserted by the customer. Utilizing a system of rubber rollers located on the upper and lower track castings, the bill is transported through the bill transport device and delivered to the bill stacker. During this transport operation the bill is subjected to a dynamic examination by optical and magnetic sensors located in the bill transport device. These sensors consist of the P1, P4, and P6 solar cells and their respective light sources (one lamp serves both P4 and P6), and the magnetic head. The magnetic head reads off a magnetic signal from the bill.

The bill pressure solenoid pulls the spring-loaded pressure roller away from the magnetic head until the trailing edge of the bill uncovers P1. The pressure roller is then released and maintains pressure on the bill and magnetic head to assure proper signal transfer from the bill. The P6 solar cell is uncovered by the anti-cheat lever as the bill advances through the bill transport device. As the bill drops from the output rollers, the anti-cheat lever swings back to cover the P6 solar cell permitting the dispenser to operate.

If a bill does not pass the required validation tests, the transport is reversed and the bill is returned to the customer. The bill will hang in the bill acceptor inlet by its trailing edge for 30 seconds. During this time, the status display on the computer control will show a code number or letter indicating why the bill was rejected.

FIGURE 2. BILL TRANSPORT DEVICE

FIGURE 3. BILL TRANSPORT DEVICE – BOTTOM VIEW
BILL STACKER

The Bill Stacker, Figure 4, accepts the validated bills from the bill transport and stacks them, one at a time, in a removable slide-out box.

After the bill exits the transport and falls into the stacker, a signal from the computer control center energizes the transistorized drive circuit inside the stacker and relay K501 is pulled in, completing a circuit to the 115 VAC bill stacker motor. The signal from the computer control center is not long enough to drive the stacker a full cycle so a set of contacts of K501 is used to hold in the coil. As the stacker leaves home position, cam switch S501 closes followed closely by the switching of cam switch S502. As switch S502 switches, it grounds a line back to the computer control center which prevents the acceptance of bills and coins and disables the machine if the stacker fails to complete its cycle in approximately 1.5 seconds. With the switching of S502, relay K501 drops out and the stacker motor operates through switch S501 only. As the stacker completes a cycle, cam switch S502 switches back and cam switch S501 opens, stopping the stacker motor. The stacker is now ready for another cycle.

COIN ACCEPTOR

The Coin Acceptor checks quarter and half-dollar coins to determine their validity. The S.B.A. Dollar Coin Acceptors are available and can be easily accommodated. Each coin is checked for thickness, diameter, weight and metallic content. If the coin is deformed or invalid it is directed through the coin acceptor to the coin return cup. Genuine coins are directed through the coin acceptor and actuate either of two solid state coin switches located on the rear bottom of the slug rejector mounting frame. Jammed coins or slugs are cleared from the coin acceptor by a wiper arm on the coin acceptor which is actuated by the coin or bill return button. The coin inlet and chute deters cheats and jams. It can be opened for easy clean out by removing the lower thumbscrew and rotating the coin track up.

SOLID STATE COIN SWITCHES

As a coin passes through a slot in the coin switch assembly it momentarily interrupts an infrared light beam causing a solid state optical detector to send an electrical pulse to the computer control center. The duration of this pulse is then checked by the computer to determine its validity. Valid coins will initiate the dispense cycle. A separate light source (INFRA - red LED) and optical sensor (photo transistor) is provided for each of the two coin denominations accepted.

DISPENSER

The Dispenser, Figure 5, contains the necessary equipment for the actual handling of the coins. Located on this assembly are the coin bucket and solenoid assembly, the chute from the bucket to the channel mounted on the power control center and the upper chute from the coin detectors to the bucket.

The three coin detectors, each consisting of a lamp and a photo transistor, detect the coins as they exit from their respective hoppers and fall into the upper chute. The upper coin chute directs the change to the change buckets. The drive for the hoppers consist of three AC motors which are also on the dispenser. These motors, as well as the solenoids which open the bottom door of the coin buckets are controlled by signals from the computer control center.

Access to the rear of the dispenser assembly is achieved by removing the two screws in the upper corners, grasping the dispenser at the arrow, and tilting the entire assembly forward on its lower pivots. When replacing the dispenser be sure that the two top screws are tightened down securely. If not, the entire dispenser assembly may tilt forward when hoppers are unloaded or removed.

FIGURE 4. BILL STACKER

RELAY K501
STACKER MOTOR
CAM SWITCH S502
CAM SWITCH S501

FIGURE 5. COIN DISPENSER

No. 755 LAMP
HOPPER DRIVE MOTORS
COIN BUCKET AND SOLENOID
HOPPERS

The bill changer contains three identical, interchangeable coin hoppers (Figure 6), which mount on the front surface of the dispenser assembly and pivot forward from the bottom for unloading and removal. A special hopper to dispense S.B.A. dollar coins or large tokens is now available.

The hopper transports coins to the detector and coin chutes by means of a chain conveyor driven by a lower sprocket. The chain follows a serpentine path which is designed so that excess coins fall back into the hopper insuring only one coin per pin into the coin counting area.

The chain picks up coins from the bottom of the hopper and carries them up to the top where they fall through the upper chain guide ring and interrupt a light beam to a photo detector, mounted on the dispenser. The coins then fall through a closed chute to the change bucket.

An agitator, mounted on the drive shaft, agitates the coin load to minimize coin jams in the hopper and insure efficient pick up of coins.

It should be noted that there is no empty sensing device in the hopper. Empty hoppers are indicated by a failure to count appropriate number of coins in a specified period of time - approximately 45 seconds. The hoppers in this machine also have teflon coated coin tracks which minimize the need for cleaning.

BURGLAR ALARM

The Burglar Alarm is a mechanically actuated, self-contained, gas operated horn making it immune to power interruptions or tampering. The alarm is armed when the top door is closed and locked. Normal unlocking with a key and opening of the top door by turning the T-handle lock does not disturb the alarm. The alarm is activated if an attempt is made to pry the door open at the shelf. A roll pin attached to the top door center lock bolt lifts a spring-loaded latch lever when an attempt is made to pry the locked door open. This latch lever then releases a spring-loaded slide bar mechanism which actuates the alarm. The alarm system can be re-armed by pulling the slide bar forward until it latches. A new can of freon may be installed by removing the spent can from its retaining clips and replacing it with the new can. Be sure the horn is screwed into the top of the new alarm can and faces to the back of the cabinet when installed.

WARNING

LIQUID FREON FROM THE POWER PACK CAN CAUSE SEVERE BURNS TO SKIN AND EYES. USE EXTREME CAUTION IN HANDLING CANS. DO NOT OVER TIGHTEN POWER PACK IN THE FOLLOWING STEP.

TEMPORARILY OUT OF SERVICE LAMP

This lamp is located on the top door above the bill and coin inlet area. It comes on whenever the machine is empty of change or shutdown due to some malfunction. The reset button on the computer control center must be pushed to turn the empty light off after the machine has been reloaded or if the malfunction is the kind requiring a manual reset.
POWER CONTROL CENTER

All power supply and associated circuitry is located in this single subassembly for easy diagnosis and repair. The power control center (Figure 8) is located below the dispenser assembly and contains the vend counters, test switches, EMI filter, power transformer, power supply circuit board, +5 VDC regulator, power control relay, circuit breakers, on-off switch and bill acceptor motor capacitor.

The vend counters register the number of respective vends. These counters are not resettable and advance one count for every vend whether the dispenser is activated by a bill or coin, or by the test switches.

The three test switches are used to manually initiate a change dispense cycle for each of the 3 denominations of money inserted into the machine. The computer will not recognize a test switch closure if the machine is in the process of validating a bill, dispensing change or in shut-down.

The EMI filter removes undesirable noise from the incoming power line. The power transformer supplies 30 VAC and 11.5 VAC from which the rest of the system voltages are derived.

The removable power supply circuit board rectifies and filters the 30 VAC and 11.5 VAC to provide 40 VDC, 30 VDC (current limited) and 14 VDC to the rest of the system. It also contains indicator LED's for each of the above voltages as well as the +5 VDC. The circuit board can be removed by removing (2) screws and pulling the board up and out from the Power Control Center beneath the left hand hopper.

The +5 VDC regulator, is fed from the 14 VDC on the power supply board and supplies +5 VDC to all the lamps and detectors as well as the solid state coin switch assembly.

The computer control center has its own on-board +5 VDC regulated power supply which operates from +14 VDC generated by this power control center.

The power control relay switches the 40 VDC, 30 VDC, 30 VAC and 120 VAC. This relay is controlled by the computer control center and is energized under normal operating conditions. Under certain conditions the computer control center de-energizes the relay to disconnect the above voltages from the rest of the system and shuts down the machine. In this condition, the +40 VDC LED on the power supply board will be out while the other 3 remain lit.

This changer will shutdown for reasons other than an empty changer, specifically, if a fault or malfunction of the machine occurs. When the changer shuts down, a code number or letter will appear on the status display located on the computer board. This unique code will greatly aid the serviceman in quickly determining the malfunction or faulty part.

The BC-20 has no fuses. Instead, a total of 4 manual resettable circuit breakers protect the machine from fire and damaging short circuits.

Access to the power control relay is provided through a removable cover plate at the bottom front of the power control center. Access to this area of the power control center is through the base door.

A 7 amp circuit breaker is in the power line to the bill changer while the power transformer is protected by a 2 amp circuit breaker in the primary circuit and two 5 amp circuit breakers in the secondary circuits.

The on-off switch controls power to the machine.

FIGURE 8. POWER CONTROL CENTER
FIGURE 9. COMPUTER CONTROL CENTER

COMPUTER CONTROL CENTER

The computer control center directs all of the operations of the bill changer including both the validation and change dispensing functions. It contains a microcomputer which is the "brain" of the system as well as the interface and drive circuitry necessary to monitor and control the rest of the machine. It also contains the following control and visual indicators.

Change Program Switches - Controls the change combination to be dispensed from each of the 3 change buckets. (See Section 2 for programming instructions).

MAG Adjustment Pot & LED - Allows adjustment of the noise threshold of the on-board magnetic amplifier. This amplifier is used in conjunction with the magnetic sensor in the bill transport in order to check for specific magnetic properties of bills. (See Section 2 for adjustment instructions).

P1 & P4 Adjustment Pots & LED's - Allow adjustment of the P1 and P4 silicon cells to compensate for light level variations. (See Section 2 for adjustment instructions).

Reset Push-Button - The computer control center shuts the machine down under certain abnormal conditions or when it is out of change. The bill changer can be put back into operation only by correcting the problem and then momentarily pressing the reset button. (See Section 2 for details).

Status Display & Fault LED - The computer control center contains a self diagnostic feature which is capable of detecting various malfunctions as well as certain normal conditions within the bill changer. The status display can show the numbers 1 through 9 and letters A through F, both with the fault LED either off or flashing. This provides an indication for 30 different conditions which may exist. (See Section 2 for a detailed explanation of these codes).

Credit LED - Flashes momentarily to indicate that the bill has been validated and the change dispensing cycle is enabled.

Vend LED - Indicates that one of the change buckets is energized, under normal conditions a short flash will be observed whenever change is dispensed.

Hopper LED - Indicates that one or more of the hopper motors is on. This occurs during the replenish cycle after change has been dispensed.

The computer control center also contains its own +5 VDC regulated power supply which is fed from the +14 VDC power supply on the power control center. This 5 VDC supplies power to the majority of the on-board circuitry. The exception is the mag amp which is powered by +30 VDC. When the decimal point LED on the status display is lit, it indicates that +5 VDC is present on the computer control center.
SECTION 2 - INSTALLATION AND PROGRAMMING

INSTALLATION

Installation of the BC-20 Bill and Coin Changer requires no special instruction. For all methods of installation, be sure of a convenient power source and also be sure that the changer is mounted level. Questionable security, in some locations, may require that the base be bolted to the floor or wall. Use lag screws and lead anchors to assure adequate security when bolting to the floor.

The following illustrations and procedures should be used for wall mounting. For attachment to concrete or masonry walls use lag screws and lead anchors. For attachment to wood frame walls, use lag screws attached directly to the wall studs. If the wall is not flat, it may be necessary to add spacer washers between the wall and the mounting plate. The universal mounting plate is optional and can be ordered from your Rowe Distributor. Order Rowe part number 4-50194-01.

The universal mounting plate is secured to the location wall and the changer is then attached to the mounting plate.

- Install washer-head upper mounting bolts in mounting plate. (See Figure 10).

- Attach mounting plate to wall. Be sure mounting plate is level and flat against the wall. Use spacer washers if necessary. For adequate security use hex head lag screws at least 3/8 inch diameter by 3 inches long for attachment to wood frame walls. Use 3/8 inch hex head lag screws and lead anchors for attachment to concrete or masonry walls.

NOTE
BE SURE LAG SCREWS USED FOR ATTACHMENT ARE AT LEAST 3/8" DIAMETER AND, FOR WOOD FRAME WALLS, ARE ATTACHED DIRECTLY TO THE WALL STUDS.

Mounting Detail - Wood Frame Wall

Mounting Detail - Masonry Wall

FIGURE 10. INSTALLING WALL MOUNTING PLATE
Figure 11. Installation of 1/2 Inch Conduit

- If the changer is rigidly mounted to either wall or floor, it will be necessary to make the power input connection through rigid conduit into the changer to meet U.L. requirements. (See Figure 11).

- The back of the upper cabinet is dimpled in 4 places. Drill a 7/16" - 1/2" hole in each of these locations to accommodate a 3/8" bolt. Be careful when drilling into cabinet not to drill into internal components. (See Figure 12).

- Install upper and lower mounting bolts from inside changer cabinet.

Figure 12. Installing Change to Wall Mounting Plate

Figure 13. Alarm System Linkage

Monitor Alarm System

Extra security for your BC-20 Bill and Coin Changer is provided by the Monitor Alarm System. The alarm system is triggered by mechanical linkage whenever forced entry is attempted. The system should be armed only after placing the changer on location.

1. Be sure that alarm latch is set correctly at front of cabinet. (See Figure 13).

Warning

Liquid freon from the power pack can cause severe burns to skin and eyes. Use extreme caution in handling cans. Do not overtighten power pack in the following step.

2. Screw power pack clockwise into horn. Secure firmly but do not overtighten.

3. Press alarm assembly (horn and power pack) into spring clips provided inside cabinet. Make sure that power pack sits firmly on floor of cabinet. Actuating shaft touching bottom of horn with horn facing to back wall of cabinet.

4. Test alarm system periodically by manually releasing linkage. After testing, rearm alarm latch.
PROGRAMMING

Machine is factory programmed as follows:

<table>
<thead>
<tr>
<th></th>
<th>$1.00</th>
<th>2Q</th>
<th>4D</th>
<th>2N</th>
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<tr>
<td>50¢</td>
<td>1Q</td>
<td>2D</td>
<td>1N</td>
<td></td>
</tr>
<tr>
<td>25¢</td>
<td>2D</td>
<td>1N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If different change combinations are desired, use the following procedure:
Change payout programming is accomplished by three banks of rocker switches on computer control center. (See figure 14). Each switch bank controls change payout from one of three change buckets. Do not use a pencil to set rocker switches. The graphite particles could cause a short or intermittent condition. Any dollar change combinations can be programmed with any half-dollar or quarter change combinations provided that it conforms to hopper loading. Possible combinations are shown in table. Program another change combination as follows:

1. Push all switches off.
2. Push appropriate switches ON to obtain desired quantity of coins from each hopper.

NOTE

Switches are additive. To obtain a count of 5, push ON switches 1 and 4 (as printed on micro-computer cover) to = 5.

EXAMPLE Assume loading in hoppers to be dimes in left hopper, quarters in center hopper and nickels in right hopper. Assume a desired change combination from $1.00 bucket to be 2 quarters, 3 dimes, and 4 nickels. Push on the following switches on the $1.00 switch bank. Dimes - push on 1 + 2 = 3 dimes. Quarters - push on 2 = 2 quarters. Nickels - push on 4 = 4 nickels.

Use the same procedure for setting the 50¢ and 25¢ switch bank. The switches shown in Figure 14 below are set for $1.00 change = 3D + 2Q + 4N. 50¢ change = 1D + 1Q + 3N. 25¢ change = 2D + 1N.

CAUTION
M.O.S. circuitry used on the computer control board could be damaged by static discharge. Handling of this board is not recommended. Both new and defective boards should be transported in their plastic housing.

Power must be turned off before removing or inserting boards.

3. Push each test switch on power control center one at a time to empty machine of old change combinations.

Push $1.00 test switch again. Watch display on computer board, if display shows "1" while hoppers are reloading, it means you have not programmed the $1.00 switch bank to give a dollars worth of change. Change dispensed will not total $1.00. Repeat steps 2 & 3. If the program does total $1.00, the display will remain blank.

4. Push 50¢ test switch and watch status display. If the display shows "1" the 50¢ switch bank is not programmed to give 50¢ change. If the program does total 50¢ the display will remain blank.

5. Push 25¢ test switch and watch status display.

NOTE
If you desire to vend change that does not total $1.00, 50¢, or 25¢, and want to program the machine to do this, feel free to do so. The machine will vend what you program. Just disregard to code of "1" which will appear every time the buckets reload.

6. The BC-20 is designed to give a maximum count of 15 coins or tokens from each hopper for both $1.00 and 50¢ vend. The 25¢ vend will give a maximum count of 7 objects from each of the right and left hoppers. The center hopper will not operate for a 25¢ input signal.
### TABLE 1. POSSIBLE CHANGE COMBINATIONS AND CAPACITIES

<table>
<thead>
<tr>
<th>HOPPER LOADING</th>
<th>DOLLAR COMBINATION</th>
<th>MAX. NO. VENDS</th>
<th>HALF-DOLLAR COMBINATION</th>
<th>QUARTER COMBINATION</th>
</tr>
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<tbody>
<tr>
<td>LEFT</td>
<td>CTR.</td>
<td>RIGHT</td>
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<td>DIMES</td>
<td>QUARTERS</td>
<td>NICKELS</td>
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<td>$600</td>
<td>$525</td>
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<td>1Q, 5N</td>
<td></td>
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<tr>
<td>5Q, 2Q</td>
<td>1000*</td>
<td>5D, - -</td>
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<tr>
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<td></td>
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<td>N</td>
<td>$120</td>
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<td>400</td>
<td>5D, - -</td>
<td>2D - 1N</td>
<td></td>
</tr>
<tr>
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<td>300</td>
<td>4D, - 2N</td>
<td>1D - 3N</td>
<td></td>
</tr>
<tr>
<td>2Q, 10N</td>
<td>1D, 6N</td>
<td>4D, - 2N</td>
<td>1D - 3N</td>
<td></td>
</tr>
<tr>
<td>1Q, 15N</td>
<td>1D, 8N</td>
<td>4D, - 2N</td>
<td>1D - 3N</td>
<td></td>
</tr>
<tr>
<td>2D, 10N</td>
<td>2D, - 6N</td>
<td>4D, - 2N</td>
<td>1D - 3N</td>
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<tr>
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<tr>
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<td>20N</td>
<td>240</td>
<td>20N</td>
<td>240</td>
<td>20N</td>
</tr>
</tbody>
</table>

* Limited by bill stacker. Coin capacity in hoppers would actually allow a higher number of vendings depending on loading and combination.

**NOTE:**

The capacity of one hopper:

- Nickel Hopper: 2400 = $120.00
- Dime Hopper: 6000 = $600.00
- Quarter Hopper: 2100 = $525.00
- S.B.A. $ Hopper: 1300 = $1,300.00
HOPPER LOADING AND UNLOADING

Hoppers used in the changer can be bulk loaded on location.

Unload hoppers as follows:

1. Place opening of bag over mouth of hopper wrapping lip of bag around handle. Grasp bag and handle with one hand and slowly tip hopper forward while holding bag against front of hopper. (See Figure 16)

2. Tip hopper forward until rubber bumpers contact front trim. Tap bumpers against trim and return to upright position. Repeat two or three times.

3. Hoppers can also be emptied by lifting up and out to remove pivot pins from brackets. Hopper now may be emptied away from machine by inverting over bag.

CAUTION

WHEN REPLACING HOPPER, BE SURE IT IS SECURELY IN PIVOT BRACKETS AND SNUG AGAINST BACK PLATE.

4. Push test switches one at a time, to empty change from change buckets. Turn the power switch off and then on between each test switch operation.

LOCK CYLINDER SECURITY

Included in the miscellaneous parts assortment is Kit No. 2-51575-01 (Armor Plate Kit) for use with National Key Set Locks.

The kit contains protective plate with nuts and screws for mounting after the lock cylinder is installed.
OPERATIONAL INFORMATION

This bill and coin changer uses several visual indicators and controls. The location of these controls and indicators are as follows:

On-Off Switch  Located on front surface of Power Control Center.

Circuit Breakers  (4 total) - Located on front surface of Power Control Center.

Vend Counters  (3 total) - Also located on front of Power Control Center.

Test Switches  (3 total) - Located under hinged cover on front of Power Control Center.

Voltage LED’s  5 total: (+5 VDC, +14 VDC, +30 VDC, & +40 VDC). Located on edge of Power Supply Board visible from front of Power Control Center. (+5 VDC computer board supply) - decimal point on status code display on Computer Control Center.

Reset Switch  Located on Computer Control Board.

Change Program Switch Banks  (3 groups of 12 switches each) - Located on Computer Control Board.

Status Display and Fault LED

P1, P4 Mag. Pots. and LED’s  Located on Computer Control Board.

Credit, Vend, and Hopper LED’s  Located on Computer Control Board.

Bill Return Switch  Located behind bill return button on front of machine.

POWER TURN ON

Turn on power switch. Briefly, you will see the “Out of Service” lamp and one or more LED’s on the computer board flash. The status display will also flash “F” as the switch is turned on. All 4 voltage LED’s on the power supply board should now be on and the display should be showing a decimal point. This decimal point indicates that voltage is present at the computer board.

The P1, P4, and/or mag LED’s may remain on and the display may show a “3” or a “b”. This merely indicates P1, P4, and/or mag is not adjusted properly. These will be adjusted in the following steps. If “b” is showing on display, P4 should always be adjusted first, then P1.

If the P1 and P4 LED’s are out at this time, the coin lockout solenoid will be energized, and so will the power relay inside the Power Control Center.

This power relay controls all power to the machine except the Computer Control Board. It remains energized as long as the machine is in operation. It is controlled by the computer and de-energizes, or drops out, only in the event of a malfunction or fault.

A convenient way to check the state of this relay is to observe the 4 voltage LED’s on the power supply board. If the +40 VDC LED is out while the other 3 are lit, most likely the power relay has dropped out. When the power relay drops out, the +40 VDC LED will slowly fade out. It takes approximately 3 to 4 minutes to discharge the capacitor to a point where the LED is out.

ADJUSTMENTS

P4 CELL ADJUST

If the P4 LED is not already lit, turn the P4 adjust pot counterclockwise until the P4 LED comes on. Also, the “Out of Service” lamp will light, the fault LED will flash and the status display will show a “b”. This is a normal condition in this case. It merely indicates P4 cell is covered when it should not be.

Now, turn the P4 pot 1-2 marks (1/8 turn max.) clockwise beyond where the P4 LED goes out. P4 cell is now adjusted.

P1 CELL ADJUST

If the P1 LED is not already lit, turn the P1 adjust pot counterclockwise until the P1 LED comes on. The transport motor will start running in the forward direction, the bill pressure solenoid will energize, and the coin lockout solenoid will drop out.

Now, turn the P1 pot clockwise until the P1 LED goes out, then 1-2 marks (1/8 turn max.) beyond. The transport motor will reverse, then stop in about one second with the pressure solenoid dropping out and the coin lockout solenoid energizing. P1 cell is now properly adjusted.

If P1 LED is left on for 5 - 6 seconds, the transport motor will stop and the display will show a “3” (which means that P1 cell was covered too long). To restore machine to service adjust P1 pot as described above.

The P1 cell adjustment on the BC-20 is somewhat more sensitive than it was on earlier Rowe changers. If the P1 pot is turned too far clockwise, bills may be rejected with a code of “4” or “7”. It is better to be slightly under 1/8 turn than over on the P1 adjustment pot setting.
MAGNETIC SIGNAL ADJUST

This adjustment is actually a noise threshold adjustment and, while not nearly as sensitive as earlier “gain” adjustments, provides the means of adjusting out the influence of external electrical noise. This adjustment is dependent on the environment and a final adjustment should be done when the machine is installed on location prior to putting the machine into service.

Push and hold in bill return button. Transport motor will start in reverse. Coin lockout solenoid will drop out, bill pressure solenoid will pull in and status display will show “8”. While holding the bill return button in, turn the MAG adjust pot clockwise until the MAG LED begins to flash intermittently.

Now back off the MAG pot (turn counter clockwise) 1 mark. If the MAG LED does not flash or blink with the pot turned fully clockwise, it indicates that the noise level is below the range of the adjustment. In this case the proper pot setting is 1/8 turn (2 marks) counterclockwise from the full on position.

Release the bill return button. The BC-20 is now properly adjusted.

SELF DIAGNOSTICS

DIAGNOSTIC CHECK

The self diagnostic features of the BC-20 are centered around a “status” display and an adjacent “fault” LED. This display can show the numbers 1 - 9 as well as the letters A, b, C, d, E, and F, both with the Fault LED off or flashing.

If the status display is showing one of the above characters and the Fault LED is flashing at the same time, there is a fault or malfunction of the machine. In this case, the machine must be repaired before restoring to service. For an explanation of what these codes mean, refer to section 4 entitled Status Codes.

Several things should be explained at this time:

1. THIS STATUS CODE WILL BE LOST IF POWER TO THE MACHINE IS DISRUPTED OR IF THE RESET BUTTON IS PULLED. Always read status code and identify fault before turning power off. However, if the fault still exists the status code will reappear when power is restored.

2. Status codes 2, 3, 4, 5, 7, E, and F with the Fault LED flashing indicate malfunctions that could result in incorrect change loads in one of the change buckets. These faults will always require a service call to correct. Just before going into shutdown, the machine will deliberately cycle the stacker away from its home position.

When one of the above status codes or code “d” is displayed, (with the Fault LED flashing ) the only way the machine can be restored to service is by pressing the reset switch after the problem has been corrected. Turning the power back on without pressing the reset switch will result in a status code of “1” with the Fault LED flashing. This indicates that power was disrupted to the machine while it was in shutdown, but because of the possible incorrect change load in one of the buckets, it was not allowed to go back into service.

3. If the code “F” is shown, the Fault LED is flashing, and the hopper LED is on, the reset switch will have no effect. This means that the +14 VDC supply to the computer control center is below approximately 8 VDC and the system is in continuous reset. To restore the machine to operation, correct the cause of low input voltage.

4. Status codes 6, 8, 9, A, b, and C with the Fault LED flashing represent malfunctions that will not result in wrong change in the buckets. If the malfunction or fault somehow self-corrects (a stuck switch frees itself or a lamp comes on again due to a poor connection) the machine will automatically go into operation again.

5. When the Fault LED is flashing, the “Out of Service” lamp will be lit. Under no circumstances should one of these indicators be operating without the other.

6. If the status display ever shows “0”, or if the Fault LED is ever flashing with the status display OFF, the computer control center should be replaced.

If the status display is showing a character (1 - 9 and A - F) and the Fault LED is off, there is probably no fault or malfunction of the machine. It is telling the operator why an abnormal condition occurred. In most cases, this is why a bill was rejected.

If a bill is rejected the bill pressure solenoid will energize, the transport motor will reverse and return the bill to the customer. The transport will stop, however, with the tail-end of the bill still hanging in the front of the transport and PI cell still covered. The status display will now show one of the status codes, but the Fault LED will be off.

The status code will be displayed for as long as the bill is left hanging in the transport. However, if the bill is left in the transport for longer than 30 seconds, the machine will go into a “Self-clear” routine. Once it is removed the status code is lost and the machine is ready to accept bills or coins again.

THIS STATUS CODE WILL ALSO BE LOST IF THE POWER IS DISRUPTED, OR IF THE RESET SWITCH IS PRESSED.

For an explanation of what these codes mean, refer to the section 4 entitled “Status Codes”.

To check out the status codes, create the fault listed and see if the proper status code is generated on the status display.
TRANSPORT SELF CLEAR CHECK

If a bill becomes jammed in the transport, the BC-20 automatically tries to clear it out itself before going into shut down. To check out this feature:

Insert bill into transport upside down. Bill will reject and stop hanging out of transport. Status display will show “4” with Fault LED off.

Hold bill in transport. Do not uncover P1 cell. In 30 seconds the transport will start to cycle reverse-forward-reverse-forward-reverse. It will do this 3 times if P1 cell is kept covered. Then motor will stop. Out of Service lamp will turn on and status code will change to “6” with Fault LED flashing. (If P1 cell is uncovered any time during the self clear cycle, the machine will automatically go back into operation.) To restore machine to service, push reset switch.

ACCEPTANCE CHECK

To aid in checking acceptance, set all dollar coin change program switches to “OFF”. This will allow checking out the validation portion of the system without having the hopper motors run.

Insert a dollar bill upside down. Bill should reject and display should show a code of “4” with Fault LED off.

Insert the dollar bill correct side up, but backwards. Bill should reject with a code of either “4” or “7” with fault LED off.

Now insert the dollar correctly. It should accept, the stacker should operate, and the dollar bucket should dump. (Since all program switches are set to “OFF” the hoppers should not operate). The dollar vend counter should also advance 1 count.

Also, as the bill moves through the bill acceptor, check to insure that the following visual indicators operate:

1. The P1 and P4 LED’s should light in sequence.
2. The Mag LED should flash several times.
3. The CREDIT and VEND LED’s should flash in sequence.
4. The status display should show a “1” for about 2 seconds then go out. (See status code chart for explanation of this code). As the display goes out, the coin lockout solenoid should energize and the machine is ready for the next bill.

MISCELLANEOUS

1. The external lockout, described on the status code “A” with flashing Fault LED is not connected on the BC-20. It is used, along with the external credit line, for other applications.
2. Both the coin acceptor and the bill acceptor are locked out during the dispense and replenish cycle. Also, the coin acceptor is locked out during the bill validation cycle as soon as the P1 cell is covered.
3. The +5 VDC voltage from the power supply does not control the computer board. It is used to provide voltage to lamps (dispenser, transport, and display), and the solid state coin switch assembly. The computer board is powered primarily by the +14 VDC voltage from the power supply. It has its own +5 VDC regulator.
4. The bill return switch is disabled during the latter portion of the validation cycle and the entire dispense and replenish cycles.
5. The reset switch is disabled during the entire validation, dispense, and replenish cycle.
6. If power is disrupted during a dispense or replenish cycle, the machine will immediately reset upon power turn on. There will be an incorrect change load in one of the buckets. This is same as the BC-9 series changers.
7. Blocking the coin photo detectors with your fingers, or with foreign objects during replenish cycle may result in wrong counts. If the detectors are blocked too long, the machine will shut down with a code of “7” (Fault LED flashing). If the wrong count is entered the display may show a “5” (see status chart). Either condition will put the machine in a shutdown mode.
8. Always turn power OFF when removing circuit boards. Avoid touching the connectors when handling these assemblies.
9. If the power supply board requires removal, wait for the +40 VDC LED to fade out before removing board. This will prevent arcing if the circuit is accidentally grounded to the cabinet or chassis.
10. When the machine is turned on there is 120 VAC voltage on the Computer Control Board. If, for any reason, this board is plugged in without its cover on, BE CAREFUL!
11. +14 VDC to the Computer Control Board should be present whenever the power switch is on. It is necessary because even though the machine is out of service, or shutdown, the computer is still monitoring and controlling the operation of the changer.
INTRODUCTION

In order to maintain control over money used for change dispensing, each changer should be charged with a predetermined amount of cash. The inventory should be checked monthly as a precaution against malfunction and theft. Inventory control is most easily accomplished by using the replacement method of servicing. Using this method, all bills and coins are removed by the routeman and the empty hoppers are refilled with a predetermined amount of change. The money removed is returned and all cash is counted against the charged inventory. Any discrepancy is easily detected at this time.

Service frequency on the changer is directly related to the inventory of change maintained and customer usage. Check changer usage daily and schedule service as required.

 REMOVING JAMMED BILL FROM BILL ACCEPTOR

If when servicing the changer a jammed bill is discovered, removal is easily accomplished in the following manner:

1. Unlock and open door.
2. Unplug bill acceptor track harness and pull acceptor out to stop.
3. Pull out retainer rod.
4. Carefully lift up top track.
5. Remove jammed item from tracks.
6. Carefully place track down, and re-insert retainer rod and harnesses.
7. If jam cannot be removed by this procedure, turn off power, unplug and remove bill acceptor by lifting up latch lever tab and pulling out acceptor.
8. Remove retainer rod.
9. Pull out retainer bushings on ends of track, and lift out top track assembly.
10. Reassemble in reverse order, and re-install acceptor in changer.

BILL JAMMING CHECK LIST

If frequent bill jamming occurs, perform the following checks and corrective procedures. (See Figure 17)

1. Make sure that all drive pulleys on both sides of bill transport are tight on their respective shafts.
2. Both drive belts must not be too loose or too tight.
3. Rubber drive rollers must not be loose or worn.
4. P6 flipper must work freely.
5. All nylon idler rollers in top track assembly must rotate freely and move up and down freely on their respective slots. The retaining springs must also slide without bind in the guide slots and exert adequate force on the idler roller.
6. Pressure solenoid must operate when P1 is covered and when unit goes into reverse.
7. Top track must be properly seated into bill transport with retaining bushings snapped into place and the retaining rod in place.
8. Both top and bottom track bill surfaces must be free of dirt, moisture, burrs, projections, rough spots, etc. which might drag or hang up on the surface of bill.
9. Top and bottom tracks must be parallel to each other with approximately 5/64 spacing between them.
10. Magnetic head must have a bevelled edge on both front and back to keep both bill edges from becoming caught in forward or reverse.
LOADING AND EMPTYING OF COIN BUCKETS

The dispensing mechanism operates on an escrow principle. Change for a vend must be in coin buckets when the customer inserts a bill. After change is dispensed, the buckets must immediately refill for the next customer. Because of this, there are steps which must be followed when filling or emptying the changer, or when resetting the changer if it has shut down.

FILLING THE CHANGER

When filling a changer that is empty, the coin buckets must be filled with their proper load of coins before the machine can be put into operation. After hoppers have been loaded and are in place, turn power switch ON and depress DOLLAR TEST SWITCH once. This will start hoppers and load the dollar coin bucket with the proper coins. Wait until hopper motors have all stopped and press DOLLAR TEST SWITCH again. Proper change should be dispensed and hopper motors will start to refill the buckets again.

Repeat the above procedure for the 50¢ TEST SWITCH and 25¢ TEST SWITCH. The machine should now be ready for operation.

CAUTION

ALWAYS WAIT UNTIL ALL HOPPER MOTORS ARE STOPPED BEFORE PRESSING ANY TEST SWITCH. THE SYSTEM WILL IGNORE ANY TEST SWITCH PRESSED WHILE THE CHANGER IS IN VALIDATION OR REPLENISH CYCLE.

EMPTYING THE CHANGER

To empty the changer of all coins, first empty all hoppers according to instructions on label on top door. When hoppers are emptied, there are still coins remaining in the change buckets. Press the test switches, one at a time, to empty these remaining coins. Turn the power switch off and then on between each test switch operation.

COIN INLET CLEANING PROCEDURE

A unique coin inlet design incorporates a built-in cleanout capability as follows:

1. Remove screw from lower front side of inlet as shown in figure 18. Grab tab as shown and rotate clean-out guide up and out of the way.

2. Insert the end of a wire coathanger into the slot and drag out jammed material through front opening. One side of the inlet is clear plastic to permit viewing the interior.

3. After cleanout, rotate guide back down into place and replace screw.

FIGURE 18. CLEANING COIN INLET
COIN HOPPER CLEANING PROCEDURE

The coin tracks are teflon coated to minimize dirt build-up. It may still be necessary to clean them at regular intervals, as dictated by the number of vends and the environment, to prevent dirt accumulation in the coin path.

Failure to keep the coin path clean may result in coins sliding out of the track, indicating empty condition even though the hopper contains sufficient coins. Clean the hoppers as follows:

1. Remove hopper from bill changer and place on a working surface.
2. Using nylon hopper cleaning brush, part no. 2-70239-02, remove dirt from the angular sides and flat surfaces of the serpentine coin path as shown in figure 19

CAUTION

DO NOT USE DETERGENTS TO CLEAN HOPPER. HOPPER HAS BEEN FACTORY LUBRICATED AND DETERGENT CLEANERS DESTROY THIS LUBRICATION.

3. Install hopper in bill changer and test vend to check for proper operation.

FIGURE 19. CLEANING HOPPER COIN PATH
CHAIN LUBRICATION IS NOT NORMALLY REQUIRED

CHANGE BUCKET LUBRICATION

The coin dispenser change bucket door pivots, links, hubs and bell cranks are factory lubricated with light machine oil Rowe Spec. No. 2-01379-00 (3 in 1 Electric Motor Oil can be used). If change bucket is worn beyond repair, order and install Kit No. 2-70258-01 (one kit required for each bucket).

For reliable performance, the lubrication should be renewed annually by applying one drop of oil at the points shown below in figure 20.

FIGURE 20. CHANGE BUCKET LUBRICATION
INTRODUCTION

The BC-20 incorporates major assemblies and components as field replaceable plug-in units. There are several on-board diagnostic indicators on these assemblies. The information in this section takes full advantage of this design by isolating possible malfunctions to one or more of these basic plug-in units. This method saves time and requires little training in electronics. Troubleshooting data requiring a higher level of skill is listed in a separate manual part number 3-65355-01.

The most significant troubleshooting aids for BC-11 are the on-board LED's and the status code display LED on the Computer Control Center in particular.

OPTIONAL MACHINE SERVICE KIT AND DIAGNOSTIC AID

A diagnostic aid is available to make troubleshooting less difficult and time consuming. The aid consists of a circuit board with a series of red LED indicators. This diagnostic aid is plugged into the circuit board edge connectors to check for defects that might damage replacement circuit boards.

If all specified diagnostic tests are O.K., it is O.K. to plug in a replacement board. Refer to the troubleshooting manual supplied with the aids for instructions on what to do.

Table lists diagnostic aids and service kit.

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<thead>
<tr>
<th>PART NO.</th>
<th>DESCRIPTION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>*6-70013-05</td>
<td>Machine Service Kit includes diagnostic aid kit plus spare parts for whole machine in a special fitted case.</td>
<td>Plugs into Computer Control Center and Power Control Center. LED indicators check inputs at connector pins for shorts, open circuits and in some cases voltage and signals.</td>
</tr>
<tr>
<td>(For BC-20 &amp; BC-11)</td>
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</tr>
<tr>
<td>*6-70013-07</td>
<td>Diagnostic Aid Kit Only.</td>
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<tr>
<td>(For BC-25)</td>
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<tr>
<td>*6-70013-06</td>
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</tr>
</tbody>
</table>

*Used in machine with power on and in test condition - machine is not operable.
BC-20 & BC-25
STATUS CODES

If "Fault" LED is flashing, out of service lamp will also be lit. This status code represents a malfunction of the machine. This status code will be lost if power to machine is disrupted, or if reset button is pushed.

If fault LED is off. Status codes that normally have fault LED off appear only for a short period of time, either while hopper motors are running or when a bill has been rejected and bill is still in transport.

If changer is setting idle or is inoperative and the status display is showing a code with fault LED OFF, most likely the out of service lamp or fault LED is defective. Read the status code displayed, then test fault LED (See page 22). If fault LED does not flash, refer to the chart of code you observed WITH FAULT LED FLASHING.

Note: Don't forget to repair fault LED circuit also.

If a segment of the display is burned out, an incorrect or misleading character could be displayed. To avoid trouble-shooting the wrong problem, always check to see if all segments of the display are working. This is done by pressing the bill return button and watching display. Display should show "8". When bill return button is released, original fault code will again appear.

It should be noted that once a fault has been identified, these charts suggest replacement of a modular subassembly rather than an individual component. This is to minimize on-location down time.
STATUS CODE

TO TEST FAULT LED

LED FLASHES ONCE

DECIMAL POINT LED

Turn power switch OFF, then back ON.

"FAULT" LED will flash momentarily.

Display will flash "F".

If this does not happen, check "Out of Service" lamp and wiring to lamp. If O.K., look to see if decimal point on display is lit. If it is, replace Computer Control Center.

If decimal point is off, check 14 VDC LED on power supply.

If it is lit, check 14V wiring. If wiring O.K., replace Computer Control Center.
If not lit, check Power Supply.

NOTE: Performing this test while machine is displaying a status code will result in loss of code.

TO TEST DISPLAY

FAULT LED OFF

TO TEST DISPLAY

Push bill return button and hold in.

Display should show "8" with decimal point.

If any segment or decimal point not lit, display or display driver is defective.
Replace Computer Control Center.

If display blank, check + 14 VDC LED on power supply. If not lit, check power supply. If lit, check 14V wiring. If wiring O.K., replace Computer Control Center.
STATUS CODE

DECIMAL POINT ON
DISPLAY LIT-
FAULT LED OFF

This is the normal operating condition.
Decimal point indicates +5 VDC at computer board.
If decimal point not lit, check +14 VDC LED on power supply. If LED lit, check 14V wiring. If wiring O.K., replace Computer Control Center. If 14 VDC LED not lit, check power supply.

DISPLAY SHOWS "0"
FAULT LED OFF
OR FLASHING

The Number "0" is not allowed.
If display is showing "0" most likely display or display driver has failed. Replace Computer Control Center.
STATUS CODE

DISPLAY SHOWS "1"  
FAULT LED OFF

HOPPER MOTOR(S) NOT RUNNING - HOPPER LED OFF
BILL HAS BEEN REJECTED - END OF BILL IS IN TRANSPORT

Bill was rejected because P1 cell was not covered long enough.

The bill may have been torn on the right side or torn or folded over at the trailing edge of bill.

If bills are rejected frequently with this code:

P1 adjustment pot may be adjusted too far clockwise, readjust P1 pot.

P1 cell may be giving intermittent signal. Check P1 cell for proper switching. If cell is O.K. check wiring from P1 cell to computer control center for possible short to chassis.

+5 VDC supply to lamps may be below 4.5 VDC. Check voltage. If low, replace VR201 regulator on Power Control Center (Part No. 2-00365-01).

If all of above is O.K., replace Computer Control Center.

BC-20 ONLY

HOPPER MOTOR(S) RUNNING - HOPPER LED ON

Program switches on computer board are not set for $1, 50¢ or 25¢. One or more switch groups is programmed for some other change combination which does not total $1, 50¢, or 25¢.

To determine which switch groups are set this way, test vend for $1 and watch display while hoppers replenish. If display shows no code, change loaded into bucket totals $1. If display shows "1" while hoppers run, change combination set into dollar switch group does not total $1 and new change load in bucket will be incorrect.

If switches are set correctly, and code "1" still shows, a switch is defective and the computer Control Center should be replaced.

Repeat above sequence for 50¢ and 25¢ test vend in turn to check these programs.

NOTE: If you have deliberately chosen to set switches to combinations which do not total to $1, 50¢, or 25¢ disregard this code. Machine will operate correctly and code will go out when all hoppers have stopped.

BC-25 ONLY

This code flashes briefly during a $1.00 vend to give the serviceman a visual indication that computer has validated bill as being a legitimate $1.00 bill.

If bill is left in transport 30 seconds, machines will go into self-clear (5 seconds on BC-25).
STATUS CODE

DISPLAY SHOWS "1"
FAULT LED FLASHING

Power to machine was disrupted while the changer was in shutdown and was displaying one of the codes 2, 3, 4, 5, 7, d, E, or F and the Fault LED was flashing. Hopper LED will be lit, but hoppers will not be running.

Most likely there will be an incorrect change load in one of the change buckets.

The actual initial fault cannot be identified due to loss of power.

Reset changer (press reset switch) and see if changer goes back into shutdown. If it does, it will display a new code identifying fault.

If it does not shutdown, refer to troubleshooting chart “Bill Changer Shutdown - Out Of Service lamp lit - status display showing “1”. (Fault LED flashing)” for a procedure on how to identify the initial cause of shutdown.

NOTE: The bill stacker has been deliberately cycled away from home when the machine is in this status. It will return when machine is reset.

For a more complete troubleshooting sequence, refer to the appropriate troubleshooting chart for this fault.
Bill was rejected because P4 or P6 cell was active too soon after P1 was uncovered.

Computer sees object as being too long to be a legitimate bill.

If bills are frequently rejected with this code:

- Check for small piece of paper or other foreign object in track.

  If track is clear, check P4 adjustment. P4 pot may be set too far counterclockwise.

- P6 flipper may be binding or hanging up on back rollers. Check for flash or burrs on flipper and back rollers.

- P4 or P6 cells may be giving intermittent signals. Check cells for proper switching.

  If cells are O.K. check wiring from P4 and P6 cells to Computer Control Center.

- +5 VDC supply may be above 5.5V. Check voltage. If high, replace VR201 regulator or check power supply.

- If all of above O.K., replace Computer Control Center.

- If bill is left in transport for 30 seconds, machine will go into self-clear (5 seconds on BC-25).
Changer was shutdown because count from right hand (nickel) hopper was not satisfied within 45 seconds.

One change bucket will have incorrect change load from right hand (nickel) hopper.

Check right hand (nickel) hopper. If not empty or low on coins, check for dirt build-up on coin path or jammed hopper.

If hopper looks O.K., check change buckets to see if one is overloaded with nickels (or coins from right hand hopper). If so, check right hand (nickel) coin detector or wiring to detector. If these check O.K. replace Computer Control Center.

If buckets are not overloaded, reset machine and test vend to see if right hand (nickel) hopper runs. If motor does not run, check motor and wiring to motor. If O.K., replace Computer Control Center.

To restore machine to operation, push reset switch after correcting problem.

NOTE: The bill stacker has deliberately been cycled away from home position when machine is in this status. It will return when machine is reset.

For a more complete troubleshooting sequence, refer to the appropriate troubleshooting chart for this fault.
Bill was rejected because P1 cell was covered too long.

Bill was held too long before releasing it, or it may be jammed near front of transport.

This code normally occurs when adjusting P1 cell.

If bills are rejected frequently with this code:

Check operation of bill pressure solenoid, it may not be pulling in. If not, check solenoid for dirt build-up and other reasons that could cause tight operation. Also, check solenoid coil and wiring to solenoid. Solenoid drive on computer board may be defective. Replace Computer Control Center.

NOTE: A shorted solenoid or suppression diode across solenoid will cause failure of replacement Computer Board. Always check resistance of coil using meter or diagnostic aid before installing replacement computer control center.

Bill transport rollers may be worn. Check and replace if necessary.

Transport motor may be running slow, or drive belt slipping. Check drive belt adjustment. If O.K., check motor speed (See Manual, Page 78). If slow, check motor capacitor, motor itself, or Computer Control Center.

Check track surfaces for burrs, obstructions, foreign substances, or anything that could hinder bill travel. Clean and polish as necessary.

If bill is left in transport for 30 seconds, machine will go into self-clear (5 seconds on BC-25).
Changer was shutdown because count from left hand (dime) hopper was not satisfied within 45 seconds.

One change bucket will have incorrect change load from left (dime) hopper.

Check left hand (dime) hopper. If not empty or low on coins, check for dirt buildup on coin path or jammed hopper. If hopper looks O.K., check change buckets to see if one is overloaded with dimes (or coins from left hand hopper). If so, check left (dime) coin detector or wiring to detector. If these check O.K., replace Computer Control Center.

If buckets are not overloaded, reset machine and test vend to see if left hand (dime) hopper runs. If motor does not run, check motor and wiring to motor. If O.K., replace Computer Control Center.
To restore machine to operation, push reset switch after correcting problem.

**NOTE:** The bill stacker has deliberately been cycled away from home position when machine is in this status. It will return when machine is reset.

For a more complete troubleshooting sequence, refer to the appropriate troubleshooting chart for this fault.
STATUS CODE

DISPLAY SHOWS "4"
FAULT LED OFF

Bill was rejected because it failed to pass first magnetic check.

Bill may have been inserted backwards or upside down.

Front edge of bill may be folded over or torn.

If bills are rejected frequently with this code:

P1 adjustment pot may be adjusted too far clockwise. Readjust P1 pot.

Mag pot may be set too low. Readjust mag pot.

Transport motor may be running slow, or drive belt slipping. Check drive belt adjustment. If O.K., check motor speed (See Manual, page 78). If slow, check motor capacitor, motor itself, or computer control center.

Transport rollers may be worn and not grabbing bill properly. Check and replace if necessary.

Check Mag LED. It should flash as bill passes through. If it does not, check bill pressure solenoid to see if it is continuously pulled in. If it is, replace computer control center (see note), and check wiring to solenoid (white/green wire) for short to ground. If solenoid O.K., check wiring (shielded cable) from computer control center to magnetic head. If O.K., replace Computer Control Center. If problem still exists, magnetic head is defective or out of alignment - replace transport.

If mag LED does flash in above step, wiring to head is O.K. but head may still be weak. Also, check bill pressure solenoid. Mag LED may flash even though solenoid is continuously pulled in. If both of these O.K., amplifier may be weak. Replace Computer Control Center.

If bill is left in transport for 30 seconds, machines will go into self-clear (5 seconds on BC-25).

NOTE: A shorted solenoid or suppression diode across solenoid will cause failure of replacement computer board. Always check resistance of coil using meter or Diagnostic Aid before installing replacement Computer Control Center.
STATUS CODE

DISPLAY SHOWS "4"
FAULT LED FLASHING

Changer was shutdown because count from center (quarter) hopper was not satisfied within 45 seconds.

One change bucket will have incorrect change load from center (quarter) hopper.

Check center (quarter) hopper. If not empty or low on coins, check for dirt build-up on coin path or jammed hopper. If hopper looks O.K., check change buckets to see if one is overloaded with quarters (or coins from center hopper). If so, check center (quarter) coin detector or wiring to detector. If these check O.K., replace Computer Control Center.

If buckets are not overloaded, reset machine and test vend to see if center (quarter) hopper runs. If motor does not run, check motor and wiring to motor. If O.K., replace Computer Control Center.

To restore machine to operation, push reset switch after correcting problem.

NOTE: The bill stacker has deliberately been cycled away from home position when machine is in this status. It will return when machine is reset.

For a more complete troubleshooting sequence, refer to the appropriate troubleshooting chart for this fault.
Bill was rejected because P6 cell was uncovered too soon.

Computer recognized this as a non-valid validation sequence.

If bills are rejected frequently with this code:

Check for small piece of paper or other foreign object in track.

Check location and alignment of P4/P6 lamp. Side of filament nearest glass shell should be positioned downwards and set at 45° angle to both P4 and P6 cells.

P6 flipper may be binding or hanging-up on back rollers. Check for flash or burrs on flipper and back rollers.

P6 cell may be giving intermittent signal. Check cell for proper switching. If cell is O.K., check wiring from P6 cell to computer control center for possible ground to chassis.

If all of above are O.K., replace Computer Control Center.

If bill is left in transport for 30 seconds, machine will go insto self-clear (5 seconds on BC-25)

**BC-25 ONLY**

This code flashes briefly during a $5.00 vend to give the serviceman a visual indication that the computer has validated bill as being a legitimate $5.00 bill.
Since last time machine was reset or power turned off, it may have dispensed 2 more coins than it should have. There could be an incorrect change load in one of the buckets.

Most likely the problem is not electrical.

Probable causes are dirt buildup in hoppers, faulty hopper motor brakes, or worn parts in hoppers or hopper motors.

Also, possible causes could be intermittent connections to coin detectors, detector lamps, or wiring.

To restore machine to operation, press reset switch after correcting problem.

NOTE: The bill stacker has been deliberately cycled away from home position when machine is in this status, it will return when machine is reset.

For a more complete troubleshooting sequence, refer to the appropriate troubleshooting chart for this fault.
NOTE: This is Code 6. For Code b see (B)

Bill was rejected because P4 cell did not cover soon enough after P1 uncovered.

Probably, left, leading corner of bill is folded over or torn off.

Also, bill could have hung up or was held back.

If bills are rejected frequently with this code:

Check operation of bill pressure solenoid. It may not be pulling in. If not, check solenoid for dirt build-up and other reasons that could cause tight operation. Also, check solenoid coil and wiring to solenoid. Solenoid drive on computer board may be defective. Replace Computer Control Center.

NOTE: A shorted solenoid or suppression diode across solenoid will cause failure of replacement computer board. Always check resistance of coil using meter or Diagnostic Aid before installing replacement Computer Control Center.

Transport motor may be running slow, or drive belt slipping. Check drive belt adjustment. If O.K., check motor speed (see manual, page 78). If slow, check motor capacitor, motor itself, or computer control center.

Check track surfaces for burrs, obstructing foreign substances, or anything that could hinder bill travel. Clean and polish as necessary.

Transport rollers may be worn. Check and replace if necessary.

If bill is left in transport for 30 seconds, machine will go into self-clear (5 seconds on BC-25).
NOTE: This is Code 6. For Code b see (B)

Bill changer is shutdown because P1 cell circuit is giving computer an incorrect signal.

Check P1 LED. If not lit, replace computer control center. If lit, check P1 lamp. If lit, check for small piece of paper or other foreign object in track. If O.K., try to adjust P1 cell. If you can, and code still exists, replace computer control center. If you cannot adjust P1, check P1 cell and wiring to cell. If O.K., replace computer control center.

If P1 lamp not lit, check P4/P6 lamp. If lit, replace P1 lamp. If P4/P6 lamp also out, check +5 VDC LED. If lit, check blue wires in system for break in +5V supply distribution. If not lit, check +14 VDC LED. If lit, replace VR201 regulator. If not lit, replace power supply board. If problem still exists, replace power control center.

Machine can be restored to service by turning power off and correcting problem.

For a more complete troubleshooting sequence, refer to the appropriate troubleshooting chart for this fault.
Bill was rejected because it failed to pass second magnetic check.

Bill may have been inserted backwards.

If bills are rejected frequently with this code:

1. P1 adjustment pot may be adjusted too far clockwise. Readjust P1 pot.
2. Mag pot may be set too low, readjust mag pot.
3. Transport motor may be running slow, or drive belt slipping. Check drive belt adjustment. If O.K., check motor speed (see manual, page 78). If slow, check motor capacitor, motor itself, or computer control center.
4. Amplifier may be weak. Replace Computer Control Center.
5. Magnetic head may be weak or out of alignment. Replace transport.
6. Transport rollers may be worn. Check and replace if necessary.

If bill is left in transport for 30 seconds, machine will go into self-clear (5 seconds on BC-25).
STATUS CODE

DISPLAY SHOWS "7"
FAULT LED FLASHING

During the last replenish cycle the system detected a coin pulse from the dispenser that was much longer than normal. Most likely there is an incorrect change load in one of the change buckets.

A detector lamp could have burned out during the replenish cycle. If lamps O.K., reset machine and see if it goes back into shutdown. If so, refer to new status code that will appear.

If machine stays in service, check coin load in buckets. One bucket could have wrong change in it. Try to establish whether nickels, dimes, or quarters are wrong, then check that photo detector and wiring is O.K. If O.K., replace computer control center.

If all three bulbs are out, check 5 VDC LED on power supply.
If OFF, check power supply, If lit check harness.

Also check upper coin chute for anything that would hold coin up.

If everything looks good, replace computer board assembly.

To restore machine to service, press reset switch after correcting problem.

NOTE: The bill stacker has been deliberately cycled away from home position when machine is in this status, it will return when machine is reset.

For a more complete troubleshooting sequence, refer to the appropriate troubleshooting chart for this fault.
STATUS CODE

Number 8 with LED off indicates that the bill return switch is activated.
It is used for display testing (see "To Test Display") and to adjust mag signal.
If this code is on continuously, check bill return switch for incorrect adjustment.
Also, check for faulty switch and shorted wiring to switch.
If everything checks O.K., replace Computer Control Center.
Machine can be restored to service by turning power off and correcting problem.

NOTE: If this problem corrects itself, machine will automatically resume operation.

DISPLAY SHOWS "8"
FAULT LED OFF

One of the coin switch inputs is showing an incorrect signal.
Leave power on and unplug main harness at coin acceptor bracket. If code goes out, replace
coin switch assembly. If code remains, check harness wiring to coin switch plug. If O.K.,
replace computer control center.
Machine can be restored to service by turning off power and correcting problem.

NOTE: If this problem corrects itself, machine will automatically resume operation.

For a more complete troubleshooting sequence, refer to the appropriate troubleshooting
chart for this fault.
STATUS CODE

DISPLAY SHOWS "9"
FAULT LED OFF

Bill was rejected because P6 cell was not uncovered soon enough after P4 was covered.

Bill is possibly torn at leading edge.

Object possibly hung up or jammed in track.

If bills are frequently rejected on this code:

Check for tight, binding, or sticky P6 flipper operation.

Check for intermittent open circuit in wiring to P6 cell.

Check rear portion of transport track for any condition that would cause bill to slow or hang up. (soft drink residue, catsup, burrs in track, etc.)

Rear drive belt of transport broken, or slipping. Check and replace if necessary.

If all of above O.K. replace Computer Control Center.

If bill is left in transport for 30 seconds, machine will go into self-clear (5 seconds on BC-25).

DISPLAY SHOWS "9"
FAULT LED FLASHING

One of the test switch inputs is showing an incorrect signal.

Leave power on, unplug 4-way connector at back of power control center (P204). If code goes out, switch or wiring to switch is bad. Replace power control center. If code remains, check harness wiring to 4-way plug. If O.K., replace Computer Control Center.

machine can be restored to service by turning off power and correcting problem.

NOTE: If this problem corrects itself, machine will automatically resume operation.

For a more complete troubleshooting sequence, refer to the appropriate troubleshooting chart for this fault.
STATUS CODE

DISPLAY SHOWS "A"
FAULT LED OFF

Bill was rejected because P4 cell was uncovered too soon.

Most likely there is a piece torn out of the left hand trailing corner of the bill, or it is folded over at this spot.

If bills are rejected frequently with this code:

P4 adjustment pot may be set too far clockwise. Readjust P4 pot.

P4 cell may be giving intermittent signal. Check P4 cell for proper switching. If cell is O.K., check wiring from P4 cell to computer control center for possible ground to chassis.

+5 VDC supply to lamps may be below 4.5 VDC. Check voltage. If low, replace VR201 regulator on power control center. (Part no. 7-00365-01).

If all of above is O.K., replace Computer Control Center.

If bill is left in the transport for 30 seconds, the machine will go into self-clear (5 seconds on BC-25).

DISPLAY SHOWS "A"
FAULT LED FLASHING

The external lockout line is grounded.

This code should never occur on the BC-20 as this line is not used in the bill changer.

This line is used only if the computer board is used to operate something other than the dispenser.

If this code does appear, replace Computer Control Center. If problem still exists, pin 15 of J1 is grounded (it should be open).

NOTE: If this problem corrects itself, machine will automatically resume operation.

For a more complete troubleshooting sequence, refer to the appropriate troubleshooting chart for this fault.
STATUS CODE

DISPLAY SHOWS "b" (B)
FAULT LED OFF

Bill was rejected because P1 cell was covered while changer was in process of validating a bill.

Wait until changer completes cycle before inserting next bill.

If bills are rejected frequently with this code:

P1 adjustment pot may be too far counterclockwise. Readjust P1 pot.

P1 cell may be giving intermittent signal. Check P1 cell for proper switching. If cell is O.K. check wiring from P1 cell to computer control center for intermittent open connection.

If both of above O.K., replace Computer Control Center.

If bill is left in transport for 30 seconds, machine will go into self-clear (5 seconds on BC-25).

DISPLAY SHOWS "b" (B)
FAULT LED FLASHING

P4 or P6 cell in transport is giving an incorrect signal.

Most likely a small object is stuck in rear of transport or P4/P6 lamp is burned out.

If both lamps are out, check +5 VDC LED. If not lit, check power supply. If lit, check +5V power distribution lines in harness (blue wires).

If above O.K., check P4 LED. If lit, try to adjust P4. If you cannot, check P4 cell. If O.K. check wiring from P4 cell to computer control center for open.

If P4 LED is out, check P6 flipper. Make sure it is fully blocking light to P6 and that it works freely without binding or sticking. If O.K., check cell. If cell O.K. check wiring from P6 cell to computer control center for possible short to ground.

If all of above O.K., replace Computer Control Center.

Machine can be restored to service by turning power off and correcting problem.

NOTE: If this problem corrects itself, machine will automatically resume operation.

For a more complete troubleshooting sequence, refer to the appropriate troubleshooting chart for this fault.
STATUS CODE

DISPLAY SHOWS "C"
FAULT LED OFF

Bill was rejected because P6 cell was covered too soon after being uncovered.

Computer recognized this as a non-valid validation sequence.

If bills are rejected frequently with this code:

Check for broken or worn parts on P6 flipper or rear of transport that would cause flipper to cover P6 cell prematurely. Replace any bad parts or replace transport.

Check location and alignment of P4/P6 lamp. Lamp filament should be positioned towards low side of lamp and set at 45° angle to both P4 and P6 cells.

P6 cell may be giving intermittent signal. Check P6 cell for proper switching. If cell O.K. check wiring from P6 cell to computer control center for possible intermittent open connection.

If all of above are O.K., replace Computer Control Center.

If bill is left in transport for 30 seconds, machine will go into self-clear (5 seconds on BC-25).

DISPLAY SHOWS "C"
FAULT LED FLASHING

One or more of the coin photodetector inputs is giving an incorrect signal. This happened when the machine was in standby, however, and the change load in the buckets should be correct.

Most likely one of the lamps on the dispenser is burned out. Check lamps and replace if bad. If any lamps still out, check wiring to lamp.

If all lamps are off, check +5 VDC LED on power supply. If not lit, check power supply. If lit, check +5 V power distribution lines in harness (blue wires).

If all lamps are lit, check for dirt on detector lamps. If clean, check coin photodetectors. If they check O.K., check wiring from photodetectors to computer control center for open connections. If O.K., replace Computer Control Center.

Machine can be restored to service by turning power off and correcting problem.

NOTE: If this problem corrects itself, machine will automatically resume operation.

For a more complete troubleshooting sequence, refer to the appropriate troubleshooting chart on this fault.
STATUS CODE

CODE d (D)

DISPLAY SHOWS "d" (D)
FAULT LED OFF

Bill was rejected because P4 cell was covered too long.
Bill may have hung up or jammed in the transport.
If bills are rejected frequently with this code:

Check rear portion of transport track for any condition that would cause bill to slow up or hang up (soft drink residue, catsup, burrs on track surfaces, etc.).
Rear drive belt of transport may be loose and slipping. Check and replace if necessary.
Center or back transport rollers may be worn. Check and replace if necessary.
If all of the above are O.K., replace Computer Control Center.
If bill is left in transport for 30 seconds, machine will go into self-clear (5 seconds on BC-25).

DISPLAY SHOWS "d" (D)
FAULT LED FLASHING

This code flashes briefly when machine is reset following codes 1, 2, 3, 4, 5, 7, E, or F with FAULT LED flashing.
This is normal operation.
If machine is in shutdown and this code is showing, bill stacker monitor input is active.
Leave power on. Disconnect main harness at bill stacker. Press reset switch, if code goes out, replace bill stacker. If code does not go out, replace computer control center. If code still exists, check stacker monitor line (green white wire) from stacker plug to computer control center for short to chassis.
Possible cause is incorrect adjustment of stacker cam switches. Also, stuck stacker relay, defective stacker motor brake or motor itself.
To restore machine to operation, press reset switch after correcting problem.
For a more complete troubleshooting sequence, refer to the appropriate troubleshooting chart for this fault.
STATUS CODE

DISPLAY SHOWS "E"
FAULT LED OFF

Bill was rejected because P6 cell was uncovered too long.

If this code appears often with good bills, check for tight P6 flipper operation, transport to stacker alignment, or non-operating stacker.

If bill is left in transport for 30 seconds, machine will go into self-clear (5 seconds on BC-25).
CHANGER HAS BEEN SHUTDOWN BECAUSE ONE OR MORE HOPPER MOTORS WERE RUNNING WHEN THEY WERE NOT SUPPOSED TO.

THERE COULD BE TOO MANY COINS IN ONE OF THE CHANGE BUCKETS. IF THERE IS, IT WILL TELL YOU WHICH MOTOR WAS RUNNING.

MOST LIKELY THE PROBLEM IS A FAULTY CIRCUIT ON THE COMPUTER BOARD ITSELF. CHANGE COMPUTER CONTROL CENTER. ALSO CHECK WIRING TO MOTOR FOR SHORTS. (SEE NOTE)

TO RESTORE MACHINE TO SERVICE, PUSH RESET SWITCH AFTER CORRECTING PROBLEM.

NOTE: THE BILL STACKER HAS BEEN DELIBERATELY CYCLED AWAY FROM HOME POSITION WHEN MACHINE IS IN THIS STATUS. IT WILL RETURN WHEN MACHINE IS RESET.

- This circuit operates on 120 VAC line voltage. ALWAYS turn power off when working on this circuitry.

ALSO - If there is ANY POSSIBILITY that the wall outlet the changer is connected to may be wired backwards, or if this changer is connected to a wall outlet via a 2-prong grounding adapter - PULL CORD FROM OUTLET before working on this circuit. Serious electrical shock could result otherwise.

FOR A MORE COMPLETE TROUBLESHOOTING SEQUENCE, REFER TO APPROPRIATE TROUBLESHOOTING CHART FOR THIS FAULT.
Bill was rejected because it failed to pass auxiliary magnetic check.

Bill may have been inserted backwards.

If bills are rejected frequently with this code:

- Mag pot may be set too high; readjust mag pot. Turn mag pot down 2 marks (1/8 turn) and try again.

- Also, rubber pressure roller, bill transport tracks, or bill being used may be contaminated with foreign metallic particles. Check and clean or replace if necessary.

- If system is operated without motor shield around transport motor, this code will show frequently. Also, defective transport motor (drawing too much current) could cause this.

If bill is left in transport for 30 seconds, machine will go into self-clear (5 seconds on BC-25).
HOPPER LED ON - (HOPPERS ARE NOT RUNNING)

Machine is in reset due to low voltage on 14 VDC line to computer board.

Check AC line voltage to machine for low voltage (below approx. 85 volts). If O.K., power supply is probably bad. Check 14 VDC supply, if under 12 VDC, replace power supply board. If still not O.K., replace power control center.

If +14 VDC supply O.K., check wiring to computer board. If O.K., replace computer control center.

NOTE:  Reset switch will not work in this mode. To restore machine to service, correct cause of low voltage.

HOPPER LED OFF

Machine has been shutdown because one or more of the bucket solenoids was energized too long, or turned on when it was not supposed to. Most likely there is an incorrect change load in one of the buckets.

Most likely cause is faulty computer control center or short in wiring to buckets. See note *. Also, a shorted supression diode on dispenser could cause this. Check diodes (See note *).

To restore machine to service, press reset switch after correcting problem.

NOTE:  Bill stacker has been deliberately cycled away from home position. It will return when machine is reset.

* Installing a replacement computer control center in machine without determining cause of original failure may cause instant destruction of replacement computer control center when power is turned on.

BC-20 Diagnostic Aid or volt-ohm-meter used in accordance with troubleshooting chart for code "F" should be used to establish whether or not it is safe to install replacement board.

For a more complete troubleshooting sequence, refer to the appropriate troubleshooting chart for this fault.
BC-20 TROUBLESHOOTING CHARTS

These charts are for use if written explanation in status code chart is not adequate, or if the serviceman wants more detail. Block diagram, Schematic diagram and Wiring diagram are helpful aids in locating and checking wires, plugs, assemblies etc.

The first charts are arranged according to a particular status code displayed. Following these are charts for faults that may occur in which no status code is displayed.

If a segment of the display is burned out, an incorrect and misleading character could be displayed. To avoid trying to troubleshoot the wrong problem, always check to see if all segments of the display are working. This is done by pressing the bill return button and watching display. Display should show "8". When bill return button is released, the original fault code will again appear.

Logical troubleshooting minimizes effort in removing and replacing the wrong parts. Many failures are caused by minor defects such as loose connections or dirty contacts which can be identified in many instances by the status code display on the Computer Control Center. Check the following before replacing any parts.

1. Check that all plugs are firmly seated.
2. Check that connector pins are not bent, broken, or pushed through the back of the connector when mated.
3. Check that the wires are not bent or broken at connector or pins.
4. Check that coin combination switches on the Computer Control Center are set correctly for the coin combination used.
5. Check that coin hoppers are properly loaded and installed.

Use tables which follow to locate specific malfunctions. Turn to the page referenced and follow the chart step by step for each problem.
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- Bill Changer Inoperative-Will Not Accept Coins Or Bills
- Test Switch Inoperative-Machines Works O.K. For Bills & Coins-No Status Code
- 1 Or More Hopper Motors Fail To Run
- B.A. Transport Motor Fails To Run-Forward Or Reverse
- Bill Changer Steals Coins-Works O.K. With Bills (Gives No Change)
- Bill Changer Steals Bills-Works O.K. For Coins (Gives No Change)
- Bill Changer Steals Bills And Coins (Gives No Change)
- Bill Changer Gives Erratic Payout For Bills & Coins-No Status Codes
- Transport Running-Lamp Off-Status Code Showing “8”
- Stacker Problems
- +5 VDC Failure - +5 VDC LED Out
- Bill Changer Rejects All Or A Large Number Of Bills
BILL CHANGER SHUTDOWN - OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "1"
(FAULT LED FLASHING)

Power to the machine was disrupted while the changer was in shutdown and was displaying one of the codes 2, 3, 4, 5, 7, d, E, or F and the Fault LED was flashing. Hopper LED will be lit, but hoppers will NOT be running.

Press reset switch and wait for stacker to home (approx. 1 - 1-1/2 sec.)
Does changer go back into shutdown?

YES

NO

Read new fault code. Consult status codes or troubleshooting charts on new condition.

Remove hoppers and look into change buckets. Is one bucket overloaded with coins?

YES

NO

Computer Control Board may have shorted coin detector input. Replace with new p/n 6-50428-01 Computer Control Center.

Changer may have failed to replenish. Are any hoppers empty or low on coins?

YES

NO

Coin Detector may be shorted. Identify denomination of excess coins and replace that photodetector ass'y Part no. 3-50549-01

Reload Changer

Leave hoppers out. Test vend for $1.00. Are all hopper motors running that have been programmed to run?

YES

NO

Count change from test vend. Was it:

See status code or troubleshooting chart for status code showing 5 fault LED flashing. (Changer in shutdown)

Determine value of short coin. Check that hopper for poor coin pickup - due to dirt buildup in coin path, or worn part.

Turn power off then back on. Go back to point "A" on chart and repeat with 50¢ test vend. Then with 25¢ test vend

See Chart Titled: "1 or more hopper motors fail to run"

Cause of shutdown unknown. Restore machine to service. If changer again goes into shutdown for unidentified reason consult Rowe Field Service.

NOTES:
Make sure change load in buckets is correct before restoring machine to service.

The bill stacker has been deliberately cycled away from home when the machine is in this status. It will return when machine is reset.
BILL CHANGER SHUTDOWN - OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "2"
[FAULT LED FLASHING]

Changer was shutdown because nickel count was not satisfied within 45 seconds. One bucket will have incorrect nickel count.

Is nickel hopper empty or low on coins?

YES

Reload changer

NO

Remove hoppers and look into change buckets. Is one bucket overloaded with nickels?

NO

Press reset switch and wait for stacker to home (approx. 1 - 1-1/2 sec.)

Leaf hoppers out. Test vend 1 denomination ($1, 50¢ or 25¢) that will dispense at least 1 nickel. Does nickel motor run properly?

NO

See Chart Titled: "1 or more hopper motors fail to run"

YES

Computer Control Board may have shorted coin detector input. Replace with new p/n 6-50428-01 Computer Control Center

OR

Nickel coin detector may be shorted. Replace photodetector ass'y with new p/n 3-50549-01

Check nickel hopper for poor coin pickup. Most likely causes are dirt buildup in coin path or worn parts, also check for jammed hopper

IF O.K.

If problem reoccurs. Exchange hoppers. If problem follows hopper, replace hopper. If problem remains with nickels, replace Computer Control Center p/n 6-50428-01.

NOTES:
Make sure change load in buckets is correct before restoring machine to service.

The bill stacker has been deliberately cycled away from home when the machine is in this status. It will return when machine is reset.
BILL CHANGER SHUTDOWN - OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "3"
[FAULT LED FLASHING]

Changer was shutdown because dime count was not satisfied within 45 seconds. One bucket will have incorrect dime count.

Is dime hopper empty or low on coins?

YES

Reload changer

NO

Remove hoppers and look into change buckets. Is one bucket overloaded with dimes?

NO

Press reset switch and wait for stacker to home (approx. 1 - 1-1/2 sec.)

OR

Leaves hoppers out. Test vend 1 denomination ($1, 50¢ or 25¢) that will dispense at least 1 dime. Does dime motor run properly?

NO

See Chart Titled: "1 or more hopper motors fail to run"

YES

Computer control board may have shorted coin detector input. Replace with new p/n 6-50428-01 Computer Control Center

OR

Dime coin detector may be shorted, Replace photodetector ass'y with new p/n 3-50549-01

Check dime hopper for poor coin pickup. Most likely causes are dirt buildup in coin path or worn parts, also check for jammed hopper.

IF O.K.

If problem reoccurs, exchange hoppers. If problem follows hopper, replace hopper. If problem remains with dimes, replace Computer Control Center p/n 6-50428-01

NOTES:
Make sure change load in buckets is correct before restoring machine to service.

The bill stcker has been deliberately cycled away from home when the machine is in this status. It will return when machine is reset.
BILL CHANGER SHUTDOWN - OUT OF SERVICE LAMP LIT STATUS DISPLAY SHOWS "4" (FAULT LED FLASHING)

Changer was shutdown because quarter count was not satisfied within 45 seconds. One bucket will have incorrect quarter count.

Is quarter hopper empty or low on coins?

YES

Reload changer

NO

Remove hoppers and look into change buckets. Is one bucket overloaded with quarters.

OR

Press reset switch and wait for stacker to home (approx. 1 - 1-1/2 sec.)

NO

Leave hoppers out. Test vend 1 denomination (51, 50c, or 25c) that will dispense at least 1 quarter. Does quarter motor run properly?

NO

See Chart Titled: "1 or more hopper motors fail to run".

YES

Check quarter hopper for poor coin pickup. Most likely causes are dirt buildup in coin path or worn parts, also check for jammed hopper.

IF O.K.

If problem reoccurs, exchange hoppers. If problem follows hopper, replace hopper. If problem remains with quarters, replace Computer Control Center p/n 6-50428-01.

COMPUTER CONTROL BOARD MAY HAVE SHORTEO COIN DETECTOR INPUT. REPLACE WITH NEW P/N 6-50428-01 COMPUTER CONTROL CENTER.

QUARTER COIN DETECTOR MAY BE SHORTEO. REPLACE PHOTODETECTOR ASS'Y WITH NEW P/N 3-50549-01

NOTES:
Make sure change load in buckets is correct before restoring machine to service.

The bill stacker has been deliberately cycled away from home when the machine is in this status. It will return when machine is reset.
BILL CHANGER SHUTDOWN - OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "5"
(FAULT LED FLASHING)

Since last time machine was reset or power turned off, it may have dispensed 2 more coins than it should have. Most likely there is an incorrect change load in one of the change buckets.

Push reset switch and wait for stacker to home. (approx. 1 - 1-1/2 seconds). Test vend for $1.00 and count change received. Does it total $1.00?

YES

WAIT FOR HOPPERS TO REPLENISH. TEST VEND FOR 50¢ AND COUNT CHANGE RECEIVED. DOES IT TOTAL 50¢?

YES

WAIT FOR HOPPERS TO REPLENISH. TEST VEND FOR 25¢ AND COUNT CHANGE RECEIVED. DOES IT TOTAL 25¢?

YES

Computer received wrong count signals. Check O/G, O/B and O/BR wires from Computer Control Center to Dispenser photodetectors for intermittent connection.

IF O.K.

Check blue wire from Power Control Center thru harness terminal block to dispenser for intermittent connection. Also check low voltage common (black) back to power control center.

IF O.K.

Check for dirt or film on photodetectors and their lamps. Clean if dirty.

IF O.K.

NOTE:
Make sure change load in buckets is correct before restoring machine to service.

The bill stacker has been deliberately cycled away from home when the machine is in this status. It will return when machine is reset.

Testing count with object other than actual coins (using fingers, scales, metal strips, etc.) may cause machine to shutdown with this fault code showing.

Determine denomination of extra coin. Check that dispenser hopper motor for faulty brake operation or coasting armature. If bad, replace motor.

IF O.K.

Check hopper from which extra coin came. For dirt buildup along top of coin path. If dirty, clean all hoppers, check for worn parts.

Make several test vends. If problem reoccurs, replace Computer Control Center p/n 6-50428-01. If not, restore machine to service and watch for reoccurrence. If problem reoccurs, consult Rowe Field Service.
BILL CHANGER SHUTDOWN - OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "6"

PI cell circuit is giving computer an incorrect signal

Is P1 LED lit?

NO

Defective computer board. Replace computer control center 6-50428-01

YES

Is P1 lamp lit?

NO

Is P4/P6 lamp lit?

NO

Replace P1 lamp p/n 2-51668-01

YES

Open transport - check for foreign object blocking P1 cell.

Can you adjust P1 cell?

NO

YES

Check P1 cell - see page does cell check O.K.?

NO

YES

P1 circuit may have just been misadjusted. Does machine go back into service?

Replace P1 cell, p/n 2-13398-01, or transport, p/n 6-50164-11

Check continuity of white/orange wire from J1 pin 17 to P1 cell. Is there an open connection?

YES

NO

Defective P1 input on Computer Board. Replace Computer Control Center p/n 6-50428-01

NOTES:
Machine can be restored to service by turning power off and correcting problem.

If +5VDC LED is much brighter than others, due to defective VR201, transport cell lamps, display lamps, and photodetector lamps could be burned out.

If this problem corrects itself, machine will automatically resume operation.
BILL CHANGER SHUTDOWN - OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "7"
(FAULT LED FLASHING)

During the last replenish cycle the system detected a coin pulse from the dispenser that was much longer than normal. Most likely there is an incorrect change load in one of the change buckets.

Are all 3 photodetector lamps lit?

NO

Are all 3 lamps out?

YES

Is +5VDC LED on power control center lit?

NO

Refer to chart "+5VDC failure +5VDC LED out"?

YES

Check lamp. Replace burned out lamp(s) with p/n 2-51668-01 Also check wiring to lamps in back of dispenser.

Is +5V LED much brighter than other 3 LED's?

NO

New status code will appear see status code or troubleshooting charts under new code.

YES

Check for restriction in upper coin chute that would hold up coins.

IF O.K.

Check orange brown, orange/green, or orange/black wires from J1 to photodetectors for intermittent open circuit.

OR

Defective +5V regulator VR201. Replace with p/n 7-00365-01 (see note)

Defective computer board. Replace with new Computer Control Center p/n 6-50428-01.

YES

Are the transport lamps lit?

NO

Harness problem exists, Open connection from harness terminal block to dispenser - blue or black wires.

Unplug P202. Measure for +5VDC between pins 2 and 5 at power control chassis. Is voltage between 4.5 VDC and 5.5 VDC.

YES

Internal harness problem in power control center.
Replace with new power control center p/n 6-50426-01

NO

Harness problem exists. Open connection from P202 to harness terminal block (blue or black wires to dispensed).

NOTES:
Make sure change load in buckets is correct before restoring machine to service.
The bill stacker has been deliberately cycled away from home when the machine is in this status. It will return when machine is reset.
If +5VDC LED is much brighter than others, due to defective VR201, transport cell lamps, display lamps, and photodetector lamps could be burned out.
Testing count with objects other than actual coins (using fingers, scales, metal strips, etc.) may cause machine to shutdown with this fault code showing.
BILL CHANGER SHUTDOWN -OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "8"
(FAULT LED FLASHING)

One of the coin switch inputs to computer is showing an incorrect signal.

Leave power on. Disconnect plug to coin acceptor and bracket ass'y (P301). Does machine go back into service?

YES
Defective coin switch assembly or harness. Replace with new ass'y p/n 3-50261-07

NO
Defective coin input on computer board. Replace computer control center p/n 6-50428-01

OR
Harness problem exists, white/Brn or White/Violet wire from J1 to P301 is shorted to ground somewhere.

NOTES:
If this problem corrects itself, machine will automatically resume operation.
Machine can be restored to service by turning power off and correcting problem.

BILL CHANGER SHUTDOWN -OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "9"
(FAULT LED FLASHING)

One of the test switch inputs to computer is showing an incorrect signal.

Leave power on, disconnect P204 (4 way) plug at power control center. Does status code "9" go out?
(power control relay will drop out when P204 is unplugged.)

YES
Defective test switch or wiring to test switches (inside power control center) Replace test switch p/n 2-15818-01 or power control center p/n 6-50426-01.

NO
Defective switch input on computer board. replace computer control center p/n 6-50428-01

OR
Harness problem exists, red/white, violet/white or brown/white wire from J1 to P204 is shorted to ground somewhere.

NOTES:
If this problem corrects itself, machine will automatically resume operation.
Machine can be restored to service by turning off power and correcting problem.
BILL CHANGER SHUTDOWN - OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "A"
(FAULT LED FLASHING)

The external lockout line is grounded.
This code should never occur on the BC-20 as
this line is not used in the bill changer. If it does:

Defective Computer Board, Replace Computer
Control Center p/n 6-50428-01

NOTE:
If this problem corrects itself, machine will
automatically resume operation.
BILL CHANGER SHUTDOWN - OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "b"
[FAULT LED FLASHING]

P4 or P6 cell circuit is giving computer an incorrect signal.

Is P4/P6 lamp lit?

NO

Is P1 lamp lit?

NO

Is +5VDC LED on power control center lit?

NO

Replace P4/P6 lamp p/n 2-51668-01

YES

Refer to chart "+5VDC failure +5 VDC LED out"

Are the photodetector lamps lit?

YES

NO

Defective +5V regulator VR201. Replace with p/n 7-00365-01 (see note)

Harness problem exists. Open connection from harness terminal block to transport - blue or black wires.

YES

NO

Unplug P202. Measure for +5VDC between pins 2 and 7 at power control chassis. Is voltage between 4.5VDC and 5.5 VDC?

YES

NO

Harness trouble exists. Open connection from P202 to harness terminal block (Blue & Black/Red wires)

Internal harness problem in power control center. Replace with p/n 6-50426-01 Power Control Center

Check continuity of White/Red wire from J1 pin 19 to P4 cell. Look for open connection.

IF O.K.

Check yellow wire from J2 pin 3 to P6 cell. Wire may be shorted to ground.

IF O.K.

Check P6 cell - see page 81. Does cell check O.K.?

NO

Does machine return to service?

YES

IF O.K.

Check for hung up or binding P6 flipper. Flipper should move freely.

Replace cell, p/n 2-13398-01 or, transport, p/n 6-50164-11

Check P4 cell - see page 78. Does cell check O.K.?

IF O.K.

Open transport - check for foreign object blocking P4 or P6 cell

Can you adjust P4 cell?

YES

NO

Check yellow wire from J2 pin 3 to P6 cell. Wire may be shorted to ground.

IF O.K.

Defective cell input circuit on control board. Replace Computer Control Center p/n 6-50428-01.

NOTES:
Machine can be restored to service by turning power off and correcting problem.
If +5VDC LED is much brighter than others, due to defective CR201, Transport Cell Lamps, Display Lamps, and Photodetector Lamps could be burned out.
If this problem corrects itself, machine will automatically resume operation.
BILL CHANGER SHUTDOWN - OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "C"
(FAULT LED FLASHING)

One or more of the coin photodetectors is giving an incorrect
signal. This happened when the machine was in standby,
however, and the change load in the buckets should be correct

Are all 3 photodetector lamps lit?

NO

Are all 3 lamps out?

YES

Is +5VDC LED on Power Control Center lit?

NO

Refer to chart "+5V failure, +5VDC LED out"

YES

Check lamps. Replace burned out lamp(s) with p/n 2-51668-01.
Also, check wiring to lamps in back of dispenser.

NO

Is +5V LED much brighter than other 3 LED's?

NO

Defective +5V regulator VR201. Replace with p/n 7-00365-01 (see note)

YES

Harness problem exists. Open connection from harness terminal block to dispenser - Blue or Black wires.

NO

Unplug P202, measure for 5VDC between pins 2 & 5 at Power Control chassis. Is voltage between 4.5 VDC & 5.5 VDC?

YES

Harness problem exists Open connection from P202 to harness terminal blocks (Blue or Black wires) to dispenser.

NO

Internal harness problem in power control center. Replace with 6-50426-01

Check photodetectors for open condition. See page 79. If bad, replace with p/n 3-50549-01

IF O.K.

Check O/G, O/B, and O/Br wires from J1 to dispenser for continuity. Look for open circuit.

IF O.K.

Defective computer board, replace with 6-50428-01

Computer Control Center.

NOTES:
If this problem corrects itself, machine will automatically resume operation.
If +5VDC LED is much brighter than others, due to defective VR201, transport cell lamps, display lamp and photodetector lamps could be burned out.
Machine can be restored to service by turning power off and correcting problem.
BILL CHANGER SHUTDOWN - OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "D"
(FAULT LED FLASHING)

Bill stacker monitor line to computer is active.

- Leave power on. Disconnect plug P501 at side of bill stacker (8 way Jones plug). Press reset switch on computer control center. Does machine return to service?
  - YES
  - Defective Bill Stacker
    - Replace with new stacker p/n 6-50249-02 or see chart "Bill Stacker Problems"
  - NO
  - OR
  - Check Green/White wire from J1, pin 16 to stacker plug. Check for grounded condition.

- Defective computer board, replace computer control center p/n 6-50428-01.

NOTES:
Machine can be restored to service by turning off power and correcting problem. (In some cases the reset switch may have to be pressed.)

BILL CHANGER SHUTDOWN - OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "E"

Changer has been shutdown because one or more hopper motors were running when they were not suppose to. There may be an incorrect change load in one of the buckets.

- Defective drive circuit on computer board.
  - Replace Computer Control Center 6-50428-01.
  - OR
    - Check Black/Red, Black/Yellow or Brown wires from J2 to hopper motors for short to ground.

NOTES:
Make sure change load in buckets is correct before restoring machine to service.
The bill stacker has been deliberately cycled away from home when the machine is in this status. It will return when machine is reset.

WARNING
* This circuit operates on 120 VAC LINE VOLTAGE.
ALWAYS turn power off when working on this circuitry.
ALSO - if there is any possibility that the wall outlet the changer is connected to may be wired backwards, or if the changer is connected to a wall outlet via a 2-prong grounding adaptor - pull cord from outlet before working on this circuit. Serious electrical shock could result otherwise.
BILL CHANGER SHUTDOWN - OUT OF SERVICE LAMP LIT
STATUS DISPLAY SHOWS "F"
(FAULT LED FLASHING)

Is "Hopper" LED on?

YES

Machine is in reset due to low voltage conditions.

NO

Disconnect plug P202. With power left on, measure +14VDC coming from power control center (Violet wire on pin 3 to ground - pins 4 thru 9 are all ground ). Is +14V supply above 8V?

NO

Measure +30VDC supply voltage (Red wire on pin 1 to ground). Is +30V supply above 24V?

YES

Defective computer board replace computer control center 6-50428-01

NO

Check AC line voltage to machine. Is it above 90VAC?

NO

Correct source of low line voltage

YES

Defective Power Supply source. (not circuit board). Replace power control center p/n 6-50426-01

OR

Defective 14V supply. Replace power supply circuit board 6-50418-01.

Defective transformer or circuit breaker. Replace power control center 6-50426-01

NOTE:
Reset switch will not work in this mode. To restore machine to service, correct cause of low voltage.
WARNING
Installing new computer control center in machine without determining cause of failure may result in
instant destruction of new board when power is turned on. BC-20 Diagnostic Aid p/n 6-70013-06 or Volt Ohm
meter should be used to establish whether or not it is safe to replace new board.

Turn power off. Remove cover to harness junction box.
Remove 3 violet/orange wires from 1 group of terminals.
Do not let wires touch each other or chassis. Reconnect
all modules if you disconnected any.

Turn power back on and press reset switch. Wait for
stacker to home (approx 1 - 1-1/2 sec.) Does machine
go back into a code "F" shutdown?

A meter or BC-20 Diagnostic Aid is necessary for troubleshooting
from this point.
Remove computer control center.

Check for short to ground or
of cabinet on Rec./Black, Yellow/
Brown, and Blue/White wire
groups at Junction Box.
Does short exist?

Reconnect 3 Violet/Orange wires
removed above. Check for short
(less than 7 ohms) from Violet/
Orange wires to:
1. Red/Black wire group (3 wires)
2. Yellow/Brown wire group (3 wires)
3. Blue/White wire group (3 wires)
are any shorts detected?

Defective drive circuit on computer
board. Replace computer control
center 6-50428-01.

Defective computer board. Replace
computer control center p/n
6-50428-01

OR

Short to cabinet on Violet/
Orange wire from J2 to
harness junction box.

Disconnect dispenser plug
P401. Does short disappear?

Disconnect P203 at Power
Control Center (12 way).
Does short disappear?

Replace dispenser
6-50275-04

Replace power
control center
6-50426-01

Short in main machine
harness, repair or re-
place with 6-50429-01

NOTE:
Bucket drive transistor on computer board may be blown.
If machine shuts down on code "F" after short is corrected
and machine put back together, replace Computer Control
Center.

(See Note)
BILLCHANGER INOPERATIVE - WILL NOT ACCEPT COINS OR BILLS

Is status Display Showing Any Code?

- **YES**
  - Out of service lamp may be burned out and machine is actually in shutdown. Replace Lamp (No.757-28V). Does it light?
    - **YES**
      - Refer to chart corresponding to shutdown code shown.
    - **NO**
      - Defective computer control center. Replace with p/n 6-50428-01.

- **NO**
  - Is +40 VDC LED on?
    - **YES**
      - Is +14 VDC LED on?
        - **YES**
          - Is decimal point on status display on?
            - **YES**
              - Defective power control relay p/n 3-50668-01
            - **NO**
              - Defective computer board replace computer control center p/n 6-50428-01
        - **NO**
          - Defective computer control center p/n 6-50428-01

  - **NO**
    - Defective power supply board. Replace with p/n 6-50418-01.

IF O.K.

Defective power supply source (not board)
Check for tripped circuit breakers (CB201 or CB202). Check line voltage for absence of 120 V AC. Check power junction box (upper left corner) for open circuit. If O.K. replace power control center p/n 6-50426-01

TEST SWITCH INOPERATIVE - MACHINE WORKS OK FOR BILLS & COINS

NO STATUS CODE

Possible defective switch. Using volt-ohm meter check actuation of switch as follows:
Turn power off, unplug P204 (4 way) at back of power control center. Attach meter (ohms scale) lead to ground (power control chassis) and to pin of 4 way plug on power control center listed below. Meter should show open circuit. Now press test switch being tested. Meter should show short circuit (0 ohms) repeat for all 3 test switches:
$1.00 test switch - P204 Pin 4 Brown/White wire
50¢ test switch - P204 Pin 3 Violet/White wire
25¢ test switch - P204 Pin 2 Red/White wire
Do switches check O.K.?

Check BR/W, V/W, OR/W wires from P204 (4 way) at power control center to J1 connector. One or more line could be open.

- **YES**
  - Replace computer control center p/n 6-50428-01

- **NO**
  - Defective switch or wiring to switch. Replace Power Control Center p/n 6-50426-01

OR
1 OR MORE HOPPER MOTORS FAIL TO RUN (REF. PAGES 2–4)

Do any of the three hopper motors run?

NO

Press reset switch and test vend using a dollar bill. Does stacker operate?

YES

Check for open circuit from harness junction box to dispenser motors (Black/White wire)

NO

Check for open circuit from harness junction box to J2, pin 21 (White wire)

OR

Replace computer Control Center p/n 6-50428-1

*SEE NOTE

YES

Determine which motor does not run. Set $1.00 change combination to vend only the denomination coin related to that hopper motor. (Set other denomination switches all off). Test vend for $1.00 Does hopper LED on computer control center light?

NO

Check wiring to motors in dispenser for open

*SEE NOTE

OR

Check Black/Red, Brown or Black/Yellow wires from J2 to dispenser for open condition.

*SEE NOTE

OR

Defective motor. replace with p/n 3-50491-02

OR

Defective computer board. Replace Computer Control Center 6-50428-01

CAUTION

* 120 VAC circuitry. Turn power off and pull plug from wall before making this check.
B.A. TRANSPORT MOTOR FAILS TO RUN -FWD OR REV.

Does status display show any code?

- **YES**
  - Machine is in shutdown. Out of service lamp probably burned out. See status code or chart for this code with fault LED flashing.

- **NO**
  - Does machine accept a coin? *
    - **YES**
      - Does machine give change for the coin (does bucket solenoid operate)?
        - **YES**
          - Defective B.A. transport motor, check by pulling bill transport forward. Do not unplug. Locate 3-pin plug on right side of transport. Insert bare end of a jumper wire into center pin (grey wire) of plug. Touch other end of jumper to metal of transport. Repeat above test shorting White/Black wire on pin No. 1 to transport. Does motor run in both directions?
            - **YES**
              - Does motor run either in forward or reverse?
                - **YES**
                  - Defective gear motor p/n 3-05984-01
                - **NO**
                  - Defective motor run capacitor (in power control center). Replace with 2-13133-01
            - **NO**
              - Defective computer board. Replace computer control center p/n 6-50428-01

- **NO**
  - Is coin acceptor lockout coil energized (pulled in)?
    - **YES**
      - Check alignment of coin acceptor lockout. Fingers on solenoid to holes in coin acceptor, adjust if necessary to insure proper lockout.
    - **NO**
      - Check 2 wires for open condition: Yellow/Black from P203, Pin 2 to Transport Motor, Black from J2, Pin 9 to P202, Pin 8
        - **YES**
          - Internal wiring problem in power control center (involving power control relay). Replace ass’y p/n 6-50426-01.
        - **NO**
          - Recheck coin acceptance (above) *
Is decimal point on status display lit?

YES → Is +40VDC LED lit?
YES → Defective computer board. Replace computer control center 6-50428-01.
NO → Defective computer control center. p/n 6-50428-01

NO → Is +14 VDC LED lit?
YES → Defective power supply board. Replace p/n 6-50418-01
NO → OR

OR

Is +30 VDC LED lit?
NO → Unplug P202 at back of power control center (9 way). Does +30 VDC LED come on?
NO → Defective power supply circuit board. Replace with p/n 6-50418-01.

YES → OR

OR

Defective power supply transistor Q203. p/n 7-00305-04
Note: mica insulator and thermal compound required for replacement.

Short to ground (current over 1 ADC) in system. Determine location by unplugging modules one at a time with power on until LED comes on OR use meter (+30VDC is distributed on Red wires).

OR

Defective power supply control relay replace relay p/n 3-50668-01
OR

Internal wiring problem in power control center (Involving power control relay) replace ass’y p/n 6-50426-01
OR

Open condition in White/Violet wire from J2 - Pin 5 to plug P204, Pin 1
BILL CHANGER STEALS COINS - WORKS OK WITH BILLS
(GIVES NO CHANGE)

How often does this happen?
Intermittent
Continuous

Defective computer board
replace computer control
center p/n 6-50428-01

Does vend LED flash when coin
is stolen?
NO
YES

Both quarters and halves
being stolen?
YES

No +5VDC or ground
at coin switch board.
Check blue and black
wires back thru to
power supply

Defective computer
control center
p/n 6-50428-01

NO

Intermittent open in wiring to
coin acceptor.

Broken, bound or worn bucket
assembly. Inspect and replace
if bad. p/n 4-50326-05

Defective computer
control center
p/n 6-50428-01

Check coin lockout
coil for activation. Check
adjustment of lockout
fingers on solenoid.

OR

Check for open circuit
red/black and blue/
white wires from J2
Pins 11 & 12 to har-
ness junction box.

OR

Defective coin switch
board ass’y replace
p/n 3-50267-01

Open coil on bucket
solenoids L401 or
L402. Also, broken
bound or worn bucket
ass’y. Inspect and
replace if bad
p/n 4-50326-05

OR

Open circuit in white/
brown (25Ω) or white/
yellow (50Ω) wires
from coin switch board
to J1 pins 10 & 11

Defective computer
control center
6-50428-01

Check for open circuit
in red/black and blue/
white wires from har-
ness junction box to
bucket solenoids.

Intermittent open in wiring to
bucket solenoids. Check for open
in red/black and blue/white wires
at dispenser and main harness.

Momentary loss of 120VAC line
voltage during machine cycle.
BILL CHANGER STEALS BILLS - WORKS OK FOR COINS  
(GIVES NO CHANGE)

How often does this happen?

Intermittent

Continuous

Defective computer board, replace computer control center p/n 6-50428-01

Does vend LED flash when bill is stolen?

NO

Defective computer control center p/n 6-50428-01

YES

Broken, bound or worn bucket assembly, inspect and replace if bad p/n 4-50326-05

NO

Defective Computer control center p/n 6-50428-01

YES

Intermittent open in wiring to bucket solenoid. Check for open in yellow/brown wire to solenoid L403.

NO

Check for open circuit in yellow/brown wire from J2 Pin 14 to harness junction box.

YES

Transport motor may not be reversing. See chart transport motor fails to run.

Open coil on bucket solenoid L403 or also, broken, bound or worn bucket ass'y. Inspect and replace if bad. p/n 4-50326-05

OR

Check for open circuit in yellow/brown wire in harness junction box to bucket solenoid.
BILL CHANGER STEALS BILLS AND COINS  
(GIVES NO CHANGE)

How often does this happen?  
Intermittent  
Continuous

Defective computer board  
Replace computer control center p/n 6-50428-01

OR

Broken, bound or worn bucket ass’y. Inspect and replace if bad. 4-50326-05

OR

Intermittent open in wiring to bucket solenoids. Check for open in orange and violet/orange wire to solenoids

OR

Intermittent 14VDC failure to board. Check violet and black wires to computer control center from P202

OR

Intermittent open in power supply circuitry. Replace power control center 6-50426-01

OR

Momentary loss of 120 VAC line voltage during machine cycle

Defective computer control center 6-50428-01

Does vend LED flash when coin or bill is stolen?  
NO  
YES

Defective computer control center 6-50428-01

Does vend counter operate?  
NO  
YES

Defective computer control center 6-50428-01

Is +40 VDC LED on?  
NO  
YES

Defective power supply board. Replace p/n 6-50418-01

OR

Defective power control relay. Replace relay. p/n 3-50668-01

OR

Defective power supply replace power control center 6-50426-01

Harness problem exists. Check 2 wires for open condition: orange wire from P203, pin 1 to J2 pin 1 violet orange wire from J2 pin 2 to harness junction box.

OR

Internal wiring problem in power control center. Replace ass’y p/n 6-50126-01

OR

Check for open condition in violet/orange wire from harness junction box to bucket solenoid.

OR

Broken, bound or worn bucket ass’y. Inspect and replace if bad. 4-50326-05
BILL CHANGER GIVES ERRATIC PAYOUT FOR BILLS & COINS
NO STATUS CODES

Do erratic payouts most likely occur in succession, with one making up difference on other vend?

YES

Worn, binding, or broken bucket ass'y. Inspect and replace if bad p/n 4-50326-05

OR

Check for coin hang-up in upper coin chute, lower coin chute, and in coin bucket.

OR

Weak or unfiltered +40VDC line. Replace power supply board p/n 6-50418-01

OR

Bad power transformer. Replace power control center. p/n 6-50436-01

OR

Replace Computer Control Center 6-50428-01

NO

Check hopper for dirt build-up in coin path. Check for worn parts in hopper

OR

Check for failing or out of spec. photodetectors. Test per method on page 79 & 80.

TRANSPORT RUNNING IN REVERSE - OUT OF SERVICE LAMP OFF
STATUS CODE SHOWING "8"

Bill return switch is giving a continuously activated signal.

Leave power on, disconnect red/green wire at bill return switch. Does code "B" go out?

YES

Bill return switch out of adjustment. See adjustment procedure page ______

OR

Defective bill return switch replace p/n 2-10732-01

NO

Defective computer board. Replace computer control center 6-50428-01

OR

Short to ground in red/green wire from J1, Pin 21 to bill return switch.
BILL STACKER PROBLEMS

Was changer shutdown with a status code "D" (with fault LED flashing)?

YES

Disconnect plug at stacker (P501). Push reset switch. Does rest of machine operate properly?

NO

Defective computer board. Replace computer control center p/n 6-50428-01

OR

Check for short to ground in green/white wire from stacker plug P501 to J1 Pin 16.

YES

Stacker cam switches out of adjustment. See adjustment procedure page 81

OR

Defective driver board in stacker p/n 3-07527-01

OR

Defective stacker relay K501 p/n 2-12751-01

OR

Defective stacker cam switch. Refer to parts manual for correct part no.

OR

Harness problem exists inside stacker. Replace stacker p/n 6-50249-02

NO

Does stacker motor run at all?

YES

In addition to steps at left, check following:

Defective stacker motor p/n 3-50396-01

OR

Open condition in one or more of the following lines:
- green/orange from J1 - pin 20 to stacker plug pin 4
- red from harness junction box to stacker plug pin 1.
- black from stacker plug pin 3 to P202
- White and black/white (120 VAC) from stacker plug pins 7 & 8 to harness junction box.
**+5 VDC FAILURE +5 VDC LED OUT**

Is +14 VDC LED out?

**YES**

Is +30 VDC LED out?

**YES**

Defective power supply (not board) Replace power control center 6-50426-01

**NO**

Turn power off, unplug P202 and allow VR201 to cool, approx. 4-5 min.

Turn power on (P202 still unplugged) does +5VDC LED come on?

**NO**

Defective power supply board. 6-50418-01

**OR**

Defective 5VDC regulator VR201 p/n 7-00365-01

Defective circuitry in power supply. Replace power control center 6-50426-01

**YES**

Short to ground in +5V lines (blue wires) at dispenser, transport, coin switch ass'y or main machine harness

**OR**

Defective regulator VR201 replace p/n 7-00365-01

---

**BILL CHANGER REJECTS ALL OR A LARGE NUMBER OF BILLS**

The BC-20 contains self-diagnostic capabilities for identifying primary causes of rejected bills. To use this feature, insert a good, untorn and unfolded bill. Let end of bill remain in front of transport, read and identify code displayed on status display. (Bill will remain in transport for 30 seconds after it has been rejected) After that, machine will go into self-clear routine - see section: Operational Characteristics.

Look up code displayed in status code charts, make sure heading lists proper code and states: “Fault LED off”.

Read cause of rejection from chart. Causes are listed in order of most probable first, next most likely second, then third, etc. Block diagram schematic diagram, and wiring diagrams are helpful aids in checking wires, assemblies, etc.
TEST PROCEDURES

Immediately following are illustrated procedures describing the various checks called for in the troubleshooting charts. A Simpson Model 260 V.O.M. is illustrated as representative of the typical meter used in service operations.

When making the voltage measurements indicated, be sure to only touch the test probes to the exact test point shown in the illustration. Shorting power circuits to ground may result in circuit damage.

1) CHECKING A DIODE

LOW APPROX. 25 Ohms

HIGH APPROX. 1000 Ohms or higher

Diodes conduct in ONE DIRECTION ONLY. They offer infinite resistance in the opposite direction.

2) CHECKING A RESISTOR

R x 100 scale

Pointer indicates 10 x scale 100 = 1000 Ohms

COLOR CODE

0 = Black       6 = Green
1 = Brown      6 = Blue
2 = Red        7 = Violet
3 = Orange     8 = Grey
4 = Yellow     9 = White

* TOLERANCE

Silver = 10%    Gold = 5%

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3) CHECKING BUCKET SOLENOID WITH OHMMETER

A coil that looks discolored or burned should be checked. Disconnect from circuit before taking measurement.

4) CHECKING BILL PRESSURE MAGNET WITH OHMMETER

A shorted diode across the Bill Pressure Magnet coil may damage a replacement Computer Control Center when it is plugged in. Always check the Bill Pressure Magnet coil before replacing Computer Control Center or if the transport is jamming bills.
5 TESTING BILL TRANSPORT MOTOR

Perform this check if the transport motor will not run.

Pull bill transport assembly forward: do not unplug. Locate 3-pin plug on right side of transport. Insert bare end of jumper wire into center pin (grey wire) of plug. Touch other end of jumper wire to metal surface of transport. Check that motor runs forward. Repeat with pin 1 (white/black wires) and surface of transport. Check that motor runs in reverse. Replace transport motor if it does not run in both directions. If motor tries to run (hums), motor capacitor C206 is defective and should be replaced.

Motor - Part No. 3-05984-03
Capacitor - Part No. 2-13133-01
Transport - Part No. 6-50164-11

GROUND TO FRAME

CENTER PIN
(GREY WIRE)
OR MARKED CCW

JUMPER

PIN 1
(WHITE/BLACK WIRE)
OR MARKED CW

JUMPER

GROUND TO FRAME

MOTOR SHOULD RUN FORWARD  MOTOR SHOULD RUN IN REVERSE

CORRECT SPEED OF BILL ACCEPTOR DRIVE ROLLERS CAN BE CHECKED BY PUTTING A WHITE CHALK MARK ON MAIN TIMING BELT AND COUNTING HOW MANY TIMES THIS MARK PASSES A PARTICULAR POINT IN ONE MINUTE. IT SHOULD BE APPROXIMATELY 47 TIMES PER MINUTE.
TESTING P1 PHOTOCCELL

Perform this check if P4 can be adjusted but not P1

Check with Simpson 260 or equivalent. Set selector switch to 2.5V and the -DC, +DC, AC switch to -DC. Connect the red probe lead to + and the black probe lead to COMMON -. Unplug the bill transport and place the black meter probe on pin 3 (Black wire) of the 9-pin plug and the red probe on pin 5 (White/Orange wire) of the 9-pin plug. Since disconnecting the bill transport removes power to the P1 lamp, the cell must be exposed to an external light source such as a flashlight or available room light. With the cell exposed, check that the meter needle deflects to the right. The cell is defective if no meter movement is noted. Replace P1 cell, p/n 2-13398-01 or bill transport p/n 6-50164-11.
TESTING P4 PHOTOCELL

Perform this check if P1 can be adjusted but not P4.

Check with Simpson 260 or equivalent. Set selector switch to 2.5V and the -DC, +DC, AC switch to -DC. Connect the red probe lead to + and the black probe lead to COMMON -. Unplug the bill transport and place the black meter probe on pin 3 (black wire) of the 9-pin plug and the red probe on pin 6 (white/red wire) of the 9-pin plug. Since disconnecting the bill transport removes power to the P4 lamp, the cell must be exposed to an external light source such as a flashlight or available room light. With the cell exposed, check that the meter needle deflects to the right. The cell is defective if no meter movement is noted. Replace with part no. 2-13398-01 if defective or replace entire transport assembly part no. 6-50164-11.
8. TESTING P6 PHOTOCELL

Make this check if bill changer accepts bills but does not give change. This problem may be intermittent.

Set meter selector switch to 10V and the -DC, +DC, AC switch to +DC. Connect the red probe lead to + and the black probe lead to COMMON. Pull out and disconnect bill transport and place on a working surface.

CONNECT BLACK PROBE TO PIN 5 (BROWN WIRE)

NEGATIVE OFF SCALE DEFLECTION

Place black meter probe lead on pin 5 (brown wire) of 6 pin plug and red probe lead on pin 6 (yellow wire). Expose the cell to an external light source. If the meter needle moves off scale to the left with the cell exposed and the needle does not move with the cell covered, the cell is good. If no meter deflection is noted with the cell exposed, replace cell p/n 2-13398-01.

9. TESTING COIN COUNTING PHOTOTRANSISTOR IN DISPENSER ASSEMBLY

Check using Simpson 260 or equivalent. Set selector switch to 10V and the -DC, +DC, AC switch to the +DC. Connect the red probe lead to + and the black probe lead to COMMON -; turn off power to the bill changer. Remove black case from phototransistor. Connect the black probe lead to the metal dispenser backing plate and the red lead to the phototransistor blue wire. Turn power on to the bill changer; check that the small lamps are lit. If meter reading is not 4.7 to 5.2 volts DC, replace voltage regulator VR201, part no. 7-00365-01 on rear of Power Control Center.
Perform this check if accountability problems are evident, usually prevalent with one denomination of coins.

Phototransistor Assembly must have black transistor at bottom; if not, replace phototransistor assembly with part number 2-70222-01.

This test assumes that +5 VDC is present at detectors (See first part of test 9 - page 79).

Set meter selector switch to 10V. With black lead still on metal plate, place red lead on yellow/black, yellow/green or yellow/violet wire on phototransistor. With power applied to changer, reading should be 3.5 to 5.0 volts DC. If the voltage is less than 3.5 V., replace the phototransistor.

Block the light source to the phototransistor. Set meter selector switch to 2.5V. If the reading is higher than 0.6 volt, replace the phototransistor with kit no. 2-70222-01 or replace dispenser assembly part no. 6-50275-04.
ADJUSTMENTS

BILL STACKER SWITCH ADJUSTMENT

Adjust the bill stacker switch as follows:

1. Remove bill stacker from changer.

2. Hold motor brake in (disengaged) and manually rotate motor shaft until stacker is 1/2 cycle from home position (Stacker chute is at its outermost extended position). The cam and cam switches should be accessible from below and the narrow lobe of the cam should be pointed at the switches as shown in figure 21.

3. Adjust cam switches by loosening adjustment screw and rotating switch bracket until .281" (7.14 mm) diameter rod bottoms spring against switch body as shown. (An ordinary wooden lead pencil is approx. this diameter.)

4. Tighten adjustment screw and reinstall stacker in changer.

5. Turn on power and press reset switch.

FIGURE 21 ADJUSTING STACKER SWITCH

BILL RETURN SWITCH ADJUSTMENT

This switch must be in the actuated condition when the machine is on standby with the bill and coin return button out.

The switch should transfer and put the bill acceptor motor in reverse when the bill and coin return button is depressed 1/8 to 1/4 inch.

HOPPER CHAIN ADJUSTMENT

NOTE

MAKE SURE HOPPER IS EMPTY OF ALL COINS BEFORE ADJUSTING CHAIN TENSION.

1. Loosen (3) screws at top back of hopper which will allow black plastic upper chain guide ring to move diagonally upwards.

2. Pull upper chain guide ring up as shown in figure 22, while rotating drive pin clockwise until slack is removed from chain but no bind is evident.

3. Tighten the 3 screws making sure the lower screw is tightened last. If a torque wrench is available, the chain should be adjusted so that the torque input at the drive pin should be 1-4 inch pounds.

FIGURE 22 ADJUSTING HOPPER CHAIN
## SECTION 5 - ADDITIONAL INFORMATION

### HARNESS COLOR CODING

Harness wiring in the BC-20 is color coded according to function. To check wiring in the machine, find the function you want in the chart below and note the wire color associated with this function. Then, check this color wiring to find the source of problem. The wiring diagram will tell you where the wires are routed.

#### FUNCTIONS

**SUPPLY VOLTAGES** (See Note 1)

<table>
<thead>
<tr>
<th>Function</th>
<th>Wire Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 VAC Hot</td>
<td>Black/White</td>
</tr>
<tr>
<td>120 AC Common</td>
<td>White</td>
</tr>
<tr>
<td>30 VAC</td>
<td>Yellow/Black</td>
</tr>
<tr>
<td>+40 VDC</td>
<td>Orange</td>
</tr>
<tr>
<td>+40 VDC Sensed</td>
<td>Violet/Orange</td>
</tr>
<tr>
<td>+30 VDC</td>
<td>Red</td>
</tr>
<tr>
<td>+30 VDC to out of service lamp</td>
<td>Yellow/Violet</td>
</tr>
<tr>
<td>+14 VDC</td>
<td>Violet</td>
</tr>
<tr>
<td>+5 VDC</td>
<td>Blue</td>
</tr>
</tbody>
</table>

**GROUNDS**

<table>
<thead>
<tr>
<th>Ground</th>
<th>Wire Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth (Fault) Ground</td>
<td>Green/Yellow</td>
</tr>
<tr>
<td>High Current Ground</td>
<td>Black</td>
</tr>
<tr>
<td>Low Voltage Common</td>
<td>Black (See note 2)</td>
</tr>
</tbody>
</table>

**SIGNAL LINES**

**Transport:**

- Magnetic Head
- P1 Cell
- P4 Cell
- P6 Cell
- Bill Pressure Solenoid
- Transport Motor Forward
- Transport Motor Reverse

- Shielded Cable (See note 3)
- White/Orange
- White/Red
- Yellow
- White/Green
- Slate
- White/Black

**Bill Stacker:**

- Stacker Drive Signal
- Stacker Monitor

- Green/Orange
- Green/White

**Coin Switch Assembly:**

- Coin Lockout Coil
- 25¢ Coin Switch
- 50¢/$1.00 Coin Switch

- White/Blue
- White/Brown
- White/Yellow
### FUNCTIONS

<table>
<thead>
<tr>
<th>Dispenser:</th>
<th>WIRE COLOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>10¢ (Left) Coin Detector</td>
<td>Orange/Green</td>
</tr>
<tr>
<td>25¢ (Center) Coin Detector</td>
<td>Orange/Brown</td>
</tr>
<tr>
<td>5¢ (Right) Coin Detector</td>
<td>Orange/Black</td>
</tr>
<tr>
<td>10¢ (Left) Hopper Motor</td>
<td>Black/Red</td>
</tr>
<tr>
<td>25¢ (Center) Hopper Motor</td>
<td>Brown</td>
</tr>
<tr>
<td>5¢ (Right) Hopper Motor</td>
<td>Black/Yellow</td>
</tr>
<tr>
<td>$1.00 (Left) Vend Solenoid</td>
<td>Yellow/Brown</td>
</tr>
<tr>
<td>25¢ (Center) Vend Solenoid</td>
<td>Red/Black</td>
</tr>
<tr>
<td>50¢ (Right) Vend Solenoid</td>
<td>Blue/White</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power Control Center:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Relay Control</td>
<td>White/Violet</td>
</tr>
<tr>
<td>$1.00 Test Switch</td>
<td>Brown/White</td>
</tr>
<tr>
<td>50¢ Test Switch</td>
<td>Violet/White</td>
</tr>
<tr>
<td>25¢ Test Switch</td>
<td>Red/White</td>
</tr>
<tr>
<td>$1.00 Vend Counter</td>
<td>Yellow/Brown</td>
</tr>
<tr>
<td>50¢ Vend Counter</td>
<td>Blue/White</td>
</tr>
<tr>
<td>25¢ Vend Counter</td>
<td>Red/Black</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bill Return Switch:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Out Of Service Lamp</td>
<td>Red/Green</td>
</tr>
</tbody>
</table>

### NOTES:

1. Inside Power Control Center, as voltage lines pass through switches, circuit breakers, relay contacts, etc. wire colors change for clarity. Consult Power Supply schematic for these wire colors.

2. At harness plug J203 to Power Control Center, two low voltage common wires are not black. These are black/red, on Pin No. 7 and black/yellow on Pin No. 4. Both wires go to main junction box where they connect to black wires.

3. On transport top track harness, the shielded cable has black and white leads. In main harness, inside leads of shielded cable are black and red. (White changes to red at P601).
COMPONENT & CONNECTOR DESIGNATION

<table>
<thead>
<tr>
<th>SERIES</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-199</td>
<td>COMPUTER CONTROL CENTER</td>
</tr>
<tr>
<td>200-299</td>
<td>POWER CONTROL CENTER</td>
</tr>
<tr>
<td>300-399</td>
<td>COIN SWITCH &amp; BRACKET ASSY</td>
</tr>
<tr>
<td>400-499</td>
<td>BILL STACKER</td>
</tr>
<tr>
<td>600-699</td>
<td>BILL TRANSPORT</td>
</tr>
<tr>
<td>700-799</td>
<td>BILL RETURN SWITCH</td>
</tr>
<tr>
<td>800-899</td>
<td>OUT OF SERVICE LAMP</td>
</tr>
<tr>
<td>900-999</td>
<td>MAIN HARNESS JUNCTION BOX</td>
</tr>
</tbody>
</table>

ALL GROUND LINES FROM MODULES ARE RETURNED DIRECT TO POWER CONTROL CENTER. INDIVIDUAL MODULE CHASSIS ARE NOT GROUNDED TO LOW VOLTAGE COMMON EXCEPT AT POWER CONTROL CENTER.

COMMONING BLOCK IN POWER CONTROL CENTER

EARTH (FAULT) GROUND

POWER GROUND (OVER 2A)

LOW-VOLTAGE COMMON (SIGNAL GROUND)

LOW-VOLTAGE COMMON LINES TO TEST SWITCHES

YELLOW

BLACK

COMMONING BLOCK IN POWER CONTROL CENTER

NOTE:
1. BLACK WIRES AT THESE LOCATIONS MAY BE INTERCHANGED.
2. BLK WIRES AT THESE LOCATIONS MAY BE INTERCHANGED.
3. BLACK WIRES AT LOCATIONS MARKED MAY NOT BE INTERCHANGED WITH BLACK WIRES AT LOCATIONS MARKED.

THESE SYMBOLS INDICATE A CONNECTION INSIDE HARNESS JUNCTION BOX (BEHIND POWER CONTROL CENTER ON BACK WALL).
<table>
<thead>
<tr>
<th>COMPONENT REF DESIGNATION</th>
<th>DESCRIPTION</th>
<th>ROWE PART NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C201</td>
<td>CAPACITOR - ELECTROLYTIC</td>
<td>2200/2500 Mfd 50 V</td>
</tr>
<tr>
<td>C202</td>
<td>CAPACITOR - ELECTROLYTIC</td>
<td>1250 Mfd 50 V</td>
</tr>
<tr>
<td>C203</td>
<td>CAPACITOR - TANTALUM</td>
<td>33 Mfd 35 V</td>
</tr>
<tr>
<td>C204</td>
<td>CAPACITOR - MYLAR</td>
<td>.1 Mfd 100 V</td>
</tr>
<tr>
<td>C205</td>
<td>CAPACITOR - ELECTROLYTIC</td>
<td>4700 Mfd 25 V</td>
</tr>
<tr>
<td>CR201</td>
<td>DIODE - ZENER</td>
<td>33 VOLT 1 W</td>
</tr>
<tr>
<td>CR202</td>
<td>DIODE - SILICON</td>
<td></td>
</tr>
<tr>
<td>CR203</td>
<td>DIODE - SILICON</td>
<td></td>
</tr>
<tr>
<td>CR204</td>
<td>NOT USED</td>
<td></td>
</tr>
<tr>
<td>CR205-CR208</td>
<td>DIODE - SILICON</td>
<td></td>
</tr>
<tr>
<td>CR209-CR212</td>
<td>DIODE - LIGHT EMITTING</td>
<td></td>
</tr>
</tbody>
</table>
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## DESCRIPTION

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<td>Base Assembly</td>
<td>104</td>
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<td>3</td>
<td>Front Door Assembly</td>
<td>105</td>
</tr>
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<td>4</td>
<td>Bill Acceptor Transport Assembly</td>
<td>106</td>
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<td>5</td>
<td>Upper Track Assembly</td>
<td>110</td>
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<td>112</td>
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<td>7</td>
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<td>9</td>
<td>Change Bucket Assembly</td>
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<tr>
<td>10</td>
<td>Hopper Assembly</td>
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<td>11</td>
<td>Coin Acceptor Bracket and Harness Assembly</td>
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<td>12</td>
<td>Bill Stacker Assembly</td>
<td>124</td>
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<td>13</td>
<td>Coin Inlet and Chute Assembly</td>
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INTRODUCTION

This parts catalog lists procurable replacement parts for the BC-20 Bill and Coin Changer.

The purpose of this parts catalog is to locate and identify replaceable components and to supply ordering information.

DESCRIPTION

The parts catalog is divided into 13 major assemblies called "FIGURES" corresponding to the illustrations used. In some instances major assemblies require more than one illustration to identify the procurable parts.

Parts of riveted or welded units are not listed since repair of these parts is normally impractical in the field; however these parts are available as assemblies.

To be sure that this parts catalog contained the latest information, last minute revisions were made. In these instances the additions were added in sequence with a letter added to the identification numbers both in the parts list and corresponding illustrations i.e., 1A, 1B, 1C.

The Parts List contains four columns:

- Fig and Index No. - The first entry in this column lists the figure number of the corresponding illustration. An index number when listed corresponds to the index number appearing on the illustration. Index numbers are not used when:
  - Items are listed for reference purposes only.
  - The item listed is an alternate part.
  - Rowe Part No. - This column lists the part number of the item which should be specified for ordering purposes.
  - Description - This column contains a brief word description of the assembly or part. Each item is indented to show its proper relationship to the unit of which it is a part or to its next higher assembly.
  - Qty. Per Assy. - This column contains the quantity of the part used in the assembly. When a figure covers more than one model of an assembly, the "Qty. Per Assy." column is divided to show each model.

ORDERING REPLACEMENT PARTS

All replacement parts can be ordered directly from an authorized ROWE Distributor.

Once the replacement item is determined, complete a standard parts order form available from your ROWE distributor at no charge. Very often parts orders are delayed, because of inadequate or incomplete information. To insure prompt parts delivery, always specify the following information:

- Part Number and Description. State color if applicable.
- Quantity required.
- Model and Serial Number of machine for which the repair part is needed.
- Complete shipping address including ZIP code.
- Shipping Instructions must be specified. If the shipping method selected is Parcel Post, Air Parcel Post, United Parcel Service or Air UPS, indicate an alternate shipping method if there is a possibility the packages may exceed the size and weight limits established by these services.

If you would like ROWE to select the best way to ship your parts order, specify "BEST WAY". If fastest delivery is the requirement, specify "FASTEST WAY". ROWE will select the carrier for those orders which justify shipment by truck.
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<th>QTY./PER ASSY</th>
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*6-50167-08        | Base Assembly - Roweswood                          |               |
Bill And Coin Changer Assembly
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# Base Assembly

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* 6-50167-08   . Base Assembly - Rowsewood

** 6-50183-10 . Base Door Assembly - Rowsewood
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# Hopper Assembly Sheet 1

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Coin Acceptor Bracket
And Harness Assembly
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