<table>
<thead>
<tr>
<th>OPERATION</th>
<th>POWER</th>
<th>COAST</th>
<th>BRAKE</th>
</tr>
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<tbody>
<tr>
<td>ACC. POSN.</td>
<td></td>
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<tr>
<td>1-74</td>
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<tr>
<td>75-79</td>
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<td>80-84</td>
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<td>85-89</td>
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<td>90-94</td>
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<td>95-99</td>
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<td>99-90</td>
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<td>89-85</td>
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<td>84-1</td>
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<table>
<thead>
<tr>
<th>OPERATION</th>
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<tbody>
<tr>
<td>B.2</td>
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<td>F.3</td>
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<td>R.1</td>
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<tr>
<td>M.2</td>
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<tr>
<td>M.1</td>
</tr>
<tr>
<td>LS</td>
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</tbody>
</table>
Preparations

(1) Remove the cover from the Motor Cut-Out switch box and move switch to "All Out" position.

(2) Lock the foot interlock pedal in its running position - to do this place the switch iron loop end over the foot interlock pedal with the shank hooked by the chain located under the operator's arm rest, or place switch iron between grab rail and gang switch to hold foot interlock down. This will in turn release the brake pedal to its "OFF" position.

(3) Move the Reverser handle to the forward position.

(4) Connect the master voltmeter across the GA and GAA terminals of the voltage regulator panel.

(5) Place the trolley pole on the trolley wire.

(6) Move the M.G. switch and the front door switch to their "ON" positions.

(7) Close the battery knife switch and after the motor generator set has started open the battery knife switch.

(8) Close the front doors from outside the car by moving the switch located under the right hand advertising hood to the door closed position.

(9) By means of the knurled calibration screw on the voltage regulator panel reduce the generator voltage to 24 volts. The voltage may also be reduced by connecting the resistor. 75 ohm 10 watt supplied for this purpose across the terminals of the 76 ohm resistor on the voltage regulator panel.

(10) Place a small piece of paper between the moving carbon and back silver contact of the limit relay.

(11) By means of the proper controller operating wrenches operate the master controller as follows.

(12) Refer to the sequence procedure for the type of cars being tested.

EE2
October 6th, 1955
SEQUENCE TESTS OF CONTROL EQUIPMENT

SEQUENCE PROCEDURE Cars 4000-4139

(1) Operate the Master controller to the "ON" position.
F3 and F4 contactors pick up.
F2, E1 and E2 contactors drop out.
Line Switch, M1 and M2 contactors pick up.

Operate controller slowly several times to make sure the above contactors drop out and pick up as outlined above.

(2) Operate Master Controller to "ON" position and hold it in this position. Rotate the pilot motor shaft by hand to move the Accelerator from position 1 to position 99 and observe that the contactors operate as follows:

Position 4 F3 contactor drops out.
Position 6 F4 contactor drops out.
Position 72 M2 contactor picks up.
Position 74 M1 contactor picks up.
Position 75 F2 contactor picks up.
Position 77 F3 contactor picks up.
Position 78 F4 contactor picks up.

(3) Release the Master Controller to the "OFF" position.

Line switch M1, M2, M3, F3 and F4 contactors drop out and E1 and E2 contactors pick up. F1 and F2 remain picked up.

Operate the controller several times to make sure the above changes take place and observe each contactor while it is operating to make sure it operates without binding or hesitation and that it seals in properly, and also that the interlocks have the required compression.

(4) With the controller in the "OFF" position rotate the pilot motor shaft to move the Accelerator from position 99 towards position 1.

Position 74 F1 contactor should drop out.

(5) Remove paper from between limit relay contacts - do not withdraw paper with contacts closed. Operate the Master controller several times allowing the Pilot Motor time to run up or down between each operation. Observe that the Accelerator operates freely. Check that the rollers roll over the main fingers smoothly and that they compress the fingers to the bus bar as they pass over the fingers. Check that the interlock fingers lift up on their segments with the proper compression and that they maintain the compression while sliding over the entire segment. Check that 11 finger breaks the pilot motor.

EE3
October 6th, 1955
circuit at position 97 and that 12 finger breaks the pilot motor circuit at position 4. Check that the lock out fingers L9 and B- break contact with their segment before the 12 finger breaks the pilot motor circuit. Check the pilot motor shaft for excessive wobble and looseness.

(6) By means of the Knurled Calibration screw on the voltage regulator panel raise the Generator voltage to 36 volts. Make sure the knifed edge of the Calibration screw fits into the slot in the bracket. If a resistor was used to lower the voltage, remove the resistor.

(7) With the Master controller in the "OFF" position press the limit relay armature so that the moving carbon contact touches the front or "16" silver contact. Observe that the Accelerator moves from position 1 to position 99.

(8) With the Master Controller in the "ON" position and the Accelerator at position 99 press the Limit Relay armatures as in 7 above and observe that the Accelerator moves from position 99 to position 1.

(9) Operate the Master Controller and check the speed at which the Pilot Motor drives the Accelerator. At 36 volts the Accelerator should move from:
   Position 1 to position 97 in 3 seconds.
   Position 99 to position 4 in 3 seconds.

(10) Connect a 32 volt non-short circuiting lamp across the limit relay contact #15 to B- and check the "OFF" tension of the relay.

   Tension for cars 4000-4139, 5 ounces.

(11) One man to go up into the car open the front doors from the outside front door switch and operate the brake pedal as follows:

   Depress the brake pedal slowly from the "OFF" position to Emergency Latch position.

   The man under the car to observe the following:

   (a) Track brake commutator and brushes for proper commutation. Excessive burning usually indicates open circuits in the wiring or sticky brushes.

   (b) All four track shoes must pull down to the rails.

   When the brake pedal is in the Emergency position, the gong must ring and the sanders must operate. The man operating the brake pedal to check as follows:

EE4
December 5th, 1966.
SEQUENCE PROCEDURE - (cont'd)

(a) That the brake pedals latches and unlatches easily in the service latch, second latch and emergency latch positions.

(b) That the brake pedal secondary spring has sufficient tension to indicate full service between position and that the track brake warning light is set to light up when the pedal is depressed past the full service position.

(c) When the brake pedal is in the Emergency position the doors are to be balanced.

(12). Restore the car to the proper Car House parking conditions:

(a) Remove the trolley pole from the trolley wire.

(b) Place brake pedal in service latch position and remove switch iron from foot interlock pedal.

(c) Move reverser handle to extreme forward position.

(d) Move M.G. Switch to the "OFF" position.

(e) Move Motor Cut-Out switch to "All In" position and replace cover.

(f) Disconnect Master Voltmeter.

October 6th, 1955
Preparations

(1) Remove the cover from the Motor Cut-Out switch box and move switch to "ALL OUT" position.

(2) Lock the foot interlock pedal in its running position - to do this place switch iron loop end over the foot interlock pedal and the shank supported by the route and destination sign index board to hold it in its running position.

(3) Move the Reverser handle to the forward position.

(4) Connect the master voltmeter across the G.A. and GAA terminals of the voltage regulator panel.

(5) Place the trolley pole on the trolley wire.

(6) Move the M.G. switch and the front door switch to their "ON" positions.

(7) Close the battery knife switch and after the motor generator set has started open the battery knife switch.

(8) Close the front doors from outside the car by moving the switch located under the right hand advertising hood to the door closed position.

(9) By means of the knurled calibration screw on the voltage regulator panel reduce the generator voltage to 24 volts. The voltage may also be reduced by connecting the resistor, 75 ohm 10 watt supplied for this purpose across the terminals of the 78 ohm resistor on the voltage regulator panel.

(10) Place a small piece of paper between the moving carbon and back silver contact of the limit relay.

(11) By means of the proper controller operating wrenches operate the master controller as follows.

(12) Refer to the sequence procedure for the type of cars being tested.

October 11, 1955.
(1) Operate the Master Controller to the "ON" position.

F3 and F4 contactors should pick up.
F2, B1 and B2 contactors should drop out.
Line switch, M1 and R1 contactors should pick up.

Operate the controller several times to make sure the above contactors drop out and pick up as outlined above.

(2) Operate Master Controller to "ON" position and hold it in this position. Rotate the pilot motor shaft by hand to move the accelerator from position 1 to position 99 and observe that the contactors operate as follows:

- Position 4: F3 contactor drops out.
- Position 6: F4 contactor drops out.
- Position 75: M2 contactor picks up.
- Position 78: F1 contactor picks up.
- Position 79: F2 contactor picks up.
- Position 81: F3 contactor picks up.
- Position 82: F4 contactor picks up.

(3) Release the Master Controller to the "OFF" position.

Line Switch M1, M2, R1, F1, F3 and F4 contactors should drop out and B1 and B2 contactors should pick up and F2 remained picked up.

Operate the controller several times to make sure the above changes take place, and observe each contactor while it is operating to make sure it operates without binding or hesitation and that it seals in properly, and also that the interlocks have the required compression.

(4) With the Master Controller "ON" and the contactors picked up hold the R1 contactor in by hand and release the Master Controller to the "OFF" position. The Line Switch M1, M2, F1, F3 and F4 should remain in as long as the R1 is held in by hand. This ensures that the easy shut-off of the control sequence is correct.

CAUTION

DO NOT TOUCH THE COIL TERMINALS OF THE R1 CONTACTOR AS THEY ARE ENERGIZED BY 600 Volts.

(5) With the controller in the "OFF" position rotate the pilot motor shaft to move the accelerator from position 99 towards position 1.

EE6
October 11, 1955
SEQUENCE PROCEDURE - Cont'd.

(6) Remove the piece of paper from the contacts of the Limit Relay and operate the Master Controller several times allowing the Pilot Motor time to run up or down between each operation. Observe that the Accelerator operates freely. Check that the rollers roll over the main accelerator fingers smoothly and that they compress each finger to the bus bar in turn as it passes over them. Check that the interlock cam switch rollers roll on their respective segments and that the cam switches open or close properly. Check that they have the proper compression when closed. Check that 11-13 cam switch breaks the pilot motor circuit as position 97 and that the 12-62 cam switch breaks the pilot motor circuit at position 4. Check the pilot motor shaft for excessive wobble and looseness.

(7) By means of the knurled calibration screw on the voltage regulator panel raise the generator voltage to 36 volts. Make sure the knifed edge of the calibration screw fits into the slot in the bracket. If a resistor was used to lower the voltage remove the resistor.

(8) With the master controller in the "OFF" position press the limit relay armature so that the moving carbon contact touches the front or "18" silver contact. Observe that the accelerator moves from position 1 to position 99.

(9) With the master controller in the "ON" position and the accelerator at position 99 press the Limit Relay Armature as in 8 above and observe that the accelerator moves from position 99 to position 1.

(10) Operate the Master Controller and check the speed at which the Pilot Motor moves the Accelerator.

At 36 volts the Accelerator should move from positions

1 - 97 = 3 seconds.
99 - 30 = 2, seconds.
30 - 4 = 2½ seconds.

(11) Connect a 32 volt non-short circuiting lamp across the limit relay contact #15 and B- and check the "OFF" tension of the relay.

Tension for cars 4150-4299 is 7 ounces.
4574-4601 is 7 ounces.

(12) One man to go up into the car, open the front doors from the outside front door switch and operate the brake pedal as follows:

EE7

December 5th, 1966.
SEQUENCE PROCEDURE - Cont'd

(12) Continued.

Depress the brake pedal slowly from the "OFF" position to the Emergency Latch position.

The man under the car to observe the following:

(a) Track brake commutator and brushes for proper commutation - Excessive burning usually indicates open circuits in the wiring or sticky brushes.

(b) All four track brake shoes must pull down to the rails.

(c) When the brake pedal is in the Emergency Latch position, the gong must ring and the sanders must operate.

The man operating the brake pedal to check as follows:

(d) That the brake pedal latches and unlatches easily in the service latch, second latch and Emergency latch position.

(e) That the brake pedal secondary spring has sufficient tension to indicate full service brake position and that the track brake warning light is set to light up when the pedal is depressed past the full service position.

(f) When the brake pedal is in the Emergency latch position, the doors are to be balanced.

(13) Restore the car to the proper Carhouse parking conditions

(a) Remove the trolley pole from the trolley wire.

(b) Place the brake pedal in service latch position and remove the switch iron from the foot-interlock pedal.

(c) Move the reverser handle to the extreme forward position.

(d) Move the M.G. switch to the "OFF" position.

(e) Move the motor cut-out switch to the "ALL IN" position, and replace the cover.

(f) Disconnect the master voltmeter.

EE6
October 11, 1955.
Preparations

(1) Remove the cover from the Motor Cut-Out switch box and move switch to "ALL OUT" position.

(2) Lock the foot interlock pedal in its running position - to do this place switch iron loop end over the foot interlock pedal and the shank supported by the route and destination sign index board to hold it in its running position.

(3) Move the Reverser handle to the forward position.

(4) Connect the master voltmeter across the G.A. and GAA terminals of the voltage regulator panel.

(5) Place the trolley pole on the trolley wire.

(6) Move the M.G. switch and the front door switch to their "ON" positions.

(7) Close the battery knife switch and after the motor generator set has started open the battery knife switch.

(8) Close the front doors from outside the car by moving the switch located under the right hand advertising hood to the door closed position.

(9) By means of the knurled calibration screw on the voltage regulator panel reduce the generator voltage to 24 volts. The voltage may also be reduced by connecting the resistor, 75 ohm 10 watt supplied for this purpose across the terminals of the 78 ohm resistor on the voltage regulator panel.

(10) Place a small piece of paper between the moving carbon and back silver contact of the limit relay.

(11) By means of the proper controller operating wrenches operate the master controller as follows.

(12) Refer to the sequence procedure for the type of cars being tested.
GENERAL INFORMATION

CHECKING ACCELERATOR DRUM INTERLOCK FINGERS FOR PROPER SEQUENCE

CARS 4000-4139

Rotate the pilot motor shaft to run the accelerator down to the bottom stops, then rotate the pilot motor shaft slowly from position 1 to position 99 and observe that the interlock fingers have sufficient tension on the segments and that they make a break as follows:

Position 1  Fingers 11, 13, 20, 43 and 44 are in contact with their respective segments.
Position 4  1/2 Finger 12 makes contact with segment for 11, 12 and 13 fingers.
Position 4  1/2 Finger 43 breaks contact with segment for 20, 43 and 44 fingers.
Position 5  1/2 Finger L9 and B- (Lock out coil circuit) make contact with their segment.
CAUTION:  Finger 12 must make contact at least 1/2 pos. before finger L9-B- and L0. This important as a failure of LR and L0 - L9-B- to break contact before 12 finger results in no air brake being applied at the end of the braking cycle.

Position 6  1/2 Finger 20 and 44 break contact with their segment.
Position 72  1/2 Finger 20 and 21 make contact with their segment.
CAUTION:  Fingers 20 and 21 must make contact at this point otherwise M2 contactor will lag behind in picking up and cause excessive burning of the main bus bar and fingers around the 75th position.

Position 74  1/2 Finger 33 and 41 make contact on the segment for 33, 41 and 42 fingers.
Position 75  1/2 Finger 42 makes contact with segment for 33, 41 and 42 fingers.
Position 77  1/2 Finger 55 and 43 make contact with the segment for 55, 43 and 44 fingers.
Position 78  1/2 Finger 44 makes contact with the segment 55 and 43 and 44 fingers.
Position 97  1/2 Finger 11 breaks contact with segment for 11, 12 and 13 fingers.

EE43
October 12, 1955.
CHECKING ACCELERATOR DRUM CAM SWITCHES FOR PROPER SEQUENCE:

Continued.

Rotate the pilot motor shaft to run the accelerator down to the bottom stop. Then rotate the pilot motor shaft slowly from position 1 to position 99 and observe that the cam switches operate as follows:

Cars 4150 - 4299 & Cars 4575 - 4601

<table>
<thead>
<tr>
<th>Position</th>
<th>Cam switches 11-13, 33-43, 33-44 and 20-33 are closed. All other cam switches are open.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position</td>
<td>-(\frac{1}{2}) Cam switch 12-62 closed.</td>
</tr>
<tr>
<td>Position</td>
<td>-(\frac{1}{2}) Cam switch 33-43 opens.</td>
</tr>
<tr>
<td>Position</td>
<td>-(\frac{3}{2}) Cam switch LR, LR2 closes.</td>
</tr>
<tr>
<td>CAUTION:</td>
<td>Cam switch 12-62 must close at least one position ahead of LR-LR2.</td>
</tr>
<tr>
<td>Position</td>
<td>-(\frac{1}{2}) Cam switches 20-33 and 33-44 open.</td>
</tr>
<tr>
<td>Position</td>
<td>-(\frac{1}{2}) Cam switch 12-13 closes.</td>
</tr>
<tr>
<td>Position</td>
<td>-(\frac{1}{2}) Cam switch 12-62 opens.</td>
</tr>
<tr>
<td>CAUTION:</td>
<td>Cam switches 12-13 and 12-62 must overlap. Both cam switches must be closed for at least one position.</td>
</tr>
<tr>
<td>Position</td>
<td>-(\frac{1}{2}) Cam switch 20-21 closes.</td>
</tr>
<tr>
<td>CAUTION:</td>
<td>Cam switch 20-21 must close at position 75 otherwise M2 contactor will lag in picking up and cause excessive burning of the bus bar fingers at the 78 position.</td>
</tr>
<tr>
<td>Position</td>
<td>-(\frac{1}{2}) Cam switch 33-41 closes.</td>
</tr>
<tr>
<td>Position</td>
<td>-(\frac{1}{2}) Cam switch 33-77 closes.</td>
</tr>
<tr>
<td>Position</td>
<td>-(\frac{1}{2}) Cam switch 33-43 closes.</td>
</tr>
<tr>
<td>Position</td>
<td>-(\frac{1}{2}) Cam switch 33-44 closes.</td>
</tr>
<tr>
<td>Position</td>
<td>-(\frac{1}{2}) Cam switch 11-13 opens.</td>
</tr>
</tbody>
</table>

END

October 12, 1955.
MASTER CONTROLLER SEQUENCE

Checking controllers for proper cam switch sequence.

It is essential for the proper operation of control equipment that the degrees that separate the opening and closing of the cam switches be maintained as described below.

By means of the proper controller wrench advance the controller from the "OFF" position to the "ON" position and check the cam switches as follows:

**CARS 4000-4139**

Controller OFF  
B1 plus to  7  closes.  
50  to  42  closes.  
All other cam switches open.

Controller ON 12°  
10  to  20  closes.  
Controller ON 14°  
50  to  42  opens.  
50  to  10  or  17  closes.  
Controller ON 17°  
B1 plus to  7  opens.  
Controller ON 18°  
31  to  20  closes.  
Controller ON 24°  
33  to  55  closes.

**CARS 4150-4199 AND 4575-4601**

Controller OFF  
B1 plus to  7  closes.  
All other cam switches open.

Controller ON 8°  
31  to  G  closes.  
Controller ON 10°  
55 or 20  to  10  closes.  
Controller ON 12°  
50  to  35  closes.  
Controller ON 14°  
B1 plus to  7  opens.  
Controller ON 19°  
77  to  42  closes.

**CARS 4200-4299**

Controller OFF  
B1 plus to  7  closes.  
All other cam switches open.

Controller ON 8°  
31 or 37  to  G  closes.  
Controller ON 10°  
55  to  20  closes.  
Controller ON 12°  
50  to  10  closes.

EE51  
October 12, 1955.
MASTER CONTROLLER SEQUENCE:  Cont’d.

CARS 4200-4299:  Cont’d.
Controller ON 14°  B1 plus to 7 opens
Controller ON 19°  77 to 42 closes

CARS 4300-4399
Controller OFF
Controller ON 7°  31 to G closes
Controller ON 8°  20 to 20A closes
Controller ON 9°  10 to 20 closes

CARS 4400-4499
Controller OFF
Controller ON 10°  5H - 5G closed
12°  B2 - G closes
14°  3 - 3A closes
16°  3 - 6G closes
35°  5B - 5D closes
40°  5B - 5C opens
52°  5B - 5E closes
60°  5B - 5D opens
72°  5B - 5G closes
80°  5B - 5E opens
100°  5B - 5G opens

CARS 4500-4549
Controller OFF
Controller ON 7°  4 - G closes
8°  3C - 3G closes
9°  3B - 3C closes

CARS 4550-4574
Controller OFF
Controller ON 7°  T3 - T3A closes
8°  5B - 5E closes
9°  5A - 5B closes
### MASTER CONTROLLER SEQUENCE: Cont'd

#### CARS 4625-4674

<table>
<thead>
<tr>
<th>Controller</th>
<th>10°</th>
<th>14°</th>
<th>22°</th>
<th>40°</th>
<th>52°</th>
<th>60°</th>
<th>72°</th>
<th>80°</th>
<th>100°</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF ON</td>
<td>5B - 5A closes</td>
<td>5D - 4 closes</td>
<td>5E - 5B closes</td>
<td>5E - 5A opens</td>
<td>5E - 5C closes</td>
<td>5E - 5B opens</td>
<td>5E - 5D closes</td>
<td>5E - 5C opens</td>
<td>5E - 5D opens</td>
</tr>
</tbody>
</table>

#### CARS 4675-4699

<table>
<thead>
<tr>
<th>Controller</th>
<th>10°</th>
<th>12°</th>
<th>14°</th>
<th>32°</th>
<th>40°</th>
<th>52°</th>
<th>60°</th>
<th>72°</th>
<th>80°</th>
<th>100°</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF ON</td>
<td>5B - 5C closes</td>
<td>3A - 3R closes</td>
<td>3 - 6C closes</td>
<td>5B - 5D closes</td>
<td>5B - 5C opens</td>
<td>5B - 5E closes</td>
<td>5B - 5D opens</td>
<td>5B - 5G closes</td>
<td>5B - 5E opens</td>
<td>5B - 5G opens</td>
</tr>
</tbody>
</table>

#### CARS 4700-4747

<table>
<thead>
<tr>
<th>Controller</th>
<th>7°</th>
<th>8°</th>
<th>9°</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>T4B - G closes</td>
<td>5B - 5C closes</td>
<td>5A - 5B closes</td>
</tr>
</tbody>
</table>

#### CARS 4750-4779

<table>
<thead>
<tr>
<th>Controller</th>
<th>8°</th>
<th>9°</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF ON</td>
<td>3D - 3E closed</td>
<td>3D - 3E opens</td>
</tr>
<tr>
<td></td>
<td>A4B - G closes</td>
<td>5A - 5B closes</td>
</tr>
<tr>
<td>Cars 4000-4139</td>
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</tr>
<tr>
<td>----------------</td>
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<td>------------------</td>
</tr>
<tr>
<td>Controller OFF</td>
<td>E8 = 50 closes.</td>
<td>C8 = 09 closes.</td>
</tr>
<tr>
<td></td>
<td>B4 = B5 closes.</td>
<td>All other cam switches open.</td>
</tr>
<tr>
<td>ON 8°</td>
<td>B4 = B5</td>
<td></td>
</tr>
<tr>
<td>10°</td>
<td>B1 ‡ = 7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B1 = LR1 or LO</td>
<td></td>
</tr>
<tr>
<td>12°</td>
<td>B1 = 50</td>
<td></td>
</tr>
<tr>
<td>124°</td>
<td>C8 = G9</td>
<td></td>
</tr>
<tr>
<td>126°</td>
<td>H6 = H5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D2 = G9</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Cars 4150-4299</th>
<th></th>
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<tbody>
<tr>
<td>Controller OFF</td>
<td>B1 = 50 closes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>61 = 30</td>
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</tr>
<tr>
<td>ON 10°</td>
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</tr>
<tr>
<td></td>
<td>B4 or B44 = B5</td>
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</tr>
<tr>
<td></td>
<td>B1 = 7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B1 = 33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B1 = LR1 or LO</td>
<td></td>
</tr>
<tr>
<td>ON 17°</td>
<td>B1 = 50 opens.</td>
<td></td>
</tr>
<tr>
<td>ON 25°</td>
<td>B4 or B44 = B5</td>
<td></td>
</tr>
<tr>
<td>ON 124°</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B1 = 30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON 126°</td>
<td>G5 = 17 opens.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>28 = G9 closes.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cars 4300-4399</th>
<th>Front Cam Switch Board</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller OFF</td>
<td>45 = B-1 closes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B1 = 5</td>
<td></td>
</tr>
<tr>
<td>ON 5°</td>
<td>B5 = B44</td>
<td></td>
</tr>
<tr>
<td>124°</td>
<td>B1 = 5</td>
<td></td>
</tr>
<tr>
<td>128°</td>
<td>B7 = 28</td>
<td></td>
</tr>
<tr>
<td></td>
<td>75 = B-</td>
<td></td>
</tr>
</tbody>
</table>

| Rear Cam Switch Board |  |  |
| Controller OFF | 8G = G8 closes.        |  |
| 36°            | 8G = 8A opens.         |  |

**October 12, 1955**
BRAKE CONTROLLERS (Cont'd)

Controller ON
61° 8C - 8B  opens
90° 9C - 9F  closes
94° 9D - 9B  closes
106° 9D - 9A  closes
116° 9D - 9C  closes
128° B3 - 41  closes

CARS 4400-4499

Controller OFF
61° 8C - 8B  opens
90° 9C - 9F  closes
94° 9D - 9B  closes
106° 9D - 9A  closes
116° 9D - 9C  closes
128° B3 - 41  closes

Front Cam Switch Board
B2 - 6A  closed
B2 - 5C  closed
B16 - 11  closed
5B - 5D  closes
B2 - 6A  opens
B2 - 5C  opens
B16 - 12  opens
Parking Latch
B2 - 8  closes
B2 - 10  closes
B2 - 8  opens

Rear Cam Switch Board
14 - 14C  closed
B2 - 18A  closes
5B - 5E  closes
5B - 5G  closes
5B - 5E  opens
5B - 5G  opens
Parking Latch
B2 - 15B  closes
14 - 14C  opens
B4 - 0  closes
10A - 0  closes

CARS 4500-4549

Controller OFF
70° 14 - 14C  closed
26° 18A  closes
45° 5E  closes
51° 5G  closes
70° 5E  opens
78° 5G  opens
Parking Latch
B2 - 15B  closes
14 - 14C  opens
B4 - 0  closes
10A - 0  closes

Front Cam Switch Board
4C - B-  closed
B2 - 3  closed
X3A - X3B  closed
B7 - 28  closed

51° 4C - B-  opens
62° 3  opens
115° 53  opens
123° B7 - 28  opens
128° 76 - B-  closes

EE. 55
June 20th, 1961.
# BRAKE CONTROLLERS (Cont'd)

## Cars 4500-4549 (Cont'd)

### Controller OFF

<table>
<thead>
<tr>
<th>Controller ON</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>70°</td>
</tr>
<tr>
<td></td>
<td>360°</td>
</tr>
<tr>
<td></td>
<td>610°</td>
</tr>
<tr>
<td></td>
<td>90°</td>
</tr>
<tr>
<td></td>
<td>94°</td>
</tr>
<tr>
<td></td>
<td>106°</td>
</tr>
<tr>
<td></td>
<td>116°</td>
</tr>
<tr>
<td></td>
<td>116°</td>
</tr>
<tr>
<td></td>
<td>128°</td>
</tr>
</tbody>
</table>

### Rear Cam Switch Board

<table>
<thead>
<tr>
<th>11A - 11D</th>
<th>closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>11B - 11D</td>
<td>closed</td>
</tr>
<tr>
<td>11C - 11D</td>
<td>closed</td>
</tr>
<tr>
<td>11A - 11D</td>
<td>opens</td>
</tr>
<tr>
<td>11B - 11D</td>
<td>opens</td>
</tr>
<tr>
<td>11C - 11D</td>
<td>opens</td>
</tr>
<tr>
<td>B+ - 8F</td>
<td>closes</td>
</tr>
<tr>
<td>8B - 10A</td>
<td>closes</td>
</tr>
<tr>
<td>8A - 10A</td>
<td>closes</td>
</tr>
<tr>
<td>B+ - 10A</td>
<td>closes</td>
</tr>
<tr>
<td>B+ - 10A</td>
<td>closes</td>
</tr>
<tr>
<td>B1 - 41</td>
<td></td>
</tr>
</tbody>
</table>

### Cars 4550-4574

### Controller OFF

### Front Cam Switch Board

<table>
<thead>
<tr>
<th>3L - B-</th>
<th>closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>B6 - 5</td>
<td>closed</td>
</tr>
<tr>
<td>28A - B3</td>
<td>closed</td>
</tr>
<tr>
<td>6C - 6B</td>
<td>closed</td>
</tr>
</tbody>
</table>

### All other cam switches open

<table>
<thead>
<tr>
<th>3L - B-</th>
<th>opens</th>
</tr>
</thead>
<tbody>
<tr>
<td>B6 - 5</td>
<td></td>
</tr>
<tr>
<td>6B - 6C</td>
<td>opens</td>
</tr>
<tr>
<td>B6 - 53</td>
<td>closes</td>
</tr>
<tr>
<td>28A - B3</td>
<td>opens</td>
</tr>
<tr>
<td>76 - B-</td>
<td>closes</td>
</tr>
</tbody>
</table>

### Controller ON

<table>
<thead>
<tr>
<th>Controller OFF</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>70°</td>
</tr>
<tr>
<td></td>
<td>360°</td>
</tr>
<tr>
<td></td>
<td>610°</td>
</tr>
<tr>
<td></td>
<td>90°</td>
</tr>
<tr>
<td></td>
<td>94°</td>
</tr>
<tr>
<td></td>
<td>106°</td>
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<tr>
<td></td>
<td>116°</td>
</tr>
<tr>
<td></td>
<td>116°</td>
</tr>
<tr>
<td></td>
<td>128°</td>
</tr>
</tbody>
</table>

### Rear Cam Switch Board

<table>
<thead>
<tr>
<th>B6 - 8</th>
<th>closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>8C - 8</td>
<td>closed</td>
</tr>
<tr>
<td>8B - 8</td>
<td>closed</td>
</tr>
<tr>
<td>B6 - 8</td>
<td>opens</td>
</tr>
<tr>
<td>8C - 8</td>
<td>opens</td>
</tr>
<tr>
<td>8B - 8</td>
<td>opens</td>
</tr>
<tr>
<td>B+ - 9F</td>
<td>closes</td>
</tr>
<tr>
<td>B+ - 9A</td>
<td>closes</td>
</tr>
<tr>
<td>B+ - 9D</td>
<td>closes</td>
</tr>
<tr>
<td>B+ - 9C</td>
<td>closes</td>
</tr>
<tr>
<td>B+ - 9C</td>
<td>closes</td>
</tr>
<tr>
<td>B2 - 41</td>
<td>closes</td>
</tr>
</tbody>
</table>
BRAKE CONTROLLERS (Cont'd.)

Cars 4575-4601

Controller OFF

71 - 30  ) closed
88 - 5

All other cam switches open

Controller ON  6°
10°
10°
15°
35°
124°
126°

70 - 25  ) opens
68 - 7  ) closes
21A - 21  ) closes
ML - LR1  ) closes
88 - 5  ) opens
B4 - B5  ) opens
B1 - LR1  ) opens
71 - 30  ) opens
65 - 17  ) closes
28 - B-  ) closes