

BSM# 821B

ELECTRIC BRAKE CONTROLS INSPECTION AND TESTS

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1. GENERAL

1.01 Electric Brake Controls are installed in the cabs of trucks used for towing trailers equipped with electric brakes. The controls provide a means for controlling the trailer brakes from the truck cab.

1.02 The purpose of this section is to provide information on how to determine whether the electric brake control equipment on a truck is in a satisfactory operating condition.

2. TYPES

2.01 There are three types of electric brake controls, namely, Hand Type, Hydraulic Type, and Compressed Air Type.

2.02 *The Hand Type*, as its name implies, is operated by hand. It is installed independently of the brake system on the truck and, hence,

can be installed on any truck regardless of its brake system. It controls the trailer brakes and the trailer and truck stop lights, but not the truck brakes.

2.03 *The Hydraulic Type* is for use only on trucks having hydraulic brakes. It is connected to the hydraulic system on the truck so that when the pedal for the truck brakes is operated, the brake fluid actuates the controller for the electric brakes on the trailer.

2.04 *The Compressed Air Type* is for use only on trucks having air brakes. It is connected to the compressed air system so that when the pedal for the truck brakes is operated, the compressed air actuates the controller for the electric brakes on the trailer.

3. HOW CONTROLS OPERATE

3.01 The Hand Type is the simplest of the three types. The controller in the cab permits the driver to apply the trailer brakes through a range of stages from "light" to "hard." This is accomplished by moving the hand lever of the controller which acts somewhat like a valve allowing a controlled amount of electric current to flow from the truck battery to the trailer brakes, the amount depending upon the position of the hand lever. The greater the amount of current flow the harder the trailer brakes are applied. When the controller is in its "off" position there is no current flow. This control operates entirely independently of the brakes on the truck so that it is necessary to operate the hand lever to operate the trailer brakes.

3.02 The Hydraulic Type controller is automatically actuated as the brake pedal of the truck is operated. The controller is generally installed under the hood near the hydraulic master cylinder to which it is connected. However, on

trucks with hydrovac systems the controller must be connected to the outlet of the hydrovac unit, not between it and the master cylinder. As the truck brake pedal is depressed, hydraulic pressure moves a piston in the controller which in turn operates the lever of the controller. A calibrated spring which bears against the piston in an oppo-

site direction determines the amount the controller lever moves for a given amount of hydraulic pressure or brake pedal travel. The amount of resistance of the spring is an important factor for proper operation of the controller. The procedure for determining the spring resistance is covered under testing.

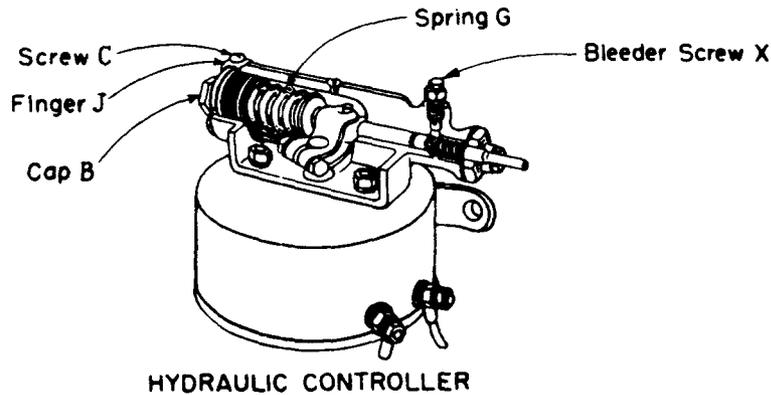


Fig. 1

3.03 The Compressed Air Type operates in a similar manner to that of the hydraulic type except that it is operated by the compressed air of the truck brake system instead of by hydraulic pressure.

3.04 All three types of brake systems have a load control which is mounted in the cab of the truck. The purpose of this control is to permit the driver to preselect the amount of trailer brake application obtained for a given amount of controller movement. This is desirable particularly on the hydraulic and compressed air types. Without a load control on such trucks the degree of trailer brake application would always be the same for a given amount of truck brake pedal travel or truck brake application. If this degree of application is sufficient for a heavily loaded trailer it will be too great when the trailer is only lightly loaded or empty, causing the trailer wheels to lock and the trailer to bounce when the brakes are applied. The load control permits the driver to obtain the ratio of trailer brake application to truck brake application required by the load carried on the trailer. There are various models of load controls. On hydraulic and compressed air type brake controls only the No. 3363N or No.

3363C load controls give satisfactory performance whereas any of the other load control models furnished in the past are satisfactory for use on the hand brake control system. Of the two load control models, the No. 3363N which is now specified for all new installations is preferred since it has a gradual adjustment instead of a step-to-step four point adjustment. It should be used whenever replacement of a load control becomes necessary. The load control can be identified by the number stamped on the back of it.

4. INSTRUMENTS REQUIRED FOR TESTING

4.01 A reliable ammeter with a range of 0 to about 15 amperes, graduated so as to indicate tenths of amperes is required in order to determine the amount of electrical current flowing through the controls and wiring system under certain conditions.

4.02 A resistance load which will draw about 6 amperes on a 6-volt current supply is required in order to permit testing the controls and wiring system under load. Such a test load may be in the form of an automotive type 6-volt 32-candle power lamp.

5. PRECAUTIONS

5.01 An ammeter has practically no electrical resistance and if put across a line, shorts the circuit and damages the instrument. Be sure never to put the ammeter across the line. Always connect it into the line in series with a load.

5.02 Connect the ammeter into the circuit last. Before making the connection, momentarily touch the lead from the ammeter to the point to which it is about to be connected to see if the ammeter needle swings in the right direction. If it does not do so, reverse the connections. If the needle goes off the scale the ammeter is improperly connected or its range is too small.

5.03 Use 12-gauge flexible insulated wire equipped with heavy duty connecting clips for the ammeter and test lamp leads.

5.04 Never remove the bleeder screw X on the controller (see Figure 1) except when bleeding the hydraulic system. Bleeding is necessary only after hydraulic connections have been opened or when there is evidence of the presence of air in the system. In bleeding the system, follow the procedure recommended by the vehicle manufacturer and include of course the controller.

6. TESTING HAND OR COMPRESSED AIR TYPES

6.01 Determine whether the "plus" or the "minus" side of the truck storage battery is grounded. If the "plus" side is grounded connect one lead from the test lamp to the lead from the "plus" terminal on the ammeter; otherwise connect it to the lead from the "minus" terminal. Connect the other lead from the test lamp to a good ground on the truck. Then connect the remaining lead of the ammeter to the battery-to-starter terminal on the starter. See Figure 2.

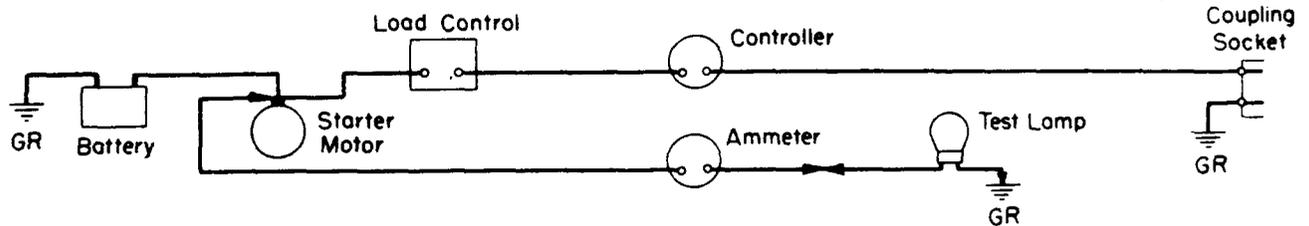


Fig. 2

6.02 Run the engine steadily just fast enough so that the ammeter on the truck instrument panel shows charging. A shim or thin coin placed under the throttle stop screw will facilitate this. Note accurately the reading on the test ammeter as reading "A" for reference later. The reading should be about 5.5 to 6.5 amps.

6.03 After noting the reading "A" under 6.02 disconnect the test lamp from the ammeter and ground and connect its leads to the "Brake" and "Ground" blades inside the coupling socket at the rear of the truck. (For arrangement of blades inside socket see Figure 3.)

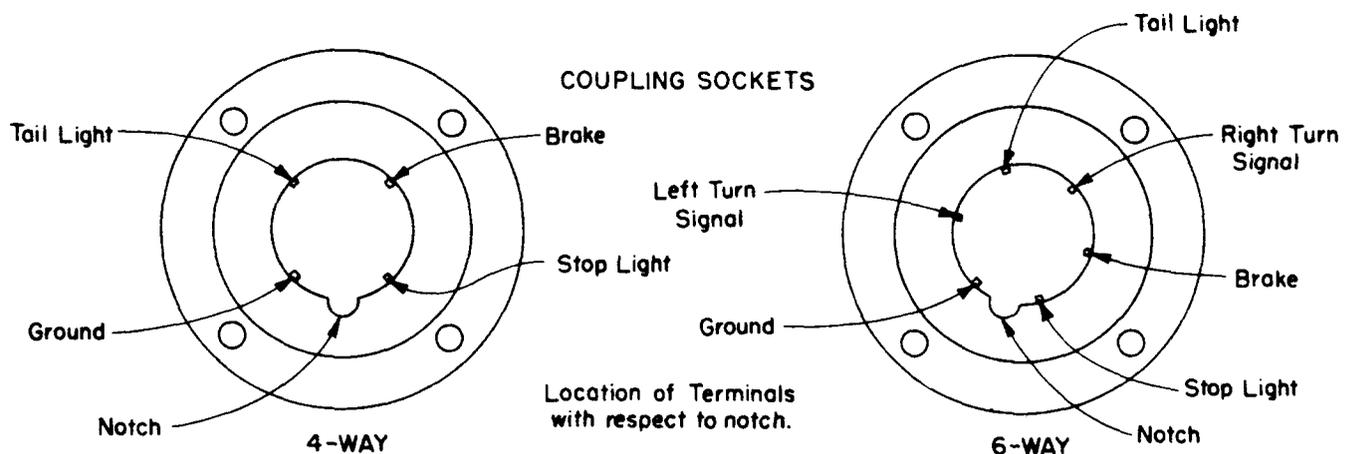


Fig. 3

6.04 Transfer the ammeter lead from the starter terminal to the terminal on the controller to which the load control is connected. Disconnect the wire from the other terminal on the controller

which leads to the coupling socket at the rear of the truck and connect this wire to the ammeter lead to which the test lamp was formerly connected. See Figure 4.

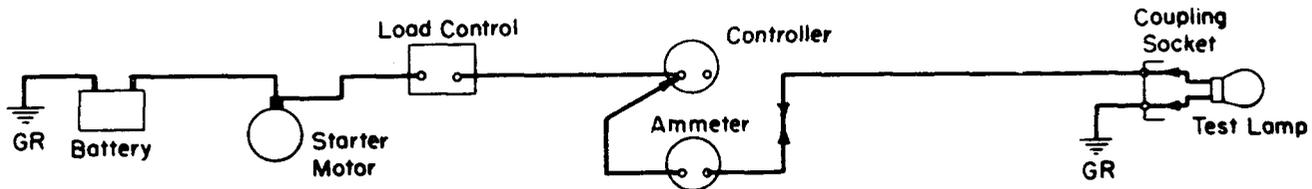


Fig. 4

6.05 Again run the engine at the same speed as under 6.02. Turn the load control knob toward the left to zero. Now turn the load control gradually to the right and watch the ammeter. Readings should increase as the knob is turned toward the right. If, when completely turned to the right, the ammeter reading is higher than "A" under 6.02 there is evidence of a short to ground either in the line running from the controller to the socket or in the socket itself, provided, of course, the engine is not running at a higher speed than under 6.02. Any fault should be located and corrected. If the ammeter reading is less than "A" by more than 1/2 ampere, there is a high resistance in the circuit. In this case, check the

connections from the battery through the load control, ammeter, and coupling socket to ground for loose or otherwise faulty connections, and for broken wires. If necessary, remove the load control, clean its terminal and reinstall it or replace it if it is defective. When the proper ammeter reading of not more than "A", nor less than "A" by more than 1/2 an ampere, is obtained note it accurately as reading "B" for reference later.

6.06 After noting ammeter reading "B" in 6.04 transfer the ammeter lead from the terminal on one side of the controller to the vacant terminal on other side of the controller. See Figure 5.

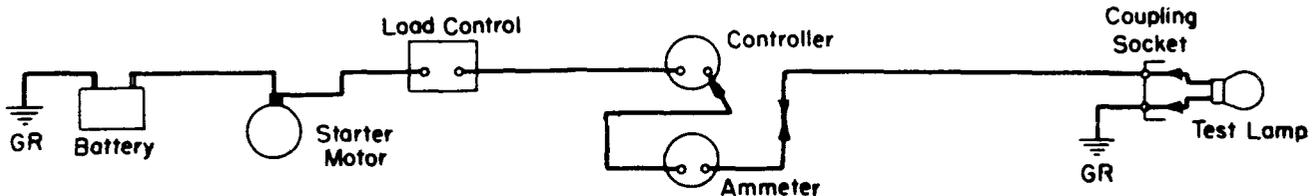


Fig. 5

6.07 Run the engine as before, turn the load control knob completely to the right (full power position), gradually move the controller hand lever (or brake pedal in case of compressed air type) through its operating range and watch the ammeter. Readings should increase from zero to a maximum as the lever is moved from its "off" to its "full power" position. In the full "power position" the ammeter reading should be the same as reading "B" obtained under 6.04. If the reading does not increase gradually or is lower than "B" the controller is defective. If com-

pressed air type, replace the controller. If hand type, remove the cover, examine and repair. If, however, the blades are bent or burned, or the wires are broken replace the controller.

7. TESTING HYDRAULIC TYPE

7.01 The manufacturer supplies four different springs with each hydraulic type brake control. Each spring has a different rating and each is of a different color in order to assist in

identifying them. The white spring has the highest rating and the black, red and green each have successively lower ratings. These different springs are supplied because of the difference in hydraulic pressures used in different braking systems. Since the black spring is the one most commonly required this spring is put in the controller at the factory. If one of the other springs is required for a particular installation, the installer is expected to replace the black spring with the one having the required rating and place the three remaining springs in the glove compartment in the cab of the truck. The following instructions include tests for determining whether the controller is equipped with the correct spring and how to proceed if this is not the case.

7.02 Begin by making tests as covered in 6.01 to 6.05, inclusive. Then make tests as in 6.06 pushing down the truck brake pedal in lieu of operating the hand lever and note ammeter readings. When the pedal is pushed as far as it will go, the ammeter reading should be the same as "B" under 6.04. If the reading is less, the spring may be too strong, so proceed as instructed in 7.03 and continue from there. If, however, the reading obtained is the same as "B" release the pedal and then push it down again gradually, watching the ammeter. If a reading equal to "B" is obtained before the pedal is pushed as far as it will go, the spring may be too weak. Try the spring with the next higher rating (see 7.01). (Also see Part 9, "How to Change Controller Spring.") When a spring with the highest rating is found which will give an ammeter reading equal to "B" when the pedal is pushed down as far as it will go, leave this spring in. Then skip instruction 7.03 and proceed as instructed in 7.04.

7.03 When a reading less than "B" is obtained under the test in 7.02, the spring in the controller may be too strong. See Part 9, "How to Change Controller Spring" and put in the spring with the next lower rating. Then repeat the tests required under 7.02 and if a reading equal to "B" is obtained with it leave this spring in place. However, if reading is still less than "B" continue trials with successively lower springs. If finally a reading equal to "B" can not be obtained with the green spring which has the lowest rating, the control is defective and should be replaced. When a reading equal to "B" is obtained proceed as instructed in 7.04.

7.04 Now, with whichever spring has been selected, push the pedal down again gradually, watching the ammeter. If the ammeter reading increases gradually up to reading "B" the controller is satisfactory and the tests are finished. If, however, the readings fluctuate erratically or jump immediately to the maximum, the controller is defective and should be repaired or replaced and the tests starting with 7.02 repeated.

7.05 When the brake controls operate satisfactorily, remove the shim from under the throttle stop screw, remove the ammeter and test lamp connections and securely restore the connection between the controller and the coupling socket.

8. TESTING STOP AND TAIL LIGHT CIRCUITS

8.01 The Hand Control Type controller is equipped with a stop light switch, the terminals of which are on the outside of the controller cover. One of these terminals is connected to the battery side of the load control and the other is connected to the stop light terminal on the coupling socket at the rear of the truck to which the stop light circuit of the truck is also connected. With this arrangement the stop light of the truck and the stop light on a trailer connected to it will be operated whenever either the hand controller or the brake pedal of the truck is operated.

8.02 On trucks equipped with the hydraulic or the compressed air type controls, a lead from the truck stop light circuit is connected to the stop light terminal on the coupling socket at the rear of the truck. As a result whenever the stop light on the truck is operated the stop light on a trailer connected to it will also operate.

8.03 To test the stop light circuits, connect the leads from the test lamp to the stop light and ground blades inside the coupling socket at the rear of the truck. Then operate the brake pedal of the truck. Both the test lamp and the truck stop light should operate. If the truck is equipped with a hand type controller operate the hand lever. Both the test lamp and the truck stop light should operate. If the lights do not go on, find the fault and correct.

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8.04 On all trucks equipped with electric brake controls the tail light circuit of the truck is connected to the tail light terminal on the coupling socket. As a result, whenever the tail light on the truck is turned on the tail light on a trailer connected to it will also go on. In order to test this circuit connect the test lamp to the tail light and ground blades inside the coupling socket and turn on the truck tail light. If both the truck tail light and test lamp do not go on, find the fault and correct.

9. HOW TO CHANGE CONTROLLER SPRING

9.01 Referring to Figure 1, loosen Screw "C", on top of and near one end of the controller, lift Finger "J" out of notch, unscrew Cap "B" and pull out Spring "G". Insert replacing

spring, restore Cap "B", Finger "J" and Screw "C".

10. ADJUSTMENTS

10.01 The controller is designed so that when

Cap "B" is screwed in as far as it will go, the trailer brakes will come on at the same instant as the truck brakes. Cap "B" affords a fine adjustment; when only partially screwed in the trailer brakes come on sooner. Ordinarily, it should be screwed all the way in. It may, however, be backed out in order to advance the trailer brake application. It should not be backed out more than two turns.

10.02 See that Cap "B" has been properly restored, Finger "J" is in place and Screw "C" tightened after making any adjustments.