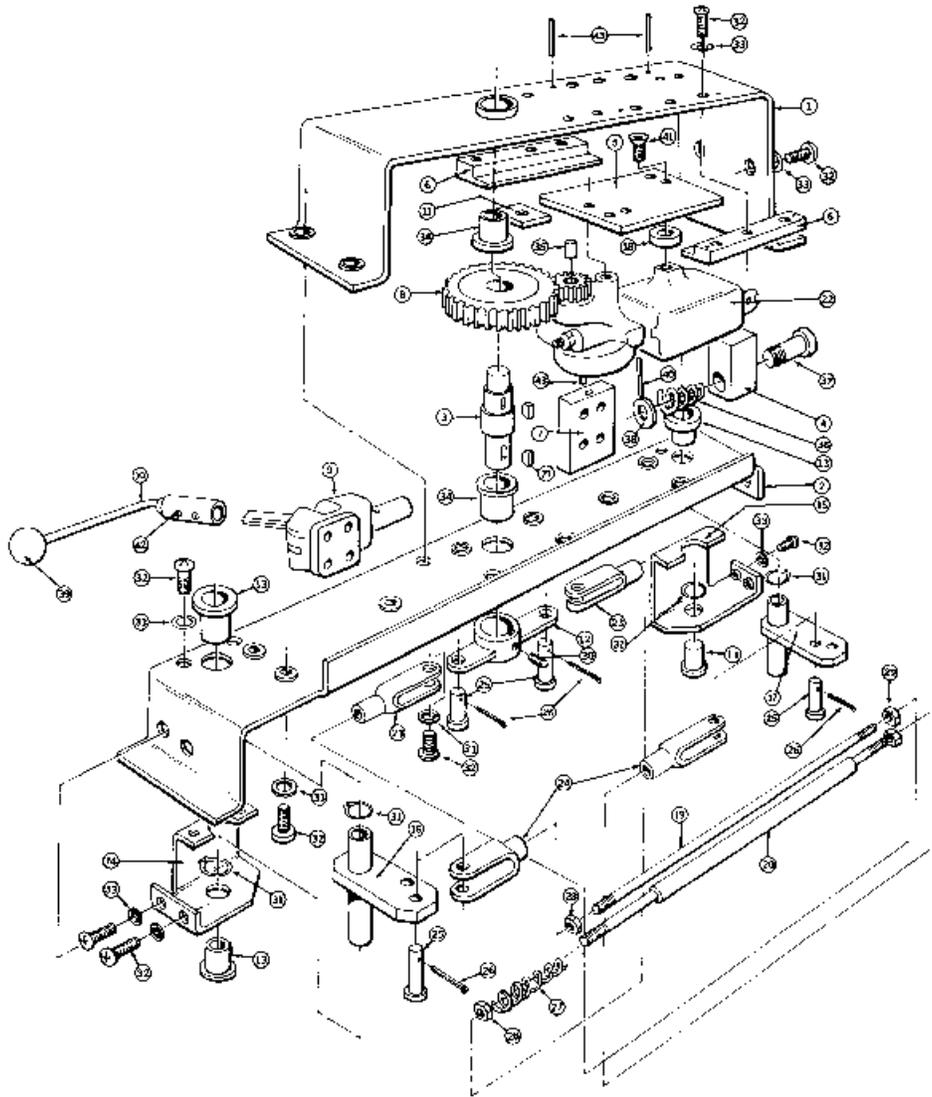


# Excell

## **Illustrated Repair Manual**

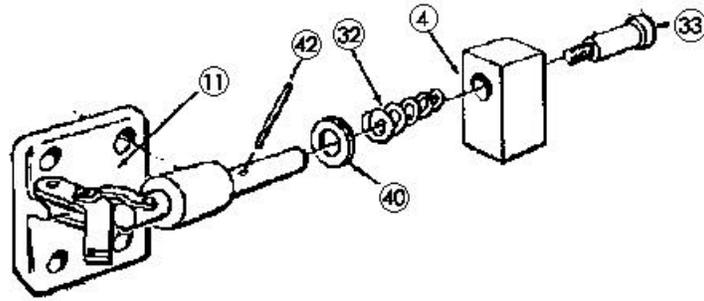
### **Door Mechanism Model Number 7189-001**

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**FIGURE 1 — Excell Shuttle-Bus Door Mechanism Model 7189-001**

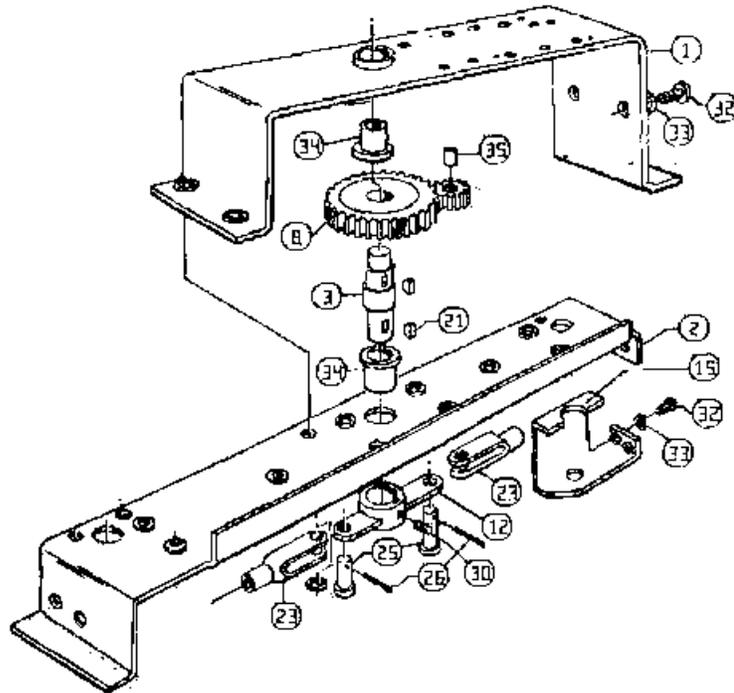




**FIGURE 3**  
**(ASSEMBLY SHOWN INVERTED**  
**FROM ACTUAL INSTALLATION FOR CLARITY)**

- \_\_\_ Follow the same procedure for R & R of the motor.
- \_\_\_ After the motor and toggle clamp assembly is removed, remove the 3/8" shoulder bolt (Fig. 3 #33) from the toggle clamp end and remove the clamp.
- \_\_\_ Reverse the above procedure to re-install. The 1/2" flat washer (Fig. 3 #40) goes on the plunger first. The blue spring (Fig. 3 #32) is next.

#### **R & R OF THE DRIVEN GEAR**



**FIGURE 4**

The driven gear (Fig. 4 #8) has hardened teeth and seldom requires replacement.

Additional gear use may be obtained by indexing the gear 180 degrees since less than half the gear is used in operation.

- \_\_\_\_ To index the gear remove the pins from the rod clevises (Fig. 4 #'s 23 & 25).
- \_\_\_\_ Turn the pivot arm (Fig. 4 #12) one half turn and reinstall the pins.

If replacement of the gear is necessary the unit must be removed from the bus.  
(see R & R OF UNIT).

- \_\_\_\_ Disassemble the two frame halves by removing the 1/4-20 bolts typ. 4 places, two at each end.
- \_\_\_\_ Remove the 1/4-20 bolts that attach the pivot bracket (Fig. 4 #15) to the main frame (Fig. 4 #1).
- \_\_\_\_ Remove main frame from assembly by holding the gear against the main frame and tap on the shaft by driving it down through the gear. The motor and emergency release assembly will remain on the main frame.
- \_\_\_\_ Remove gear from the driveshaft (Fig. 4 #3).
- \_\_\_\_ Replace the gear.
- \_\_\_\_ Reverse this procedure to reassemble.

After the unit is re-assembled check for free rotation of the driveshaft. With the emergency release disengaged the gear and shaft should turn freely. If not, strike the gear sharply from each side with a soft hammer or wood block. The main frame may also be struck to free up any binding due to misalignment of the driveshaft bushings. When the driveshaft turns freely, operate the emergency release to ensure that the gears mesh properly and test run the motor.

## **LINKAGE MECHANISM**

### **ADJUSTMENT OF LINKAGE ARMS**

The Model 7189 door controls operate the doors with linkage rods connected to each door. The rods are set at a length equal to one half of the door hinge centerline distance. For example, a bus with door hinges 32" apart will have rods set at 16" from pin center to center. The front door leaf uses a solid rod (Fig. 1 #9) while the rear leaf uses a spring loaded rod (Fig. 1 #20). The purpose of the spring loaded rod is to allow the front leaf to continue to move after the rear leaf has come to rest against its stop. When the rear door reaches its stop the front leaf should be approximately 2" to 3" from closing. This difference in timing creates an overlapping seal.

Both linkage rods have right hand threads on one end and left hand threads on the other. To adjust the rod length:

- \_\_\_\_ Loosen the 3/8-24 jam nuts (Fig. 1 #'s 28 & 29).
- \_\_\_\_ Turn rod as required.

It should be noted that adjusting the rod length changes the timing relationship of the doors only, it does not affect how far the door travels.

## **R & R OF LINKAGE RODS**

Should the rods become bent due to accident or break-in, replacement is required.

- \_\_\_ Remove the clevis pins (Fig. 1 #25).
- \_\_\_ Replace the rods.
- \_\_\_ Re-insert clevis pins to re-assemble. The pivot bracket (Fig. 1 #17) has two pin holes. One hole is in the center of the bracket and the other is offset near the edge. The offset hole is used for the rear door leaf, making the rear door travel slightly faster than the front leaf.

## **SET-UP AND ADJUSTMENT OF 7189 WITH BUILT IN LIMIT SWITCHES**

The Model 7189 door control is available with built in limit switches to stop the motor at door open and closed positions. These limit switches are mounted in a stack adjacent to the drive shaft and are operated by two cams on the drive shaft (Fig. 8). The upper switch stops the motor in the door open position and the lower switch stops the motor in the door closed position. When using this control circuit, the door open/close switch on the dash must be a SPST Latch switch. This switch completes and breaks a ground to operate a relay mounted near the limit switches. The setup and adjustment of both the limit switch cams and the door linkage is a delicate and critical operation.

The lower limit switch which stops the motor in the door closed position is the most critical and is adjusted first. The correct combination of door linkage arm length and limit switch cam position is required to ensure the doors are properly positioned and closed tight enough to prevent door flutter at highway speeds and when the power to the motor is shut off.

### **WARNING**

**Damage to the motor may occur in a matter of seconds if  
power is left on while the motor is stalled.**

Initial adjustments are made with the power to the unit off. If the ignition switch in the off position doesn't cut the power to the unit, the fuse that protects the circuit must be removed.

To allow the doors to be pushed open and shut by hand with the power to the unit off, the emergency release must be disengaged. Some door seals will leave enough room between the doors to reach through and pull the front leaf shut against the rear leaf. If this is not possible, a second person outside the bus will be necessary.

The arm operating the rear door is spring loaded. This spring is pre-loaded to a length of 1.63" (Fig. 9). Should this arm require adjustment of more than one turn the rod should be unpinned and the adjustment be made at the solid end to maintain this spring preload. The door arms are threaded right hand at one end and left hand at the other. To shorten the rear door rod, loosen the jam nut and turn the top of the rod towards the inside of the bus. Turning the front door rod in the same direction will lengthen it. Jam nuts must be re-tightened after any adjustment. (Note: It will be helpful if the 9/16 open end wrench needed to turn the jam nuts is ground to a thickness of less than 3/16" (0.19") to clear the spring.)

Pull the door closed, as the rear door hits its stop the front leaf should be 2" to 3" from closed. Now push the front leaf tightly closed and check the spring compression. A gap between the spring coils of 0.003" to 0.008" is ideal in this closed position. The spring must not be fully compressed as it would be a stop. The spring compression is adjusted by changing the length of the front door rod. If the spring is fully compressed the front rod should be shortened which will decrease the 2" to 3" gap between the doors described above. It is desirable to use all of the spring travel possible without fully compressing the spring. This makes the gap between the doors wider and the doors are less likely to hit one another or overlap the wrong way. As these adjustments are being made in the door closed position the doors should be pushed to full open to ensure the full 90° of movement. Adjusting the rod lengths to get the correct closed position as well as adequate opening can be a rather tedious matter of give and take but it is both necessary and doable.

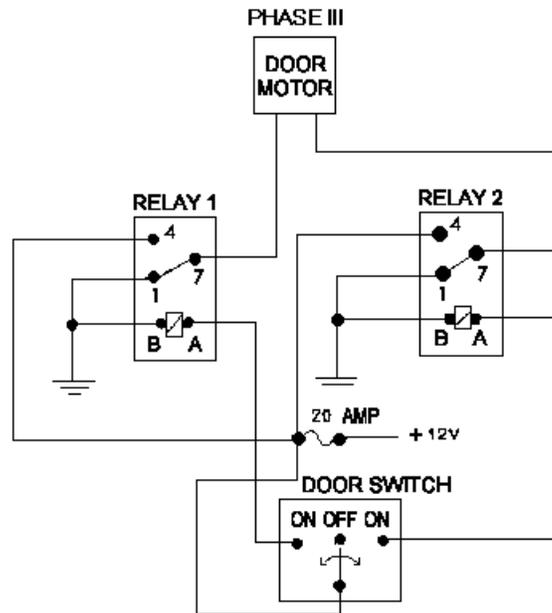
After the linkage has been adjusted to satisfaction, the cams on the drive shaft are initially set (Fig. 8). They will likely require further adjustment after the power is on but must be set now to protect the motor from being stalled with the power on. The cams are held in place with a set screw that requires a 1/8" Allen wrench (A long "T" handle Allen wrench is preferred). The set screws are located 180° from the cam lobe that trips the limit switch. As the doors are closed the drive shaft will be turning CW (looking down from the top). With the doors slightly open, loosen the set screw on the lower cam and hold the cam from turning using the Allen wrench for a handle. Push and hold the doors tightly closed and then turn the cam CW until the limit switch makes (the switch will produce an audible click). Now back the cam CCW until the limit switch opens (very delicate setting: listen for click) and tighten the set screw. This will allow for backlash and over travel under power. The same adjustments are next made to the upper cam with the drive shaft turning CCW and the doors pushed to the open position.

The unit should now be ready to try under power, but care must be taken that the motor not remained powered when stalled. If the work environment is too noisy to hear the limit switches click, a test light or voltage meter may be necessary to verify the power to the motor is off when the motor is stalled. Final adjustments can now be made to the limit switch cams. When the motor stops in the closed position, the front door leaf should be tightly closed over the rear leaf and the spring on the rear arm should not be fully compressed.

## **ELECTRICAL**

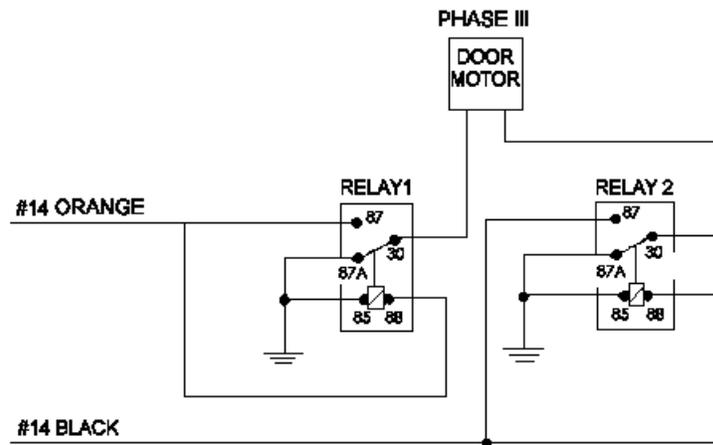
The door motor is reversed by reversing the polarity. This is usually done by a momentary rocker switch. The motor will run until it stalls in the direction indicated by the switch. The first test is to verify +12V power to both wires at the motor. Ground tester to the frame and check voltage on both wires. One wire must show power for each direction. Correct voltage test here indicates the motor is bad and needs to be replaced. If this test results in no power to one or both wires at the motor the next step is to check the output from the switch. If the switch is not working, replace switch. If the switch is working properly, the next step is to check for loose connections, broken, or damaged wires.

Some units may employ a pair of relays that ground the motor in the off position to eliminate door drift. These relays will be either a pair of P & B relays mounted on a small sheet metal chassis and attached directly to the door opener frame or a pair of small black HELLA brand automotive type relays included in the wire harness. While these relays are extremely durable and should not cause a problem, they can be easily checked. On the P & B relays the A terminal is +12V from the switch with the switch on. The B terminal is ground. See diagram in Figure 5. These relays will produce a definite click when energized.



**FIGURE 5**  
**PHASE III DYNAMIC BRAKE CIRCUIT**  
**P & B RELAY**

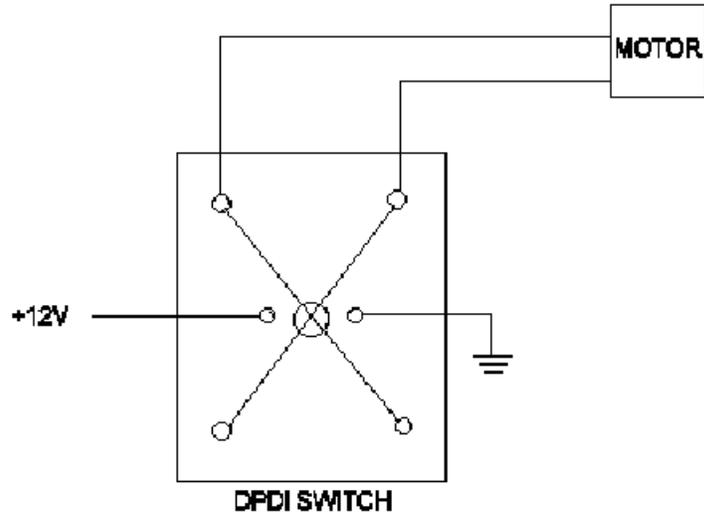
The HELLA brand relays are mounted in a plug-in base. The terminals are marked on the plug-in side of the relay. The terminal marked 86 is +12V with the switch on. The terminal marked 85 is ground. See diagram in Figure 6.



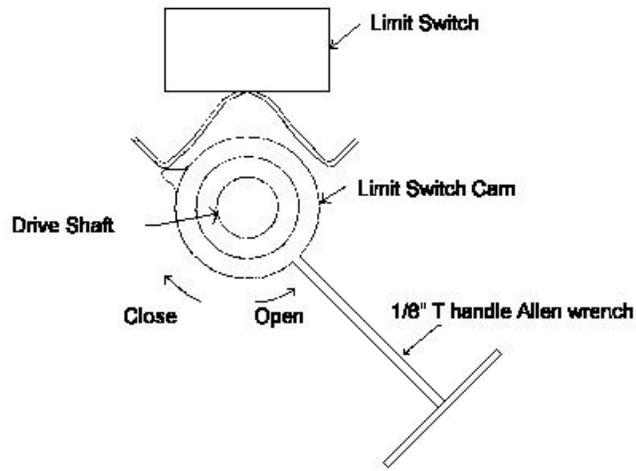
**FIGURE 6**  
**DYNAMIC BRAKE CIRCUIT**  
**HELLA RELAY**

Replacing a Phase II motor with a Phase III requires no change in wiring or motor connector. However a different motor plate (Fig. 2 #5) must be used and will be furnished with the Phase III motor upon request.

Replacing the black Delco motor with a Phase III motor requires changing the motor plate as well as the control switch. The black motor is reversed by switching power from one terminal to the other with the motor case grounded. This can be done with a single pole, double throw switch. See diagram in Figure 7. The existing wires from the switch to the Phase III motor will be furnished on request and may be spliced into the motor wires to replace the spade terminals on the black motor.

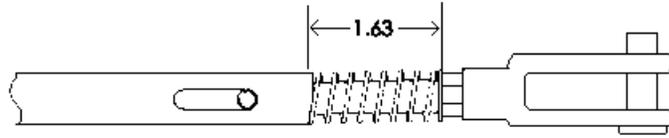


**FIGURE 7**



VIEW LOOKING DOWN FROM TOP

**FIGURE 8**  
**LIMIT SWITCH CAM ADJUSTMENT**



**FIGURE 9**  
**REAR DOOR LINKAGE ARM**