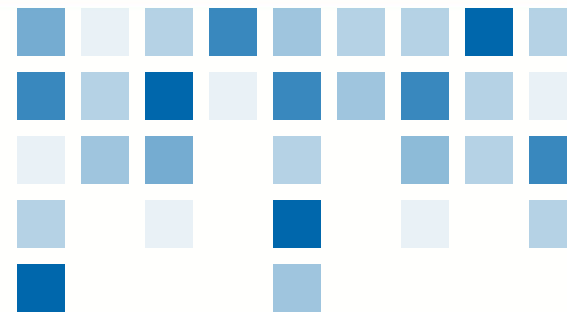
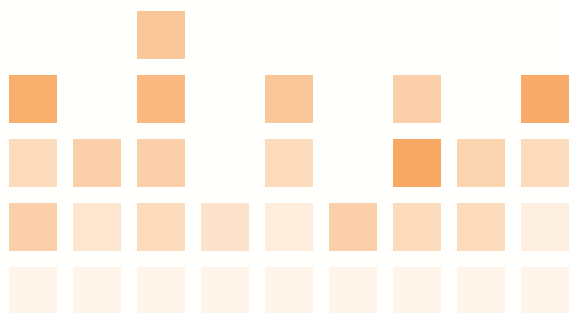




SHACMAN 汽车电器知识培训

F2000-F3000

陕汽进出口公司服务部培训科



第三十六课 门窗玻璃摇窗机升降电路

1、门窗玻璃电动摇窗机升降电路：

汽车的门窗玻璃电动摇窗机升降器装置，使得驾驶员在汽车的行驶过程中，不再手工摇动操作车窗玻璃，实现了电力自动升降，降低驾驶员工作强度，提高驾乘舒适性，丰富车辆豪华配置。

Power Window Lift Circuit for Door and Window Glass:

The power window lift device for door and window glass in automobiles enables drivers to automatically raise and lower the window glass without manual operation during the vehicle's movement. This feature achieves automatic elevation using electrical power, reducing the workload for drivers, enhancing driving comfort, and enriching the luxury features of the vehicle.



2、电动摇窗机的操纵开关：

电动摇窗机的操纵开关安装在左右车门衬板上，为了驾驶员的操作方便，均布置在尽量靠近驾驶员的地方。其中主驾驶员一侧配置两个电动摇窗机的操纵开关，上面的开关可以操纵主窗玻璃的升降，下面的开关可以操纵副窗玻璃的升降。其中副驾驶员一侧配置一个电动摇窗机的操纵开关，这一个开关只能操纵副窗玻璃的升降。

每一个电动摇窗机的操纵开关，如果按压白色标记，即圆弧突出部分，内部的微型开关闭合，可以控制相应的门窗玻璃上升。如果按压白色标记后面，即圆弧凹下部分，内部的微型开关闭合，可以控制相应的门窗玻璃下降。

Control Switch for Power Window Regulator:

The control switch for the power window regulator is installed on the upper panel of the left and right doors, positioned as close to the driver as possible for convenience. On the driver's side, there are two control switches for the power window regulator. The upper switch controls the ascent and descent of the main window glass, while the lower switch controls the ascent and descent of the auxiliary window glass. On the passenger side, there is a single control switch for the power window regulator, which only controls the ascent and descent of the auxiliary window glass.

Each control switch for the power window regulator features a white mark, either protruding or recessed. Pressing the protruding part, marked with a white arc, activates the micro-switch inside, allowing for the corresponding door window to ascend. Pressing the recessed part, located behind the white mark, activates the micro-switch inside, allowing for the corresponding door window to descend.



每一个电动摇窗机的操纵开关连接4根电线到圆形插接器。

圆形插接器共有5个位置，只使用了4个端子。

其中1号端子和2号端子是它的控制信号输出端，按压上升则1号输出低电平（就是0伏电压）控制信号，按压下降则2号输出低电平（就是0伏电压）控制信号。

其中3号端子空位。

其中4号端子是它的电源输入端，4号端子连接的是31000搭铁线，通常连接到了驾驶室左仪表搭铁点。如果是右置车则连接到了驾驶室右仪表搭铁点。其中5号端子是它的夜光照明电源输入端，5号端子连接的是58000线，通常连接到了X644的58000线分电器。

Each control switch for the power window regulator is connected to a circular connector with four wires.

The circular connector has a total of five positions, with only four terminals being used. Terminals 1 and 2 serve as control signal output terminals. When pressed for ascent, terminal 1 outputs a low voltage signal (0 volts), while for descent, terminal 2 outputs a low voltage signal (0 volts).

Terminal 3 remains unoccupied.

Terminal 4 serves as the power input terminal, connected to the 31000 grounding wire, typically linked to the grounding point on the left instrument panel in standard placement or to the right instrument panel in right-hand drive vehicles.

Terminal 5 serves as the night illumination power input terminal, connected to the 58000 wire, usually linked to the 58000 wire distributor on X644.



3、电动摇窗机的电动机：



电动摇窗机的电动机是额定电压24伏的直流电动机。它通过蜗轮蜗杆机构减速，带动一个扇形半圆齿轮的连接杆作局部上下摆动，连接杆拖动门窗玻璃上下运行，实现门窗玻璃打开和关闭动作。

此电动摇窗机的电动机和连接杆机构是一个总成，需要区分左右。

它的连接线束是一个黑色的椭圆形2孔插接器。

注意：当门窗玻璃上升到最高位置，不可以继续按压上升按钮，应该立即释放上升按钮。或者当门窗玻璃下降到最低位置，不可以继续按压下降按钮，应该立即释放下降按钮。否则摇窗机的电动机处于堵转通电状态，堵转电流很大，长时间堵转就会烧坏保险丝、电动机、控制器等相关电器零部件。

The electric motor of the power window regulator is a 24-volt DC motor. It utilizes a worm gear mechanism to reduce speed, driving a connecting rod with a semi-circular gear, which swings locally up and down. This connecting rod moves the window glass up and down to open and close the window.

This electric motor and connecting rod mechanism constitute an assembly, which needs to be distinguished for left and right sides.

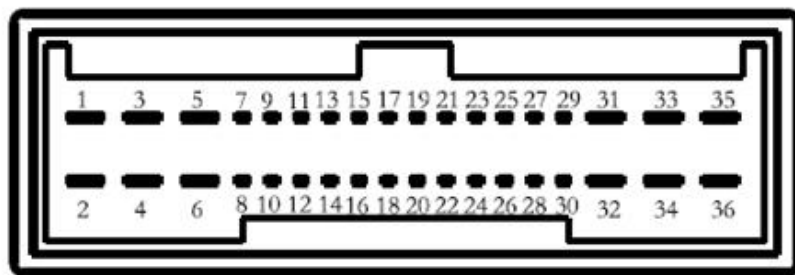
Its wiring harness is a black oval-shaped 2-pin connector.

Note: When the window glass reaches its highest position, do not continue pressing the up button; instead, release it immediately. Similarly, when the window glass reaches its lowest position, do not continue pressing the down button; release it promptly. Otherwise, the electric motor of the window regulator will be in a stalled state, drawing a large current. Prolonged stalling can damage fuses, the electric motor, controllers, and other related electrical components.



4、电动摇窗机的门控单元控制器:

Electric Window Regulator Door Control Unit Controller.



电动摇窗机的门控单元控制器，零件号：DZ95189586600。它是新式的模块化自动控制电子元器件。它安装固定在主驾驶位置的仪表板下方的车架横梁上面，有一个36孔的插接器，如图所示的孔位布置。

其各个连接端子连接线束和功能定义如下：

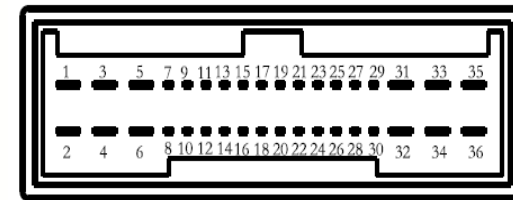
1号孔位：91307，左车门电动机1#端 2号孔位：91306，左车门电动机2#端

3号孔位：91304，右车门电动机2#端 4号孔位：30010，常电电源

5号孔位：91305，右车门电动机1#端 6号孔位：30010，常电电源

13号孔位：91302，主控左车门下降开关控制端

14号孔位：91300，副控右车门下降开关控制端



Electric window regulator door control unit controller, part number: DZ95189586600. It is a new modular automatic control electronic component. It is installed and fixed on the frame beam under the dashboard at the main driver's position, with a 36-hole connector arranged as shown in the figure.

The connections and functions of each terminal are as follows:

1st hole: 91307, left door electric motor 1# terminal

2nd hole: 91306, left door electric motor 2# terminal

3rd hole: 91304, right door electric motor 2# terminal

4th hole: 30010, constant power supply

5th hole: 91305, right door electric motor 1# terminal

6th hole: 30010, constant power supply

13th hole: 91302, master control left door down switch control terminal

14th hole: 91300, auxiliary control right door down switch control terminal



15号孔位：91303，主控左车门上升开关控制端

16号孔位：91301，副控右车门上升开关控制端

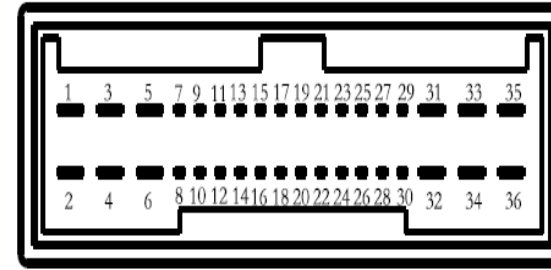
17号孔位：91300，主控右车门下降开关控制端

18号孔位：91301，主控右车门上升开关控制端

24号孔位：15001，钥匙开关电源输入

31号孔位：31000，搭铁

34号孔位：31000，搭铁（未注明孔位均是空位）



15th Position: 91303, Control Terminal for Main Left Door Up Switch

16th Position: 91301, Control Terminal for Assistant Right Door Up Switch

17th Position: 91300, Control Terminal for Main Right Door Down Switch

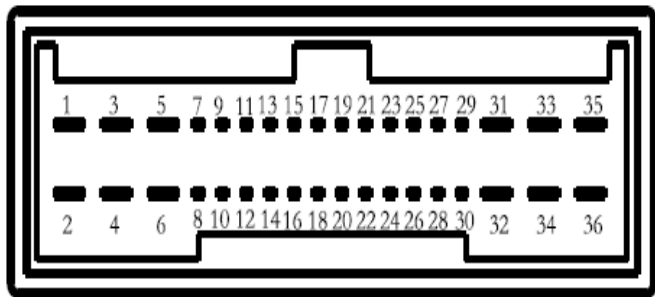
18th Position: 91301, Control Terminal for Main Right Door Up Switch

24th Position: 15001, Key Switch Power Input

31st Position: 31000, Ground

34th Position: 31000, Ground (Unspecified positions are vacant)





注意：此电动摇窗机控制器内部具有短路自动保护功能，如果其中的某一个车门开关控制端线束短路搭铁，则控制器短路保护起作用，这一个车门的其它开关控制信号就会不再动作。直至车门开关控制端线束短路搭铁故障排除为止。

如果其中的某一个车门电动机线束短路搭铁，则控制器短路保护起作用，这一个车门的所有开关控制信号就会不再动作。直至电动机线束短路搭铁故障排除为止。

当控制器短路保护起作用时，并不是控制器损坏有故障，而是连接的线束有短路故障。

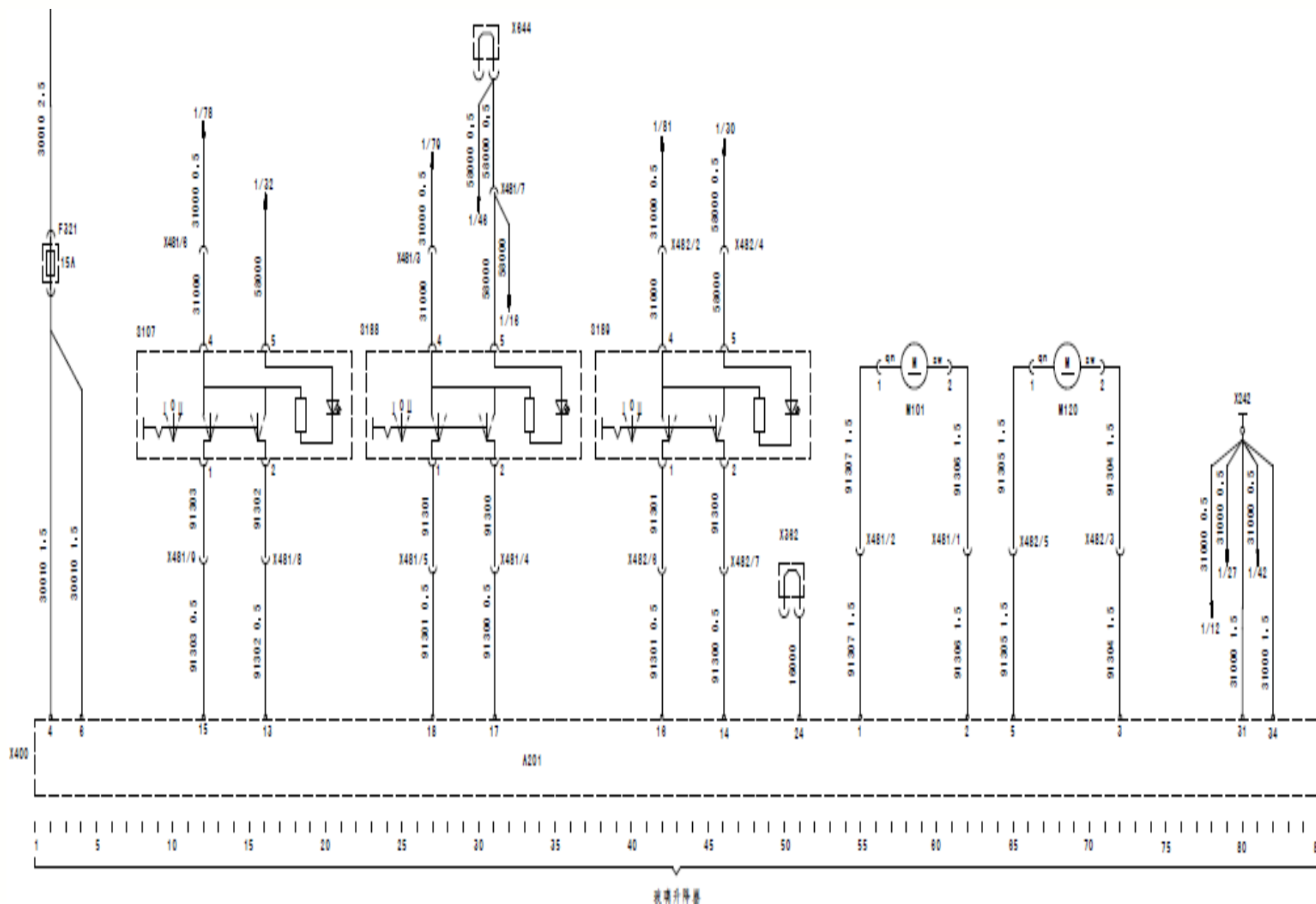
Note: The controller for this power window regulator system is equipped with automatic short-circuit protection. If the wiring harness of any door switch control terminal is short-circuited to ground, the short-circuit protection of the controller will be activated, causing other switch control signals for that door to cease operation until the short-circuit fault in the wiring harness is rectified.

If the wiring harness of any door motor is short-circuited to ground, the short-circuit protection of the controller will be activated, causing all switch control signals for that door to cease operation until the short-circuit fault in the motor wiring harness is rectified.

When the short-circuit protection of the controller is activated, it does not indicate a fault or damage to the controller itself, but rather a short-circuit fault in the connected wiring harness.



5、电动摇窗机电器原理图：



原理图说明:

A100 中央电器装置板 A201 门控单元控制器 F321 门控单元控制器保险 M101 驾驶员车窗玻璃升降器电机 M120 副驾驶员车窗玻璃升降器电机
S107 驾驶员车窗玻璃升降器驾驶员控制按钮 S188 副驾驶员车窗玻璃升降器驾驶员控制按钮 S189 副驾驶员车窗玻璃升降器副驾驶员控制按钮
X242 驾驶室左搭铁点 X400 门控单元36孔控制器 X481 驾驶员车门侧9孔插接器 X482 副驾驶员车门侧7孔插接器
X362 14孔分线器（16000） X644 14孔分线器（58000）

此原理图结构较为简单，所有的外围元器件都是通过线束一对一的和电动摇窗机的门控单元控制器相互连接，并没有复杂的串联、并联、继电器控制等关系，维修识图无难度。

Schematic Diagram Explanation:

A100 Central Electrical Device Board A201 Door Control Unit Controller F321 Door Control Unit Controller Fuse M101 Driver's Window Regulator Motor
M120 Passenger's Window Regulator Motor
S107 Driver's Window Regulator Driver Control Button S188 Passenger's Window Regulator Driver Control Button S189 Passenger's Window Regulator
Passenger Control Button X242 Driver's Cab Left Grounding Point X400 36-Pin Control Unit Connector X481 Driver's Door Side 9-Pin Connector X482
Passenger's Door Side 7-Pin Connector
X362 14-Pin Branching Unit (16000) X644 14-Pin Branching Unit (58000)

This schematic diagram has a relatively simple structure. All peripheral components are directly connected to the door control unit controller of the power window regulator through individual wire harnesses. There are no complex series, parallel, or relay control relationships, making it easy to understand and troubleshoot.



电动摇窗机电路的电源：

电路的1个保险丝是F322，电流20A，安装位置在电器装置板右侧外挂。此保险丝接入的是常电电源30010。

控制器4号和6号孔位的常电电源，是通过F322保险丝直接连接到电器装置板背面90号接线柱30010端。

控制器24号孔位钥匙电是通过X362的16000分电器连接到电器系统的钥匙电T15。

控制器31号和34号孔位负极搭铁线直接连接到仪表板下方左侧搭铁点X242。

这里重点说明一下电动机的动作输出。如下图：

当司机侧门窗下降时，即主控左车门下降开关控制端，控制器13号孔位的91302线低电平，此时控制器1号孔位91307线左车门电动机1#端输出+24伏，同时控制器2号孔位91306

实现功能	司机侧门窗下降输出	司机侧门窗上升输出
	(管脚1)	(管脚2)
司机侧门窗下降	+	-
司机侧门窗上升	-	+

实现功能	副司机侧门窗下降输出	副司机侧门窗上升输出
	(管脚5)	(管脚3)
副司机侧门窗下降	+	-
副司机侧门窗上升	-	+

Power Supply for Power Window Regulator Circuit:

The circuit is protected by fuse F322, rated at 20A, installed on the right side of the external mounting of the electrical device board. This fuse is connected to the constant power supply 30010.

The constant power supply for terminals 4 and 6 of the controller is directly connected to fuse F322, which is connected to terminal 30010 on the back of the electrical device board.

The key power supply for terminal 24 of the controller is connected through the 16000 branching unit X362 to the key power T15 of the electrical system.

The negative grounding wires for terminals 31 and 34 of the controller are directly connected to the left grounding point X242 below the dashboard.

Now, let's focus on the operational output of the electric motor as illustrated in the diagram:

When the driver's side window is lowered, i.e., when the main control left door down switch control terminal is activated (terminal 13 of the controller), the wire 91302 connected to terminal 13 of the controller goes low. At this time, wire 91307 connected to terminal 1 of the controller outputs +24 volts to the left door motor 1# terminal. At the same time, wire 91306 connected to terminal 2 of the controller... [continue with the description of the motor's action outputs].



线左车门电动机2#端输出0伏。

当司机侧门窗上升时，即主控左车门上升开关控制端，控制器15号孔位的91303线低电平，此时控制器1号孔位91307线左车门电动机1#端输出0伏，同时控制器2号孔位91306线左车门电动机2#端输出+24伏。

当副司机侧门窗下降时，即主控右车门下降开关控制端，控制器17号孔位的91300线低电平，此时控制器5号孔位91305线右车门电动机1#端输出+24伏，同时控制器3号孔位91304线右车门电动机2#端输出0伏。

当副司机侧门窗上升时，即主控右车门上升开关控制端，控制器18号孔位的91301线低电平，此时控制器5号孔位91305线右车门电动机1#端输出0伏，同时控制器3号孔位91304线右车门电动机2#端输出+24伏。

可以看出，控制器1号和2号孔位控制的左车门电动机两个输出端，其或上升、或下降，电压的正负关系是变化的。

同理，控制器5号和3号孔位控制的右车门电动机两个输出端，其或上升、或下降，电压的正负关系是变化的。

For the output of the left door motor 2# terminal, wire 91306 connected to terminal 2 of the controller outputs 0 volts.

When the driver's side window is raised, i.e., when the main control left door up switch control terminal is activated (terminal 15 of the controller), wire 91303 connected to terminal 15 of the controller goes low. At this time, wire 91307 connected to terminal 1 of the controller outputs 0 volts to the left door motor 1# terminal, while wire 91306 connected to terminal 2 of the controller outputs +24 volts.

When the passenger's side window is lowered, i.e., when the main control right door down switch control terminal is activated (terminal 17 of the controller), wire 91300 connected to terminal 17 of the controller goes low. At this time, wire 91305 connected to terminal 5 of the controller outputs +24 volts to the right door motor 1# terminal, while wire 91304 connected to terminal 3 of the controller outputs 0 volts to the right door motor 2# terminal.

When the passenger's side window is raised, i.e., when the main control right door up switch control terminal is activated (terminal 18 of the controller), wire 91301 connected to terminal 18 of the controller goes low. At this time, wire 91305 connected to terminal 5 of the controller outputs 0 volts to the right door motor 1# terminal, while wire 91304 connected to terminal 3 of the controller outputs +24 volts to the right door motor 2# terminal.

As can be observed, for the left door motor controlled by terminals 1 and 2 of the controller, the voltage polarity changes depending on whether it is raising or lowering. Similarly, for the right door motor controlled by terminals 5 and 3 of the controller, the voltage polarity changes depending on whether it is raising or lowering.



6、电动摇窗机附加线束结构：

左、右车门线束：在仪表台两侧与驾驶室对接。

图1所示线束为F3000左车门线束，零件号：DZ95189772117。其中9孔方插接器X481为电动摇窗机插接器。线束进入车门后一路向上敷设，分出的2个电动摇窗机开关插接器（5孔圆插接器）和电动摇窗机电机插接器M101（2孔），其中编号S107的插接器接靠上的电动摇窗机开关，控制左车门摇窗机的升降。

编号S188的插接器接靠下的电动摇窗机开关，控制右车门的摇窗机。

Left and right door harnesses: Interface with the dashboard on both sides of the cabin.

The harness shown in Figure 1 is the F3000 left door harness, part number: DZ95189772117. The 9-hole square connector X481 is the connector for the power window mechanism. After entering the door, the harness is routed upward, with two connectors separated: the power window switch connector (5-hole circular connector) and the power window motor connector M101 (2-hole). Connector labeled S107 connects to the upper power window switch, controlling the operation of the left door power window mechanism. Connector labeled S188 connects to the lower power window switch, controlling the right door power window mechanism.

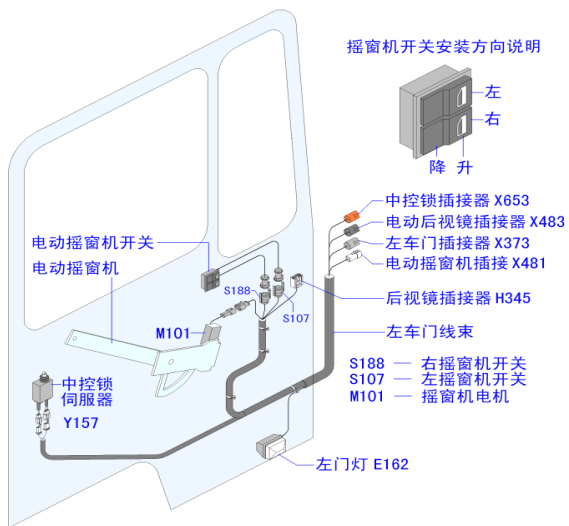


图1 左车门线束结构及在车门内的敷设示意图



图2所示线束为F3000右车门线束，零件号：DZ95189772116。其中7孔圆插接器X482为电动摇窗机插接器。线束进入车门后一路向上敷设，分出右车门电动摇窗机开关插接器S189（5孔圆插接器）和电动摇窗机电机插接器M120（2孔）。

电动摇窗机附加线束的其他部分，还有控制器插接器，电动摇窗机保险丝，分电器连接线，正负电源连接线，结构简单，具体连接可以查阅电动摇窗机电器原理图，这里不再叙述。

The harness shown in Figure 2 is the F3000 right door harness, part number: DZ95189772116. The 7-hole circular connector X482 is the connector for the power window mechanism. After entering the door, the harness is routed upward, with two connectors separated: the right door power window switch connector S189 (5-hole circular connector) and the power window motor connector M120 (2-hole).

The additional parts of the power window mechanism harness include the controller connector, power window mechanism fuse, distribution wiring, positive and negative power supply wiring. The structure is simple, and specific connections can be found in the power window mechanism electrical schematic. Further details are not provided here.

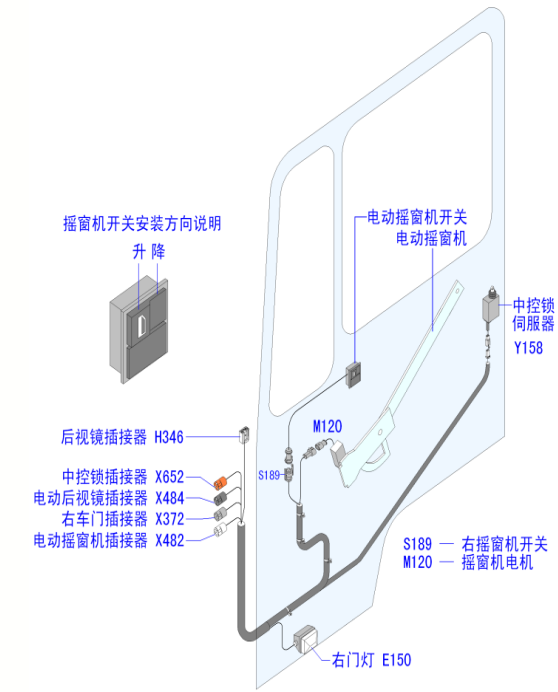


图2 左车门线束结构及在车门内的敷设示意图