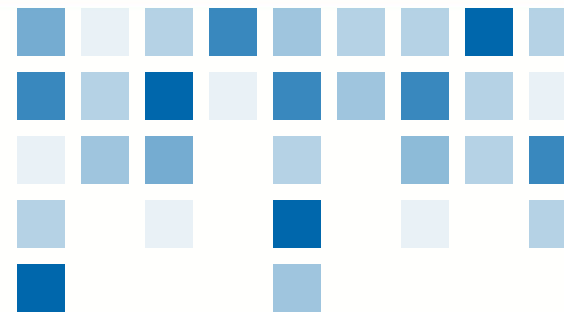
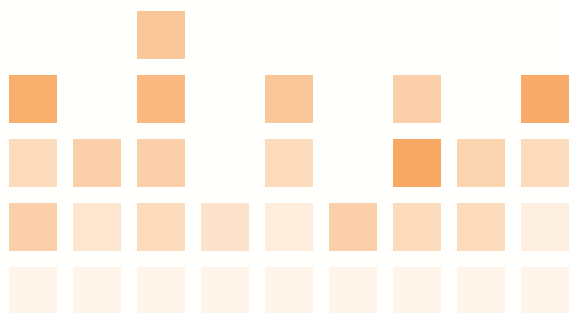




SHACMAN 汽车电器知识培训

F2000-F3000

陕汽进出口公司服务部培训科



第三十八课 阅读电路图

1. 电气原理图识图；

要想全面掌握整车的电器系统，首先就要全面细致地了解电器系统全部的构成，电路图就是最好的也是唯一的工具。只有全面地了解整车电器原理图，才能掌握整车电路，出现故障也才能依据电路图来进行排查。

电气原理图是汽车维修查找电气问题的重要工具，学会使用电路图将减少查找故时间，电路图上标柱出电路的相互关系、电路在何处接到电源电压、用什么颜色的导线等供维修工作准确诊断所需的补充资料。

陕汽重卡车原理图按类型分主要有SX2150K 系列，军车SX2153系列，奥龙S2000、新S2000系列，德龙F2000、F3000系列，M3000、新M3000系列，X3000系列，其他各附加电器功能的系统电气原理也是在各车型系列基础上再增加一部分，虽然种类很多，但电气原理图识图方法基本相同。

下面我们首先介绍如何阅读理解德龙F2000系列的整车电器原理图。参考资料是F-2000新原理图。



2.电气图形符号;

大多数电路图上不使用实际图形而是使用电气图形符号，图形符号是用于电气图或其他文件中的表示项目或概念的一种图形、标记或字符，是电气技术领域中最基本的工程语言。

因此，为了看懂汽车电路图，我们要掌握和熟练地运用它，各原理图中经常使用的电器元件符号与所对应编号规则如下所示。

A: 一般代表几个特定的电器设备，代表特定的插接器，代表重要的控制器，代表某个电器总成，代表某个传感器等。

例如：A100是中央电器装置板，A101是火焰预热控制器，A104是空调控制器，A106是空调风机控制器，A107是电动天窗控制器，A148是收音机，A155是24/12V变压器，A156是右后视镜加热器，A157是左后视镜加热器，A186是组合仪表总成，A185是组合仪表信号灯总成，A187是左前照灯总成，A188是右前照灯总成，A387是驾驶室内温度传感器等等。

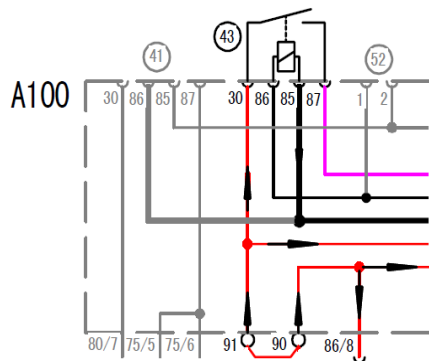
Electrical Schematic Interpretation: To comprehensively understand the electrical system of a vehicle, it's essential to meticulously comprehend the entirety of the electrical system. Electrical schematics are the best and often the only tool available for this task. Only by fully understanding the electrical schematics of the entire vehicle can one grasp the entirety of the vehicle's electrical circuitry. Troubleshooting electrical issues becomes feasible only with the aid of electrical schematics.

Electrical schematics are crucial tools in automotive repair for identifying electrical problems. Proficiency in using circuit diagrams can significantly reduce the time required to diagnose faults. Circuit diagrams illustrate the interrelationships between circuits, indicate where circuits receive power voltage, specify the colors of wires used, and provide other supplementary information necessary for accurate diagnosis and repair work.

Schematic diagrams for Shaanxi Heavy-duty Trucks are categorized primarily by series, including the SX2150K series, the military SX2153 series, the Aolong S2000 and new S2000 series, the Delong F2000 and F3000 series, the M3000 and new M3000 series, and the X3000 series. Although there are various types, the methods for interpreting electrical schematics are essentially the same across all series.

Now, let's start by introducing how to read and understand the electrical schematics of the Delong F2000 series. The reference material used is the F-2000 new schematic diagram.





A100是中央电器装置板： 电器原理图F-2000新，第1页，实际上在原理图的每一页左上角，都有A100的标记，如上图。

A100图中，附有虚线框把电器装置板内部和外部区分出来。可以把虚线框理解为电器装置板的塑料外壳。

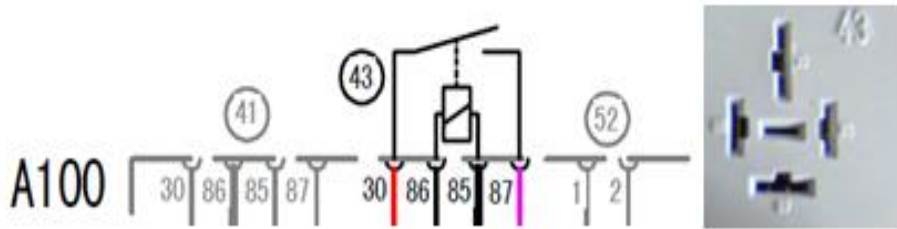
A100图中，虚线框包围的区域以内，实线代表电器装置板内部的电路导通连接情况。实际上电器装置板的内部是大量的镀锌紫铜片、紫铜条、紫铜板相互紧密按压接触装配在一起形成一个电器总成。

A100 is the Central Electrical Equipment Board: Electrical Schematic F-2000 New, Page 1. In fact, on the top left corner of each page of the schematic, there is a mark indicating A100, as shown in the above diagram.

In the A100 diagram, a dashed line frame separates the internal and external areas of the electrical equipment board. The dashed line frame can be understood as the plastic casing of the electrical equipment board.

Within the area enclosed by the dashed line frame in the A100 diagram, solid lines represent the continuity of circuits inside the electrical equipment board. In reality, the interior of the electrical equipment board consists of numerous galvanized copper sheets, copper bars, and copper plates tightly pressed and assembled together to form an electrical assembly.





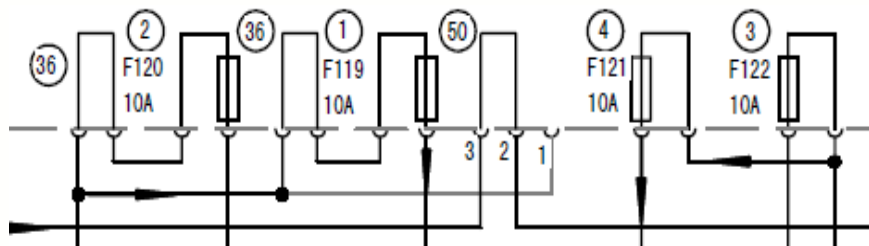
A100图中，虚线框包围的区域以外，代表电器装置板外面的电路导通连接情况。其中虚线框上部，代表的是电器装置板前面的各个插接器位置等，所有的带圆圈的数字字符，如上图中的“带圈41号”是电器装置板前面的41号继电器插接器位置，“带圈43号”是电器装置板前面的43号继电器插接器位置，“带圈52号”是电器装置板前面的52号连接铜片位置。

注意：上图中的“带圈41号”和“带圈52号”是预留位置，目前暂时未使用，所以使用较浅颜色画出和标注。

In the A100 diagram, the area outside the dashed line frame represents the continuity of circuits outside the electrical equipment board. The upper part of the dashed line frame represents various connector positions on the front of the electrical equipment board. All the numbered characters enclosed in circles, such as "Circled 41", indicate the positions of relay connectors on the front of the electrical equipment board. "Circled 41" represents the position of relay connector 41, "Circled 43" represents the position of relay connector 43, and "Circled 52" represents the position of connection copper plate 52 on the front of the electrical equipment board.

Note: "Circled 41" and "Circled 52" in the diagram are reserved positions that are currently not in use, hence they are drawn and labeled with lighter colors.





注意：带圆圈的数字字符，只代表电器装置板前面的各个插接器位置编号，它具体是什么功能是由插接器的针脚位置排列决定的。它有时候是小继电器如“带圈37号”，有时候是大继电器如“带圈70号”，有时候是保险丝如“①号”，有时候是连接铜片如“带圈50号”，有时候是二极管如“带圈53号”，有时候是直铜片如“带圈36号”。每一个带圆圈的数字字符的功能是设计固定的，不可更改。

Note: The numbered characters enclosed in circles represent only the identification numbers of various connector positions on the front of the electrical equipment board. The specific function of each position is determined by the arrangement of pins in the connector. Sometimes it represents a small relay, as in "Circled 37", sometimes a large relay like "Circled 70", sometimes a fuse like "①", sometimes a connection copper plate like "Circled 50", sometimes a diode like "Circled 53", and sometimes a straight copper plate like "Circled 36".

The function of each numbered character enclosed in circles is fixed and cannot be changed.

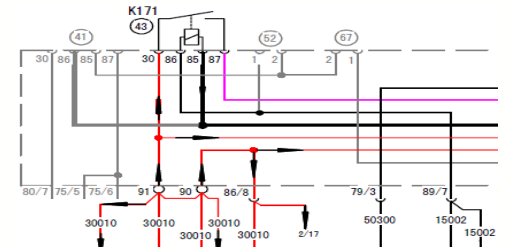


A100图中，在电器装置板前面的43号位置，标记有30,87,85,86端子位置，都和继电器的功能端一一对应。它们和其他部分的电路连接表达了电器装置板内部真实的电路连接关系。下图中，如86端子连接“89/7”位置就是电器装置板后面的89号插接器7号相连接。30端子连接“91”位置就是电器装置板后面的91号接线柱相连接。

A100图中，虚线框包围的区域以外，代表电器装置板外面的电路导通连接情况。其中虚线框下部，代表的是电器装置板后面的各个插接器位置等。如上图中的“89/7”是电器装置板后面的89号插接器7号位置，此处连接了2个15002线。

如图中的“79/3”是电器装置板后面的79号插接器3号位置，此处连接50300线。

In the A100 diagram, at position 43 on the front of the electrical equipment board, there are markings for terminals 30, 87, 85, and 86, each corresponding to the functional terminals of a relay. They express the actual circuit connections inside the electrical equipment board with other parts. In the diagram below, for example, the connection of terminal 86 to position "89/7" corresponds to the connection with position 7 of connector 89 at the back of the electrical equipment board. Terminal 30 connected to position "91" corresponds to the connection with terminal 91 at the back of the electrical equipment board. Outside the dashed box in the A100 diagram represents the external circuit connections of the electrical equipment board. The lower part of the dashed box represents the positions of various connectors at the back of the electrical equipment board. For instance, "89/7" in the diagram corresponds to position 7 of connector 89 at the back of the electrical equipment board, where two 15002 wires are connected. Similarly, "79/3" corresponds to position 3 of connector 79 at the back of the electrical equipment board, where a 50300 wire is connected.



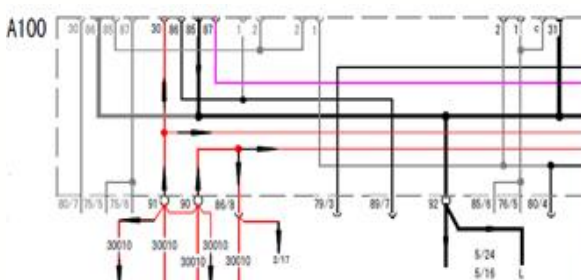
如图中的“90”和“91”是电器装置板后面的90号和91号接线柱位置，此处连接30010线。

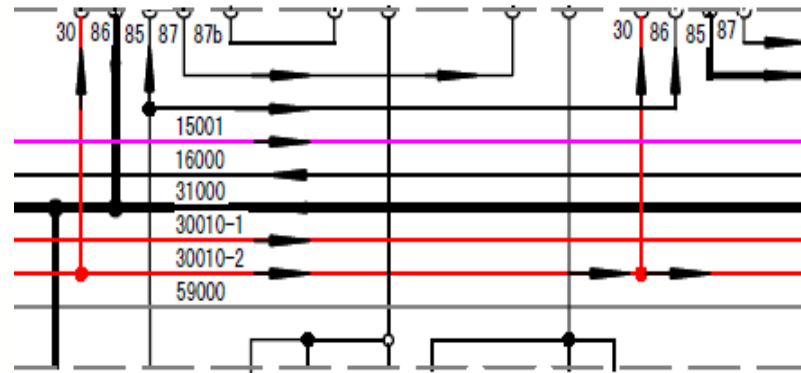
The markings "90" and "91" in the diagram represent positions on the back of the electrical equipment board corresponding to terminals 90 and 91. At these positions, the 30010 wires are connected.



A100图中，与电器装置板后面92号接线柱连接的是搭铁线，使用较粗的实体黑线画出，31000代表电器装置板内部的搭铁线导通连接情况。

In the A100 diagram, the connection to terminal 92 on the back of the electrical equipment board is the ground wire, indicated by a thick solid black line. The designation "31000" represents the internal grounding wire connection situation within the electrical equipment board.





A100图中，在电器装置板内部，使用连接较多的电线，如15001钥匙电使用细紫色线画出，16000仪表电使用细黑色线画出，31000搭铁线使用粗黑色线画出，30010常电使用细红色线画出，同时在电线上方予以代码标注，如上图。

In the A100 diagram, within the electrical equipment board, various wires are depicted with different colors and designated codes above them. Specifically:

The key power wire (15001) is drawn in thin purple.

The instrument power wire (16000) is drawn in thin black.

The ground wire (31000) is drawn in thick black.

The constant power wire (30010) is drawn in thin red.

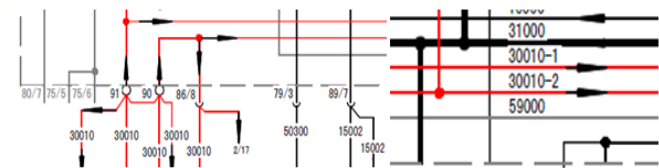
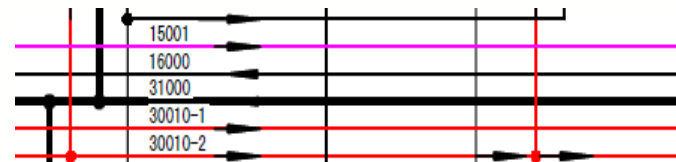


A100图中，为了表达电器装置板内部的直流电路导通连接情况，电流方向使用箭头画出和标注，如下图，用于维修判断参考。

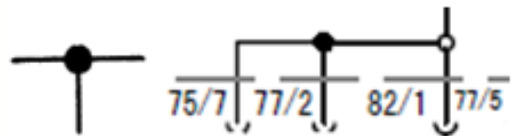
A100图中，为了表达电器装置板内部的30010常电电路导通连接情况，与91号接线柱连接的常电使用30010-1标注，与90号接线柱连接的常电使用30010-2标注。实际上91号和90号在电器装置板后面的接线柱是使用铜片连接在一起的。

In the A100 diagram, to illustrate the continuity of the electrical circuits within the electrical equipment board, arrows indicating the direction of current flow are used and labeled for reference during maintenance and troubleshooting.

Furthermore, to depict the continuity of the constant power (30010) circuit within the electrical equipment board, the constant power connected to the 91st terminal is labeled as "30010-1", and the constant power connected to the 90th terminal is labeled as "30010-2". In reality, terminals 91 and 90 on the rear terminal board of the electrical equipment board are connected using copper strips.



A100图中，为了表达电器装置板内部的电路导通连接情况，电路的分支连接使用圆形黑点画出，如下图，表示此处的电路是导通连接的。



A100图中，为了表达电器装置板内部的电路导通连接情况，电路的交叉使用十字画出，无黑点，如下图，表示此处的电路不导通连接的。

In the A100 diagram, to indicate the continuity of the electrical circuits within the electrical equipment board, branch connections are marked with circular black dots, as shown in the diagram below, indicating that the circuit at these points is connected.

Similarly, to represent the continuity of the electrical circuits within the electrical equipment board, intersections are marked with a cross without a black dot, as shown in the diagram below, indicating that the circuit at these points is not connected.

