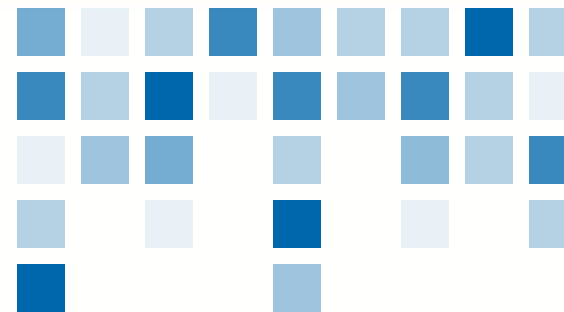
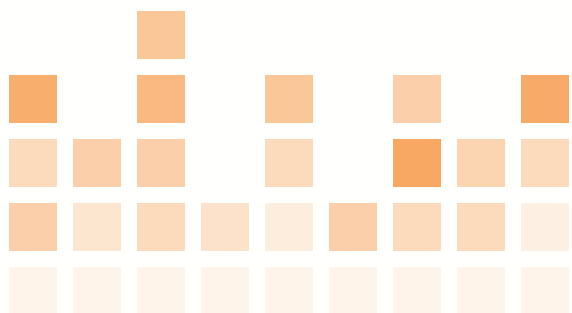




# SHACMAN 汽车电器知识培训

F2000-F3000

陕汽进出口公司服务部培训科



## 第十八课 主要车型启动电路3

### 1. 德龙国III 柴油发动机启动电路

如下图，德龙国III 柴油发动机启动电路系统主要由M100-启动机、Q101-钥匙开关、ECU-发动机ECU、F163-ECU保险丝、S14-空档开关等组成。因为篇幅较大，此图分为两页显示。

#### Delong Euro III Diesel Engine Starting Circuit

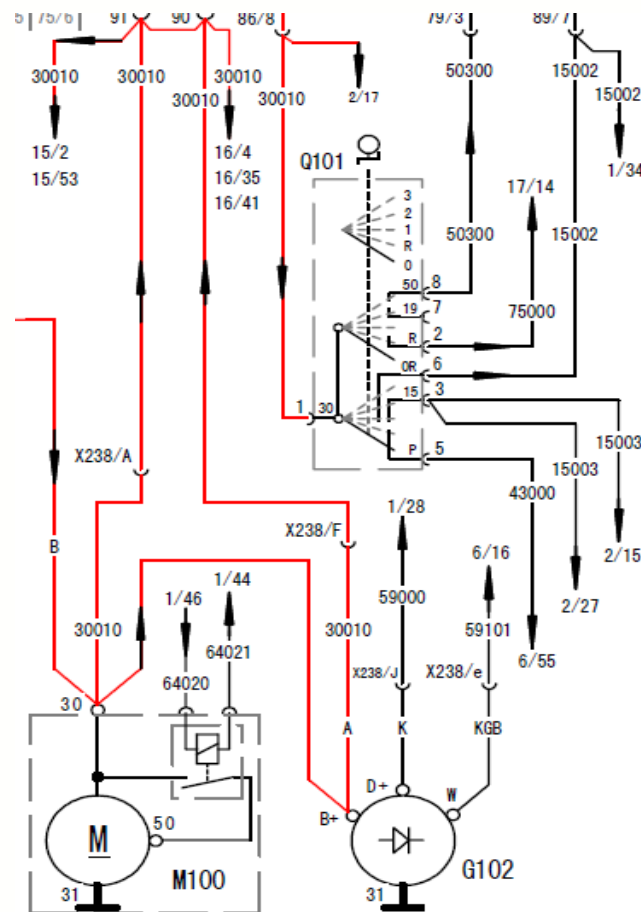
As shown in the diagram below, the starting circuit system of the Delong Euro III diesel engine mainly consists of M100 - Starter Motor, Q101 - Ignition Switch, ECU - Engine Control Unit, F163 - ECU Fuse, S14 - Neutral Switch, etc.

Due to its large size, this diagram is displayed on two pages.

德龙F2000国三启动电路组成： M100-启动机 Q101-钥匙开关

ECU-发动机ECU F163-ECU保险丝 S14-空档开关 德龙F2000国三启动电路原理图1

Delong Euro III Starting Circuit Composition: M100 - Starter Motor Q101 - Ignition Switch ECU - Engine Control Unit F163 - ECU Fuse S14 - Neutral Switch Delong F2000 Euro III Starting Circuit Schematic 1

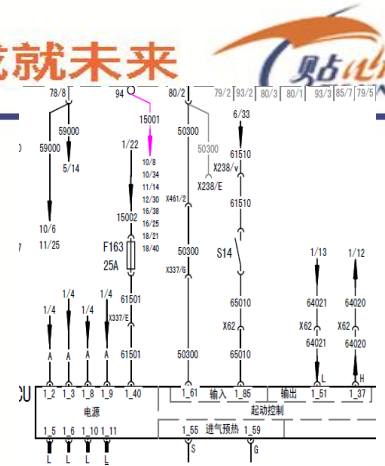


如果德龙F2000国三车型的钥匙开关Q101打开到1号位置给整车通电，此时继续旋转钥匙开关至3号启动位置，启动信号电源由（50300线）经电器装置板A100-79-3位置进入，再由电器装置板A100-80-2位置输出，然后经过X461-2（烟灰盒后面）插接器和X337-G（水龙头）插接器连接到了发动机ECU的1.61孔位（收到启动信号）。

ECU根据当时的各个发动机传感器的信号判断可以启动，则通过ECU的1.51孔位和1.37孔位输出24V启动信号（37孔是高电平，H端，+24伏，51孔是低电平，L端，0伏），经过64020和64021线直接接通启动机50端的线圈回路（此启动机50端是2孔插头连接），启动继电器触点闭合，启动机运转工作，带动发动机旋转启动。待发动机正式启动运转ECU自动退出启动控制。

If the ignition switch Q101 of the Delong F2000 Euro III model is turned to position 1 to power the entire vehicle, and then the key is further rotated to position 3 for starting, the starting signal power is provided by the (50300 wire) through the electrical device board A100-79-3 position, then output from the electrical device board A100-80-2 position, and then connected through the X461-2 (behind the ashtray) connector and X337-G (water tap) connector to the engine ECU's 1.61 hole (receiving the starting signal).

The ECU determines based on the signals from various engine sensors at that time whether it can start. If so, it outputs a 24V start signal through the ECU's 1.51 and 1.37 holes (37 hole is high level, H end, +24V, 51 hole is low level, L end, 0V), which is directly connected to the coil circuit of the starter 50 terminal (this starter 50 terminal is connected by a 2-hole connector) through the 64020 and 64021 wires. The starter relay contacts close, the starter motor operates, and the engine starts to rotate. After the engine starts running normally, the ECU automatically exits the starting control.



德龙F2000国三起动电路组成：

M100-启动机\Q101-钥匙开关

ECU-发动机ECU\F163-ECU保险丝

\S14-空档开关\

The starter circuit of the Delong F2000 Euro III model consists of the following components:

- M100: Starter motor
- Q101: Ignition switch
- ECU: Engine Electronic Control Unit
- F163: ECU fuse
- S14: Neutral position switch



## 2. 德龙WP国三发动机起动控制的一些特点：

- ①. 应急起动功能（3秒启动功能）：与奥龙国三相同。
- ②. 起动限时保护：与奥龙国三相同。
- ③. 起动自动断电：与奥龙国三相同。

## 3. 德龙WP国三发动机的ECU的工作电源：

德龙潍柴国三发动机的ECU的工作电源有两种，分为**常电电源**和**钥匙电电源**。

它的常电电源有4个正极和4个负极。由电瓶正极柱的24V**常电电源**，直接由6平方毫米的红色线连接到2路保险丝盒的30A保险丝，然后通过4根2.5平方毫米白色线连接到了ECU的1.02, 1.03, 1.08, 1.09端子，这是ECU的4个正极常电电源。

由电瓶负极柱的负极（搭铁线），直接由2.5平方毫米的棕色线连接到了ECU的1.05, 1.06, 1.10, 1.11端子，这是ECU的4个负极线。

The starting control features of the Delong WP Euro III engine are as follows:

Emergency start function (3-second start function): Similar to the Olong Euro III. Start time protection: Similar to the Olong Euro III. Automatic power-off after starting: Similar to the Olong Euro III.

Regarding the ECU power supply for the Delong WP Euro III engine, there are two types: constant power supply (constant electricity) and key power supply (switched electricity).

The constant power supply has four positive poles and four negative poles. The 24V constant power supply from the positive pole of the battery is directly connected to the 30A fuse in the 2-way fuse box via a 6 square millimeter red wire. Then, it is connected to the ECU's terminals 1.02, 1.03, 1.08, and 1.09 through four 2.5 square millimeter white wires. These are the four positive constant power sources of the ECU.

The negative pole (ground wire) from the battery's negative pole is directly connected to the ECU's terminals 1.05, 1.06, 1.10, and 1.11 through a 2.5 square millimeter brown wire. These are the four ground lines of the ECU.





WP国三发动机的ECU的**钥匙电电源**：德龙的钥匙电，是把钥匙开关Q101-6位置的15002线传递到了电器装置板A100-89-7位置，由此处分配一根15002线，然后由F163（25安培）保险丝经过X337-E插接器（水龙头）送入ECU的1.40孔位，ECU根据此24伏电压作为指令执行开机动作。\\

The key power supply for the Delong WP Euro III engine's ECU is as follows:

The key power is derived from the key switch Q101-6 position's 15002 wire, which is transmitted to position 89-7 on the electrical apparatus board A100. From there, a single 15002 wire is distributed. Then, it passes through the F163 (25-ampere) fuse and the X337-E connector (water faucet) before entering the ECU's 1.40 terminal. The ECU executes startup actions based on this 24-volt voltage as an instruction.



#### 4. 德龙国四柴油发动机起动电路:

如下图, 德龙国四柴油发动机起动电路系统主要由M100-启动机、Q101-钥匙开关、ECU-发动机ECU、F604-ECU常电保险丝、F603-ECU开机保险丝、S14-空档开关等组成。因为篇幅较大, 此图分为两页显示。

Delong Euro IV diesel engine starting circuit:

As shown in the diagram below, the starting circuit system of Delong Euro IV diesel engine mainly consists of M100 - starter motor, Q101 - ignition switch, ECU - engine ECU, F604 - ECU constant power fuse, F603 - ECU startup fuse, S14 - neutral switch, etc. Due to the large size, this diagram is displayed on two pages.

德龙国四起动电路组成:

Q101-钥匙开关

S14-空档开关

A100 电器装置板

F603-ECU开机保险丝

F604-ECU常电保险丝

ECU-发动机ECU

X337-插

接器

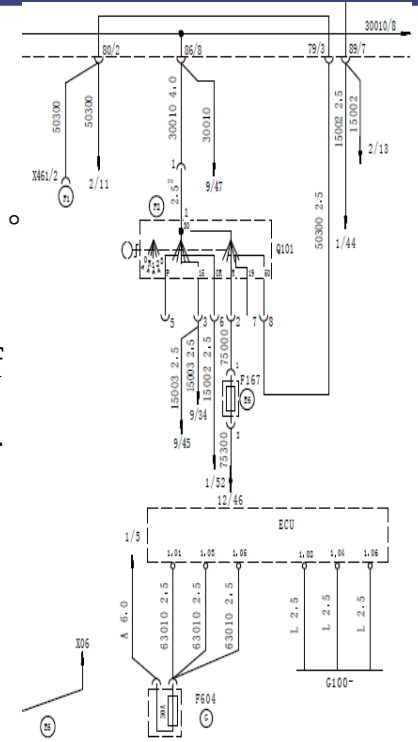
M100启动机

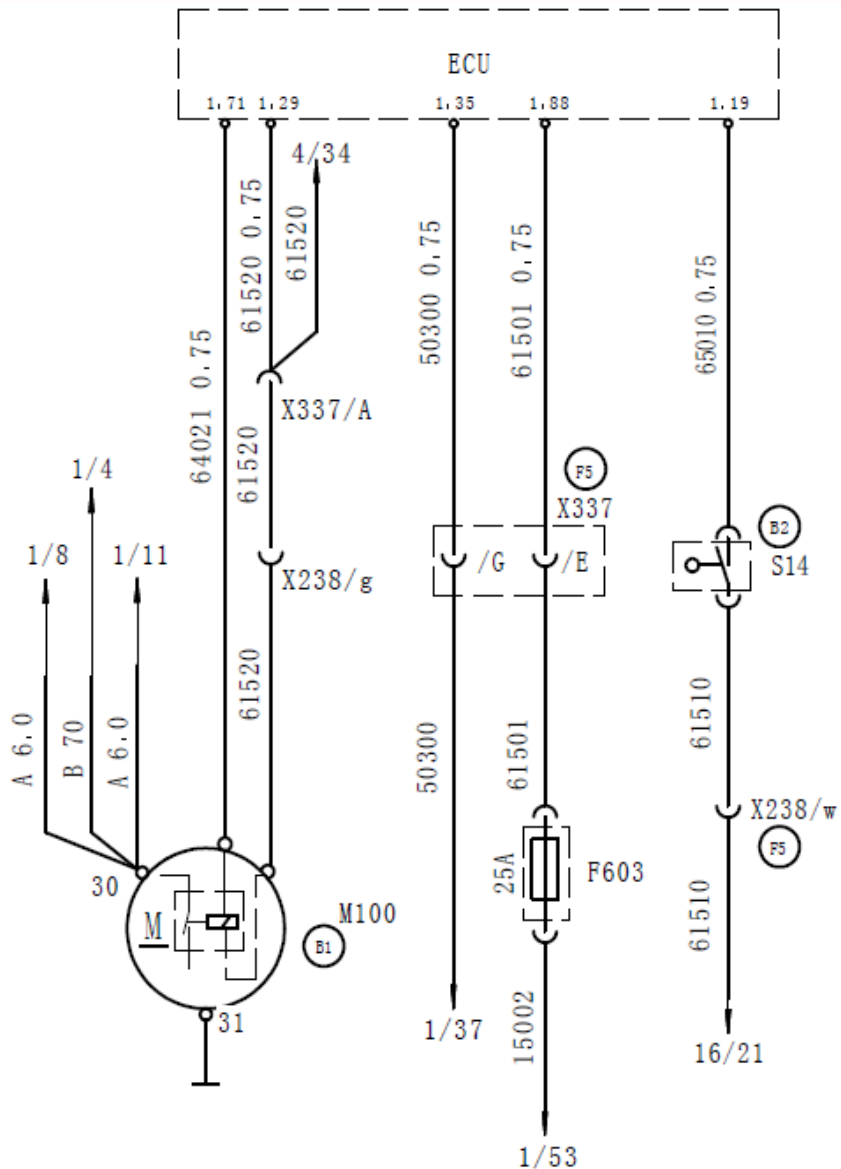
Composition of Delong Euro IV starting circuit:

Q101 - Ignition switch S14 - Neutral switch A100 - Electric control unit board F603 - ECU startup fuse

F604 - ECU constant power fuse ECU - Engine control unit X337 - Connector

M100 - Starter motor





德龙国四起动电路组成:

Q101-钥匙开关      S14-空档开关  
A100 电器装置板      F603-ECU开机保险丝      F604-ECU常  
电保险丝      ECU-发动机ECU      X337-插接器  
M100启动机

Composition of Delong Euro IV starting circuit: Q101 -  
Ignition switch

S14 - Neutral switch A100 - Electric control unit board

F603 - ECU startup fuse

F604 - ECU constant power fuse

ECU - Engine control unit X337 - Connector

M100 - Starter motor

德龙F3000国四起动电路原理图2



如果德龙F3000国四车型的钥匙开关Q101打开到1号位置给整车通电，此时继续旋转钥匙开关至3号启动位置，启动信号电源由（50300线）经电器装置板A100-79-3位置进入，再由电器装置板A100-80-2位置输出，然后经过X337-G（水龙头）插接器连接到了发动机ECU的1.35孔位(收到启动信号)。

ECU根据当时的各个发动机传感器的信号判断可以启动，则通过ECU的1.71孔位和1.29孔位输出24V启动信号（29孔是高电平，H端，+24伏，71孔是低电平，L端，0伏），经过61520和64021线直接接通启动机50端的线圈回路（此启动机50端是2孔插头连接），启动继电器触点闭合，启动机运转工作，带动发动机旋转启动。待发动机正式启动运转ECU自动退出启动控制。

If the key switch Q101 of Delong F3000 Euro IV model is turned to position 1 to power the entire vehicle, then continued rotation of the key switch to position 3 for starting, the starting signal power is supplied through the (50300 line) via the A100-79-3 position on the electrical device board, then output from position A100-80-2, and then through the X337-G (faucet) connector to the 1.35 hole of the engine ECU (receiving the starting signal).

The ECU determines whether the engine can be started based on the signals from various engine sensors. If the conditions are met, the ECU outputs a 24V starting signal through the 1.71 and 1.29 holes (the 29 hole is high level, H terminal, +24 volts, the 71 hole is low level, L terminal, 0 volts) . This signal is directly connected to the starter motor's coil circuit via the 61520 and 64021 lines (the starter motor's 50 terminal is connected by a 2-pin connector). The starter relay contacts close, the starter motor operates, and the engine starts to rotate. Once the engine is running properly, the ECU automatically exits the starting control.





## 5. 德龙WP国四起动控制的一些特点:

①. **应急起动功能（3秒启动功能）**：当空档开关损坏又无法及时更换的情况下，将钥匙开关置于起动档持续3秒钟，ECU 便会控制起动机起动。注意：此操作具有一定危险性，操作前一定要确保档位处于空档（一般左右摇动挡杆，如果感觉轻便灵活则表明此时处于空档位置），如无把握则不要通过此种方式起动发动机。

另外在气压足够的情况下，起动前踩下离合器踏板会减少起动阻力，使起动更加顺利。

②. **起动限时保护**：起动机是短时工作制，一次起动时间不可过长，ECU 有限时保护功能，当一次连续起动时间超过12秒仍未能起动，ECU会自动切断起动继电器电源，保护起动机。

③. **起动自动断电**：当起动机已成功起动，ECU 会自动切断起动继电器电源，并且在发动机运转过程中误将钥匙开关置于起动档时ECU也不会接通起动继电器电源。

Some characteristics of the starting control system of Delong WP Euro IV:

Emergency starting function (3-second start function): When the neutral switch is damaged and cannot be replaced in time, placing the key switch in the start position for 3 seconds will prompt the ECU to control the starter motor to start. Note: This operation carries certain risks. Before operation, ensure that the gear lever is in neutral (generally, move the gear lever left and right; if it feels light and flexible, it indicates neutral position). If uncertain, do not attempt to start the engine in this way. Additionally, pressing the clutch pedal before starting, provided there is sufficient air pressure, reduces starting resistance, making the starting process smoother.

Starting time limit protection: The starter motor operates on a short-term basis, and prolonged starting is not recommended. The ECU incorporates a time limit protection feature, automatically cutting off the starter relay power if continuous starting exceeds 12 seconds, thus safeguarding the starter motor.

Automatic disconnection after starting: Once the starter motor successfully starts the engine, the ECU automatically disconnects the starter relay power. Moreover, during engine operation, if the key switch is mistakenly turned to the start position, the ECU will not activate the starter relay power.



## 6. 德龙WP国四发动机的ECU的工作电源:

德龙潍柴国四发动机的ECU的工作电源有两种, 分为**常电电源**和**钥匙电电源**。

它的常电电源有3个正极和3个负极。

由电瓶正极柱的24V**常电电源**, 直接由6平方毫米的红色线连接到2路保险丝盒的30A保险丝, 然后通过3根2.5平方毫米63010白色线连接到了ECU的

1. 01, 1. 03, 1. 05端子, 这是ECU的3个正极常电电源。

由电瓶负极柱的负极(搭铁线), 直接由2.5平方毫米的L棕色线连接到了ECU的1. 02, 1. 04, 1. 06端子, 这是ECU的3个负极线。

WP国四发动机的ECU的钥匙电电源: 德龙的钥匙电, 是把钥匙开关Q101-6位置的15002线传递到了电器装置板A100-89-7位置, 由此处分配一根15002线, 然后由F603(25安培)保险丝经过X337-E插接器(水龙头)送入ECU的1.88孔位, ECU根据此24伏电压作为指令执行开机动作。

### Power Supply of ECU for Delong WP Euro IV Engine:

The ECU of the Delong Weichai WP Euro IV engine has two types of power supply: constant power supply and key power supply.

Its constant power supply consists of 3 positive poles and 3 negative poles.

The constant power supply from the positive pole of the battery column, which is 24V, is directly connected to the 30A fuse in the 2-way fuse box via a 6 square millimeter red wire. Subsequently, it is connected to the ECU's terminals 1.01, 1.03, and 1.05 through three 2.5 square millimeter white wires, serving as the ECU's 3 constant positive power supplies.

The negative pole (ground wire) from the battery column is directly connected to the ECU's terminals 1.02, 1.04, and 1.06 through a 2.5 square millimeter brown wire, serving as the ECU's 3 ground wires.

The key power supply of the WP Euro IV engine's ECU is derived from the key switch Q101's position 6 via the 15002 wire, which is then routed to position 7 of the A100 electronic device board. From there, one 15002 wire is allocated, and it is passed through the F603 (25 ampere) fuse and then via the X337-E connector (water tap) to reach the ECU's position 1.88 hole. The ECU utilizes this 24V voltage as an instruction to execute the startup operation.

