

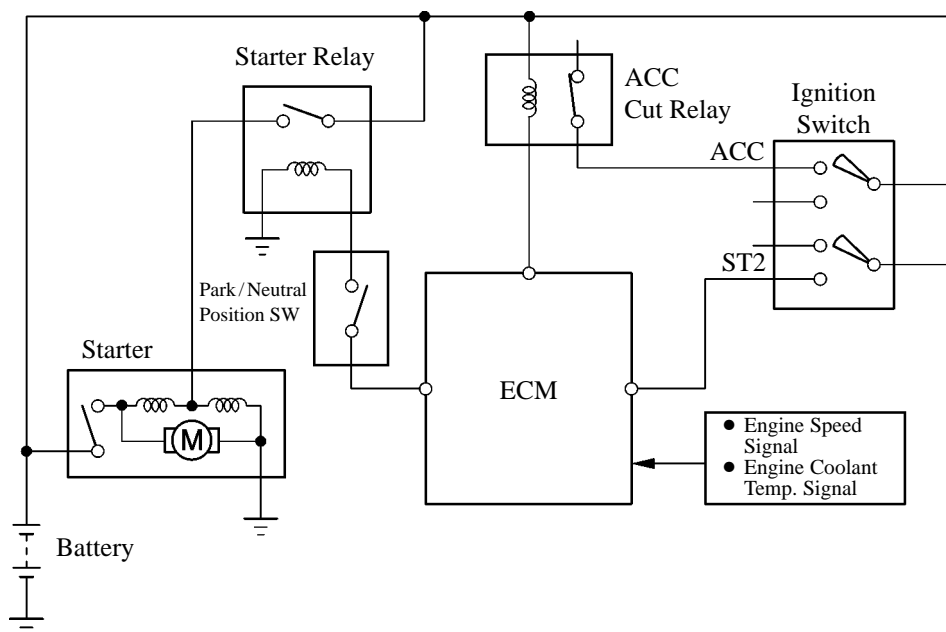
12. Cranking Hold Function

General

- The '03 4Runner has adopted cranking hold function. Once the ignition switch is turned to the START position, this control continues to operate the starter until the engine starts, without having to hold the ignition switch in the START position. This prevents starting failures and the engine from being cranked after it has started.
- When the ECM detects a start signal from the ignition switch, this system monitors the engine speed (NE) signal and continues to operate the starter until it has determined that the engine has started. Furthermore, even if the ECM detects a start signal from the ignition switch, it will not operate the starter if it has determined that the engine has already started.

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► System Diagram ◀

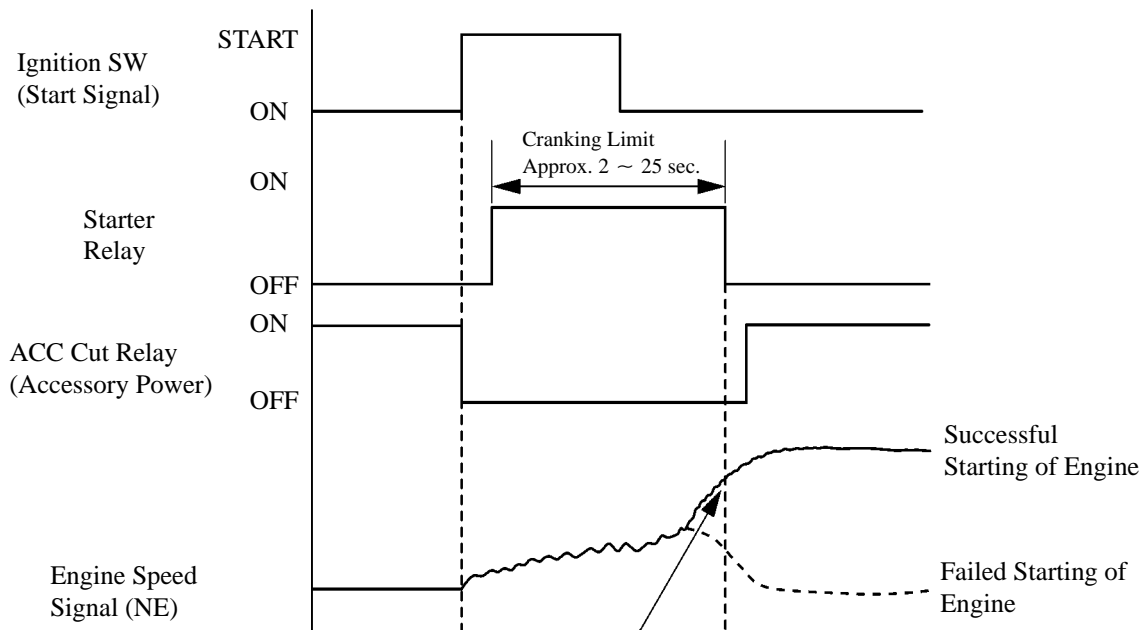


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Operation

- As indicated in the timing chart shown below, when the ECM detects a start signal from the ignition switch, it energizes the starter relay to operate the starter. If the engine is already running, the ECM will not energize the starter relay.
- After the starter operates and the engine speed becomes higher than approximately 500 rpm, the ECM determines that the engine has started and stops the operation of the starter.
- If the engine has any failure and will not work, the starter operates as long as its maximum continuous operation time and stops automatically. The maximum continuous operation time is approximately 2 seconds through 25 seconds depending on the engine coolant temperature condition. When the engine coolant temperature is extremely low, it is approximately 25 seconds and when the engine is warmed up sufficiently, it is approximately 2 seconds.
- This system cuts off the current that powers the accessories while the engine is cranking to prevent the accessory illumination from operating intermittently due to the unstable voltage that is associated with the cranking of the engine.
- This system has following protection.
 - While the engine is running normally, even if turning the ignition switch to START position, the starter will not operate.
 - In case that the driver keep holding the ignition switch in START position and the engine starts half way, the ECM will stop the starter operation when the engine speed has become approximately 1200 rpm or more.
 - In case that the driver keep holding the ignition switch in START position and the engine will not start, the ECM will stop the starter operation when approximately 30 seconds have been passed.
 - In case that the starter begins to operate, but cannot detect the engine speed signal, the ECM will stop the starter operation immediately.

► Timing Chart ◀



ECM determines that the engine has started successfully when the engine speed is approximately 500 rpm.

13. Diagnosis

- When the ECM detects a malfunction, the ECM makes a diagnosis and memorizes the failed section. Furthermore, the MIL (Malfunction Indicator Lamp) in the combination meter illuminates or blinks to inform the driver.
- The ECM will also store the DTCs of the malfunctions.
- The DTCs can be accessed the use of the hand-held tester.
- To comply with the OBD-II regulations, all the DTCs (Diagnostic Trouble Codes) have been made to correspond to the SAE controlled codes. Some of the DTCs have been further divided into smaller detection areas than in the past, and new DTCs have been assigned to them.
For details, refer to the 2003 4Runner Repair Manual Supplement (Pub. No. RM1034U).

Service Tip

To clear the DTC that is stored in the ECM, use a hand-held tester or disconnect the battery terminal or remove the EFI fuse for 1 minute or longer.

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14. Fail-Safe

General

When the ECM detects a malfunction, the ECM stops or controls the engine according to the data already stored in the memory.

► Fail-Safe Chart ◀

DTC No.	Fail-Safe Operation	Fail-Safe Deactivation Conditions
P0031, P0032, P0037, P0038, P0051, P0052, P0057, P0058	The heater circuit in which an abnormality is detected is turned off.	Ignition switch OFF.
P0100, P0102, P0103	Ignition timing is calculated from an engine speed and a throttle angle.	Return to normal condition.
P0110, P0112, P0113	Intake air temp. is fixed at 20°C (68°F).	Return to normal condition.
P0115, P0117, P0118	Engine coolant temp. is fixed at 80°C (176°F).	Return to normal condition.
P0120, P0122, P0123, P0220, P0222, P0223, P2135	Fuel cut intermittently when idle.	Return to normal condition and ignition switch OFF.
P0121	Fuel cut intermittently when idle.	Return to normal condition and ignition switch OFF.
P0325, P0330	Max. timing retardation.	Ignition switch OFF.
P0351, P0352, P0353, P0354, P0355, P0356	Fuel cut.	Return to normal condition.
P2102, P2103	Fuel cut intermittently when idle.	Return to normal condition and ignition switch OFF.
P2111, P2112	Fuel cut intermittently when idle.	Return to normal condition and ignition switch OFF.
P2119	Fuel cut intermittently when idle.	Return to normal condition and ignition switch OFF.