PARK FADEC-2101

Fully Authorized Digital Engine Control Unit

Overview

PARK FADEC-2100 houses two modules of PARK ECU-100.

PARK FADEC-2100 performs following functions:

- Engine Control
- Propeller Pitch Control
- Redundancy Management
- Voter Logic & Output Switching
- Health Monitoring
- Control of Glow Plug Control unit

The PARK ECU-100 is an Engine Control Unit for interfacing and controlling a four-stroke, four cylinder and common rail direct injection engine for airborne (UAV) application. The ECU accepts inputs from a variety of sensors, processes the parameters and provides outputs to control various actuators. The ECU primarily controls the fuel supply to the engine. It computes fuel quantity based on demand from vehicle control unit, engine speed and position and other sensors. Apart from quantity of fuel to be supplied, the ECU also computes the timing for achieving demanded power and performance.

Salient Features

Reads inputs from various sensors

- Power Level Sensor
- Camshaft Position Sensor
- Crankshaft Position Sensor
- Intake Air Pressure Sensor
- Intake Air Temperature Sensor
- Atmospheric Pressure Sensor
- Coolant Temperture Sensor
- Fuel Temperature Sensor
- Rail Pressure Sensor
- Mass Airflow Sensor

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Provides outputs to / drives following actuators

- Fuel Injectors (4 Nos.)
- Glow Plug Controller
- Inlet Fuel Metering Valve
- Boost Pressure Control Valve (2 Nos)
- Caution Lamps (2 Nos)
- Governor Set Point Actuator
- Stores various lookup tables and Propeller Set Point Curve
- Supports Turbocharger interface
- Engine safety with limit checks and interlocks
- Power-on Self-test, CBIT
- MIL-STD-1553B Bus interface
- Sensor data, POST and CBIT are available as output on CAN Bus and RS-422 Serial Port
- Customization, Calibration, Fuel optimization, Emission Control
- 28V Operation

Processing of Sensor Signals

Power Lever Sensor	:	The power lever sensor indicates desired power or control the thrust output of the aircraft's engines.
Crankshaft Position Sensor	:	The crankshaft position sensor provides the position and rotational speed of the crank. The ECU uses this information in controlling the fuel injection. Based on this information and Camshaft position, current combustion cycle will be determined by the ECU. The ECU determines the amount of fuel injected and start of injection.
Camshaft Position Sensor	:	The camshaft position sensor, in conjunction with the crankshaft position sensor, serve the function of cylinder identification. With this information, the ECU determines which cylinder is approaching the top dead center. The ECU determines the amount of fuel injected and start of injection.

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Boost (Intake Air) Pressure Sensor	:	It measures the air pressure in the intake manifold. The ECU uses the parameter to regulate and monitor intake air pressure.
Intake Air Temperature Sensor	:	It measures the air temperature in the intake manifold. The ECU uses the parameter to calculate a correctional value for the intake air pressure
Mass Airflow Sensor	:	Mass Airflow Sensor (MAF) measures the air entering the engine. The ECU uses this information to calculate the amount of fuel injected and amount of recirculated exhaust gas, if the engine features Exhaust Gas Recirculation (EGR).
Rail Pressure Sensor	:	It measures the fuel pressure in the common rail. The ECU uses this parameter in determining the duration for which the Inlet Fuel Metering valve to be opened.
Coolant Temperature Sensor	:	The coolant temperature is used by the ECU as a correction value to calculate the amount of fuel to be injected, the intake air pressure, start of delivery and the amount of recirculated exhaust gas.
Fuel Temperature Sensor	:	The ECU calculates fuel density from fuel temperature. This is used as a correction value in calculating the amount of fuel to be injected
Altitude Sensor	:	Altitude sensor provides vehicle altitude above mean sea level. This information is used by the ECU to determine a correction value for intake air pressure control and exhaust gas recirculation.
Injectors	:	The start of injection affects several engine properties, such as performance, fuel consumption, noise emission and exhaust emissions. ECU determines precise point of fuel delivery and inject. The ECU calculates the start of injection primarily based on engine speed and calculated quantity of fuel to be injected. ECU considers coolant temperature and air pressure too in calculating the start of injection.
Inlet Fuel Metering Valve	:	The quantity of fuel injected influences important engine properties, such as the torque, output, fuel consumption / efficiency, exhaust gas emission and mechanical and thermal stress of the engine. By supplying precise amount of fuel, the ECU ensures the engine operates with optimal fuel combustion in all working conditions. To reach the desired torque, a set quantity of fuel is required to be supplied to the engine. The ECU calculates this quantity based on below factors: • Power Level Sensor input • Engine speed • Amount of Air Drawn • Coolant temperature • Fuel temperature • Intake air temperature Also, the ECU calculates a limit value for the maximum quantity of fuel injected. This limit value depends on engine speed, air mass and air pressure. If engine is supplied with fuel beyond this limit, mechanical damage may happen to the engine.

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Glow Plugs	:	Glow plugs facilitate starting of engine at low external temperatures. The ECU, based on external / ambient temperature, actuates glow plug relays. The glow plugs are activated when an attempt is made to start the engine at lower outside temperature (below 10°C). The Glow Plug Enable discrete output signal shall be set. On expiry of glow period, Glow Plug Enable discrete output reset and then the engine can be started. Glow Plugs continue to be actuated for extended glow period, provided battery voltage is not low. The Glow Plug relays shall be deactivated once the engine reaches 2500 rpm. Glow Plugs can be activated when the aircraft is on ground only. This extended glow period helps lowering the combustion noise, improves idling speed quality and reduces carbon dioxide emissions

* The specification of the product is likely to change with better features due to constant R&D of the product for better performance.