

CHAPTER

74

Engine Ignition GE 115

(GE90-100 SERIES ENGINES)

CHAPTER 74
ENGINE IGNITION GE 115

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**CHAPTER 74
ENGINE IGNITION GE 115**

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IGNITION - INTRODUCTION

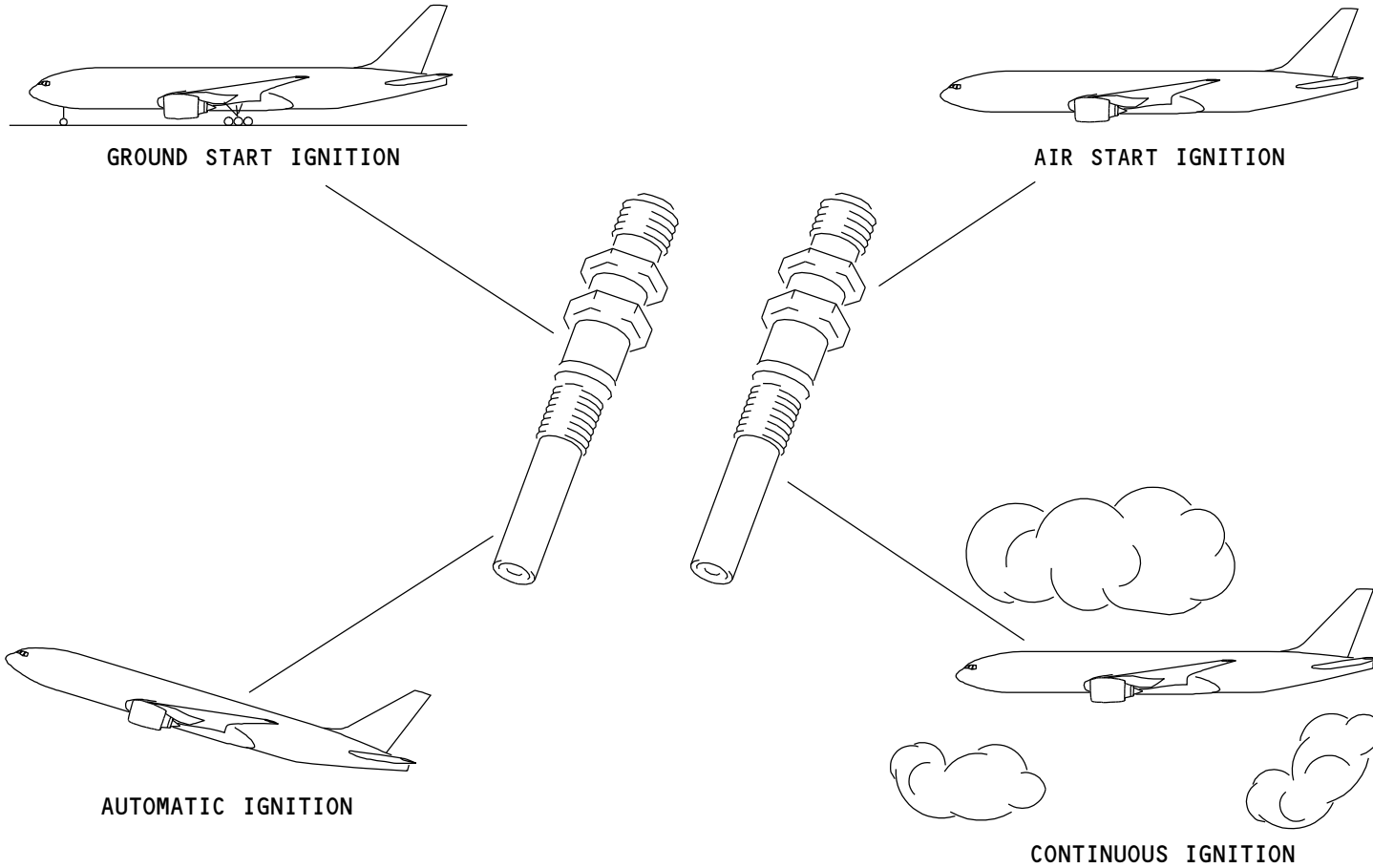
Purpose

Each engine has two ignition systems that operate independently. They supply electrical sparks in the combustion chamber to start combustion or make sure combustion continues.

The ignition system has automatic and manual operation modes on the ground and in flight.

Abbreviations and Acronyms

- ACIPS - airfoil and cowl ice protection system
- AIMS - airplane information management system
- CON - continuous
- EAI - engine anti-ice
- EDIU - engine data interface unit
- EEC - electronic engine control
- ELMS - electrical load management system
- FSEU - flap slat electronics unit
- HPC - high pressure compressor
- NORM - normal
- OPAS - overhead panel ARINC 629 system



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IGNITION - INTRODUCTION

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IGNITION - GENERAL DESCRIPTION

General

The ignition system for each engine contains these components:

- (1) Ignition Exciter (2)
- (2) Ignition Lead (2)
- (3) Igniter (2).

These components control the operation of the ignition system:

- (1) Start/Ignition Selector
- (2) Fuel Control Switch
- (3) Airfoil and Cowl Ice Protection System (ACIPS)
- (4) Flap Slat Electronics Unit (FSEU).

Power

The ignition system gets 115v ac power from the Electrical Load Management System (ELMS). The fuel control switch must be in the RUN position to let the ELMS supply ignition power to the EEC. The EEC controls the power to the ignition exciters.

Autostart or Manual Start Ignition

For the first auto-relight (automatic) or manual engine start on the ground, the EEC supplies power to one ignition exciter only. During the second and third start attempts, the EEC selects both ignition systems.

During an autostart, the EEC starts a timer at 2000 RPM (21.4%). After 15 seconds, the EEC supplies power to the ignition system. For a manual start, the EEC supplies power when the fuel control switch is put in the RUN position.

During a ground or in-flight engine start, the EEC removes power to the ignition system at 56 percent N2. The start/ignition selector moves to the NORM position just before the engine gets to idle speed.

Auto-Relight (Automatic) Ignition

When the START/IGNITION selector is in the NORM position, the igniter is energize when the flameout is detected.

The EEC will energize ignitors if a blowout is detected, based on N2 rate exceeding a threshold for 240 msec. Once auto-relight has energized the ignitors, it will keep them energized until the N2 rate drops to half of the triggering threshold. This logic applies above idle, regardless of flaps and anti-ice status.

NOTE: A Refused Take Off (RTO) decel is sufficient to trigger the auto-relight logic.

The auto-relight system test is done during the EEC self-test at engine start. There is an EICAS message if the system fails the test or if the system fails during a later phase of flight.

ARO ALL; AIRPLANES WITHOUT CONTINUOUS IGNITION SWITCH**Continuous Ignition**

There is EEC logic to inhibit continuous ignition on the ground during taxiing with N1 below 53% and when compressor discharge pressure (PS3) is above the ignitor quench pressure.

When the start/ignition selector is in the START position, the EEC causes the two ignition exciters to operate. The start/ignition selector position goes through AIMS or OPAS to the EDIU.

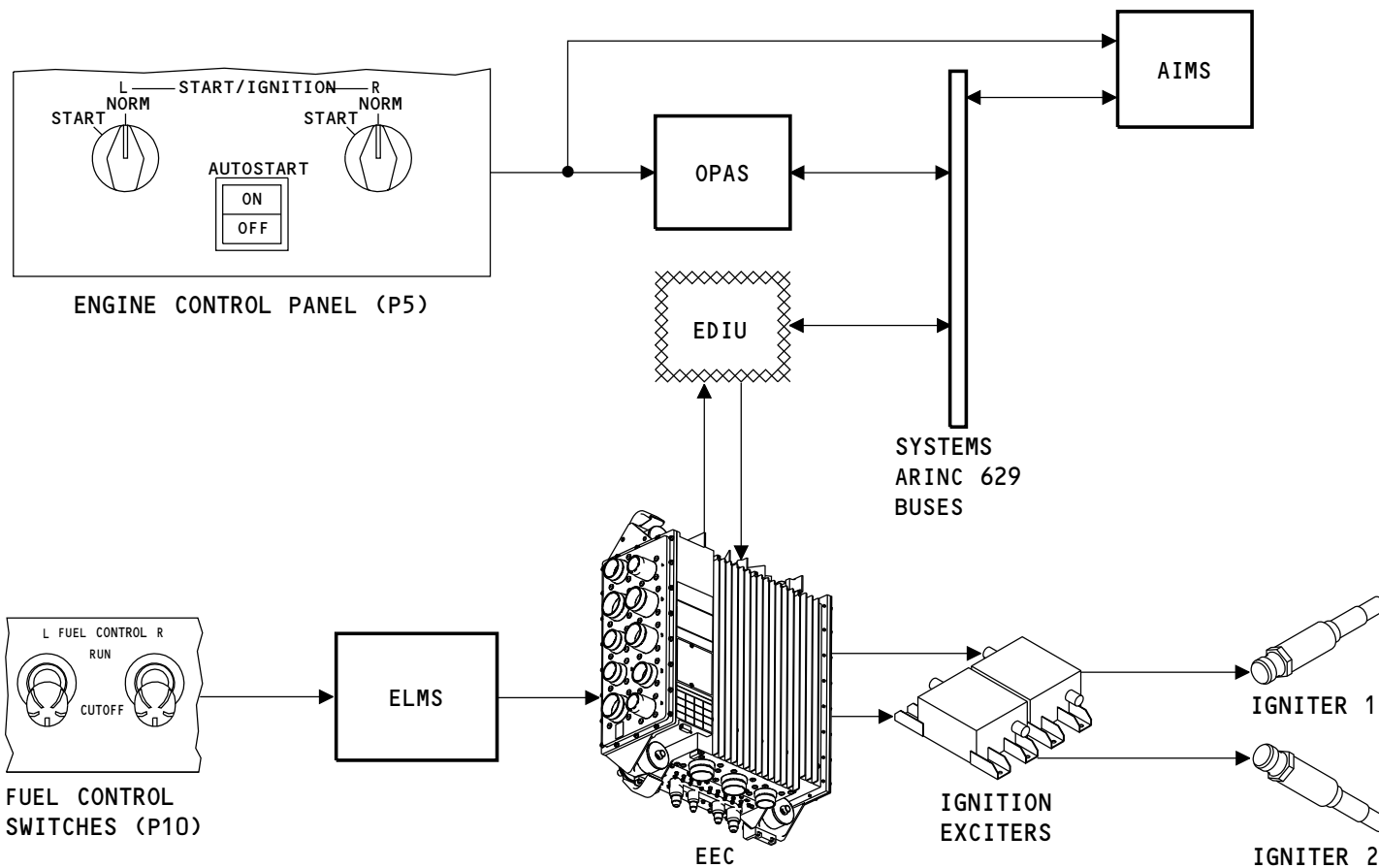
The EEC will energize ignitors if a blowout is detected, based on N2 rate exceeding a threshold for 120 msec, but only if flaps are not up or anti-ice is ON. Once ignition has energized the ignitors, it will keep them energized until N2 rate drops to half the triggering threshold and then for an additional 3 seconds.

In flight, the ignition logic energizes the ignitors whenever the manual switch on the flight deck is in the AUTOSTART position.

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IGNITION - GENERAL DESCRIPTION

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IGNITION - ENGINE COMPONENT LOCATIONS

General

The ignition system components are on the left side of the engine. You open the left thrust reverser half to get access to these components:

- Ignition exciter (2)
- Ignition lead (2)
- Igniter (2).

The two ignition exciters are on the left side of the high pressure compressor (HPC), above the accessory gearbox.

The upper ignition lead goes to the upper igniter at the 9:30 position. The lower ignition lead goes to the lower igniter at the 8:00 position.

Training Information Point**WARNING**

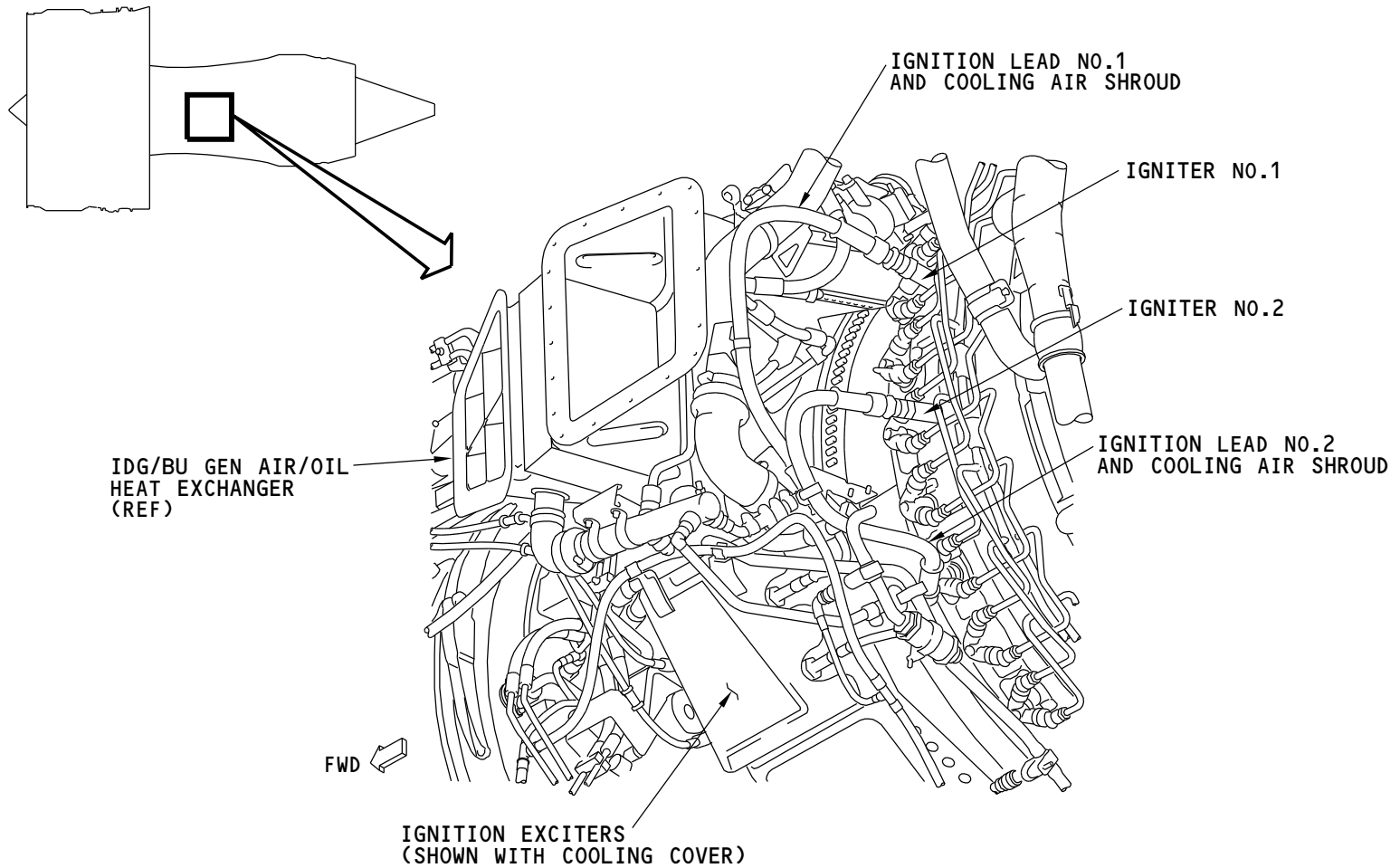
MAKE SURE THAT THE IGNITION SYSTEM IS OFF FOR FIVE MINUTES BEFORE YOU TOUCH THE COMPONENT. IGNITION VOLTAGE IS HIGH WHICH MAKES IT DANGEROUS. IGNITION VOLTAGE CAN CAUSE INJURIES TO PERSONNEL.

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IGNITION - ENGINE COMPONENT LOCATIONS

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IGNITION - IGNITION EXCITER

General

The ignition exciter changes 115v ac input power to pulsing high voltage output power. The high voltage power operates the igniter.

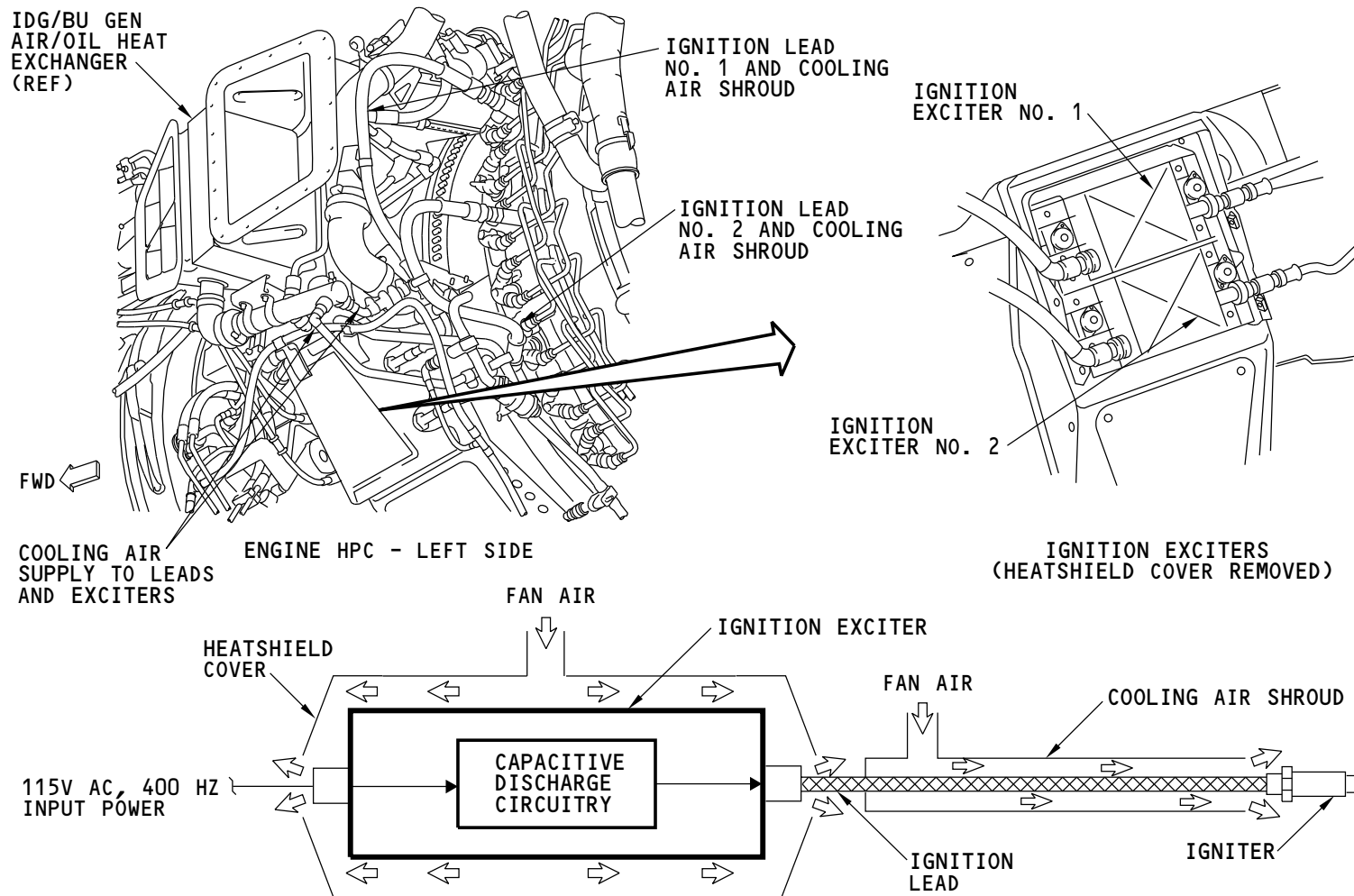
The exciter is a sealed unit. The input lead connects to the front of the exciter. It supplies 115v ac power to the exciter. The output lead connects to the rear of the exciter. It supplies high voltage pulses to the igniter.

Fan air cools the ignition exciters, leads and igniters.

Functional Description

The exciter uses capacitive discharge to make high voltage output pulses. The output pulses go through the ignition lead to the igniter tip.

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IGNITION - IGNITION EXCITER

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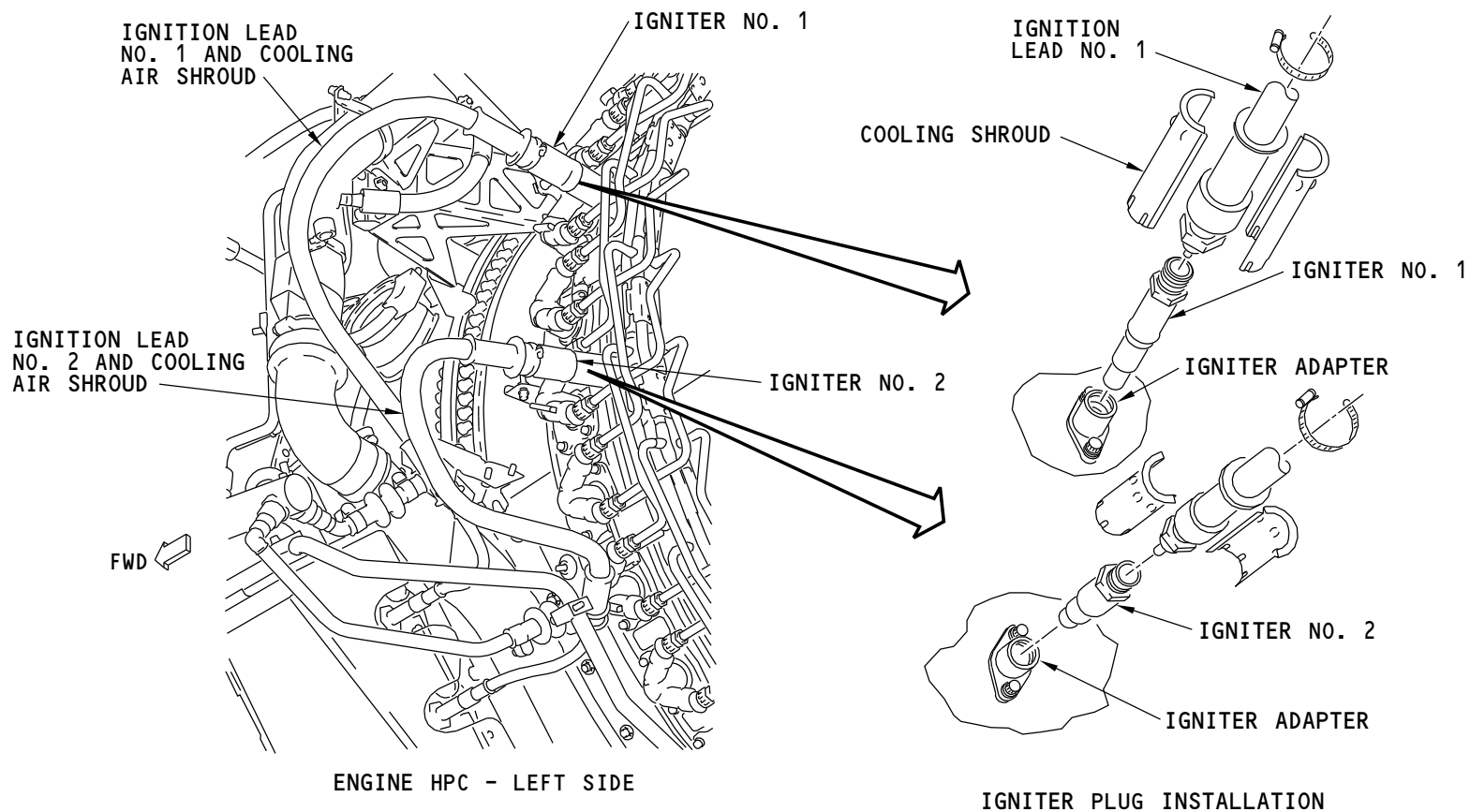
IGNITION - IGNITERS

General

The igniters fit into threaded adapters on the combustor/diffuser assembly. The fan air that cools the ignition lead goes out through the cooling shroud. This keeps the igniter cool.

Training Information Point

To remove an igniter, you must disconnect the cooling shroud halves and the ignition lead. Do not remove the igniter adapter.



IGNITION - IGNITERS

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IGNITION - FUNCTION DESCRIPTION

General

The EEC uses 28v dc and 115v ac to control and supply power to the ignition system.

Power Sources

The normal supply of power to energize the ignition exciters is 115v ac from the left and right main ac buses. The 115v ac standby bus is the alternate power supply to energize the ignition units.

Relays in the P110 left power management panel automatically select the supply for the ignition units.

Control

When the fuel control switch is in the RUN position, the ignition/fire detection relay and the generator control/ignition relay send power to the EEC.

The EEC uses airplane and engine conditions to control power to the ignition exciters. Each channel of the EEC can control power to one or two ignition exciters. Each ignition exciter can get power through one of two EEC switches. Channel A of the EEC commands one switch and channel B commands the other switch.

The EEC monitors the position of each switch. A failure of one switch causes the EEC channel in command to operate the switch in the other EEC channel.

For the first autostart or manual start attempt on the ground, the EEC lets only one ignition exciter get power. The choice of the ignition exciter changes for each ground start. If the engine fails to start, the EEC supplies power to the two ignition exciters on the second and third autostart attempt. You can cycle the fuel control knob after a failed manual start attempt, while continuing to motor the engine to change ignitors.

During an in-flight start, the EEC selects the two ignition exciters to get power.

When the start/ignition selector is in the NORM position, the EEC operates in the auto-relight mode. The EEC automatically supplies power to both ignition exciters when necessary.

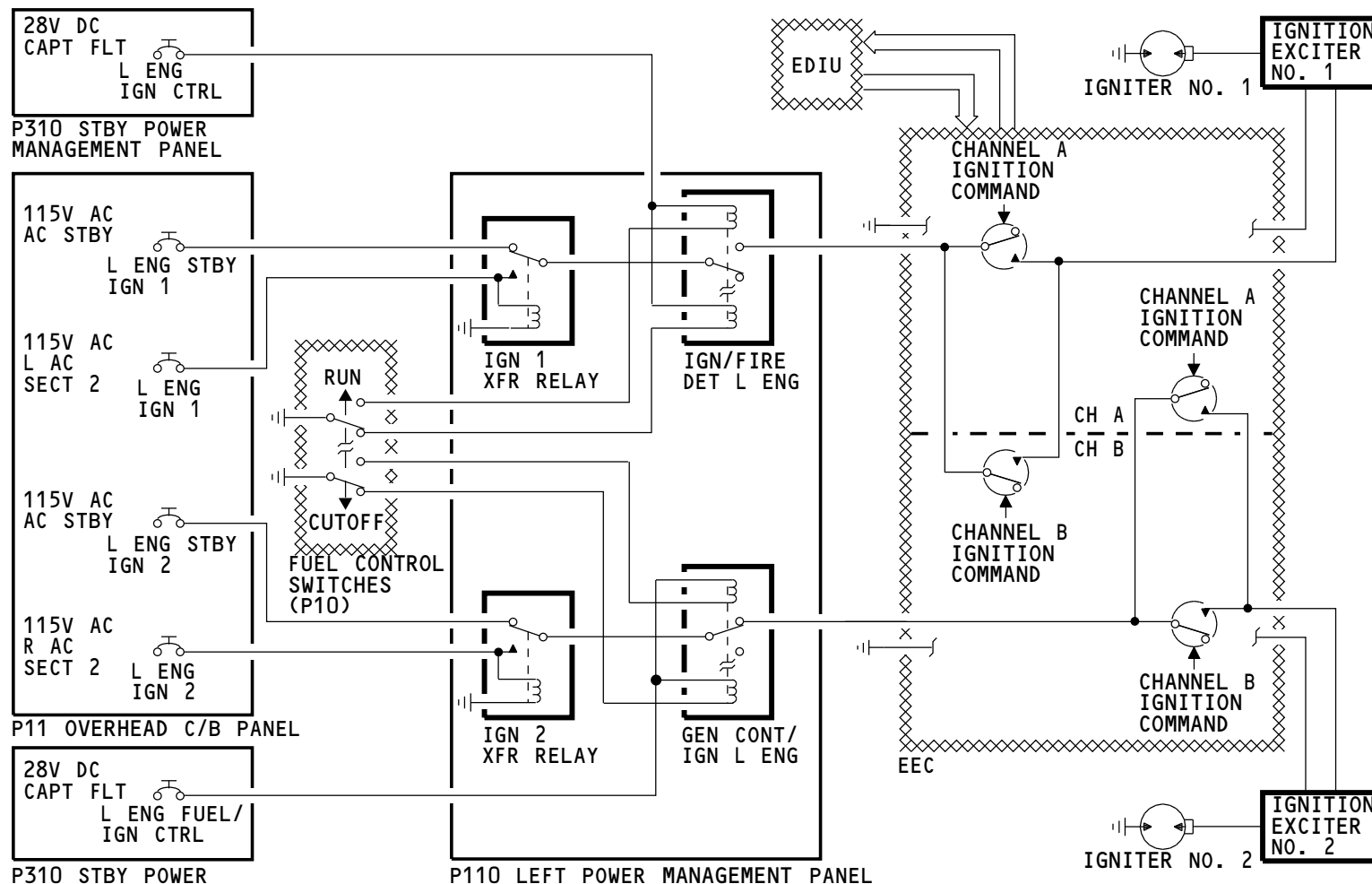
When the start/ignition selector is in the START position, the EDIU gets the switch position signal from the ARINC 629 system busses. This signal causes the EEC to operate the two ignition exciters.

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IGNITION - FUNCTION DESCRIPTION

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IGNITION - OPERATION

General

The EEC controls the operation of the ignition system. The EEC gets the start/ignition selector position to set these modes of operation for the ignition system:

START - Engine start ignition

NORM - (Auto-Relight) ignition.

The fuel control switch must be in the RUN position for the ignition system to operate.

Engine Start Ignition

When you do an autostart or manual start, the EEC can use one or two igniters.

On the first ground start (autostart or manual), the EEC uses one igniter. If the engine does not start, the EEC closes the FMV and dry motors the engine to purge unburned fuel from the combustor. The EEC then selects both ignition systems and attempts two additional start sequences before it stops the start process.

For all in-flight restarts, the EEC supplies power to both igniter systems.

During an autostart, the EEC starts a 15 second timer when N2 gets to 2000 rpm (21.4%). After 15 seconds, the ignition system starts and at 18 seconds, the fuel metering valve opens.

The EEC removes power to the igniter(s) at 56% N2.

Auto-Relight (Automatic) Ignition

When the START/IGNITION selector is in the NORM position, the igniter is energize when the flameout is detected.

The EEC will energize ignitors if a blowout is detected, based on N2 rate exceeding a threshold for 240 msec. Once auto-relight has energized the ignitors, it will keep them energized until the N2 rate drops to half of the triggering threshold. This logic applies above idle, regardless of flaps and anti-ice status.

NOTE: An Refused Take Off (RTO) decel is sufficient to trigger the auto-relight logic.

The auto-relight system test is done during the EEC self-test at engine start. There is an EICAS message if the system fails the test or if the system fails during a later phase of flight.

Continuous Ignition

There is EEC logic to inhibit continuous ignition on the ground during taxiing with N1 below 53% and when compressor discharge pressure (PS3) is above the ignitor quench pressure.

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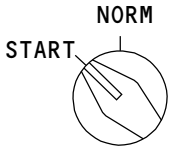
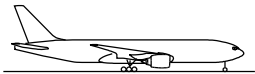
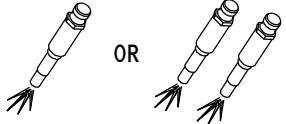
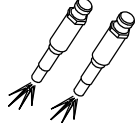
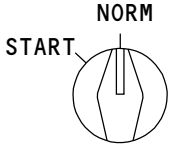
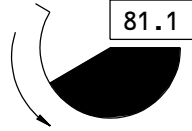
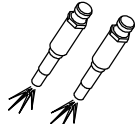
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START/IGNITION SELECTOR	AIRPLANE/ENGINE CONDITION	IGNITER OPERATION
 - ENGINE START IGNITION	 	 
 - AUTOMATIC IGNITION	 - PS3 LESS THAN 175 PSIG  - REJECTED TAKEOFF (RTO) COMMANDED  - ENGINE FLAMEOUT OR RAPID DECEL COMMANDED	

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IGNITION - OPERATION

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