

Gulfstream IV

OPERATING MANUAL

ENGINE IGNITION

2A-74-10: Engine Ignition System

1. General:

A. Description:

The ignition system, together with the cranking system, starts the engine on the ground and independently in flight (to re-start the engine).

The function of the ignition system is to supply ignition to the fuel and air mixture in the discharge of a series of sparks across the electrodes of the igniter plugs (the igniters are in combustion liners No. 4 and No. 8 in each engine). Combustion then passes between each liner through interconnectors to complete the combustion cycle. The aircraft electrical system supplies 28V DC to the high-energy ignition units, control is by the start master switch and the individual start selector switches.

B. Operation:

During the start sequence (MASTER START and ENG START switchlights to the ON position), the engine's start relay energizes to supply 28V DC power from the Essential DC bus to energize the respective ignition relay. The ignition relay then closes to supply 28V DC bus to the ignition unit(s).

NOTE:

On aircraft SN 1000 thru 1143 with ASC 151 and 1144 thru subsequent, only one ignition unit and igniter plug operate during ground starting, for example:

- Left Engine — No. 1 Ignition Unit
- Right Engine — No. 2 Ignition Unit
- With the ignition unit(s) energized, a green IGN annunciation appears next to the engine's HP RPM display.

As engine RPM reaches approximately 38 to 45%, the starter's centrifugal cutout switch opens to de-energize the start and ignition relays. The ignition unit(s) de-energize and the IGN annunciation clears.

Lifting the switch guard and pressing an AIR START IGN switchlight supplies 28V DC directly from the DC bus to the corresponding ignition units. With an AIR START IGN switchlight in on, the switchlight's blue ON caption illuminates and the green IGN annunciation appears next to the engine's HP RPM display on EICAS. When the ignition units are receiving power through the AIR START IGN switchlight they operate continuously.

C. Subsystems, Units and Components:

(See Figure 2.)

The Engine Ignition system is composed of the following units and components:

- Ignition Relay
- High Energy Transistorized Ignition Units (2 Per Engine)
- High Tension Leads (2 Per Engine)

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- Igniter Plugs (2 Per Engine)

2. Description of Subsystems, Units and Components:

A. Ignition Relay:

During ground starting, the ignition relay is energized when the starter relay and pneumatic starter are energized. When energized, the relay provides power from the Essential DC bus through the #1 IGN and #2 IGN circuit breakers to the high energy ignition units. Each ignition unit is provided with DC power from a separate circuit breaker.

B. High Energy Transistorized Ignition Units:

The ignition units change a low voltage DC electrical supply into a High Energy (HE.) output. They can be energized independently of the engine starting system if a re-start in flight is required. The components of the unit are housed in a light alloy case. This case also carries a Light Duty (LD) receptacle to connect it to the aircraft electrical supply and a HE receptacle to connect it to the igniters.

C. High Tension Leads:

A high tension lead connects the ignition unit output to its igniter plug.

D. High Energy Igniter Plugs:

The engine has two HE igniter plugs, installed in the diffuser case at numbers 4 and 8 combustion liner positions. The HE ignition unit supplies power to the terminal connector of the plug. This electrical energy causes a high intensity spark across the electrodes of each plug and supplies ignition to the fuel and air mixture in the combustion chamber.

3. Controls and Indications:

(See Figure 1.)

NOTE:

A description of the Engine Instruments and Crew Alerting System (EICAS) can be found in Section 5 of Honeywell's SPZ-8000 (or SPZ-8400) Digital Automatic Flight Control System Pilot's Manual for the Gulfstream IV.

A. Circuit Breakers:

The Engine Ignition system is protected by the following circuit breakers:

| Circuit Breaker Name: | CB Panel: | Location: | Power Source: |
|-----------------------|-----------|--------------|----------------|
| L/R #1 IGN | P | I-8, I-9 (1) | ESS 28V DC Bus |
| L/R #2 IGN | P | J-8, J-9 (1) | ESS 28V DC Bus |

NOTE(S):

(1) Depending on effectivity.

4. Limitations:

A. Flight Manual Limitations:

(1) For airplanes SN 1000 thru 1249 without ASC 304:

The duty cycle time for continuous (airstart) ignition without ASC 304 is five (5) minutes ON and thirty (30) minutes OFF for cooling. There

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is no limitation on the ignition when used in a thirty (30) seconds ON, thirty (30) seconds OFF cycle.

- (2) For airplanes SN 1250 and subs and SN 1000 thru 1249 with ASC 304:

There is no duty cycle time limitation for continuous (airstart) ignition with ASC 304 installed.

B. System Notes:

Although selection of continuous ignition is not time-limited, it will reduce overall igniter life. It should be turned off as soon as the condition has returned to normal.

It is recommended that the Air Start Ignition be selected ON for landing on a runway with standing water, slush, or snow.

If volcanic ash is encountered, however, it is recommended that Airstart Ignition be selected OFF. Operation of igniters when flying through volcanic ash may create a "glassed over" condition and render them inoperative.

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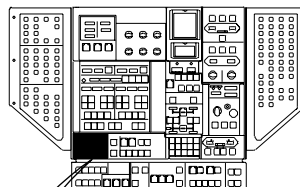
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MASTER CRANK

OFF:

- Blue ON legend is extinguished
- De-energizes start relay
- Automatically closes isolation valve (on ground only)

ON:

- Blue ON legend illuminates
- Allows the START switches to energize the start relay without energizing the auto-ignition relay
- Allows for cranking of engine without ignition or starting of engine
- Automatically opens isolation valve (on ground only)

MASTER START

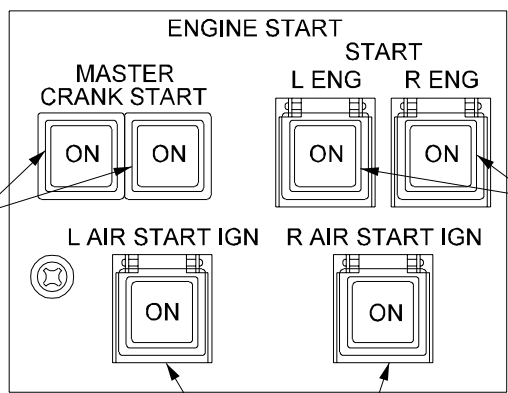
OFF:

- Blue ON legend is extinguished
- De-energizes start and auto-ignition relay
- Automatically closes isolation valve (on ground only)

ON:

- Blue ON legend illuminates
- Allows the START switches to energize the start relay and the auto-ignition relay
- Allows for cranking of engine without ignition or starting of engine
- Supplies ignition when starter is selected
- Automatically opens isolation valve (on ground only)

NOTE: For aircraft 1000 through 1155 (excluding 1034) having ASC 135, aircraft 1034, and aircraft 1156 and subsequent, selection of the MASTER CRANK or MASTER START switch closes the LEFT ECS PACK valve (on ground only). The valve will automatically reopen when the MASTER CRANK or MASTER START switch is deselected.



L/R ENG START

OFF:

- Blue ON legend is extinguished
- De-energizes start relay
 - Can be used to manually terminate power that energizes start relay (in lieu of automatic power termination at 42% HP RPM)

ON:

- Blue ON legend illuminates
- Start relay energized

NOTE: For aircraft 1000 through 1155 (excluding 1034) having ASC 135, aircraft 1034, and aircraft 1156 and subsequent, selection of the L ENG START or R ENG START switch closes the RIGHT ECS PACK valve (on ground only). The valve will automatically reopen when the start valve closes.

L/R AIRSTART IGN

OFF:

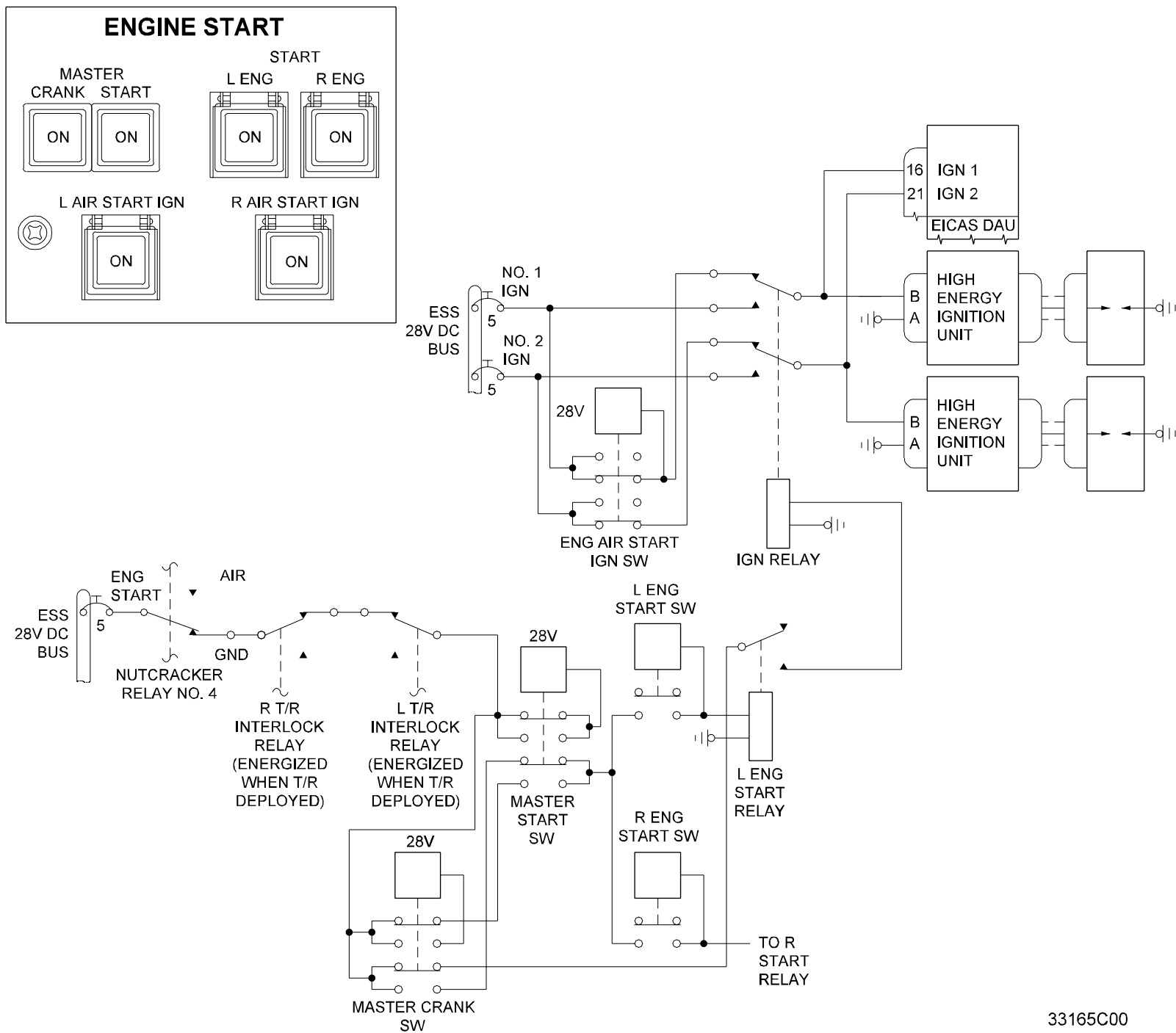
- Blue ON legend is extinguished
- De-energizes ignition units

ON:

- Blue ON legend illuminates
- Energizes ignition units directly from the Essential DC bus through the ignition unit CBs (this does not indicate ignition unit is operational)

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Engine Ignition System
Controls
Figure 1



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Engine Ignition System
Simplified Block Diagram
Figure 2

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