

NOTE: Procedures are clearly defined by section for ease of revising and printing.

General

Engine starts are normally accomplished by the Flight Crew in communication with ground personnel. If the Interphone is not available, Standard Hand Signals will be briefed before use. During start the ground crew will report any observed malfunction or abnormality. Obtain start clearance from ATC and ground crew as appropriate and accomplish the following.

When the Towbar is connected, the ground crew will call the Flight Deck via the Interphone to advise of the hookup prior to departure. This call will establish communication and check that the Interphone system is operating normally. The Captain/First Officer will advise if there will be any delay. The ground crew will standby on the headset for clearance to commence push-back.

CAUTION: Prior to push confirm **BYPASS PIN INSTALLED**.

CAUTION: IF THE PIN IS NOT INSTALLED, **System A hydraulic pumps must be OFF prior to connecting the towbar and during the entire pushback procedure. After the towbar has been disconnected, the A hydraulic pumps must be turned on during the after start flow.**

When pushback clearance (as required) has been received, initiate the push-back as below.

CAUTION: **Ground crew coordination is vital to a safe operation. Normal procedure is to pushback with the nose wheel steering bypass pin installed and the A hydraulic pumps ON**

NOTE: Unless dictated by operational requirements, only the No.1 engine should be started at the gate. If a cross bleed start is required, refer to Cross-Bleed Start Procedure in the Supplementary Normal Procedure section of the A.O.M. Normal engine start sequence is 2, 1.

Consideration should be given to delaying engine start until clear of the jetway or ramp area to avoid FOD ingestion and unnecessary engine running time.

Push Back / Engine Start Procedure

NOTE: NOTES, CAUTIONS, WARNINGS are clearly defined and easily readable. They can be tagged and programmed to be sorted and printed in any way (the whole manual).

NOTE: Procedures are laid out clearly and defined by boxes and areas to help eliminate any confusion.



737 Operations Manual

Ground	Captain (PF)	First Officer (PNF)
Pre Departure Check Complete.	"Roger Confirm Bypass Pin" installed and receive response.	
Ready for Push Back.	Standby for Push Back Clearance.	
	When ready, (door lights out), request push back clearance.	Obtain push back clearance as required.
	When pushback clearance is received check door lights and select Anti-collision light ON. Call "ENGINE START" checklist. If anticipating a delay from push back until engine start and maximum use of air-conditioning is desired call for "ENGINE START CHECKLIST TO THE LINE" (GOM Ch. 10, 1.4).	Read the ENGINE START checklist to the line.
"ROGER, CLEARED TO PUSH."	"Cleared to Push, "RELEASING BRAKES ON YOUR COMMAND."	
"RELEASE BRAKES."	"BRAKES RELEASED."	
"CLEARED TO START BOTH ENGINES."	"ROGER."	
	Call "BELOW THE LINE."	Select air conditioning pack OFF, check start pressure. Read and respond to the "BELOW THE LINE" items of the ENGINE START Checklist and state "ENGINE START CHECKLIST COMPLETE."
	NOTE: Unless dictated by operational requirements, only the No.1 engine should be started at the gate. If a cross bleed start is required, refer to Cross-Bleed Start Procedure in the Supplementary Normal Procedure section of the A.O.M. Normal engine start sequence is 2, 1.	
	NOTE: Consideration should be given to delaying engine start until clear of the jetway or ramp area to avoid FOD ingestion and unnecessary engine running time.	
	Announce to F/O "STARTING ENGINE # ____, " position Engine Start Switch to GRD.	Verify start valve opens by duct pressure drop and start valve open light illuminated.

Airline Information Systems - AIS, Inc.
Sample Only - Not to be used for operations of any kind.

737 Operations Manual

Ground	Captain (PF)	First Officer (PNF)
	<p>NOTE: The Start Switch need not be guarded during start but must be observed to return to OFF by 46% N2.</p> <p>NOTE: At least one aircraft Clock Sweep Second Hand must be running during the start to allow monitoring of the various time limits.</p>	
	Verify increase in N2 RPM. Call "CHECK"	Verify increase in oil pressure. Call "OIL PRESSURE RISING."
	Verify N1 RPM prior to positioning engine start lever to idle. At 25% N2 RPM, position Engine Start Lever to IDLE at earlier of 25% N2 or maximum Motoring.	Monitor N1 rotation.
	<p>WARNING:20% N2 IS MINIMUM REQUIRED FOR START. START LEVER MUST BE GUARDED DURING START. MAXIMUM MOTORING IS DEFINED WHEN THE N2 ACCELERATION IS LESS THAN 1% IN APPROXIMATELY 5 SECONDS.</p>	
	Verify Fuel Flow and EGT.	Monitor Fuel Flow and EGT.
	At 46% N2 RPM verify Start Switch moves to OFF.	As engine Start Switch moves to OFF verify duct pressure increases before start pressure and start valve light extinguishes. Then call "STARTER CUTOUT."
	<p>CAUTION:Monitor N1, N2, EGT, Fuel Flow and Oil Pressure as engine accelerates and stabilizes at idle. Do not start second engine until first engine is stabilized.</p>	
"SET BRAKES."	"BRAKES SET."	Verify oil pressure by the time engine is stabilized.
"TOW BAR DISCONNECTED."	"ROGER."	
Disconnecting Watch for Salute (Advise of Location).	Once starter cutout has been reached on the second engine and the engine is indicating normal acceleration, if the ground crew is no longer required, advise "DISCONNECT HEADSET."	
	The tractor and towbar will be positioned clear of the aircraft. Ground crewman will position himself to receive the "READY TO TAXI" signal (usually at the 11 o'clock position from the aircraft).	

Airline Information Systems - AIS, Inc.
Sample Only - Not to be used for operations of any kind.

Standard day, sea level, approximate stabilized idle indications for CFM56-3.



737 Operations Manual

N1 RPM - 22% EGT - 475°C**
 N2 RPM - 60% Fuel Flow - 326 KGPH / 717 LBSPH

Idle EGT may vary from 450°C depending on OAT, bleed configuration, and engine condition.

WARNING: NORMAL ENGINE START CONSIDERATIONS:

- Advancing engine start lever to idle prematurely can cause a “HOT” start.
- Keep hand on engine start lever while observing RPM, EGT and fuel flow until stabilized.
- If fuel is shut off inadvertently (by closing engine start lever) do not reopen engine start lever in an attempt to restart engine.
- Failure of ENGINE START switch to hold in GRD until starter cutout RPM is reached can result in a “HOT” start. Do not re-engage ENGINE START switch until engine RPM is below 20% N2.

NOTE: Accomplish the Aborted Engine Starts procedure for one or more of the following conditions:

- No N1 rotation before the engine start lever is raised to IDLE.
- No oil pressure indication by the time the engine is stabilized at idle.
- No increase in EGT within 10 seconds of raising the engine start lever to IDLE.
- No increase in, or a very slow increase in N1 or N2 after EGT indication.
- EGT rapidly approaching or exceeding the start limit.

After Start Procedure

Captain (PF)	First Officer (PNF)
Position both Engine Generator Switches - ON. Verify the "GEN OFF BUS" lights extinguish.	
Pitot Heat Switches - ON. Verify all probe heat lights - Extinguished.	
When icing conditions exist or are anticipated: <ul style="list-style-type: none"> • Position Engine Start Switches Continuous. • Position Engine Anti-ice Switches ON. • Position Wing Anti-ice Switch ON. Verify proper indications.	

Airline Information Systems - AIS, Inc.
Sample Only - Not to be used for operations of any kind.

737 Operations Manual

Captain (PF)	First Officer (PNF)
<p>CAUTION: Taxi with BOTH Engine Bleeds ON to prevent asymmetrical leading edge heating, establish the Bleeds OFF configuration, if required, <u>just prior</u> to takeoff.</p>	
<p>WARNING: ICING CONDITIONS EXIST WHEN THE OAT IS +10°C OR LESS AND:</p>	
<p>NOTE: Visible moisture in any form is present such as low clouds, fog with visibility of one mile or less, rain, snow, sleet or ice crystals OR if there is standing water, slush, ice or snow present on the ramps, taxiways or runways.</p>	
<p>If off, select System 'A' Hydraulic Pumps to ON. Verify hydraulic pressures are normal.</p>	
<p>Monitor F/O's configuration of Pressurization Panel.</p>	<p>Configure Air Conditioning system:</p> <ul style="list-style-type: none"> • both pack switches - TO AUTO. • APU BLEED air switch - OFF.
	<p>Isolation Valve switch - AUTO.</p>
<p>APU - AS DESIRED.</p>	
<p>Ground Equipment - REMOVED.</p>	
	<p>Continue to monitor Captain's After Start Procedure.</p>
<p>Verify both Start Levers are in IDLE detent.</p>	
<p>Call for the "AFTER START CHECKLIST" and respond to the checklist as it is read.</p>	<p>Read the After Start Checklist and state "AFTER START CHECKLIST COMPLETE."</p>
<p>Select the taxi light or runway turnoff lights to ON then OFF to indicate ready to taxi to ground crew. When the ground crew observes the taxi light signal, he/she will give a hand salute and shows the bypass pin if used. You may now proceed at your own discretion. Ground crewman will standby for the aircraft to turn and taxi and may give a specific direction for the aircraft to turn. To ensure the safety of Ramp personnel, do not move the aircraft until the hand salute has been received.</p>	
<p>Request taxi clearance when requested by the Captain. READ BACK any taxi restrictions and ADVISE the Captain.</p>	
<p>Seat belts and shoulder harnesses - FASTENED.</p>	

Airline Information Systems - AIS, Inc.
 Sample Only - Not to be used for operations of any kind.



737 Operations Manual

Intentionally Left Blank

Airline Information Systems - AIS, Inc.
Sample Only - Not to be used for operations of any kind.