

CANADAIR CHALLENGER
BREAKOUT TEST SET

Procedure No. CCSC4900-01-09

Rev. NC

OPERATING GUIDE

For Auxillary Power Unit Breakout Box

P/N CCSC4900-01-111

Mod Status A

WARNING!

To prevent possible damage to equipment
or injury to personnel,
familiarize yourself with these procedures
and the maintenance manual
for operation of the
Auxillary Power Unit System

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NOT AUTHORIZED
FOR
INFLIGHT USE

The CANADAIR Auxillary Power Unit (APU) BREAKOUT BOX (or B.O.B.), p/n CCSC4900-01-111, provides many features to assist technicians in fully checking or troubleshooting the APU system.

The main features of this unit are:

- a. The capability to monitor inputs and outputs of the APU system Electronic Control Unit (ECU) during system operation.
- b. Indication lamps that monitor the start sequencing and operation of the APU.
- c. Operational testing of the APU system ; starter, fuel shut-off valve, ignition circuit, surge and load control valves without starting or running the APU.
- d. Remote APU Shut down switch, duplicates aircraft APU FAULT panel.
- e. Cockpit EGT and RPM gauge testing, tests gauge and aircraft wiring integrity, simulates ECU signals.
- f. Remote auto shut down lights which parallel the aircraft APU FAULT panel.

I. Additional Support Tooling Required:

The following additional support tooling (or suitable substitutes) may be required, depending on the particular maintenance you are performing. If in doubt, consult the Maintenance Manual.

- a. Digital Multimeter, 3 1/2 digits minimum.
- b. APU fuel pressure gauges.

II. Break out Box Technical Support:

If you have questions regarding the use of the APU Breakout Box, contact:

Canadair Challenger Service Center
Avionics Manufacturing Department
Bradley International Airport
Windsor Locks, CT 06096

Phone: 203/627-9491, ext 236
or
your Challenger Field Service Representative

III. P R E C A U T I O N S :

- a. Do not connect/disconnect B.O.B. to/from system with aircraft power applied.
- b. Check aircraft and B.O.B. connectors for pushed or bent pins before attempting connections.
- c. Technicians must familiarize themselves with the Challenger maintenance manual for the APU system and these procedures before performing maintenance with the APU Breakout Test Set.
- d. Ensure the APU system is clear and free to operate, internally and externally.
- e. Observe maintenance manual APU start duty cycle limitations.
- f. Do not reposition B.O.B. "RUN/OFF/TEST" switch after normal APU start. Select "OFF" after cockpit APU system control switches are de-selected.
- g. APU Pre-start and post-operation checklists must be performed per maintenance manual direction.
- h. Do Not bypass B.O.B. circuitry for APU ECU inputs or outputs, unless directed to do so by these procedures. Damage to personnel and/or equipment may result.
- i. Use only test probes with .100 in dia. tips in the B.O.B.'s test jacks.

IV. R E F E R E N C E S :

- a. Maint. Manual Chap. 6 for location of Access Panels
- b. Maint. Manual Chap. 12 for application of aircraft power
- c. Maint. Manual Chap. 49 for APU system operation
- d. Maint. Manual Chap. 20 for standard aircraft practices

V. B.O.B. LEGEND:

A. 1. Test Jack Color Code:

- BLACK - Airframe grounds.
- RED - 28 vdc power, steady state.
- WHITE - DC signals, high when active (28 vdc).
- BLUE - DC signals, low when active (0 vdc).

2. Lamp Color Code:

- GREEN - 28 vdc power input normal or APU ECU ready output. Remains on during system operation.
- AMBER - ECU Output on. Should extinguish after start.
- WHITE - ECU Output on. Remains on during system operation.
- RED - ECU Output on. Indicates manual or automatic fault shut down of system.

B. Switch and Lamp Functions:

1. RUN/OFF/TEST Switch:

- RUN - Normal power applied to ECU through normal aircraft circuits. Test mode disabled. All lamps (listed below) operational, monitoring ECU inputs and outputs.
- OFF - All power inputs disconnected. All modes disabled.
- TEST - Normal ECU inputs and outputs interrupted. B.O.B. test simulation switches (listed below) enabled:

- a. LAMP TEST-switch.....tests B.O.B. lamps.
 - b. POWER- lamp.....indicates 28vdc to ECU (start).
 - c. STARTER- switch.....energizes APU starter only.
lamp.....starter "on" commanded.
 - d. FUEL SOV- switch.....energizes Fuel SOV only.
lamp.....fuel SOV "open" commanded (10% RPM).
 - e. IGNITION- switch.....energizes ignition only.
lamp.....ignition "on" commanded, (10% RPM plus 4 seconds).
 - f. VALVES;
SURGE- switch.....energizes Surge vlv solenoid.
lamp.....surge valve "open" commanded.

LCV- switch.....energizes LCV solenoid.
lamp.....LCV "open" commanded.
3. 95%- lamp.....indicates APU at/above 95% RPM.
4. READY- lamp.....indicates APU ready, at 100% RPM, (95% plus 4 seconds).

VI. NORMAL Procedures:

The following setup produces normal system operation. With the B.O.B. installed in line, monitoring of all ECU connections at the test points is obtained, with B.O.B. lamp annunciations, with no alteration of system operation.

1. B.O.B./ SYSTEM SETUP

- a. Remove power from aircraft.
- b. Connect B.O.B. in-line at connectors P/J4KD and P/J5KD at the APU system Electronic Control Unit (ECU). Check all connectors for bent or pushed pins before connecting.
- c. Position the B.O.B. "RUN/OFF/TEST" switch to "RUN".

The APU system may now be operated and controlled from the cockpit normally, and monitored on the B.O.B.. Follow maintenance manual or assigned aircraft checklist procedures for APU operation and shut down.

The B.O.B. lights will annunciate system operation as follows:

<u>APU Status</u>	<u>B.O.B LIGHT</u>
RPM's at 0% / Start.....	POWER.....ON STARTER.....ON *1
" 10%.....	FUEL.....ON
" 10% plus 4 sec...	IGNITION.....ON
" 60%.....	STARTER.....OFF *1
" 95%.....	IGNITION.....OFF *2 VALVE POWER available.....ON
" 100%, (95% plus 4 sec) READY.....	ON

*1 - STARTER light should extinguish at 60%. If light fails to extinguish "Hung Start" is probable.

*2 - IGNITION light should extinguish at 95%. If not, the APU will operate, however, igniter damage will result.

Note: The B.O.B. APU "EMER STOP" button may be used to shut down the APU in case of an emergency.

- d. After APU shut down, turn aircraft power OFF, disconnect B.O.B.. Reconnect aircraft connectors P4KD and P5KD to ECU. Note, APU start, run and shutdown should be performed after test equipment is removed and normal connections are made.

VII.. TEST PROCEDURES:

The following setup produces an ALTERED mode of operation. Care should be taken not to exceed the duty cycle limitations as directed by the maintenance manual. Perform all steps in full before proceeding to the next step.

1. B.O.B./ SYSTEM SET-UP.

- a. Remove power from aircraft.
- b. Connect B.O.B. in-line at connectors J/P4KD and J/P5KD at the ECU. Check B.O.B. and aircraft connectors for bent or pushed pins before connecting.
- c. Position the B.O.B. "RUN/OFF/TEST" switch to "OFF".
- d. Perform APU Pre-start check list per maintenance manual or assigned aircraft checklist.
- e. Switch aircraft battery on.

Note: APU will not start until step k.

- f. On cockpit APU control panel, select/depress "POWER/FUEL" PBA.
- g. On cockpit APU control panel, select/depress "START/STOP" PBA.
- h. Position the B.O.B. "RUN/OFF/TEST" switch to "TEST".
- i. Check B.O.B. "Power" light is on.

If B.O.B. "Power" light fails to light, depress B.O.B. "LAMP TEST". If B.O.B. lamps: 1) test good, proceed to step j; 2) do not test, position B.O.B. "RUN/OFF/TEST" switch to "OFF". Check B.O.B. fuse. If good, aircraft circuitry must be checked for failure of 28vdc signal to APU system. Check procedure APU system schematics

- i. Depress B.O.B. "LAMP TEST", all B.O.B. lamps should light (tests B.O.B. lamps only). Failure of any light does not affect APU system operation.
- j. Individual ECU output commands may now be simulated by depressing the appropriate B.O.B. test switch to activate the desired circuit (see V.1.a-f, starter, ignition, fuel sov, valves or gauges). Depressing switch will light appropriate B.O.B. light and activate selected aircraft/APU circuit.

Note: Operation of more than one system component at one time is not possible.

C A U T I O N

If FUEL SOV has been tested, do not test IGNITION until after starter has been motored to clear fuel vapors from combustion chamber. Observe starter duty cycle limitations.

VII.. Test Procedures cont.

A T T E N T I O N

APU WILL BEGIN NORMAL START SEQUENCE WITH STEP k.

k. Position the B.O.B. "RUN/OFF/TEST" switch to "RUN". APU should immediately begin normal start and run operation.

The B.O.B. lights will annunciate system operation as follows:

<u>APU Status</u>	<u>B.O.B. LIGHT</u>
RPM's at 0% / Start.....	POWER.....ON STARTER.....ON *1
" 10%.....	FUEL.....ON
" 10% plus 4 sec...	IGNITION.....ON
" 60%.....	STARTER.....OFF *1
" 95%.....	IGNITION.....OFF *2 VALVE POWER available.....ON
" 100%, (95% plus 4 sec) READY.....	ON

*1 - STARTER light should extinguish at 60%. If light fails to extinguish "Hung Start" is probable.

*2 - IGNITION light should extinguish at 95%. If not, the APU will operate, however, igniter damage will result.

The system may now be operated and controlled from the cockpit normally and monitored from the B.O.B.. Follow maintenance manual or assigned aircraft checklist procedures for APU operation and shut down.

NOTE: B.O.B. "EMER STOP" button may be used to shut down APU, if necessary, for emergencies.

After APU shut down:

- l. Turn aircraft power OFF.
- m. Disconnect B.O.B.. Reconnect aircraft connectors, P4KD and P5KD to ECU connectors, J4KD and J5KD, respectively.
- n. Perform APU start, run and shutdown after test equipment is removed to confirm system integrity.