



**BOMBARDIER**  
**AEROSPACE**

***canadair challenger***

RELAY BREAKOUT TEST SET  
P/N CCSC3940-01

OPERATING GUIDE

**CCSC3940-01-09**

rev E.01

05 AUG 92

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**CAUTION**

Before proceeding with testing, technicians *must* familiarize themselves with these procedures and the applicable Canadair Challenger maintenance manual. Damage to equipment or injury to personnel may result.

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Inflight testing with this test set connected to aircraft circuits *is not authorized* unless approved by Bombardier Aviation Technical Support

## TEST SET CALIBRATION/CERTIFICATION

Canadair Challenger Breakout Test Sets, part number prefix CCSC, are computer tested and certified for proper operation before return to service for new, modified, repaired or rental units.

CCSC Test Sets do not require annual or periodic calibration since there is no alteration to the aircraft system under test with a CCSC test set connected in the "NORMAL" mode of operation.

It is recommended that periodic inspection and recertification of CCSC test sets be accomplished by Avionics Fabrication, Bombardier Aviation Services, Windsor Locks, CT, to ensure faults and/or malfunctions will not be induced into the aircraft systems by faulty test set components. This is essential if a test set has been loaned or used by another operator/facility before the test set is returned to the owner's tooling storage.

The "TEST" or "SIMULATE" operations of each test set *do* alter the aircraft's system operation and are to be used for testing and fault isolation only.

Technicians should ensure only a calibrated/certified multimeter and test equipment is used to make measurements during functional testing. "TEST" and "SIMULATE" must not be used to certify an aircraft system in lieu of aircraft component signals as directed by the applicable CMM procedures

To arrange for for recertification, modification or repair, to arrange for operational/technical training or if you have questions regarding the use of CCSC test sets, contact:

**BOMBARDIER AVIATION SERVICES  
AVIONICS FABRICATION**

Bill Bowen

Hartford Service Center

toll free phone: 888-227-1235 ext 7292

fax: 860-292-7380

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## CANADAIR BREAKOUT TEST SET OPERATING GUIDE

The CANADAIR RELAY BREAKOUT TEST SET, p/n CCSC3940-01, provides many features to assist you in fully checking or troubleshooting system malfunctions at the heart of the problem, the relays themselves.

This tester tests the 4 most common types of relays found throughout the Challenger's electrical and avionics systems. The test set will also interface with any other type of aircraft which uses these relays.

The Relays Breakout Test Set contains 2 totally independent troubleshooting tools:

- A. An ACTIVE TESTING SIMULATOR Test Set (left half) - allows operation of a suspected faulty relay to check operating characteristics. This dynamic testing will find resistive relay contacts when an ohm-meter can't.
- B. An AIRCRAFT TESTING BREAKOUT Test Set (right half) - allows monitoring of an improperly operating system at a relay suspected of being faulty, while maintaining the system intact. This will allow more accurate isolation of faulty wiring, or more accurate confirmation of the cause of the fault condition in a system.

### I. ADDITIONAL TOOLING REQUIRED:

- A. Digital Multimeter,
- B. 28VDC power supply, 3.0 amps

### II. PRECAUTIONS:

- A. Do not install or remove relays with aircraft power on.
- B. Do not connect or disconnect Test Set to/from system with power applied.
- C. Check aircraft and Test Set connections for pushed or bent pins before connecting.
- D. Do not turn the AIRCRAFT TESTING - NORMAL/MANUAL switch to the MANUAL position unless you are aware of the system misconfiguration you will induce. This position is provided for the EXPERIENCED user. It allows the operator to MANUALLY RUN whichever relay is being patched out for troubleshooting. **SERIOUS AIRCRAFT OR PERSONNEL DAMAGE WILL RESULT IF THIS FEATURE IS NOT USED PROPERLY.**

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III. TECHNICAL REFERENCES:

- Maint. Manual Chap. 6 - access panels and fairings.
- Maint. Manual Chap. 12 - application of aircraft power.
- Maint. Manual Chap. 20 - standard maintenance practices.
- Maint. Manual Chap. ?? - specific to system being troubleshot.

IV. TEST SET TECHNICAL SUPPORT:

If you encounter difficulties or problems while using the Relay Breakout Test Set, contact:

Canadair Challenger Service Center  
AVIONICS FABRICATION Department  
Bradley International Airport  
Windsor Locks, CT 06096

phone: 203/627-9491

or

your Canadair Field Service Representative.

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V. TEST SET LEGEND:

A. LEAD CONNECTION DIAGRAM COLOR CODE

1. black - Airframe grounds
2. red - DC power, steady state
3. orange - DC signals, variable or high when active
4. blue - DC signals, low when active
5. green - signals, unknown (dependent on system relay is in)

B. SWITCHES:

1. LAMP TEST:

Depressed - Will activate the four lamps, provided external 28 VDC is applied to test set.

Released - De-energizes the four lamps.

2. Active Testing Y COIL ON/OFF/X COIL ON:

Y COIL ON - Energizes latching type (top socket only) relay under test with external 28VDC connected to test set.

OFF - De-energizes non-latching type relay under test. Has no effect on latching type relays.

X COIL ON - Energizes any type relay under test with external 28VDC connected to test set.

3. Active Testing TEST ON:

Depressed - Activates high current power circuits internally to allow accurate voltage measurement across contacts to determine operating condition of relay.

Released - Deactivates high current power circuits to reduce heat buildup inside test set.

4. Aircraft Testing NORMAL/MANUAL:

NORMAL - Relay under test commanded by aircraft circuits.

MANUAL - Relay under test manually commanded to energize with external 28VDC connected to test set. Operates in conjunction with Aircraft Testing Y COIL ON/OFF/X COIL ON switch.



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V. TEST SET LEGEND: cont'd

5. Aircraft Testing Y COIL ON/OFF/X COIL ON:

Switch is disabled when Aircraft Testing NORMAL/MANUAL switch is in NORMAL position.

Y COIL ON - Energizes latching type (top socket only) relay, regardless of aircraft circuit command present, provided external 28 VDC is connected to test set.

OFF - De-energizes non-latching type relay under test, regardless of aircraft circuit command present. Has no effect on latching type relays. Latching type relays should hold their last commanded position until commanded to move the other way.

X COIL ON - Energizes any type relay under test, regardless of aircraft circuit command present, provided external 28 VDC is connected to test set.

C. LAMPS: - ON indicates relay coil commanded to energize.

D. FUSES: - 2 amp, fast blow

NOTES:

1. When checking relay operation (active testing), you will be measuring the voltage drop (difference) across the contacts, not to ground.
2. A faulty relay will display a voltage difference across a closed set of contacts which will be greater than .015VDC.
3. Test Set schematic diagrams show the relay in the de-energized position.

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VI. AIRCRAFT TESTING Procedures: (right half of Test Set)

PLEASE READ COMPLETELY THROUGH THIS SECTION BEFORE TESTING.

A. INITIAL SYSTEM SETUP

The following setup produces normal system operation. With the Test Set installed in line, monitoring of all available test points is obtained, with no alteration of system operation.

1. Turn aircraft power OFF.
2. Position Test Set "AIRCRAFT TESTING" "NORMAL/MANUAL" switch to NORMAL.
3. Position Test Set "ACTIVE TESTING" switch to OFF.
4. Remove aircraft system's relay from relay track, install relay into the correct sized socket on the right side of the Test Set.
5. Connect proper test set adapter harness between the aircraft's empty relay socket and the Test Set's adapter socket.

The aircraft and system may now be operated normally and monitored on the Test Set.

Test Set ON lamp will indicate relay ENERGIZED.

C A U T I O N:

IF THE RELAY IS IN AN ACTIVE AIRCRAFT CIRCUIT,

IT CAN BE OVERRIDDEN

by placing the test set's

AIRCRAFT TESTING NORMAL/MANUAL switch

in the MANUAL position,

OR

by REMOVING THE RELAY FROM THE TEST SET.

THIS ALTERS THE NORMAL SYSTEM CONFIGURATION.

DAMAGE AND/OR INJURY MAY RESULT.

IT IS THE OPERATOR'S RESPONSIBILITY TO KNOW

WHAT ACTION WILL RESULT IN THE SYSTEM.



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VI. AIRCRAFT TESTING Procedures: cont.

B. RELAY SIGNAL MONITORING

1. Perform Aircraft Testing INITIAL SYSTEM SETUP.
2. Apply aircraft power.
3. Energize aircraft system under test.
4. Connect negative (BLK) multimeter test lead to known good structural airframe ground.
5. Connect positive (RED) multimeter test lead to desired test set jack to measure signal present.

AFTER TESTING:

6. De-energize system under test.
7. Turn aircraft power OFF.
8. Remove test set adapter from aircraft relay mount.
9. Remove relay under test from test set, install relay in relay mount.

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VI. AIRCRAFT TESTING Procedures: cont.

C. MANUAL COMMAND MODE

This feature is provided to allow verification/simulation of system conditions and/or failures.

1. Perform Aircraft Testing INITIAL SYSTEM SETUP.

C A U T I O N

IT IS ESSENTIAL

THAT TECHNICIANS CHECK AND DETERMINE  
THE CONSEQUENCES OF MANUALLY OPERATING  
THE RELAY AND SYSTEM UNDER TEST.

- a. Position Test Set NORMAL/MANUAL switch to:

MANUAL - to manually operate relay.

Position Test Set Y COIL ON/OFF/X COIL ON switch to:

OFF - to de-energize relay, overriding system signal.

X COIL ON - to override the system signal and energize the relay. Supply external 28VDC to the Test Set at the external test jacks from external power supply or aircraft 28VDC. Use alligator leads provided, to power test set with aircraft circuit breaker panel 28VDC. Make power connections to circuit panels with aircraft power OFF.

Y COIL ON - performs the same as X COIL ON for Latching type relays.

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VII. ACTIVE TESTING Procedures: (left half of Test Set)

A. INITIAL SETUP

The following setup provides a miniature bench test rig to operationally test a suspected faulty relay.

1. Position test set Aircraft Testing NORMAL/MANUAL switch to NORM.
2. Position test set Active Testing Y COIL ON/OFF/X COIL ON switch to OFF (Y COIL ON for latching type relays).
3. Connect 28VDC power (+) and (-) to Test Set (+) and (-) EXTERNAL JACKS respectively.

C A U T I O N !

T H E   E X T E R N A L   P O W E R  
I S   A L S O   A P P L I E D  
T O   T H E   R I G H T   S I D E  
O F   T H E   T E S T   S E T .

4. Install relay under test into proper socket on the LEFT side of the Test Set.
5. Using digital multimeter on VDC mode, measure across test set jacks for the relay's RELAXED / DE-ENERGIZED contacts:  
AC-ANC, BC-BNC, CC-CNC, DC-DNC

Press and hold test set TEST ON push button switch to make measurement:

GOOD CONTACTS   - Read less than .015 VDC.  
SUSPECT CONTACTS - Read more than .015 VDC.  
BAD CONTACTS   - Read more than .100 VDC.

6. Release test set TEST ON switch after taking measurements.
7. Position test set "Active Testing Y COIL ON/OFF X COIL ON switch to X COIL ON.
8. Using a digital voltmeter (set to volts), measure across test set jacks for the relay's CLOSED / ENERGIZED contacts:  
AC-ANO, BC-BNO, CC-CNO, DC-DNO
9. Press and hold test set TEST ON push button switch to make measurement:  
  
GOOD CONTACTS   - Read less than .015 VDC.  
SUSPECT CONTACTS - Read more than .015 VDC.  
BAD CONTACTS   - Read more than .100 VDC.
10. Release test set PUSH BUTTON after taking measurements.

CANADAIR BREAKOUT TEST SET OPERATING GUIDE

VII. ACTIVE TESTING Procedures: cont'd

A. DETAILED ACTIVE TESTING:

1. Place meter negative lead on test point AC ("A" common contact).
2. Place meter positive lead on test point ANC ("A" normally closed).
3. With Active Testing Y COIL ON/OFF/X COIL ON switch set to OFF (Y COIL ON for latching type relays), push and hold Active Testing TEST ON push button switch, measure, and record this reading. Release switch.
4. Compare your reading to the chart.
5. Place meter positive lead on test point ANO ("A" normally open).
6. Measure as in step 3 and 4.
7. Repeat steps 2 through 6 with ACTIVE TESTING ON-OFF switch set to ON.
8. Repeat steps 1 through 7 with test points BC, BNC, and BNO substituted for the A set called for previously.
9. Repeat steps 1 through 7 with testpoints CC, CNC, and CNO substituted for the A set previously called for.
10. Repeat steps 1 through 7 with testpoints DC, DNC, and DNO substituted for the A set previously called for.

Meter Pos lead	Active Testing X COIL ON/OFF	Meter Reading	Reading Should Be
ANC	OFF (Y COIL ON)		0 to 0.015VDC
ANO	OFF (Y COIL ON)		supply voltage
ANC	X COIL ON		supply voltage
ANO	X COIL ON		0 to 0.015VDC

END