

**MAINTENANCE MANUAL – ATC SYSTEM**

**for**

**Boeing 737-300 Series Aircraft**

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**Boeing 737-300**  
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## ATC – DESCRIPTION AND OPERATION

1. General (Figure. 1)
  - A. The Air Traffic Control Radar Beacon System (ATCRBS or ATC), provides airplane tracking, altitude and identification information to an ATC ground station. The ATC transponder responds to an interrogation from an ATC ground station. The ATC system responds to ground station interrogations in one of three different modes: mode-A, mode-C and mode-S. Mode-A and Mode-C provide identification and altitude information. Mode-S provides selective airplane identification and data link capabilities. After a ground station interrogation, the transponder automatically transmits a pulse coded reply signal in one of the above modes. The mode of reply is determined by the mode of interrogation.
  - B. Two ATC systems are installed on the aircraft, each with its own transponder. Only one transponder operates at a time. A dual ATC Control Panel provides independent and isolated control for both systems. Control information is sent to either transponder by discrete signals and an ARINC 429, 572, 718, or 730 bus.
  - C. ATC antennas:

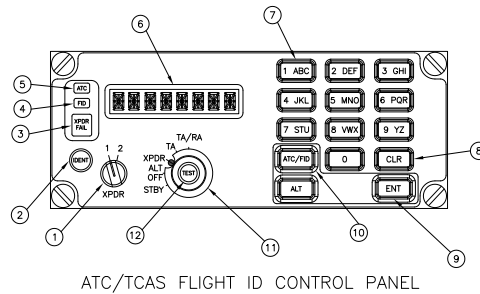
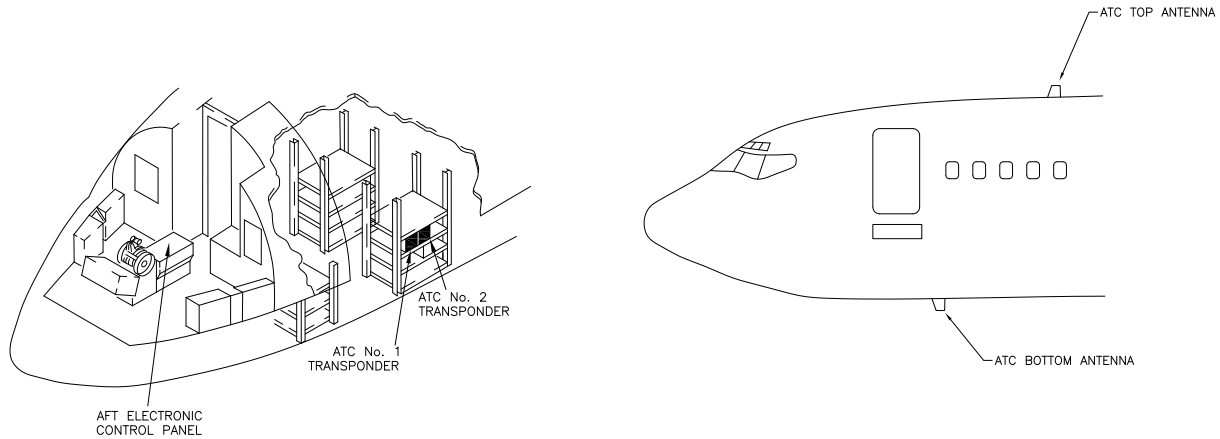
The bottom antenna is shared by the transponder 2 (Mode C) and transponder 1 (Mode S). A RF relay for bottom antenna switches between transponders 1 or 2.

The top antenna is used by Transponder 1.
  - D. Each transponder receives altitude data from Air Data Computer 1 (ADC-1).
  - E. The ATC, TCAS and DME systems operate in the same L-band frequency range. A suppression circuit is connected between the TCAS Computer, ATC transponders and the DME interrogators to prevent simultaneous transmissions.
  - F. The ATC system operates in three different modes: Mode-A, mode-C and mode-S. The mode of operation is determined by the mode of interrogation from a ground station and the current configuration of the altitude reporting function.
  - G. The ATC-1 system receives 115VAC 400Hz, power from the electronics power bus No. 1. Power is supplied through the ATC-1 circuit breaker located on the left load control center circuit breaker panel P18.
  - H. The ATC-2 system receives 115 volt, 400Hz ac power from the electronics power No. 2 bus. Power is supplied through the ATC No. 2 circuit breaker located on the right load control center circuit breaker panel P6.
2. ATC Control Panel (Fig. 1)
  - A. The ATC Control Panel is located on the aft electronic control panel (P8). The Control Panel contains switches and controls which provide reply codes and mode selection for two ATC transponders. The Control Panel is divided into two operational systems No. 1 and No. 2. Each system. Each system provides its respective transponder with tuning and control signals for system operation.
    - (1) ATC Control Panel

The controls and indicators operate in the following manner:

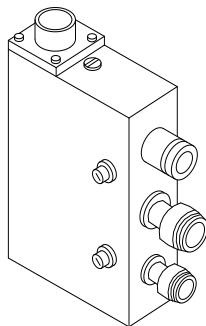
      - (a) The ATC keypad select the 4-digit identification code which is displayed in the ATC code display window.
      - (b) The transponder select switch activates the left or right transponder, as selected. Both transponders are off with the switch in the STBY position.
      - (c) The altitude reporting switch enables the transponder to reply with coded altitude information supplied by left and right ADCs.
      - (d) The identification switch causes the transponder to transmit a special pulse with each ATC code reply generated. This is used to identify the airplane on the ground station scope.

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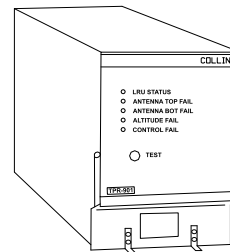


1. Transponder Select Knob - Rotate to select transponder system L or system R.
2. Identification Button - Push to transmit identification information.
3. Transponder FAIL Indicator - This indicator comes on when a failure is encountered.
4. Flight ID Indicator - Illuminates when the FID mode is selected. Flashes while a Flight ID is being entered.
5. ATC Indicator - Illuminates when the ATC mode is selected.
6. Display - Digital indication of ATC and FID codes.
7. Keypad - Press these keys to enter the ATC or FID code.
8. Clear (CLR) Button - Press to go back one space, or press and hold for 2 seconds to clear display.
9. Enter Button - Press to validate and transmit a Flight ID code.
10. ATC/FID Button - Press to switch between the ATC and the FID modes.
11. Mode Select Knob - Rotate to select mode.
12. TEST Button - Press to initiate Function Test.

TCAS/ATC Control Panel



Detail B. RF Switch



Detail B. Transponder

ATC System Component Location  
Figure 1

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#### 3. ATC Transponders (Figure. 1)

- A. The transponders are located on the E2 electronic equipment rack on E2-2 shelf.
- B. The active ATC transponder transmits a coded reply when it is interrogated by an ATC ground station.
- C. This aircraft is equipped with two Mode-S transponders.
- D. Transponders Mode-S:

This transponder has the following switches and indicators:

- (1) An LRU STATUS indicator light which turns green when a transponder self-test is successful and turns red when a transponder self-test detects a failure.
- (2) A red ANTENNA TOP FAIL indicator light which comes during self-test when the upper antenna impedance is incorrect.
- (3) A red ANTENNA BOT FAIL indicator light which comes during self-test when the lower antenna impedance is incorrect.
- (4) A red ALTITUDE FAIL indicator light which comes on when the altitude input source indicates a barometric altitude failure.
- (5) A red CONTROL FAIL indicator light which comes on when there is a failure of the control input.
  - (a) A TEST switch which starts a transponder self-test.

#### 4. ATC Antennas

- A. The antennas are installed on the top and the bottom of the airplane. The top antenna and bottom antenna are connected to the Mode-S transponders. Two RF switching relays connect the bottom antenna and top antenna to the active transponder. The top antenna is located on the centerline of the fuselage at station 430.25. The bottom antenna is located on the centerline of the fuselage at station 355. The antennas are omni-directional L-blade type antennas. Each antenna can transmit and receive signals for the active transponder. When active the Mode-S transponder automatically uses the antenna with the greatest signal strength.

#### 5. Operation

##### A. Basic ATC Transponder Principles

- (1) The transponder is an integral part of the Air Traffic Control Radar Beacon System (ATCRBS). In the airplane, its function is to transmit a coded response to a coded interrogation transmitted by the air traffic control ground station.
- (2) There are two types of radar at each ATC ground station. The first, called the Primary Surveillance Radar (PSR), operates on the normal radar principles of receiving energy reflected from the airplane under surveillance. The second, called the Secondary Surveillance Radar (SSR), operates on the coded reply from the airborne transponder. Both radars are used in conjunction to develop the total air traffic situation and to display it on a single radar scope.
- (3) The SSR interrogates the transponder in one of two modes. These are referred to as mode A, or mode C interrogations. The type of interrogation is determined by the spacing between two pulses (P1 and P3) transmitted by the SSR on a carrier of  $1030 \pm 2$  MHz. Each interrogation contains a third pulse at the same frequency which is not transmitted by the SSR but by an omni directional antenna which is located at the ground radar station. This pulse is transmitted 2  $\mu$ sec after the P1 pulse and is referred to as P2. Mode A and mode C interrogation characteristics are shown in Fig. 2.
- (4) The purpose of P2 is to allow the airborne transponder to determine whether the interrogation come from the main beam or a side lobe of the SSR. If the transponder has been interrogated by a side lobe, no reply is generated. A reply to a side lobe interrogation would give the ground radar operator an erroneous position reading of the airplane carrying the transponder. The transponder determines by an amplitude comparison between P1 and P2 if the interrogation is by a side lobe. If P1 is larger than P2, the interrogation is a valid main beam interrogation. If P2 is equal to or larger than P1, the interrogation is from the side lobe of the SSR.
- (5) The transponder replies to mode A and mode C interrogations with a coded pulse group on a carrier frequency of  $1090 \pm 3$  MHz. The transmitted message consists of four octal digits (0-7) which gives the transponder the capability of 4096 different identification numbers and altitude data from -1000 to +128,000 ft. In a mode A reply the coding of the pulses represents an identification number of the

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airplane carrying the transponder. The coding of a mode A reply can consist of up to fifteen pulses. Twelve of these pulses carry the identification number. Two others, called framing pulses, come before and after the twelve information pulses. The last is a special identification pulse to aid the radar operator. The mode C reply is basically the same as a mode A reply; however, in a mode C reply, the coding of the pulses represents altitude data. The data to be transmitted is inserted in the transponder on the appropriate input lines on the main connector and originate at the altitude digitizer. The special identification numbers and the reply coding characteristics for the full 15 pulse reply are shown in Fig. 2.

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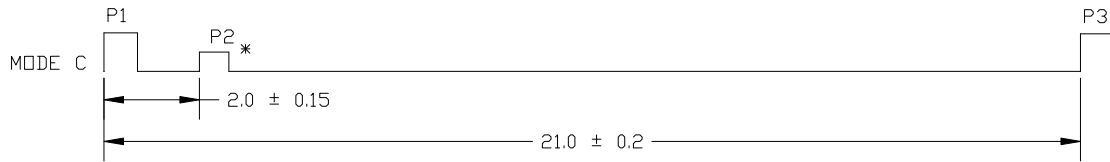
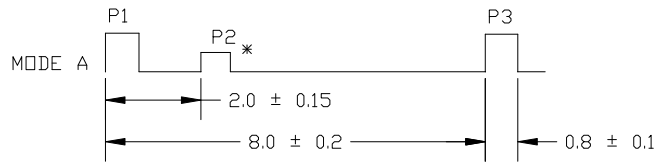
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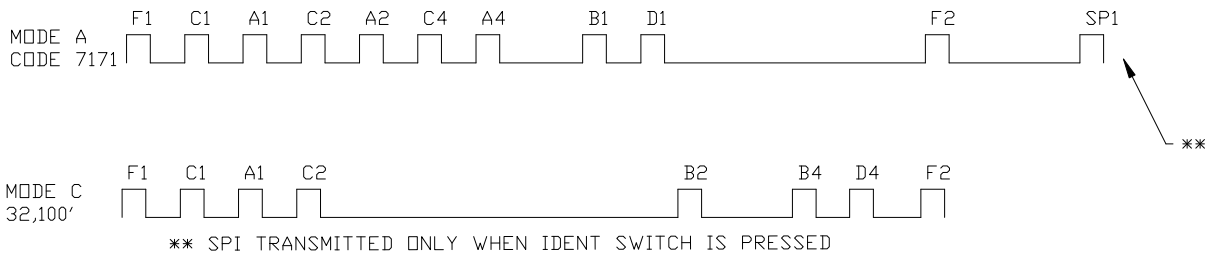
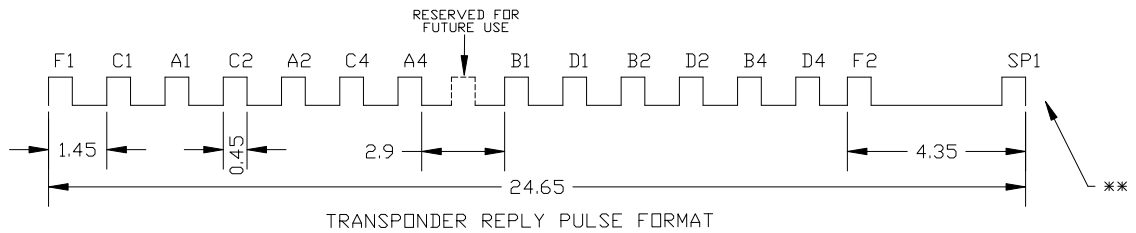


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\* SIDE LOBE SUPPRESSION PULSE

MODE INTERROGATION PULSES



Transponder Reply Pulses  
Figure 2

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### **B. Functional Description**

#### **(1) Receiver**

- (a) Received signals from the antenna are routed through the Diplexer/Low Pass Filter and applied to the Pre-selector/Mixer. In the Pre-selector the signal is passed through a bandpass filter tuned to 1030 MHz. The filter output is applied to the mixer diode and mixed with the 970-MHz local oscillator (LO) signal. The LO signal is filtered in the pre-selector, by a 2-pole bandpass filter prior to mixing. The 60-MHz IF signal from the mixer is applied to the IF amplifier/detector module where it is amplified and detected. The output of the IF amplifier/detector is applied to the video processor where it is amplified, pulse shaped, cleaned up by a noise suppression circuit, and elimination of P2 pulse is performed if the received signal is from the ATC ground station main lobe. The signal is then sent to the decoder/encoder circuitry.

#### **(2) Decoder/Encoder**

- (a) The video processor output is applied to the decoder/encoder along with the 2.7586 MHz 2-phase clock from the decoder/encoder (D/E) oscillator. The decoder/encoder then decodes the received message, determines whether mode A or mode C data is requested and then develops the appropriate serial data output to be applied to the transmitter.

#### **(3) Transmitter**

- (a) The modulator accepts the decoder/encoder serial data outputs, adjusts the amplitude and width of the pulses and supplies the proper signals to the transmitter modulator circuit. The modulation signal modulates the transmitter oscillator which is a 1090-MHz cavity controlled pulsed oscillator. The output of the transmitter oscillator is approximately 1.5 watts peak RF power. The pulse RF signal is applied to the exciter module where the signal is amplified to 150 watts peak RF power. This 150 watt signal is then used to drive the power amplifier module where the RF signal is amplified to 500 watts peak RF power. The power amplifier output is then sent to the Diplexer to be routed to ATC transponder antenna.

#### **(4) Functional Test**

- (a) Upon manual activation of the test switch, either on the unit front panel or Control Panel, the functional test module will generate an RF pulsed signal. This signal is then applied to the local oscillator module where 60-MHz sidebands are generated on the local oscillator signal. These sidebands are a pulsed pair which is properly spaced to represent a valid mode interrogation. The LO signal with the 60-MHz sidebands is applied to mixer and a 60-MHz If signal is generated. From this point on the signal is processed as a valid interrogation and the monitor/reply indicator as well as the light on the front panel will come on. The front panel light will go out immediately when the front panel switch is released; however, the control panel reply indicator will remain on for the prescribed 15 seconds after the last reply.

#### **(5) Monitor**

- (a) On transponders with fault indicators, the R/T monitor circuits check the transponder for proper output power, frequency, mode decoding, clock frequency, and shift register fill-up. The monitor circuit supplies signals to these to provide an indication of the operational status of the transponder. The ANT monitor circuits check the dc resistance of the antenna and coaxial cable. If the circuits detect a dc resistance greater than 200 ohms, the ANT fault indicator will be activated. The ANT fault indicator is reset by depressing the RESET switch on the transponder front panel. The R/T fault indicator is reset from inside the transponder.
- (b) On all transponders when eight consecutive replies are completed, the reply indicator (transponder and Control Panel) are energized.

### **C. Mode-A and Mode-C Operation**

- (1) There is no power switch on the ATC Control Panel. Power is applied to the system when the ATC-1 and ATC-2 circuit breakers on the P6 and P18 panels are closed.
- (2) Altitude Reporting.
  - (a) The desired altitude reporting condition is set with the altitude reporting switch. The '1' position causes the altitude reporting function to come on and sets the altitude data source to ADC 1. The '2' position is not installed. The OFF position disables the altitude reporting function of the ATC system.

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- (b) The desired ATC system is set with the transponder select switch. The '1' position causes the Control Panel to send an 'ON' discrete to transponder No. 1 if the AIR/GND RELAY is in AIR mode and the mode switch is set to XPDR. The '2' position causes the Control Panel to send an 'ON' discrete to transponder No. 2 if the AIR/GND RELAY is in AIR mode and the mode switch is set to XPDR.
  - (3) If the altitude reporting function is on, then the ATC system will reply to mode-A and mode-C ground station interrogations. If the altitude reporting function is off, then system will reply only to mode-A interrogations. Mode-S replies are not affected by the condition of the mode switch.
  - (4) The identity code and mode configuration information is sent to the transponders through ARINC busses and discrete. The 4-digit code identifies the airplane to the ground station for mode-A and mode-C interrogations.
  - (5) When the airplane leaves the ground, the AIR/GND relay is set to AIR. This sends a discrete signal to the Control Panel. The Control Panel then sends an 'ON' discrete to the selected transponder. At this point, the system will respond to ground station interrogations.
- D. Mode-S Operation
- (1) Mode-S functions operate when the mode-S programming plug is configured with a unique mode-S address. If all the programming pins are grounded (they have a bit value of one), then there is no unique address and the mode-S functions do not operate. The mode-S code is hard wired on mode-S. The identity code set on the ATC Control Panel has no effect on the mode-S address code of the airplane. Mode-S functions in the airplane are automatic and are not configured by the pilot.
- E. Self-Test Operation
- (1) Both ATC transponders have Built-In Test Equipment (BITE). A BITE test can be started if the transponder to be tested has power. The BITE test is started when the TEST switch on the transponder face is pushed. The BITE test does the following:
    - (a) Does a checksum of internal ROM contents.
    - (b) Tests the transponder RAM.
    - (c) Simulates noise sources and monitors the results.
    - (d) Tests the antenna impedance.
    - (e) Simulates a Mode-S All-Call interrogation and reply (Mode-S transponder only).
    - (f) Samples the internal power supply monitor.
    - (g) Checks the operation of the serial busses connected to the transponder
  - (2) Mode-S Transponders:  
The green LRU STATUS indicator light will come on if no errors were detected during the BITE test. It will illuminate red if any part of the BITE test fails.
  - (3) The BITE monitor continuously tests transponder functions while the ATC system operates normally (not in test mode). If a failure is detected, the red CTL indicator light will come on and a TRANSPONDER FAIL DISCRETE will be sent to the Control Panel. If the altitude input from the ADC is in error, the red ALT indicator light will come on.

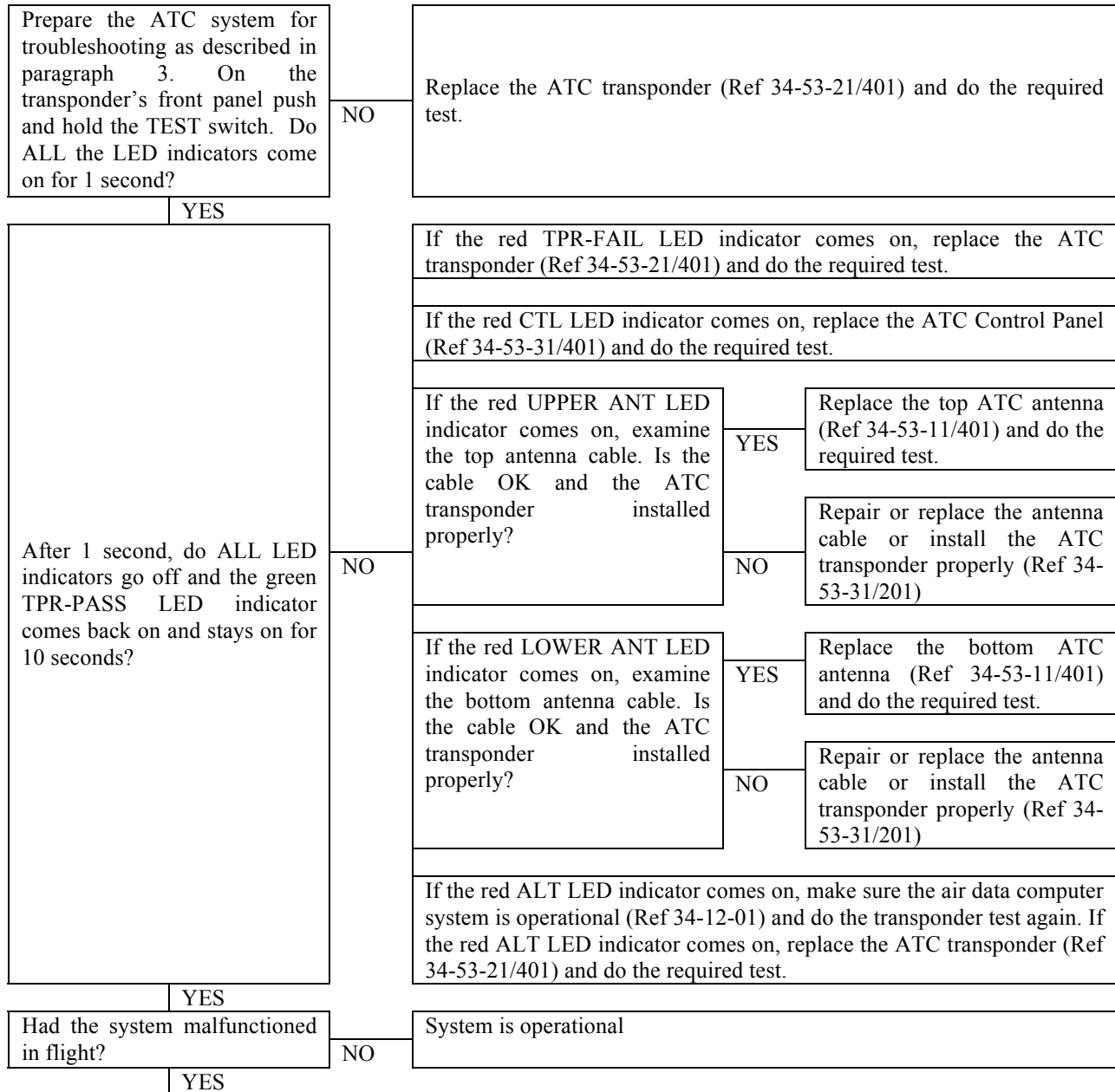
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ATC SYSTEM - TROUBLE SHOOTING

1. General
  - A. The troubleshooting procedures make use of the self-test features of the ATC transponder and ATC system tests to isolate problems. These procedures are in a tree-type format.
  - B. If the procedure does not correct the problem examine and repair if necessary, the circuit between the equipment.
  - C. The troubleshooting procedures are applicable to ATC system No.1 (Figure 101) and ATC system No.2 (Figure 102).
2. References
  - A. 24-22-00/201, Manual Control
  - B. 34-53-02/501, ATC System - Adjustment/Test
  - C. 34-53-11/201, ATC Antenna - Removal/Installation
  - D. 34-53-21/201, ATC Transponder - Removal/Installation
  - E. 34-53-31/201, ATC Control Panel - Removal/Installation
3. Prepare for Troubleshooting
  - A. Supply the electrical power (Ref 24-22-00).
  - B. Make sure the ATC, interphone and air data system circuit breakers on P18 and P6 panels are closed.
  - C. On the ATC Control Panel, set the ATC select switch to the transponder to be tested (No.1 or No.2).

**NOTE:** Let the transponder warm-up for at least one minute.

- D. Do the operational or system test (Ref. 34-53-00/501).

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**Trouble shooting diagram for ATC Transponder No.1  
Figure 101 (Sheet 1).**

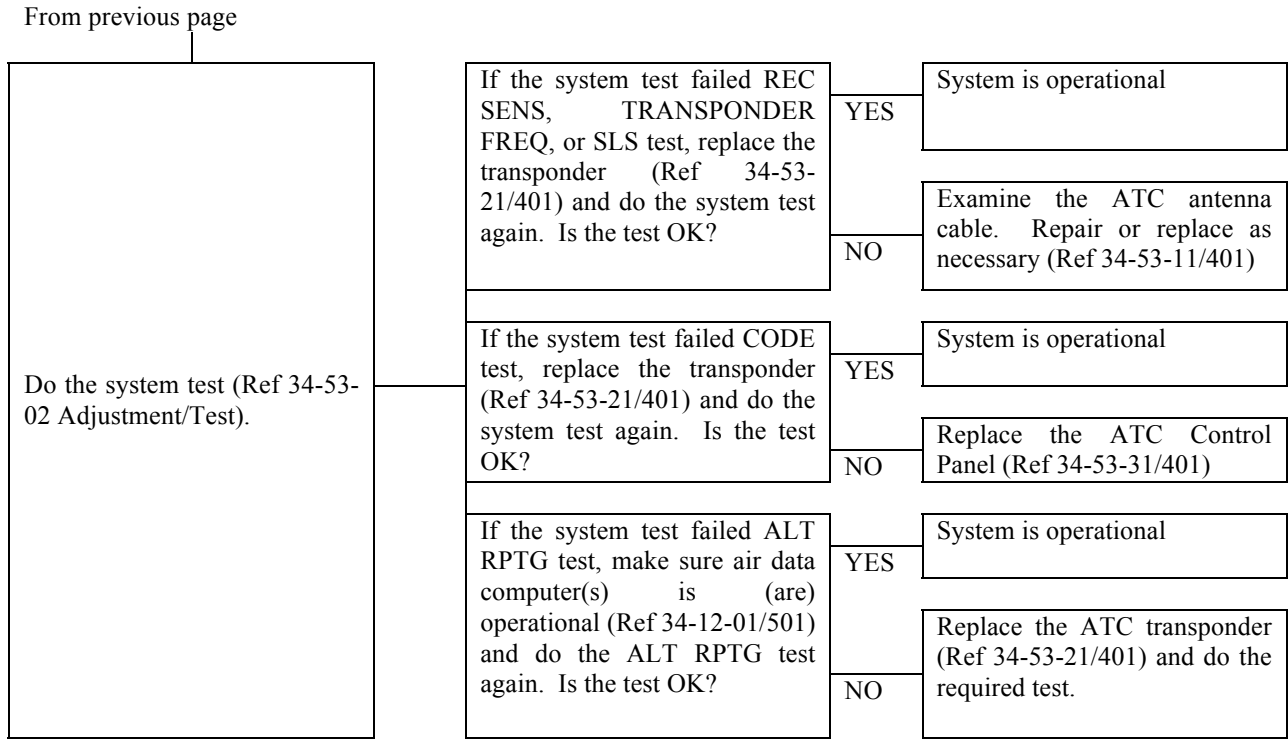
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**Trouble shooting diagram for ATC Transponder No.1**  
**Figure 101 (Sheet 2).**

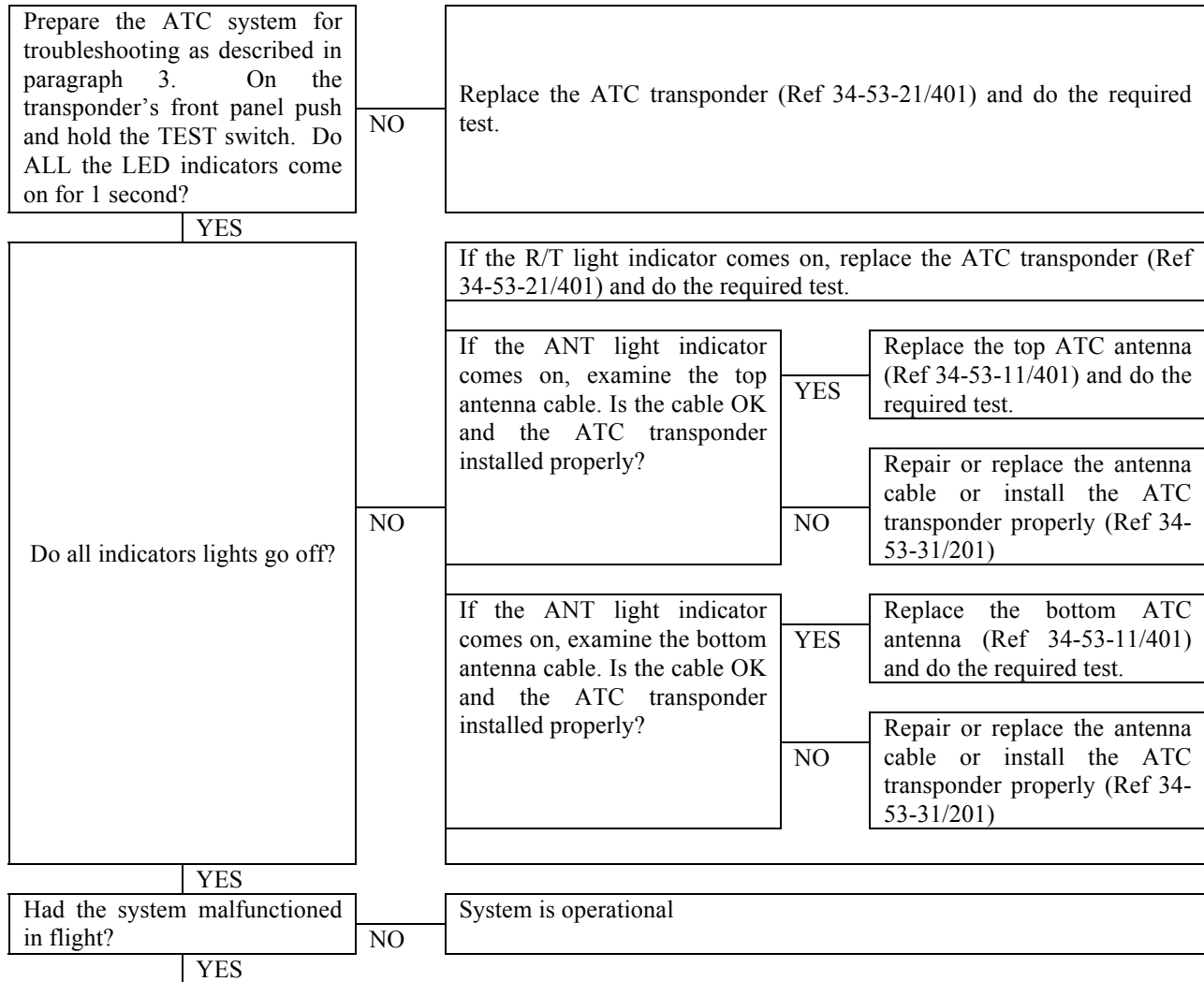
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**Trouble shooting diagram for ATC Transponder No.2  
Figure 102 (Sheet 1).**

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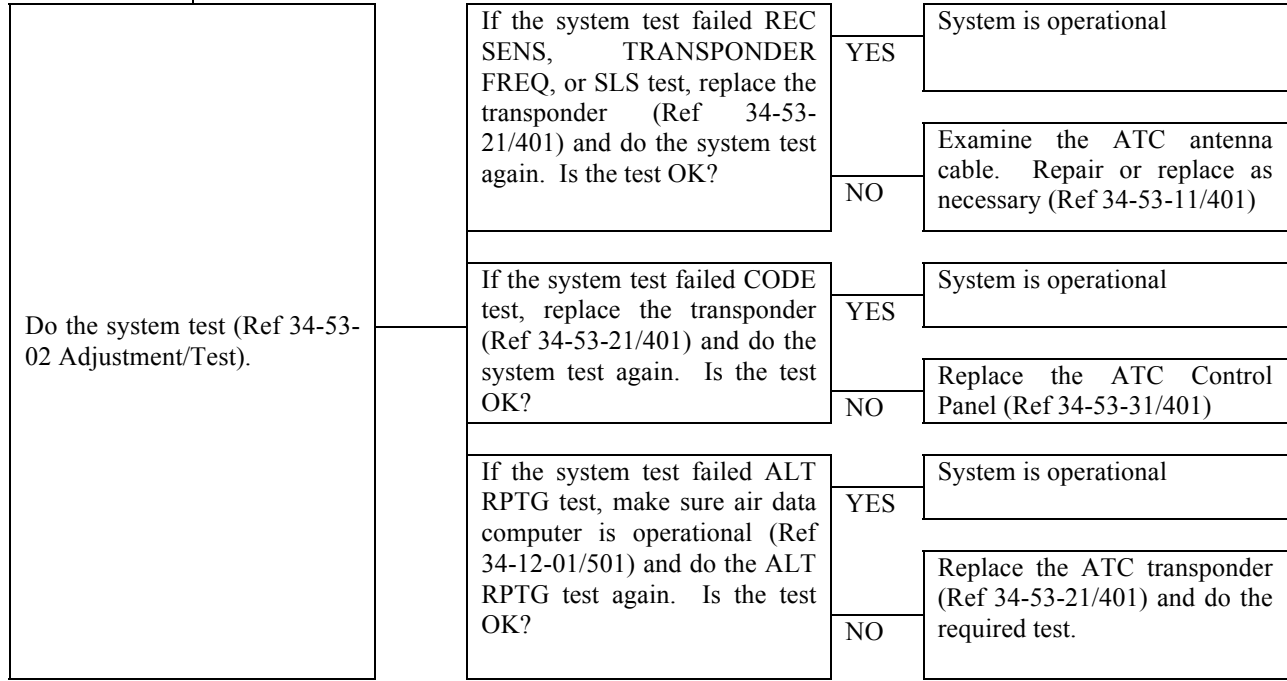
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**Trouble shooting diagram for ATC Transponder No.2  
Figure 102 (Sheet 2).**

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ATC SYSTEM - ADJUSTMENT/TEST

1. General
  - A. The ATC system adjustment/test procedure contains two tasks. One is an operational test; the other is a system test. The operational test is a fast check of the ATC system and no test equipment is needed. The system test first does the operational test. Then it uses test equipment to examine the ATC code reception, altitude reporting, transponder sensitivity, side lobe suppression and transmitter frequency.
  - B. The system test uses the Instrument Flight Research 601 ATC ramp test sets or the TIC T-48 or T-49 ramp test set. Because the ATC transponder responds to signals from the antenna with the strongest signal strength, it is necessary to put the test set antenna close to the airplanes antenna to do a proper test. The test set antenna should be put near the bottom ATC antenna on the airplane to examine the bottom transponder circuitry and the same for the top ATC antenna.
2. Operational Test - ATC System
  - A. General
    - (1) The operational test is a fast check of the ATC system. It uses only the system's BITE function. No special test or ground equipment is necessary.
    - (2) The ATC transponder internal BITE circuitry does a self-test on all internal circuitry. This includes the injection of Mode S signals into the receiver unit to examine if the signals are processed properly. If the Mode S function fails, the red TPR FAIL LED indicator comes on.
  - B. References
    - (1) AMM 24-22-00/201, Manual Control
  - C. Access
    - (1) Location Zones
      - 101/102 Flight Compartment
      - 205 Electronic Compartment
    - (2) Access Panel
      - 1201 Electronics Equipment Access Door
  - D. Prepare for the Operation Test
    - (1) Supply electrical power (AMM 24-22-00/201).
    - (2) Close these circuit breakers.
      - (a) P18 Load Control Center - Left
        - 1) ATC 1
        - 2) ADC 1
        - 3) ALTM CAPTAIN
      - (b) P6 Load Control Center - Right
        - 1) ATC 2
  - E. Procedure (Mode-S Transponder)
    - (1) On the ATC Control Panel, set the transponder select switch 1.
      - (a) Start the self test on the front of the transponder.
      - (b) Airplane with Collins ATC transponder;  
Make sure the LED's sequence that follows occurs:
        - 1) All LED's comes on for about one second
        - 2) All red LED's go off
        - 3) The green LED stay on
      - (c) Release the TEST switch.
    - (2) Set the ATC system to STBY.

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Procedure (Mode-C Transponder)

- (3) On the ATC Control Panel, set the transponder select switch 2.
    - (a) Start the self test on the front of the transponder.
    - (b) Airplane with Collins ATC transponder;  
Make sure the SELF TEST light illuminates
    - (c) Release the TEST switch.
    - (d) Press RESET for ATC Transponder 2.
  - (4) Set the ATC system to STBY.
3. System Test - ATC System (With the IFR ATC-601 Test Set)
- A. General
    - (1) This system test is a more complete check of the ATC system. The system test first does the ATC-Operational Test. Then it uses ground test equipment to examine the left and right ATC systems.
    - (2) The IFR ATC-601 test set is used to test the functionality of the mode S transponder. All twenty tests can be run automatically in the AUTO mode or individually in single test mode. Results from the last test are shown on each test page. The PASSED/FAILED indication is shown on top of the page. To do a single test, use the select keys to get to the desired test and push the RUN/STOP key.
  - B. Special Tools and Equipment
    - (1) ATC Transponder Ramp Test Set IFR ATC-601
  - C. References
    - (1) AMM 24-22-00/201, Manual Control
    - (2) AMM 34-12-01/501, Air Data Computer System
  - D. Access
    - (1) Location Zones
      - 101/102 Flight Compartment
      - 205 Electronic Compartment
  - E. Prepare for the System Test

**CAUTION:** Do not place the remote test set antenna closer than 15 inches (0.40 meters) to the aircraft antenna with the test set on. This will cause damage to the test set.

- (1) Put the test set antenna approximately 30 feet from the ATC antenna for the related system.

**NOTE:** The test set antenna must be within the line of sight of the ATC antenna.

- (2) Put the test set antenna in position towards the aircraft antenna.
- (3) Connect the coax cable from the remote test set antenna to the test set.
- (4) Close these circuit breakers:
  - (a) P18 Load Control Center - Left
    - 1) ATC 1
    - 2) DADC 1
  - (b) P6 Load Control Center - Right
    - 1) ATC 2
- (5) Do the ATC Operational Test.
- (6) Set the PWR switch on the Test Set to the ON position.

**NOTE:** The test set is a source of interference for radio and L-band radar equipment operating on the airplane and located near the test set. Turn the test set off as soon as the test is completed or when you must perform other radio checks on the airplane.

- (7) Push the SETUP key to enter the SETUP menu.

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**NOTE:** For information regarding the battery test, timing and recharging refer to the operation section of the test set operators manual.

- (8) Push the SELF TEST key on the Test Set.
- (9) Push the RUN/STOP key to start the self test.
  - (a) Make sure the test set display shows PASSED.
- (10) Push the SETUP key to enter the SETUP menu.
- (11) Enter 30 feet in the RANGE field for the TOP and BOTTOM antenna.
- (12) Enter 17 feet for the HEIGHT field for the TOP antenna and 3 feet for the BOTTOM antenna.
- (13) Choose the bottom antenna on the SELECTED field.
  - (a) Use the SLEW keys to change the values.
  - (b) Use the SELECT keys to change the items.
  - (c) Use the SELECT keys to select the antenna which you must test.
- (14) Enter the gain listed on the test set antenna into the GAIN\_1030 and GAIN\_1090 field.
- (15) Enter the cable loss listed on the cable in the LOSS field.
- (16) Open this circuit breaker.
  - (a) P6 Circuit breaker Panel
    - 1) AIR/GND and LTS
- (17) Set the captain's altimeter to 29.92 inches of mercury.

#### **F. ATC System Test**

**CAUTION:** Do not use codes 7500, 7600-7677, and 7700-7777. These are emergency codes.

- (1) Set the code switches on the ATC Control Panel to a desired ATC ID code.
- (2) Set the transponder select switch on the ATC Control Panel to the No. 1 system.
- (3) On the ATC Control Panel do the steps that follow:
  - (a) Set the mode switch on the ATC Control Panel on the XPDR position.
  - (b) Set the altitude source switch on the ATC Control Panel to the 1 (2) position.
- (4) Push the AUTO TEST key on the Test Set.
- (5) Use the RUN/STOP key to start or stop individual test.
- (6) Use the SELECT key to select each individual test.
- (7) Do a check of the REPLY DELAY TEST.
  - (a) Make sure the reply delay is 128.00 $\mu$ s ( $\pm$ 0.25 $\mu$ s) for mode S and ITM.
  - (b) Make sure the reply delay is 3.00 $\mu$ s ( $\pm$ 0.50 $\mu$ s) for ATC A and C.
- (8) Do a check of the REPLY JITTER TEST.
  - (a) Make sure the reply jitter is  $\leq$  0.05 $\mu$ s for mode S.
  - (b) Make sure the reply jitter is  $\leq$  0.06 $\mu$ s for ITM A and C.
  - (c) Make sure the reply jitter is  $\leq$  0.1 $\mu$ s for ATC A and C.
- (9) Do a check of the ATCRBS REPLY TEST.
  - (a) Make sure the spacing of the F1 to F2 pulse is 20.3 $\mu$ s ( $\pm$ 0.10 $\mu$ s).
  - (b) Make sure the duration of the F1, F2 pulse is 0.45 $\mu$ s ( $\pm$ 0.10 $\mu$ s).
- (10) Do a check of the SLS LEVEL TEST.
  - (a) Make sure the reply is received when the SLS pulse is -9dB and no reply is received when the SLS pulse is 0dB.

**NOTE:** Run the SLS level test in less than 95 feet (28.96 meters) of the UUT antenna.

- (11) Do a check of the ATC ONLY ALL-CALL TEST. (Mode-S transponder Only)
  - (a) Make sure the mode S transponder did not reply to the interrogation (PASSED TEST).

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- (12) Do a check of the MODE S ALL CALL TEST. (Mode-S transponder Only)
  - (a) Make sure the test set shows PASSED and the airplane's mode S address.
- (13) Do a check of the INVALID MODE S ADDRESS TEST. (Mode-S transponder Only)
  - (a) Make sure the mode S transponder did not reply (PASSED TEST).
- (14) Do a check of the SPR ON/OFF TEST. (Mode-S transponder Only)
  - (a) Make sure a reply is received when SPR is ON and no reply is received when SPR is OFF.
- (15) Do a check of the MODE S UF0 TEST. (Mode-S transponder Only)
  - (a) Make sure (Downlink format) DF=0, AC=(airplane's altitude) and ADDRESS=(airplane's mode S address) (WDM 34-53-12).

**NOTE:** Make sure the reported altitude is within | 125 feet of the local field elevation altitude shown on captain's altimeter (applicable for all altitude reporting check).

- (16) Do a check of the MODE S UF4 TEST. (Mode-S transponder Only)
  - (a) Make sure DF=4, AC=(airplane's altitude) and ADDRESS=(airplane's mode address).
- (17) Do a check of the MODE S UF5 TEST. (Mode-S transponder Only)
  - (a) Make sure DF=5, ID=(selected ATC ID code on the ATC Control Panel) and ADDRESS=(airplane's mode S address).
- (18) Do a check of the MODE S UF11 TEST. (Mode-S transponder Only)
  - (a) Make sure DF=11 and AA=(airplane's address).
- (19) Do a check of the MODE S UF16 TEST. (Mode-S transponder Only)
  - (a) Make sure DF=16, AC=(airplane's altitude) and ADDRESS=(airplane's mode S address).

**NOTE:** No reply to the UF16 test is not a failure of the ATC system.

- (20) Do a check of the MODE S UF20 TEST. (Mode-S transponder Only)
  - (a) Make sure DF= 20, AC= (airplane's altitude) and ADDRESS= (airplane's mode S address).

**NOTE:** No reply to the UF20 test is not a failure of the ATC system.

- (21) Do a check of the MODE S UF21 TEST. (Mode-S transponder Only)
  - (a) Make sure DF= 21, ID= (selected ATC ID code on the ATC Control Panel) and ADDRESS=(airplane's mode S address).

**NOTE:** No reply to the UF21 test is not a failure of the ATC system.

- (22) Do a check of the SQUITTER TEST. (Mode-S transponder Only)
  - (a) Make sure the squitter's period is between 0.8 to 1.2 seconds.
- (23) Do a check of the FREQUENCY TEST.
  - (a) Make sure the reply frequency of the transponder Mode S is 1090 MHz  $\pm$ 1MHz or 1090 $\pm$ 3 for ATCRBS Transponder type.
- (24) Move the test set to less than 50 feet from the top ATC antenna.

**NOTE:** Make sure the top ATC antenna is not in the line of sight of the test set antenna. Follow the test set operator's guide to reduce multi-path errors. Do the test several times with the test set at different locations until you get valid results.

- (25) Push the SETUP key on the test set and enter the appropriate range for the top and bottom antenna.
- (26) Do a check of the DIVERSITY TEST. (Mode-S transponder Only)
  - (a) Make sure the power level difference is  $\geq$  20dB between 'on' antenna squitters and 'off' antenna squitters.

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**NOTE:** To make sure the dynamic range is  $\geq 20\text{dB}$ , a diversity test must be run at a distance of less than 50 feet (15.2 meters) from the airplane antenna.

- (27) Do a check of the MTL DIFFERENCE TEST.
  - (a) Make sure the Minimum Threshold Level (MTL) difference between mode A and mode C is  $\leq 1.0\text{dBm}$ .
- (28) Push the PWR TEST key on the test set.
- (29) Use the SELECT key on the test set and select the bottom antenna.

**NOTE:** Make sure the top ATC antenna is not in the line of sight of the test set antenna during the POWER TEST.

- (30) Push the antenna push button switch.
- (31) Slowly move the test set antenna 3 feet vertically from the ground, at less than 1 FT/SEC (30 CM/SEC).
- (32) Push the antenna push button switch a second time to stop the test when the test set antenna is approximately 6 feet high.
- (33) Do a check of the POWER TEST.
  - (a) Make sure the peak power output of the transponder is between 125W (ERP = 51.0 dBm) and 500W (ERP = 57.0 dBm).

**NOTE:** Effective Radiated Power (ERP) is the product of the antenna output power and antenna gain.

- (b) Make sure the Minimum Threshold Level (MTL) sensitivity is  $-74\text{dBm}$  ( $\pm 3\text{dBm}$ ).

**NOTE:** An additional 3dBm loss is allowed to compensate for antenna coupling errors. Also, make sure to correct for other factors that would change the sensitivity measurement.

- (c) Make sure the test set shows PASSED for the BOT AVG (dBm).
- (34) Insert the antenna shield over the bottom ATC antenna.
- (35) Move the test set so that it is in the line of sight of the top ATC antenna.
- (36) Push the SETUP key on the test set.
  - (a) Enter the appropriate range for the top antenna.
  - (b) Choose the top antenna on the SELECTED field.
- (37) Push the PWR TEST key on the test set.
- (38) Use the SELECT key on the test set and select the top antenna.
- (39) Do a check of the POWER TEST.
  - (a) Make sure the peak power output of the transponder is between 125W (ERP = 51.0 dBm) and 500W (ERP = 57.0 dBm).

**NOTE:** Effective Radiated Power (ERP) is the product of the antenna output power and antenna gain.

- (b) Make sure the Minimum Threshold Level (MTL) sensitivity is  $-74\text{dBm}$  ( $\pm 3\text{dBm}$ ).

**NOTE:** An additional 3dBm loss is allowed to compensate for antenna coupling errors. Also, make sure to correct for other factors that would change the sensitivity measurement.

- (c) Make sure the test set shows PASSED for the TOP AVG (dBm).

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(40) Do the system test again for the right or No. 2 ATC system and use the No 1 air data source.

**NOTE:** On the test set, select the BOT ATC antenna.

Transponder 2 is mode C, skips Mode S steps for check of Transponder 2.

G. Put the Airplane Back to Its Usual Condition

- (1) Remove the ATC ramp test set and antenna shield.
- (2) Close this circuit breaker.
  - (a) P6 Circuit Breaker Panel:
    - 1) AIR/GND and LTS
- (3) Remove the electrical power if it is not necessary (Ref 24-22-00/201).

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#### **4. System Test - ATC System (With the TIC T-48 or T-49 Test Set)**

##### **A. General**

- (1) This system test is a more complete check of the ATC system. The system test first does the ATC - Operational Test. Then it uses ground test equipment to examine the left and right ATC systems.
- (2) This system test uses the TIC T-48 or T-49 test set to test the functionality of the ATC transponder. The test set can do all the tests automatically or each test individually. Each test shows on the test set as it is done. If a test has failed, the test sequence will stop and a failed message shows. All data will show at the end of the test if the test is successful.
- (3) Operation with the antenna coupler, TAP-115, TAP 118, or TAP 125 used with the applicable test set, is necessary when the test to do a check of the output power, receiver, sensitivity and radio frequency. For mode S diversity channel isolation check, the TAP 125 is necessary.

##### **B. Special Tools and Equipment**

- (1) ATC Transponder Ramp Test Set TIC T-48 or T-49
- (2) RF through-line wattmeter Bird model 43 or equivalent (up to 500 watts).

##### **C. References**

- (1) 24-22-00/201, Manual Control
- (2) 34-12-01/501, Air Data Computing (ADC) System

##### **D. Access**

- (1) Location Zones
  - 205 Electronic Compartment
  - 211/212 Flight Compartment
  - 223/224 Area Above Passenger Cabin Ceiling (Exterior)

##### **E. Prepare for the System Test**

- (1) Follow the instructions in the TIC operator's manual and do all necessary calibration.
- (2) Insert the Antenna Coupler over the ATC antenna.

**NOTE:** Make sure the orientation of the antenna coupler setup is correct.

- (3) Connect the antenna coupler connector to the test set antenna connector.
- (4) Apply power to the test set and follow operating procedures.
- (5) Make sure these circuit breakers are closed:
  - (a) P18 Load Control Center - Left
    - 1) ATC 1
    - 2) DADC 1
    - 3) ALTM CAPTAIN
  - (b) P6 Load Control Center - Right
    - 1) ATC 2
- (6) Do the ATC Operational Test.
- (7) Open this circuit breaker.
  - (a) P6 Circuit breaker Panel:
    - 1) AIR/GND and LTS
- (8) Set the captain's and first officer's altimeter to 29.92 inches of mercury.

##### **F. ATC System Test**

**CAUTION:** Do not use codes 7500, 7600-7677, and 7700-7777. These are emergency codes.

- (1) Set the code switches on the ATC Control Panel to a desired ATC ID code.
- (2) Set the transponder select switch on the ATC Control Panel to the No. 1 (or 2 for Transponder No 2) system.

- (3) On ATC Control Panel

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Do the steps that follow:

- (a) Set the mode switch on the ATC Control Panel to the XPDR position.
- (b) Set the altitude source switch on the ATC Control Panel to the 1 position.
- (4) Push the INTERROGATE switch.
  - (a) Make sure the test set shows the correct transponder type.

**NOTE:** If the test set shows "NO REPLY FROM XPDR", do a check on the test antenna connections. Also, make sure the ATC system is operational.

- (5) Push the INTERROGATE switch to run a complete test.
  - (a) Make sure the test set does these tests:
    - 1) ATCRBS/A & SLS
    - 2) ATCRBS/C
    - 3) ATCRBS/A Mode S All
    - 4) ATCRBS/C Mode S All
    - 5) ATCRBS/A only
    - 6) ATCRBS/C only
    - 7) Mode S Surv Identity
    - 8) Mode S Surv Altitude
    - 9) Mode S Surv Short
    - 10) Mode S Comm Identity
    - 11) Mode S Comm Altitude
    - 12) Mode S Comm Short

**NOTE:** The Mode-S Comm will be tested by the T-49 tester if the transponder is equipped with the capability. If not, the T-49 skips over these steps.

- 13) Undesired Replies
- 14) Squitter
- 15) Diversity

**NOTE:** This test is only available to test set with the TAP 125 option.

- 16) POWER, RCVR & FREQ
- (6) The test set display shows the test results when the test is completed.
  - (a) Make sure the test set shows the same ATC ID code set on the ATC Control Panel.

**NOTE:** If the identification switch on the ATC Control Panel is pushed during the test, the ID code will have an underscore.

- (b) Make sure the Mode S address is correct (WDM 34-53-12).
- (c) Make sure the reported altitude agrees with the local field elevation shown on the captain's or first officer's altimeter.

**NOTE:** Make sure the reported altitude is within  $\pm 125$  feet of the local field elevation altitude shown on captain's and first officer's altimeter (applicable for all the altitude reporting check).

- (d) Make sure the output power is not less than 70W (ERP = 48.5 dBm) and not more than 500W (ERP = 57.0 dBm).

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**NOTE:** Effective Radiated Power (ERP) is the product of the antenna output power and antenna gain.

- (e) Make sure the receiver sensitivity, Minimum Threshold Level (MTL), is  $-74 \pm 3$  dBm.

**NOTE:** An additional 3dBm loss is allowed to compensate for antenna coupling errors. Also, make sure to correct for other factors that would change the sensitivity measurement.

- (f) Make sure the frequency deviation is less than  $\pm 1$  MHz.
- (g) The test set automatically does a check on the MTL difference between mode A and mode C. If the MTL value difference is greater than 1.0 dBm, the test set will show the FAIL indication and stops the test.
- (7) For individual test, use the TEST switch to step through each test.
  - (a) Do a check on each test result after each test.
- (8) Change the ATC ID code on the ATC Control Panel to its compliment. The compliment of the code is 7777 minus the code.

EXAMPLE: If the code is 0340, its compliment is:  $7777 - 0340 = 7437$  compliment.

- (9) Push the identification switch on the ATC Control Panel.
- (10) Push the TEST switch on the test set to run ATCRBS/A test.
  - (a) Make sure the test set shows the IDENT indication, the ATC ID code selected on the ATC Control Panel, and a %REPLY greater than 90%.
- (11) Push the TEST switch on the test set to run the ATCRBS/C test.
  - (a) Make sure the test set shows the airplane's altitude and %REPLY greater than 90%.

**NOTE:** Make sure the reported altitude is within  $\pm 125$  feet of the altitude shown on captain's and first officer's altimeter.

- (12) Push the TEST switch on the test set to run the ATCRBS/A Mode S ALL test. (Mode-S transponder only).
  - (a) Make sure the test set shows the airplane's mode S address and % REPLY greater than 90%.
- (13) Push the TEST switch on the test set to run the ATCRBS/C Mode S ALL test. (Mode-S transponder only).
  - (a) Make sure the test set shows the airplane's mode S address and % REPLY greater than 90%.
- (14) Push the TEST switch on the test set to run the ATCRBS/A only test.
  - (a) Make sure the test set shows NO REPLY FROM XPDR.
- (15) Push the TEST switch on the test set to run the ATCRBS/C only test.
  - (a) Make sure the test set shows NO REPLY FROM XPDR.
- (16) Push the TEST switch on the test set to run the Mode S Surv. (Identity/Altitude/Short) test. (Mode-S transponder only).
  - (a) Make sure the test set shows the airplane's mode S address, the airplane's altitude, and %REPLY greater than 90%.
- (17) Push the TEST switch on the test set to run the undesired replies test.
  - (a) Make sure the test set shows No Replies.
- (18) Push the TEST switch on the test set to run the squitter test. (Mode-S transponder only).
  - (a) Make sure the test set shows PASS.
- (19) For test set with the TAP 125 option, push the TEST switch on the test set to run the Mode S Diversity Channel Isolation Test. (Mode-S transponder only).

**NOTE:** The test set should show the Diversity test page.

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- (a) Make sure the test set shows PASS.
- (20) For test set without the TAP 125 option, do the Mode S Diversity Channel Isolation (Mode-S transponder Only) Test as follows:
  - (a) Disconnect the antenna cable at connector D9628P.
  - (b) Install the wattmeter between the antenna cable and the connector D9628P.

**NOTE:** Make sure the correct element is installed into the sample port of the wattmeter.

- (c) Turn the element to the stop to select the direction of the power toward the antenna.
- (d) Make a note of the maximum power output and the minimum power output measured by the RF through-line wattmeter during the mode S squitter transmission period.
  - 1) Make sure the minimum power output is 100 times or 20 db lower than the maximum power output.
- (e) Disconnect the RF through-line wattmeter.
- (f) Connect the antenna cable to connector D9628P.
- (21) Remove the antenna coupler from the lower ATC antenna and insert it to the top ATC antenna.

**NOTE:** Make sure the orientation of antenna coupler setup is correct.

- (22) Do the system test again for the ATC system No 2, and use the No 1 air data source.

**NOTE:** Use BOT antenna.

Transponder 2 is mode C, skips Mode S steps for check of Transponder 2.

- G. Put the Airplane Back to its Usual Condition
  - (1) Remove the antenna coupler and the test set.
  - (2) Close this circuit breaker.
    - (a) P6 Circuit Breaker Panel:
      - 1) AIR/GND and LTS
  - (3) Remove electrical power if it is not necessary (Ref 24-22-00/201).

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AIR TRAFFIC CONTROL (ATC) ANTENNA - REMOVAL/INSTALLATION

1. General
  - A. The subject has two tasks. The first task is the removal of the ATC antenna. The second task is the installation of the ATC antenna and a test of the ATC antenna.
2. ATC Antenna Removal
  - A. Reference
    - (1) AMM 20-10-34/701, Metal Surfaces
    - (2) AMM 51-21-31/701, Corrosion Removal and Control
  - B. Access
    - (1) Location Zone  
101/102 Flight Compartment
  - C. Equipment
    - (1) Aerodynamic smoother cutting tool - hardwood or plexiglass
  - D. Procedure
    - (1) Open these circuit breakers and attach DO-NOT-CLOSE tags:
      - (a) P18 Load Control Center - Left
        - 1) ATC-1 AC
        - 2) ATC-1 DC
        - 3) TCAS Speaker
      - (b) P6 Load Control Center - Right
        - 1) ATC-2 AC
        - 2) ATC-2 DC
    - (2) Remove the ATC antenna:
      - (a) Remove the screws that attach the ATC antenna to the airplane structure (Fig. 401).

**CAUTION:** Move the antenna only as far as necessary to disconnect the cable. Damage to the antenna cable can occur if you pull the cable.
      - (b) Pull the antenna assembly away from the airplane structure to get access to the coaxial cables.
      - (c) Disconnect the coaxial cables.

**NOTE:** Do not let the antenna cable retract into the fuselage.
      - (d) Install dust caps on the electrical connectors.
      - (e) Remove the ATC antenna.
      - (f) Do this task to clean the airplane surface. Aluminum Corrosion Removal (AMM 51-21-31/701).
3. ATC Antenna Installation
  - A. Consumable Materials
    - (1) G00009 Corrosion Preventive Compound (Dow Corning No. 4) - BMS 3-23
    - (2) A00073 Aerodynamic Sealant - BMS 5-95, class B-1/2 (Ref 20-30-11)
  - B. References
    - (1) SWPM 20-20-00, Standard Wiring Practices Manual
    - (2) AMM 24-22-00/201, Manual Control
    - (3) AMM 51-31-00/200, Seals and Sealing
    - (4) SRM 51-20-01
  - C. Access
    - (1) Location Zone  
101/102 Flight Compartment

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**D. Equipment**

- (1) Sealing gun - 6-inch length cartridge, Senco Research, or equivalent (not required for material furnished in tubes)
- (2) Bonding meter (AMM 20-22-01)
- (3) Varnish brush - 1- or 2-inch (Commercial)
- (4) Spatula (Commercial)

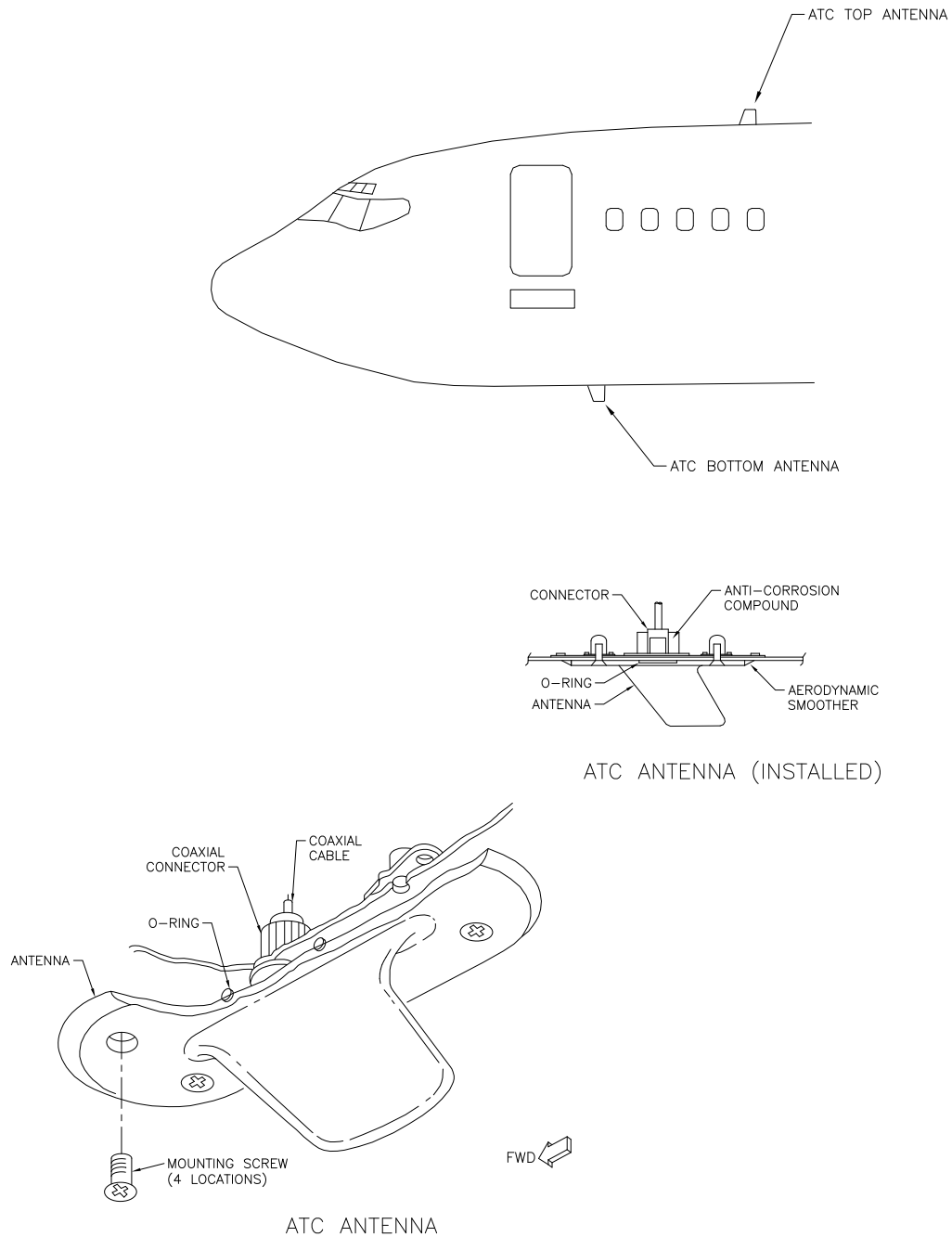
**E. Procedure**

- (1) Apply a layer of BMS 3-23 corrosion-preventive compound to the mating surfaces of the antenna and the airplane structure (AMM 51-21-31/701).
- (2) Install the ATC antenna:
  - (a) Remove the dust caps from the electrical connectors.
  - (b) Connect the coaxial cables to the ATC antenna.
  - (c) Put the antenna into its position and install the screws.
- (3) Do this task to do a check of the resistance between the antenna base and the airplane skin. Electrical Bonding Check (SWPM 20-20-00).
  - (a) Make sure the resistance is not more than 0.001 ohm.
- (4) Apply the weather aerodynamic sealant (BMS 5-95) to the outer edge of the antenna (AMM 51-31-00/201).
- (5) Remove the unwanted sealant from around the antenna base (AMM 51-31-00/201).
- (6) Remove the DO-NOT-CLOSE tags, and close these circuit breakers:
  - (a) P18 Load Control Center - Left
    - 1) ATC-1 AC
    - 2) ATC-1 DC
    - 3) TCAS Speaker
  - (b) P6 Load Control Center - Right
    - 1) ATC-2 AC
    - 2) ATC-2 DC

**F. ATC Antenna Test**

- (1) Supply electrical power (AMM 24-22-00/201).
- (2) Set the transponder select switch on the ATC Control Panel to the applicable transponder.
  - (a) If ATC-1 selected, start the self test on the front of the transponder.
  - (b) Airplane with Collins ATC transponder;  
Make sure the LED's sequence that follows occurs:
    - 1) All LED's comes on for about one second
    - 2) All red LED's go off
    - 3) The green LED stay on
  - (c) Release the TEST switch.
  - (d) IF ATC-2 selected, start the self test on the front of the transponder.
  - (e) Airplane with Collins ATC transponder;  
Make sure the SELF TEST light illuminates
  - (f) Release the TEST switch.
  - (g) Press RESET for ATC Transponder 2.
- (3) Set the ATC system to STBY.

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**ATC Antenna Installation  
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AIR TRAFFIC CONTROL (ATC) TRANSPONDER - REMOVAL/INSTALLATION

1. General
  - A. This procedure has two tasks. The first task is the removal of the ATC transponder. The second task is the installation of the ATC transponder.
  - B. The No. 1, and No. 2 ATC transponders are installed on the E2 rack in the main equipment center.
2. ATC Transponder Removal
  - A. References
    - (1) AMM 20-10-07/201, E/E Rack Mounted Components
  - B. Access
    - (1) Location Zones  
205 Electronic Compartment
    - (2) Access Panels  
1201 Electronics Equipment Access Door
  - C. Procedure
    - (1) Open these circuit breakers and attach DO-NOT-CLOSE tags:
      - (a) P18 Load Control Center - Left
        - 1) ATC-1 AC
        - 2) ATC-1 DC
        - 3) TCAS Speaker
      - (b) P6 Load Control Center - Right
        - 1) ATC-2 AC
        - 2) ATC-2 DC

CAUTION: Do not touch the connector pins or other conductors on the ATC transponder. If you touch these conductors, electrostatic discharge can cause damage to the ATC transponder.

  - (2) Remove the ATC transponder (AMM 20-10-07/201).
  - (3) Install dust caps on the electrical connectors.
3. ATC Transponder Installation
  - A. References
    - (1) AMM 20-10-07/201, E/E Rack Mounted Component
    - (2) AMM 24-22-00/201, Electrical Power - Control
  - B. Access
    - (1) Location Zones  
205 Electronic Compartment
    - (2) Access Panels  
1201 Electronics Equipment Access Door
  - C. Procedure
    - (1) Make sure these circuit breakers are open:
      - (a) P18 Load Control Center - Left
        - 1) ATC-1 AC
        - 2) ATC-1 DC
        - 3) TCAS Speaker
      - (b) P6 Load Control Center - Right
        - 1) ATC-2 AC
        - 2) ATC-2 DC

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**CAUTION:** Do not touch the connector pins or other conductors on the ATC transponder. if you touch these conductors, electrostatic discharge can cause damage to the ATC transponder.

- (2) Remove the dust caps from the electrical connectors.
  - (3) Install the ATC transponder (AMM 20-10-07/201).
  - (4) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
    - (a) P18 Load Control Center - Left
      - 1) ATC-1 AC
      - 2) ATC-1 DC
      - 3) TCAS Speaker
    - (b) P6 Load Control Center - Right
      - 1) ATC-2 AC
      - 2) ATC-2 DC
- D. ATC Transponder Test
- (1) Supply electrical power (AMM 24-22-00/201).
  - (2) Push and hold the TEST switch on the applicable ATC transponder.
    - (a) Make sure the self-test passes and no faults are detected.
  - (3) Release the TEST switch on the ATC transponder.
  - (4) When a full system test is needed, does the ATC system test (AMM 34-53-00/501 or AMM 34-53-02/501)
  - (5) Remove electrical power if it is not necessary (AMM 24-22-00/201).

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AIR TRAFFIC CONTROL (ATC) CONTROL PANEL - REMOVAL/INSTALLATION

1. General
  - A. This subject has two tasks. The first task is the removal of the ATC Control Panel. The second task is the installation of the ATC Control Panel.
  - B. The ATC Control Panel, is installed in the aft electronics panel, P8.
  - C. Electrical connections are made through multi-pin connectors on the rear of the Control Panel. The Control Panel is installed in the aft electronic Control Panel.
2. ATC Control Panel Removal
  - A. Access
    - (1) Location Zones  
101/102 Flight Compartment
  - B. Procedure
    - (1) Open these circuit breakers and attach DO-NOT-CLOSE tags:
      - (a) P18 Load Control Center - Left
        - 1) ATC-1 AC
        - 2) ATC-1 DC
      - (b) P6 Load Control Center - Right
        - 1) ATC-2 AC
        - 2) ATC-2 DC
    - (2) Do these steps to remove the ATC Control Panel:
      - (a) Loosen the quarter-turn fasteners on the Control Panel.

**CAUTION:** Do not touch the connector pins or other conductors on the ATC Control Panel. if you touch these conductors, electrostatic discharge can cause damage to the ATC Control Panel.
      - (b) Pull the Control Panel out until you can get to the electrical connectors.
      - (c) Disconnect the electrical connectors from the Control Panel.
      - (d) Remove the Control Panel.
      - (e) Install dust caps on the electrical connectors.
3. ATC Control Panel Installation
  - A. References
    - (1) AMM 24-22-00/201, Electrical Power - Control
  - B. Access
    - (1) Location Zones  
101/102 Flight Compartment  
205 Electronic Compartment
    - (2) Access Panel  
1201 Electronic Equipment Access Door
  - C. Procedure
    - (1) Make sure these circuit breakers are opened:
      - (a) P18 Load Control Center - Left
        - 1) ATC-1 AC
        - 2) ATC-1 DC
      - (b) P6 Load Control Center - Right
        - 1) ATC-2 AC
        - 2) ATC-2 DC

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- (2) Do these steps to install the ATC Control Panel:

**CAUTION:** Do not touch the connector pins or other conductors on the ATC Control Panel. if you touch these conductors, electrostatic discharge can cause damage to the ATC Control Panel.

- (a) Remove the dust caps from the electrical connectors.
- (b) Connect the electrical connectors to the Control Panel.
- (c) Install the Control Panel.

**NOTE:** ATC Mode S and ATC Non Mode S Control Panel are not interchangeable.

- (d) Tighten the quarter-turn fasteners on the Control Panel.
- (3) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
  - (a) P18 Load Control Center - Left
    - 1) ATC-1 AC
    - 2) ATC-1 DC
  - (b) P6 Load Control Center - Right
    - 1) ATC-2 AC
    - 2) ATC-2 DC

D. ATC Control Panel Test

- (1) Supply electrical power (AMM 24-22-00/201).
- (2) Set the transponder select switch on the ATC Control Panel to the 1 position.
- (3) Push and hold the TEST switch on the front panel of the ATC Transponder 1.
  - (a) Make sure the self-test passes and no faults are detected.
- (4) Release the TEST switch on the ATC transponder.
- (5) Set the transponder select switch on the ATC Control Panel to the 2 position.
- (6) Pull ATC-2 AC circuit breaker.
  - (a) Make sure the fail lamp illuminates for approximately one second.
  - (b) Push ATC-2 AC circuit breaker.
- (7) Remove electrical power if it is not necessary (AMM 24-22-00/201).

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AIR TRAFFIC CONTROL (ATC) ANTENNA SWITCH - REMOVAL/INSTALLATION

1. General
  - A. This procedure has two tasks. One is the removal of the ATC antenna switch; the other is the installation of the ATC antenna switch.
  - B. Bottom ATC antenna switch, S9001. The ATC antenna switches are installed on the E2-2 rack.
2. ATC Antenna Switch Removal
  - A. Access
    - (1) Location Zones  
205 Electronic Compartment
    - (2) Access Panels  
1201 Electronics Equipment Access Door
  - B. Prepare for the Removal
    - (1) Open these circuit breakers and attach DO-NOT-CLOSE tags:
      - (a) P18 Load Control Center - Left
        - 1) ATC-1 AC
        - 2) ATC-1 DC
      - (b) P6 Load Control Center - Right
        - 1) ATC-2 AC
        - 2) ATC-2 DC
  - C. Procedure
    - (1) Remove the electrical connector from the ATC antenna switch.
    - (2) Remove the nuts and screws from the ATC antenna switch.
    - (3) Remove the ATC antenna switch.
3. ATC Antenna Switch Installation
  - A. Equipment
    - (1) Resistance measuring bridge or ohmmeter which can measure 0.001 ohm
  - B. References
    - (1) AMM 20-10-34/701, Metal Surfaces
    - (2) SWPM 20-20-00, Standard Wiring Practices Manual
    - (3) AMM 24-22-00/201, Electrical Power - Control
  - C. Access
    - (1) Location Zones  
101/102 Flight Compartment  
205 Electronic Compartment
    - (2) Access Panels  
1201 Electronics Equipment Access Door
  - D. Prepare for the Installation
    - (1) Make sure these circuit breakers are open:
      - (a) P18 Load Control Center - Left
        - 1) ATC-1 AC
        - 2) ATC-1 DC
      - (b) P6 Load Control Center - Right
        - 1) ATC-1 AC
        - 2) ATC-1 DC
  - E. Procedure
    - (1) Make sure the ATC antenna switch bracket has no corrosion. If there is corrosion, clean the mating surfaces (AMM 20-10-34/701).
    - (2) Use the electrical bond fastener to install the ATC antenna switch on the bracket (SWPM 20-20-00).
    - (3) Install the antenna transfer switch.

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**NOTE:** Make sure to install the part number as shown in the IPC (IPC 34-53-00).

- (4) Tighten the screws on the ATC antenna switch.
- (5) Make sure the resistance from the ATC antenna switch to the E2 rack is less than 0.001 ohm.
- (6) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
  - (a) P18 Load Control Center - Left
    - 1) ATC-1 AC
    - 2) ATC-1 DC
  - (b) P6 Load Control Center - Right
    - 1) ATC-1 AC
    - 2) ATC-1 DC
- F. ATC Antenna Switch Test
  - (1) Supply electrical power (AMM 24-22-00/201).
  - (2) Set the transponder select switch on the ATC Control Panel to the 1 position.
  - (3) Push the TEST switch on the left ATC transponder.
    - (a) Make sure the self-test passes and no faults are detected.
  - (4) Release the TEST switch on the ATC transponder.
  - (5) Set the transponder select switch on the ATC Control Panel to the 2 position.
  - (6) Push the TEST switch on the ATC transponder 2.
    - (a) Make sure the self-test passes and no faults are detected.
- G. Put the Airplane Back to Its Usual Condition
  - (1) Remove electrical power if it is not necessary (Ref 24-22-00/201).