# Avionics

## ATC-601 Mode A/C/S Transponder Ramp Test Set

The ATC-601 performs Mode A/C/S transponder tests required by Federal Aviation Regulations

- Accurate measurement of transponder transmitting frequency, power and receiver sensitivity
- AUTO TEST minimizes test time
- Tests include Flight ID, Tail Number decode and UELM/DELM data link
- Non-volatile storage for two sets of test data
- Enhanced Surveillance Testing and ADS-B/GICB Testing to RTCA-DO260 & ICAO Annex 10 Vol 3 Chapter 5
- Operating range of 0 to 300 feet from the aircraft under test
- Dump test data to printer via RS-232
- Built-in self test
- LCD display with automatic backlight
- Tripod mountable directional antenna
- 2 hour battery operation
- FCC Type Acceptance approved
- Two-year limited warranty

*Aeroflex is a leader in the design, manufacture and marketing of avionics test systems.*
*The ATC-601 performs the ATC transponder test required by the revised Federal Aviation Regulations (91.172 and Part 43, Appendix F as amended August 18, 1990) for Mode S, A and C transponders.*

The ATC-601 provides a comprehensive 'AUTO TEST' function which allows the operator to verify and certify the operation of Mode S/A/C transponders with little or no intervention once the test has been commanded.

Tests may be individually run for diagnostic fault finding purposes during routine maintenance.

The ATC-601 is environmentally packaged to operate in all weather conditions and be protected against the shock and vibration encountered during ramp use.

### OPERATION

#### Setup Menu

The setup menus are used to program parameters for power and sensitivity measurements, RS-232 parameters, test data storage, recall and data dump.

```
          ** SETUP#1 MENU **
    UUT ANTENNA: RANGE HEIGHT
          TOP = 63     18
       BOTTOM = 55      8
     SELECTED = BOTTOM
GAIN_1030=11.5 GAIN_1090=12 LOSS=1.0
```

#### Auto Test

The AUTO TEST screen is selected with the 'AUTO TEST' key. When initiated with the 'RUN/STOP' key, this test runs through 23 discrete tests in approximately 30 seconds.

If the required operating modes pass, this completes the 'Part 43, Appendix F' requirements. The detailed results of individual tests conducted during AUTO TEST are stored in memory and may be reviewed by using the 'SELECT' keys. Once selected, the test may be initiated by the 'RUN/STOP' key and will continue to run until

Exit To CD

the ‘RUN/STOP’ key is pressed again.

```
        ** AUTO TEST - PASSED **
   MODE TESTED - A,C,S  FREQ: 1090.00 MHz
   MODE PASSED - A,C,S   ERP:  53 dBm
   MODE FAILED -         MTL: -73 dBm
   DIVERSITY ISOLATION: 25 dBm
           Press RUN TO start
```

### Reply Delay Test

```
      ** REPLY DELAY TEST - PASSED **

       MODE S: 128.00 uS
        ITM A: 128.00 uS  C: 128.00 uS
        ATC A:   3.02 uS  C:   3.10 uS
            Press RUN to start
```

### ATCRBS Reply Test

```
     ** ATCRBS REPLY TEST - PASSED **
  F1 TO F2 SPACING A:20.30 uS  C:20.30 uS
  F1 PULSE WIDTH   A: 0.45 uS  C: 0.45 uS
  F2 PULSE WIDTH   A: 0.45 uS  C: 0.45 uS
  CODE= 7777       ALT= 10,700 FT [6140]
           Press RUN to start
```

### Mode S UF0 Test

```
      ** MODE S UF0 TEST - PASSED **

    DF 0  VS=1    RI=C    AC= 10,700 FT
    ADDRESS=3AC421

           Press RUN to start
```

### Mode S UF11 Test

```
   ** MODE S UF11 TEST - PASSED **

DF11   CA=0  AA=3AC421 PI=000001


         Press RUN to start
```

### Mode S UF20 Test

```
      ** MODE S UF20 TEST - PASSED **

    DF20 FS=0  DR=00 UM=00 AC= 10,700 FT
    MB=00000000000000 ADDRESS=3AC421

           Press RUN to start
```

### Squitter Test

```
       ** SQUITTER TEST - PASSED **
     PERIOD = 1.00 SECONDS
     TAIL NUMBER = N12345
     SQUITTER ADDRESS = 3AC421 [1654201]

           Press RUN to start
```

### Flight ID Test

```
       ** FLIGHT ID TEST - PASSED **

     DF20  BDS1=02  BDS2=00
     AIS=20420CCB9C1041  FLIGHT ID=BA349
     ADDRESS=3AC421
           Press RUN to start
```

### Mode S UELM Test

```
     ** MODE S UELM TEST - PASSED **
  RES: DF20  DR=15  IIS=F  IDS=2
  ACK: DF24  KE=1    ND=0  TAS=000F
  CLO: DF20  DR=15   IIS=F IDS=2
  ADDRESS=3AC421  ERROR=
           Press RUN to start
```

### Power

```
          ** POWER TEST - PASSED **
                        ERP    MTL
    TOP AVG (dBm) = 53.0  -73.4 PASSED
   •BOT AVG (DBM) = 52.0  -74.3 PASSED
    INSTANTANEOUS = 47.0  -73.4
          Press RUN to start
```

### Individual Tests

*V3.00R Firmware*

1. *REPLY DELAY*
2. *REPLY JITTER*
3. *ATCRBS REPLY*
4. *SLS LEVEL*
5. *ATCRBS ONLY ALL-CALL*
6. *MODE S ALL-CALL*
7. *INVALID MODE S ADDRESS*
8. *SPR ON/OFF*
9. *MODE S UF0*
10. *MODE S UF4*
11. *MODE S UF5*
12. *MODE S UF11*
13. *MODE S UF16*
14. *MODE S UF20*
15. *MODE S UF21*
16. *SQUITTER*
17. *FREQUENCY*
18. *DIVERSITY*
19. *MTL DIFFERENCE*
20. *POWER*
21. *FLIGHT ID*
22. *UELM*
23. *DELM*

### European Enhanced Surveillance and DO-260 ADS-B testing capabilities

### Elementary Surveillance:

Altitude Decode in 25ft increments
Flight Status
II & SI Code test
BDS 1,0  Data Link Capability Report
BDS 1,7 Common Usage GICB Capability Report
BDS 2,0 Aircraft Identification
BDS 3,0 ACAS Active Resolution Advisory

### Enhanced Surveillance:

BDS 4,0 Selected Vertical Intention
BDS 5,0 Track & Turn Report
BDS 6,0 Heading & Speed Report

**ADS-B:**

BDS 0,5 Extended Squitter Airborne Position
BDS 0,6 Extended Squitter Surface Position
BDS 0,7 Extended Squitter Status
BDS 0,8 Extended Squitter Ident & Category
BDS 0,9 Extended Squitter Airborne Velocity
BDS 6,1 Extended Squitter Aircraft Status

```
** EXT SQUIT AIRB VEL #1 ** - PASSED
DF20 BDS=0, 9        TYPE=19 AA=3AC421
SUBTYPE= VEL OVR GND NORMAL
EAST-WEST VEL= 1000 Kts E
NORTH-SOUTH VEL= 1000 Kts N
        Press RUN TO start
```

*Extended Squitter Airbourne Velocity Part 1 Screen (GCIB)*

```
** EXT SQUIT AIRB VEL #1 ** - PASSED
DF17 PERIOD= 1s      TYPE=19 AA=3AC421
SUBTYPE= VEL OVR GND NORMAL
EAST-WEST VEL= 1000 Kts E
NORTH-SOUTH VEL= 1000 Kts N
         Press RUN TO start
```

*Extended Squitter Airbourne Velocity Part 1 Screen (DF17)*

# SPECIFICATION

## SIGNAL GENERATOR

***Output***

*1030 MHz DCXO controlled 10 kHz*

***Level***

*-57 to -7 dBm typically, into 50 Ω (Automatically controlled to determine receiver sensitivity [MTL] for the selected range and 4 dB typically, higher than MTL for test interrogations)*

***Test Antenna***

***VSWR***

*1.5:1*

***Gain***

*10 dB typical, specified on the antenna*

*Range 1.83 meters (6 feet) to 91.44 (300 feet)*

## INTERROGATION TEST SIGNALS

***Rate***

*235 Hz PRF (±5 Hz)*

***Interlace Ratio***

| *MTL Interrogations to test interrogations* | |
|---|---|
| *ATCRBS* | *2:1* |
| *Mode S* | *8:1* |
| *Modes* | *A, C, S, Intermode* |

NOTE: The ATC-601 Interrogates with the mode(s) necessary to run selected test.

## PULSE CHARACTERISTICS

***ATCRBS/Mode S Pulse Spacing***

***Mode A***

*$P_1$ to $P_2$ 2.00 µs (±50 ns)*

*$P_1$ to $P_3$ 8.00 µs (±50 ns)*

***Mode C***

*$P_1$ to $P_2$ 2.00 µs (±50 ns)*
*$P_1$ to $P_3$ 21.00 µs (±50 ns)*

***Mode S***

*$P_1$ to $P_2$ 2.00 µs (±50 ns)*
*$P_1$ to $P_6$ 3.5 µs (±50 ns)*
*$P_1$ to spr 4.75 µs (±50 ns)*

***Intermode Pulse Spacing***

***Mode A***

*$P_1$ to $P_3$ 8.00 µs (±50 ns)*
*$P_1$ to $P_4$ 10.00 µs (±50 ns)*

***Mode C***

*$P_1$ to $P_3$ 21.00 µs (±50 ns)*
*$P_1$ to $P_4$ 23.00 µs (±50 ns)*

***Pulse Widths***

***Mode A, C, S, Intermode***

*$P_1$, $P_2$, $P_3$ 0.80 µs*

***Mode S***

*$P_6$ (Short) 16.25 µs*
*$P_6$ (Long) 30.25 µs*

***Intermode***

*$P_4$ (Short) 0.80 µs*
*$P_4$ (Long) 1.60 µs*

***All Modes***

*Accuracy ±50 ns*
*Rise Time 50 to 100 ns*
*Fall Time 50 to 200 ns*

***Phase Modulation***

***Transition time***

*≤80 ns*

***Phase Shift***

*180° (±10°)*

***Amplitude Levels***

***SLS Level ($P_2$)***

*-9 dB (±1 dB) and 0 dB relative to $P_1$ level*

NOTE: SLS Level is automatically controlled in the SLS LEVEL Test.

## UUT MEASUREMENTS (REPLIES)

***XMTR Power (at 1090 MHz) Effective Radiated Power (ERP)***

***Range***

*+48.5 to +57 dBm (71 to 500 W)*

***Accuracy***

*±2 dBm*

***Direct Connection - Peak Pulse Power***

***Range***

*+46.5 to +59 dBm (45 to 800 W)*

***Accuracy***

*1 dB*

***Resolution***

*0.1 dB*

***XMTR Frequency***

***Range***

*1087 to 1093 MHz*

***Accuracy***

*50 kHz*

***Resolution***

*10 kHz*

***Receiver Sensitivity***

***Direct Connection - Minimum Triggering Level (MTL)***

***Range***

*-67 to -79 dBm*

***Accuracy***

*±2 dB*

***Radiated Field Strength (MTL)***

***Range***

*-69 to -77 dBm into 0 dBm antenna (-77 dB W/m$^2$ to -85 dB W/m$^2$)*

***Squitter Period***

***Range***

*0.10 to 4.88 sec*

***Accuracy***

*±10 ms*

***Reply Delay***

***ATCRBS***

***Range***

*1.80 to 7.00 µs*

***Accuracy***

*±100 ns*

***Mode S and ATCRBS/Mode S All Call***

***Range***

*125.00 to 131.00 µs*

***Accuracy***

*±100 ns*

***Diversity Isolation***

***Range***

*0 to >20 dB (depending on Antenna range)*

***Antenna Range***

*1.83 m (6 ft) to 28.96 m (95 ft)*

***Accuracy***

*±3 dB*

## *GENERAL*

***Calibration Interval***

*1 year*

***Battery Operation***

*Duration 2 hours before re-charge at 25°C*

*Automatic Shut-off after 15 minutes of non-use*

***AC Supply***

*103.5 to 129 VAC, 207 to 253 VAC, 47.5 to 420 Hz, ≤+10% of the nominal voltage*

*30 W (used to re-charge battery)*

***Environmental***

***Temperature***

*-20° to 55°C*

***Relative humidity***

*≤80% for temperatures up to 31°C decreasing linearly to 50% at 40°C (Non-condensing)*

***Altitude***

*≤4000 m (13,124 ft)*


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