Application Note 1: AV-15 commands used to do FAR transponder tests.

First a recap of FAA regulations;

The integrated transponder/altitude reporting system must be verified in accordance with Title 14 of the Code of Federal Regulations (14 CFR) §§ 91.411 and 91.413, every 24 calendar months, or any time the transponder is removed/replaced/modified.

Additionally, the ADS-B Out parameters must be verified in accordance with Title 14 of the Code of Federal Regulations (14 CFR) § 91.227 any time the position source (GPS) is replaced/modified.

Appendix F to Part 43—ATC Transponder Tests and Inspections

The ATC transponder tests required by § 91.413 of this chapter may be conducted using a bench check or portable test equipment and must meet the requirements prescribed in paragraphs (a) through (j) of this appendix. If portable test equipment with appropriate coupling to the aircraft antenna system is used, operate the test equipment for ATCRBS transponders at a nominal rate of 235 interrogations per second to avoid possible ATCRBS interference. Operate the test equipment at a nominal rate of 50 Mode S interrogations per second for Mode S. An additional 3 dB loss is allowed to compensate for antenna coupling errors during receiver sensitivity

measurements conducted in accordance with paragraph (c)(1) when using portable test equipment.

(a) Radio Reply Frequency:

(1) For all classes of ATCRBS transponders, interrogate the transponder and verify that the reply frequency is 1090 ±3 Megahertz (MHz).

(2) For classes 1B, 2B, and 3B Mode S transponders, interrogate the transponder and verify that the reply frequency is 1090 ±3 MHz.

(3) For classes 1B, 2B, and 3B Mode S transponders that incorporate the optional 1090 ±1 MHz reply frequency, interrogate the transponder and verify that the reply frequency is correct.

(4) For classes 1A, 2A, 3A, and 4 Mode S transponders, interrogate the transponder and verify that the reply frequency is 1090 ±1 MHz.

(b) Suppression: When Classes 1B and 2B ATCRBS Transponders, or Classes 1B, 2B, and 3B Mode S transponders are interrogated Mode 3/A at an interrogation rate between 230 and 1,000 interrogations per second; or when Classes 1A and 2A ATCRBS Transponders, or Classes 1B, 2A, 3A, and 4 Mode S transponders are interrogated at a rate between 230 and 1,200 Mode 3/A interrogations per second:

(1) Verify that the transponder does not respond to more than 1 percent of ATCRBS interrogations when the amplitude of P2 pulse is equal to the P1 pulse.

(2) Verify that the transponder replies to at least 90 percent of ATCRBS interrogations when the amplitude of the P2 pulse is 9 dB less than the P1 pulse. If the test is conducted with a radiated test signal, the interrogation rate shall be 235 ±5 interrogations per second unless a higher rate has been approved for the test equipment used at that location.

(c) Receiver Sensitivity:

(1) Verify that for any class of ATCRBS Transponder, the receiver minimum triggering level (MTL) of the system is -73 ±4 dbm, or that for any class of Mode S transponder the receiver MTL for Mode S format (P6 type) interrogations is -74 ±3 dbm by use of a test set either:

(i) Connected to the antenna end of the transmission line;

(ii) Connected to the antenna terminal of the transponder with a correction for transmission line loss; or

(iii) Utilized radiated signal.

(2) Verify that the difference in Mode 3/A and Mode C receiver sensitivity does not exceed 1 db for either any class of ATCRBS transponder or any class of Mode S transponder.

(d) Radio Frequency (RF) Peak Output Power:

(1) Verify that the transponder RF output power is within specifications for the class of transponder. Use the same conditions as described in (c)(1)(i), (ii), and (iii) above.

(i) For Class 1A and 2A ATCRBS transponders, verify that the minimum RF peak output power is at least 21.0 dbw (125 watts).

(ii) For Class 1B and 2B ATCRBS Transponders, verify that the minimum RF peak output power is at least 18.5 dbw (70 watts).

(iii) For Class 1A, 2A, 3A, and 4 and those Class 1B, 2B, and 3B Mode S transponders that include the optional high RF peak output power, verify that the minimum RF peak output power is at least 21.0 dbw (125 watts).

(iv) For Classes 1B, 2B, and 3B Mode S transponders, verify that the minimum RF peak output power is at least 18.5 dbw (70 watts).

(v) For any class of ATCRBS or any class of Mode S transponders, verify that the maximum RF peak output power does not exceed 27.0 dbw (500 watts).

Note:

The tests in (e) through (j) apply only to Mode S transponders.

(e) Mode S Diversity Transmission Channel Isolation: For any class of Mode S transponder that incorporates diversity operation, verify that the RF peak output power transmitted from the selected antenna exceeds the power transmitted from the nonselected antenna by at least 20 db.

(f) Mode S Address: Interrogate the Mode S transponder and verify that it replies only to its assigned address. Use the correct address and at least two incorrect addresses. The interrogations should be made at a nominal rate of 50 interrogations per second.

(g) Mode S Formats: Interrogate the Mode S transponder with uplink formats (UF) for which it is equipped and verify that the replies are made in the correct format. Use the surveillance formats UF=4 and 5. Verify that the altitude reported in the replies to UF=4 are the same as that reported in a valid ATCRBS Mode C reply. Verify that the identity reported in the replies to UF=5 are the same as that reported in a valid ATCRBS Mode 3/A reply. If the transponder is so equipped, use the communication formats UF=20, 21, and 24.

(h) Mode S All-Call Interrogations: Interrogate the Mode S transponder with the Mode S-only all-call format UF=11, and the ATCRBS/Mode S all-call formats (1.6 microsecond P4 pulse) and verify that the correct address and capability are reported in the replies (downlink format DF=11).

(i) ATCRBS-Only All-Call Interrogation: Interrogate the Mode S transponder with the ATCRBS-only all-call interrogation (0.8 microsecond P4 pulse) and verify that no reply is generated.

(j) Squitter: Verify that the Mode S transponder generates a correct squitter approximately once per second.

(k) Records: Comply with the provisions of § 43.9 of this chapter as to content, form, and disposition of the records.

[Amdt. 43-26, 52 FR 3390, Feb. 3, 1987; 52 FR 6651, Mar. 4, 1987, as amended by Amdt. 43-31, 54 FR 34330, Aug. 18, 1989]

Now how the AV-15 may be used to do the required tests;

The tests are typically done as a ramp test using a transponder ramp test set, such as the AV-15.

Detailed instructions for operating the ramp tester are contained in the operator's manual.

Reference Part 43 Appendix F for testing criteria. The ramp test includes checks as follows:

1. Reply Frequency

   See c) in manual reprint below. will measure to better than 1MHz

2. Suppression

   See a),b) and f) commands. The sidelobe suppression can be set for none, equal to P1 or -9db

   and the reply percent is displayed. Command f) even allows you to read suppression time.

3. Receiver Sensitivity

   See e) below. The MTL level is displayed as the output power is being measured. Mode A/C/S modes

   are provided and in mode A the power is measured during the F2 pulse thus facilitating droop measurement.

4. Reply RF Output Power

   See e) below. The output power is displayed as the MTL is also being measured. Mode A/C/S modes

   are provided and in mode A the power is measured during the F2 pulse thus facilitating droop measurement.

5. Mode S Diversity Channel Isolation (if applicable)

   The AV15 was intended primarily for single antenna transponder installations however;

   See e) below and measure transponder output power when the antenna is selecter/de-selected. need 20db

6. Mode S Address

   See (g,i,j,k,l,n,o)

7. Mode S Formats

   Provides for formats 4,5,20,21 See (j,k,l,m)

8. Mode S All-Call

See (i)

9. ATCRBS –Only All Call

See (h)

10. Squitter

See (n,o,p,q,r)

Reference AC 43-6B and 14 CFR Part 43, Appendix E (c) for testing criteria. The ramp test includes

checks as follows:

1. Altitude Reporting

See (b,j)

Reference Advisory Circular 20-165A and 14 CFR Part 91.227 for the following ADS-B Out parameters:

1. NACp = 8 See p)

2. NIC = 7 See r)

3. NACv = 1 See q)

4. SIL = 3 See p)

5. SDA = 2 See p)

6. Ensure all 14 CFR 91.227(d) parameters are populated and transmitted.

------ REPRINT OF AV15 Ver 2.02 TRANSPONDER MODE A/C/S TEST INFORMATION ONLY ----------

6. TRANSPONDER A/C/S ADS-B

a) Generates MODE-A test signal and display's squawk code and reply percentage. Also allows side lobe suppression check. If the transponder IDENT is activated then the AV-15 will display IDENT. The AV-15 sends about 235 MODE-A interrogations per second. The AV-15 sends 1030MHz P1 and P3 pulses spaced 8.0uS apart. The P2 side lobe suppression pulse can be selected as the same amplitude as P1-P3 or -9db {*****}. The suppression pulse is sent 2.0uS after the P1 pulse if enabled. No P4 pulse is sent. The top LCD line display's the squawk code then F1=nn. The hex number nn is the approx transponders F1 pulse width. The hex number times 50nS equates to the measured F1. If the transponder is sending ident then the word IDENT replaces the F1 display. Reply percent is on the bottom LCD line.

Example; After turning on the AV15 and waiting for the self

test to run, the display will read

PUSH TO SEL MODE
< VOR >

push left push button so that display line 2 reads;

< TRANSPONDER >

now push center button to select transponder testing.
The display will now show

SEL TXPDR MODE
MODE A SQUAWK

If we wanted to do a different transponder test we would use the right or left buttons to step through the tests available Since we wish to do the Mode-A test we press the center button to select it. The display will show

SIDELOBE SUPPRES
NO SLS P2 OFF ?

If we wish to do Mode-A with the SLS off then press center select button. If you wish to send a P2 pulse that is equal in amplitude or -9db to the P1 pulse then use the right or left buttons Once the center button is pressed the AV-15 will begin sending Mode-A interrogations and looking for replies. The AV-15 will display something like;

SQ=1200 F1=08
Reply%=100

Line 1 displays the Squawk code and the F1 shows the pulse width of the reply F1 pulse where a Hex number between 7 to B is normal. Line 2 displays the reply percentage. If all interrogations result in a good reply to the AV-15 then 100% is shown. To stop Mode-A testing and select a different test, press and hold the center button down until the blue LED goes off or blinks. The power switch will also work but any saved mode-S address info will be lost. To calculate received pulse width (hex number)*50nS. For example; Hex A=10 so 10*50nS=500nS or 0.5uS width.

b) Generates MODE-C test signal and displays the altitude and reply percentage. Also allows sidelobe suppression check.
The AV-15 sends about 235 MODE-C interrogations per second.
The AV-15 sends 1030MHz P1 and P3 pulses spaced 21.0uS apart.
The P2 sidelobe suppression pulse is the same amplitude or -9db {*****} from P1-P3 and sent 2.0uS after the P1 pulse if enabled.
No P4 pulse is sent. The top LCD line displays the raw received code in hex and the calculated altitude. The bottom line gives reply percentage.

c) checks the Aircraft **Transponders Transmit carrier frequency.**
The AV-15 sends MODE-A requests and displays a number that is representative of the magnitude of the received reply. By moving a filter about the nominal 1090MHz receive frequency the approximate transponder transmit frequency is determined.
The filter can be moved +/- 15MHz from 1090MHZ in 1MHz steps.

Use the left button to move down and the right key to move the offset up in frequency. The bottom LCD line shows the offset and the filter output magnitude. The MAG=(number) will be largest at the transmit frequency. For example, if you get -2 MHz MAG=(77), -1 MHz MAG=(122), 0 MHz MAG=(85). Then the acft transponder Tx freq is a bit less than 1 MHz lower than the 1090 MHz nominal transmit frequency.

d) Aircraft **transponder receive frequency** check. **{*****}**
To determine where the transponder is most sensitive to ATC requests, this feature allows you to step the AV15 transmitted frequency +/- 15 MHz from the nominal 1030 MHz. For example if you find that by moving the frequency, your getting 100% reply from -3 MHz up to +5 MHz that would indicate that your transponders IF filter is a bit high. For best reception the transponder may need alignment, especially if the MTL value needs improvement.

e) MTL and Output Power check **{*****}**
This routine allows you to determine the transponders minimum trigger level (MTL) [its input sensitivity] as well as the power of the transmit signal from the transponder. This test can be done via the antenna over air, or using the optional 40db attenuator, a direct connection measurement can be performed. **NOTE !!! +20 dbm [0.1 Watt] is the max input** to the AV-15. A 250 watt transponders output is 54 dbm. Using the optional 40 db attenuator, between the AV-15 and the txpdr, the signal will be reduced to +14 dbm which is within limits for the AV-15.
The tester measures MTL by attenuating its transmit signal until 90% or less reply percentage is found. Transponder output power is measured at a specific point. So that power output droop, as a function of message content, can be measured, [Australia], the F2 pulse [last pulse] power is measured for A/C modes. While doing a Mode A MTL/power test, the squawk code can be changed as the AV-15 is displaying the F2 pulse power. Since F2 pulse is after the squawk data, the power reading will change if the transponder has power droop. The AV-15 also provides a P1/P2 trigger output for an oscilloscope to facilitate bench testing.

The following is an example;

select TRANSPONDER test mode.
Then select MTL-POWER CHECK?
The AV-15 then asks for Path Loss. It starts with -50db and, by using the left / right keys, that value can be modified between -40 to -60 db.
If you are doing a direct connect via a 40+ db attenuator, then you know exactly what the path loss between the AV-15 and the txpdr is. If you are doing an over air measurement, a well established procedure is 40db path loss and about 4 foot spacing from the transponder antenna. Another good choice is -50db if you are about 15 foot from the txpdr antenna. If your location is poor due to reflections, you can find a better local or average as follows;
You don't know the path loss exactly but, since the transponder Tx and Rx frequencies are less than 6% different, most of the time the path loss for will be about same. Not always the same, due to reflections, but on average they will be about equal.
Use center key to select your Path Loss value.
Next you will select the type of transponder mode to use for the measurement.
You can choose between Mode A [best for power droop test]
Mode C or Mode S only all-call. Therefore Power/MTL for A/C/S can easily be measured.
When the test is started, the AV-15 will slowly move MTL power down until a drop in reply percentage is found. The AV-15 will continue to vary Tx output to hold around 90% reply. The Po=nnn will slowly show the measured Power from the transponder. If reflections are a problem, Move around to find an average

and Power reading. As we said before, the path loss will on average be the same for Tx and Rx directions. If your Loss guess was to high, then both MTL and Power will be less than spec. If your Loss guess was low, then both MTL and Power will be better than spec. A little common sense here and you will determine MTL and Power with adequate accuracy.

RF POWER TABLE;

45 dbm = 15 db watt = 32 watts
46 dbm = 16 db watt = 40 watts
47 dbm = 17 db watt = 50 watts
48 dbm = 18 db watt = 63 watts
49 dbm = 19 db watt = 80 watts
50 dbm = 20 db watt = 100 watts
51 dbm = 21 db watt = 126 watts
52 dbm = 22 db watt = 158 watts
53 dbm = 23 db watt = 200 watts
54 dbm = 24 db watt = 251 watts
55 dbm = 25 db watt = 316 watts
56 dbm = 26 db watt = 398 watts
57 dbm = 27 db watt = 501 watts

f) All ATCRBS transponders are required to go inactive or **suppress** for 35 +/- 10 microseconds (uS) after receiving the P1-P2 side lobe suppression signal. This ATCRBS suppression feature is now also used by the mode-s system. The ground stations mode-s interrogation begins with two pulses spaced 2.0 uS apart just like the SLS pulses. The mode-s message then continues while the ATCRBS transponders are in suppression. Therefore it is nice to know if your transponder is being suppressed as it should.
The AV-15 provides this "SLS TIME CHECK ?" function to measure the actual suppression time. The AV-15 sends out a SLS pulse pair then sends a mode A inquiry after the variable delay time. The time between the SLS pulse pair and the inquiry is adjustable by you. So by decreasing the delay time until the reply percentage begins to fall, the transponder suppression time is determined. The top LCD line display's the squawk code and reply percentage. The bottom line display's the delay time in microseconds. Use the left and right keys to change the delay time.

g) A/C/S ALL-CALL and READs mode-S reply message.
ATCRBS MODE-A/C transponders will send a normal MODE-A reply. MODE-S transponders will send an S reply. The AV-15 will display the HEX Aircraft ID and a all 0's CRC error code for good received S reply's. The AV-15 sends 1030MHz P1 and P3 pulses spaced 8.0uS apart. A 1.6uS wide P4 pulse is sent 2.0uS after P3. The reply from an old ATCRBS transponder is ignored by the AV-15.

h) ATCRBS only ALL-CALL message,
The AV-15 sends MODE-A 1030MHz P1 and P3 pulses spaced 8.0uS. The 0.8 uS P4 pulse is sent 2.0uS after P3. The mode-S transponder should not reply due to the short P4 pulse. The AV-15 looks for erroneous mode-s reply's. When working with an old ATCRBS transponder the top LCD line will display the squawk code and F1 pulse width while line 2 shows "OK; no S reply". When testing a MODE-S unit the

top LCD line should display "SQ=0000 F1=(small)". The second line should be the same "OK; no S reply". If the AV-15 finds a MODE-S all-call reply then it will display "MODE-S ERROR" on LCD line 1 and "ALL-CALL REPLY" on line 2.

i) send **MODE-S only ALL-CALL.**
The AV-15 will send a differential phase-shift keyed (DPSK) MODE=S ALL-CALL interrogation. ATCRBS MODE-A/C will not respond since the interrogation starts with two 1030MHz pulses spaced 2.0uS apart that is seen as a side lobe suppression. Since an all 1's ALL-Call address is sent, any MODE-S transponder will send a MODE-S reply. The AV-15 will display the HEX aircraft address and all 0's CRC for a good reply. The Hex address is also saved to RAM for use by following discrete addressed commands. The top LCD line display's the calculated CRC and L= the capability number 1 to 7.
0=level 1 unit. 4-7=level 2 transponder unit. This command runs aprox 50 times per second.

Info; when the transponder is set to on ground status it should not provide all-call reply's. The aircraft hex address must be entered into the AV-15 manually or from a ADS-B ID squitter if available.

j) Mode-S **DF=4 discrete addressed altitude request.**
The saved address from (i) or (n) is used as a starting point of the adjustable address. The AV-15 sends a UF=4 Altitude request command with the 24 bit Address as defined by you. So to see if the Transponder responds with its Altitude, that should match its mode C altitude reply, just use the saved address. To insure that it does not reply to other addresses, change the saved address before sending the command. After the address is selected the AV-15 will display the hex ID on top LCD line and the calculated altitude on the bottom line. This command runs at aprox 50 times per second.

Info: The Aircraft hex address must be manually entered if the all-call or ADS-B ID are not functioning. To set the hex address, select yes to modify address. Then use the right and left buttons to change a digits hex value and the center button to enter each hex character. The AV-15 starts with a $000000 hex address after power on and it must equal the aircraft hex address, as set in the transponder, for commands h, i, j, or k to function.

k) Mode-S **DF=5 discrete addressed Squawk code** request.
The saved address from i or n is used as a starting point of the adjustable address. The AV-15 sends a UF=5 ID request command with the 24 bit Address as defined by you. So to see if the the Transponder responds with its SQUAWK, that should match its mode C SQUAWK reply, just use the saved address. To insure that it does not reply to other addresses, change the hex address before sending the command. The AV-15 will display the hex ID on the top line and the squawk code and the Flight Status on the bottom line. This command runs at aprox 50 Hz.

Flight Status decode

FS=0	no alert	no SPI	Airborne
FS=1	no alert	no SPI	On Ground
FS=2	alert	no SPI	Airborne
FS=3	alert	no SPI	On Ground

FS=4 alert SPI Either
FS=5 no alert SPI Either
FS=6 RESETVED
FS=7 NOT USED

l) Mode-s **DF=20 discrete addressed Tail number (ID) request.** The transponder should reply with its flight number or tail number. The AV15 will display the tail number on line 1. The hex aircraft code is displayed on line 2.

m) Mode-s **DF=21 discrete addressed capability report request.** The AV15 will display the raw transponder reply in hex as well as the received aircraft hex address. All of line 1 gives 16 hex char's or the first 8 bytes and line 2 provides 6 hex char's or 3 bytes giving the first 11 message bytes in hex. Line 2, second half, provides the decoded aircraft hex address given by 6 hex char's. If the address is correct then the parity was good and the first 11 bytes are OK. The meaning of each bit can be found in the standard documents. The first two hex characters of the top line should be A8 through AF to signify that a DF=21 command was received.

Note 2; For the following Squitter functions, the squitter messages are sent by the transponder without being requested by the AV15 and may be sent infrequently. The best way to check squitter is to first run the mode-s only all-call command and find a good location. After finding a location where AV15 reception is good, then run the squitter functions. Sometimes when testing in a hangar with lots of reflections off walls other equipment and even people, a few inches of AV15 movement can change the reception dramatically. The AV15 antenna can also be mounted on our tripod-25 foot cable accessory which can help in keeping the antenna stationary or while allowing you to operate the equipment while in the cockpit.

n) ADS-B MODE-S **ID SQUITTER**
The AV-15 will listen for the ID-SQUITTER AND display the HEX Address and 0's CRC for good reply. The HEX aircraft address is also saved in RAM for use by commands h to k above.

o) AIRCRAFT **TAIL NUMBER SQUITTER**
The AV-15 will listen for the flight number - tail number squitters and display the Emitter Cat, Tail number and the HEX ID. Note that this squitter is only sent a couple times per minute. It is necessary

to be sure you have a good reception location before running this command
see note above.

EXAMPLE display will show;
 Cn   ID=N12345
 HEX ADD=3ABD9F +

C = THE **EMITTER** CLASS A,B,C,D
n = NUMBER IN CLASS

The Emitter Category code definitions;

A0=NO INFO	B0=NO INFO	C0=NO INFO	D0=NO INFO
A1=LIGHT ACFT	B1=GLIDER	C1=EMER SURFACE	D1 to D7 RESERVED
A2=SMALL ACFT	B2=BLIMP	C2=SERFACE VEHICLE	
A3=LARGE ACFT	B3=SKYDIVE	C3=POINT OBSTACLE	
A4=HIGH VORTEX	B4=ULTRALIGHT	C4=CLUSTER OBSTACLE	
A5=HEAVY	B5=RESERVED	C5=LINE OBSTACLE	
A6=HIGH PERFOR	B6=UAV	C6,C7 RESERVED	
A7=ROTORCRAFT	B7=SPACE VEHICLE		

p} AIRCRAFT STATUS MESSAGE

The squitter type code 31 will be found and parsed to give the
Following LCD 2 line display;
  ANTg SDAh VERi
  NACp j SILk/time

THE g NUMBER 0 or 1 ; IS 1 for single antenna
h equals 0 to 3 giving SDA value
i is the version; 0=DO-260, 1=DO-260A, 2=DO-260B
j provides the NAC position information
k is the SIL value and time will list per Hr or Smp = sample

q) AIR VELOCITY SQUITTER

The squitter type code 19 subtype 1 to 4 will be found and parsed to
Show following 2 line display
  NACv=n VSI=svvvv
  Del_Alt=saaaa   +

The NACv is the Navigation accuracy category for velocity and
The value is given by the following table;

0 >= 10m/s   1 < 10m/s   2 < 3m/s   3 < 1m/s   4 < 0.3m/s

The VSI is vertical rate in foot/minute and NONE signifies none available
From the transponder.

Del_Alt provides the difference between GNSS or INS altitude from the barometric
Altitude in feet. NONE signifies that none available from transponder.

r) LOCATION SQUITTER

The AV-15 will listen for the GPS derived location squitter
and display the calculated LATitude and LONgitude in **decimal degrees.**

To convert from decimal degrees to Deg, Minute;
Use the whole number part for Deg, the fractional part times 60 for Minutes
Example 27.37 decimal deg = 27 Deg, 0.37*60=22.2 Minutes
The AV15 uses lower precision math when calculating the position, so if its
Within a couple minutes of the Txpdr readout its good.

Due to the way position data is sent, It takes at least 2 received squitters
to calculate the AIRBOURNE GLOBAL and SURFACE relative GLOBAL position.
This position command includes 2 additional characters during location

squitter display:
An S or A (Surface or Airborne), followed by a hex value from 0 to B
that represents the NIC (Navigational Integrity Category) Value.
The NIC value represents a radius of containment value defined as follows:

0 = unknown
1 = < 20 NM
2 = < 8 NM
3 = < 4 NM
4 = < 2 NM
5 = < 1 NM
6 = < .6 NM
7 = < .2 NM
8 = < .1 NM
9 = < 75 meter
A = < 25 meter
B = < 7.5 meter

NOTE: The way the ground position is coded in Compact Position Reports (CPR), It requires 2 messages to calculate position as in the airborne case. However In order to provide 4 times the ground location resolution, the upper 2 bits Of coded latitude and longitude are not sent. Therefore the calculated ground Position always assumes North latitude and 0-90 deg east of the prime meridian. To get your actual position one must know in which quadrant you are in. Rather Than asking you for that information the AV-15 keeps track of it for you. When airborne positions are found the AV-15 will save quadrant data for use by the ground position calculations. The quadrant information will saved in battery backed memory. So if you see odd ground position data, be sure that an air position has been done at your location.

s) TEST SQUITTER function.
The AV-15 will display the first squitter transmission it finds each time you short press the center key. This can be used to manually decode squitter DF=17 messages or to check that squitters are being sent.

---------- end of AV-15 transponder portion of manual ----------

We hope this application note helps to correlate AV-15 test commands to FAR required transponder tests.