UAT1 PROFESSIONAL RAMP TESTER USERS MANUAL

POWER

The UAT1 is powered by (4) AA batteries.
For battery operation, please install the (4) AA batteries. Remove four rubber
feet using small phillips screwdriver. Use care to install batteries in correct
orientation (neg battery to springs). When shipping or when storing it is recommended
to remove the batteries.

Due to customs problems we are unable to send batteries out of the USA.

TESTING PROCEDURE

The transmit power of the UAT1 is very low - at approximately 1/4 of
one thousandth of a watt (0.25 milliwatt) - so you will need to be close
(15-40 ft) to the aircraft for most testing. The power was designed to be very small
so that the likelihood of interference is low and so that the sensitivity
of the aircraft receivers can be checked. However, when using the UAT1,
remember the aircraft transmitts at much higher power.
Be sure that you do not interfere with any other aircraft or ATC system.

******* 20 dbm = 0.1 watt is the MAX allowed input *******

To test a transponder using direct connection, you must use an external attenuator to
reduce the 54dbm, or so, power out to +20dbm or less into the UAT1. An optional 40db

attenuator kit is available. Exceeding the 20dbm input level will cause damage to the UAT1.

Note 1; when testing do not overload the UAT1 front end. The UAT1 was designed for input signals to the antenna port of **+20db or less**. When testing with the UAT1, stay 3 foot or more away from the DME and transponder antennas,
and a couple feet or more from Comm antennas. To perform direct connect transponder testing, 40 db or more, of power appropriate, attenuation MUST be used. Sun offers an optional 25 watt 40 db attenuator kit.

FRONT PANEL OPERATION

To operate the UAT1, turn on unit and wait for its self test to finish. It will display the software version then;

>   **PUSH TO SEL MODE**
>   **< TRANSPONDER >**

The UAT1 is controlled using the 3 keys just below the 2 line LCD display. The center key has two functions based on how long the key is pressed. A short normal press is used to select the currently displayed menu item. A long (approx 2 seconds) press causes the unit to stop the current operation and jump back to the < TRANSPONDER > beginning menu item. The Left and Right keys just move you through the menu's or adjust selection values.

NOTE; The menu's are circular. From the TRANSPONDER item, a left key press will move to the 1090 TRAFFIC SIM While a right key press will move you to UAT.

The LED just above the 2 line LCD display will turn on to indicate that the UAT1 is transmitting. Connect the antenna to the BNC connector that is above the display. During UAT1 operation collapse the antenna to its shortest length.

UAT1 OPERATION:

The UAT1 aircraft avionics ramp tester provides test functions for the following aircraft avionic equipment:

1. TRANSPONDER A/C

 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 UAT1 will
    display IDENT. The UAT1 sends about 235 MODE-A interrogations
    per second. The UAT1 sends 1030MHz P1 and P3 pulses spaced
    8.0uS apart. The P2 side lobe suppression pulse can be selected off,
    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 UAT1 and waiting for the self

test to run, the display will read

PUSH TO SEL MODE
< TRANSPONDER >

push left push button so that display line 2 reads;

< 1090 TRAFFIC SIM >

Push the right key to go back to 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 UAT1 will begin
sending Mode-A interrogations and looking for replies. The
UAT1 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 UAT1 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 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 UAT1 sends about 235 MODE-C interrogations per second.
   The UAT1 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) Generate signals to allow the uavionix "SKY BEACON" and "TAIL BEACON"
   978MHz UAT ADS-B units to sync to its aircraft Mode-A/C transponder.
   While this command is running the LED will be on to signify
   that the UAT1 is sending mode A and C requests.

d) Checks the Aircraft **Transponders Transmit carrier frequency**.
The UAT1 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.

e) Aircraft **transponder receive frequency** check.
To determine where the transponder is most sensitive to ATC requests,
this feature allows you to step the UAT1 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.

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 UAT1 provides this "SLS TIME CHECK ?" function to measure
the actual suppression time. The UAT1 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.

2. UAT mode

This new UAT menu allows you to read UAT 978MHz ADS-B squitter from your
Test aircraft or generate UAT simulated traffic to test the aircrafts
receiver and traffic display.

a) UAT ADS-B READ ?

Select with center key. The UAT1 will display "DOING UAT INPUT" on line 2.
When a message is received and an error free decode is done, the results will
be displayed. Two types of messages are displayed.
- The short message contains type code=0. The UAT1 will decode and display the
  following information on the LCD display.

Line 1= N or S Latitude, the NIC code and then the hex aircraft address,
Line 2= E or W Longitude, A/G for air or ground, P/G for pressure or GPS altitude
Source, and the altitude in feet.

The NIC code character is a hex digit 0-F. The containment radius, Rc is given;

```
NIC=0    Rc>=20NM
NIC=1    Rc<20NM
NIC=2    Rc<8NM
NIC=3    Rc<4NM
NIC=4    Rc<2NM
NIC=5    Rc<1NM
NIC=6    Rc<0.6NM
NIC=7    Rc<0.2NM
NIC=8    Rc<0.1NM
NIC=9    Rc<112 meter
NIC=A    Rc<37.5 meter
NIC=B    Rc<11 meter
NIC=C,D,E,F Reserved for future needs
```

*   The long type message with type code=1 or 3. The UAT1 will decode and display the following mode status information on the LCD display.

Line 1= Aircraft call sign / ID, two digit emitter category, NIC baro char, UAT in capability, 1090 in capability, TCAS capability.

two digit emitter category;
```
      00=no aircraft information
      01=Light acft
      02=Small acft
      03=Large acft
      04=Large high vortex
      05=Heavy
      06=Highly maneuverable
      07=Rotorcraft
      08=unassigned
      09=Glider
      10=Lighter than air
      11=Parachutist
      12=Ultra light
      13=unassigned
      14=Unmanned aerial vehicle
      15=Space vehicle
      16=unassigned
      17=Surface vehicle emergency
      18=Surface vehicle service
      19=Point obstacle
      20=Cluster obstacle
      21=Line obstacle
       22 to 39 reserved
```

NIC baro indicates if the barometric altitude has been cross checked with another altitude source. If 0 then no if 1 then yes cross checked. The three capability digits equal 1 if true.

[Vn, space, En, space, Snh or s, space, Dn, space, n, space, n]

Line 2= Version number, Emergency status, SIL code and SIL supp h or s, SDA value, NACp, and finally NACv.

The emergency status number;
      0=No emergency
      1=General emergency
      2=Medical
      3=Minimum fuel
      4=Lost communications
      5=Unlawful interference
      6=Downed aircraft
      7=reserved

The SIL number;
      0 unknown
      1 <=1 x 10-3 per SIL-supp
      2 <=1 x 10-5 per SIL-supp
      3 <=1 x 10-7 per SIL-supp
SIL-supp is h for per hour, or s for per sample.

The SDA number;
      0 unknown
      1 Minor
      2 Major
      3 Hazardous

The NACp number;
      0 >10NM
      1 <10NM
      2 <4NM
      3 <2NM
      4 <1NM
      5 <0.5NM
      6 <0.3NM
      7 <0.1NM
      8 <0.05NM
      9 <30 meter
      A <10 meter
      B <3 meter
   C to F reserved

The NACv number;
      0 >=10 M/S
      1 <10 M/S
      2 <3 M/s
      3 <1 M/s
      4 <0.3 M/S
   5,6,7 reserved

b) UAT TRAFFIC SIMULATION

This function will simulate an aircraft sending 978 MHz UAT squitter
as it fly's an south-north-south path. You control the center Lat, Lon, and
Altitude. This function can be used to test your aircrafts ADS-B receiver
and traffic display system.

After the UAT TRAFFIC SIM mode is selected, you are prompted to change
location and altitude. The UAT1 will automatically save latitude, longitude
and altitude as data is read by UAT, Mode-C transponder functions. Mode-C
saves altitude info and UAT READ saves Lat Lon data.

When this function is selected, you are allowed to modify the saved values.

To modify Latitude for example. When the UAT1 displays;

LAT=N 32.45 deg
MODIFY LAT ? NO
use the left or right key to change the NO to yes, then use the center key
to select.
The LCD will then display;

LAT=N 32.45 deg
    ^

the pointer is pointing at the N for North. To change to South press the
left/right key. Then to accept the change and go to the next element press
the center key. The LCD line 2 pointer will then move under the 10's place 3
digit. Change it using the right/left keys and accept using the center key.
If a value element doesn't need to be changed, just press the center key to
keep it as is. When you are done changing location
and altitude the UAT1 will send UAT squitters at every step;

The UAT1 will start at a position about ¼ degree (15 mile) south of the set
location and each time you short press the center key the simulated aircraft
will step north until it is about ¼ degree north then turn around and step
back south. The north-south-north-south stepping
will continue until the center key is given a long press to take you back to
the main menu. 16 step points are generated for each direction. The
transmitted altitude will be within 100 foot of the adjusted altitude.
AV17UAT is the aircraft ID and 123456 is the HEX code sent.
Remember the UAT1 transmits a very low output power so its signal will only
be heard within a 25 foot or so radius.
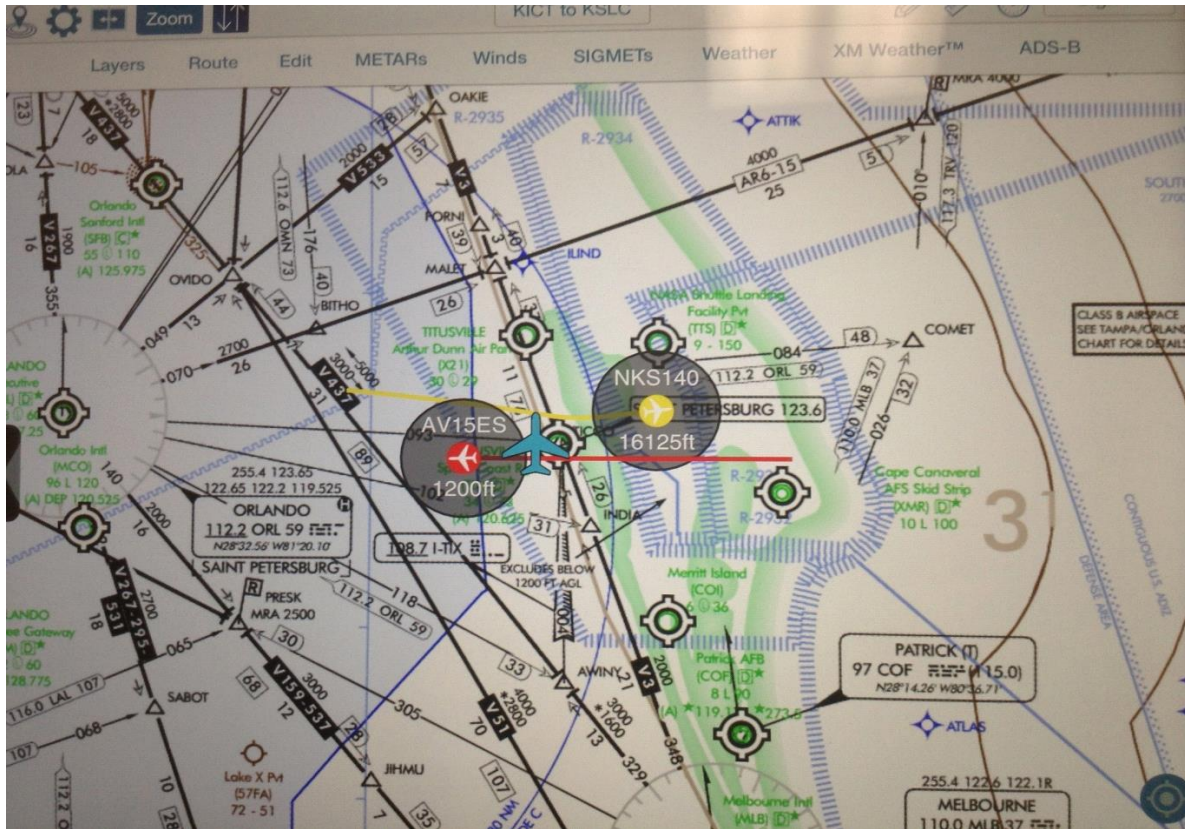
3. 1090 TRAFFIC SIMULATION

This function will simulate an aircraft sending 1090MHz ADS-B squitter
as it fly's an east-west-east path. You control the center Latitude,
Longitude, and Altitude. This function can be used to test your aircrafts
ADS-B receiver and traffic display system.

After the 1090 TRAFFIC SIM mode is selected, you are prompted to change
location and altitude. The UAT1 will automatically save latitude, longitude
and altitude as data is read by UAT READ and transponder functions. you are
allowed to modify the saved values.

To modify Latitude for example. When the UAT1 displays;

   LAT=N 32.45 deg
   MODIFY LAT ? NO

use the left or right key to change the NO to yes, then use the center key
to select.

The LCD will then display;

   LAT=N 32.45 deg
       ^

the pointer is pointing at the N for North. To change to South press the
left/right key. Then to accept the change and go to the next element press

the center key. The LCD line 2 pointer will then move under the 10's place 3
digit. Change it using the right/left keys and accept using the center key.
If a value element doesn't need to be changed, just press the center key to
keep it as is. When you are done changing location and altitude the UAT1
will send the following ADS-B squitters at every step;

    Even Airbourne location ADS-B squitter

    Odd Airbourne location ADS_B squitter

    Aircraft Velocity squitter

    Aircraft ID squitter

    Short Acquisition squitter message

The UAT1 will start at a position about ¼ degree (15 mile) west of the set
location and each time you short press the center key the simulated aircraft
will step east until it is about ¼ degree east then turn around and step
back west. The east-west-east-west stepping will continue until the center
key is given a long press to take you back to the main menu.
16 step points are generated for each direction. The transmitted altitude
will be within 100 foot of the adjusted altitude. AV17ES is the aircraft ID
and 123456 is the HEX code sent.
Remember the UAT1 transmits a very low output power so its signal will only
be heard Within a 25 foot or so radius.

END OF COMMANDS

    ABOUT CALIBRATION

The UAT1 factory calibration is valid for 1 year and we offer a 2 day turn
Re-cal service at the factory for $100 US plus shipping and any repairs if required.

    BATTERY REPLACEMENT and USB POWER

The UAT1 is powered by (4) AA batteries. Heavy duty alkaline
or equivalent should provide over 2 hours of continuous operation.
To replace the batteries, remove the four rubber feet using a #1 phillips
Screw driver to access the battery holder. Make sure battery negative goes to
spring end of holder positions. Before long term storage it's best to remove the
batteries to prevent battery leakage damage. Also promptly replace expended batteries.

    REGULATIONS

Sun Avionics has done its best to provide a useful piece of test
equipment; Please understand your requirements when using the UAT1.
Your country's aviation authority has rules that determine who may work
on or repair avionic equipment. Please understand and follow those
requirements.

For updated information, questions, or to send your comments please see our web site:
        www.sunavionics.com <http://www.sunavionics.com>
e-mail us at:
     sales@sunavionics.com <mailto:sales@sunavionics.com>

Phone: **321-383-9488**

Thank you for selecting Sun Avionics