KLJ INSTRUMENTS

SQTR-5
UAT Ramp Test Set

Operators Manual

REVISION

A	B	C	D	E	F	G	H	J	K	L	M	N
P	R	S	T	U	V	W	X	Y	Z			

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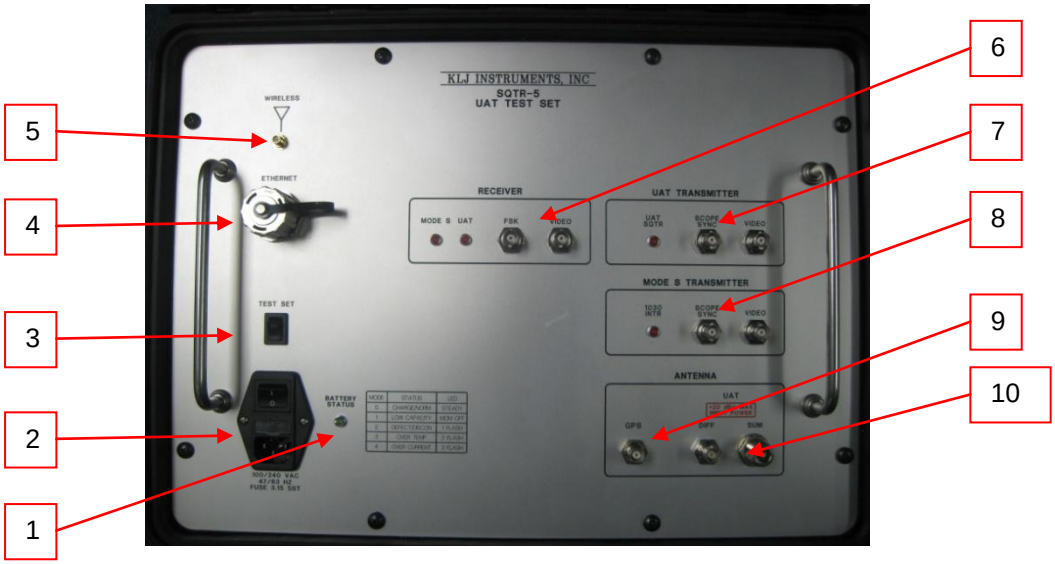
Date	REV	ECO	Page	Description
Nov 2011	A			Initial Release

INTRODUCTION

1.1 Manual Description

The SQTR-5 Ramp Test Set provides portable testing capability of Universal Access Transceiver (UAT) ADS-B Squitters. The purpose of this manual is to provide instructions for use of the SQTR-5. The SQTR-5 is housed in a rugged case and is supplied with a tablet computer (stored in case lid) for control of the SQTR-5 via a Wi-Fi connection. The SQTR-5 is supplied with an RF antenna for over-the-air testing of the UAT transceiver that is mounted on the case lid and connected to SUM antenna connection. The SQTR-5 antenna connection is designed to be used with a variety of optional antennas which may be connected to the SQTR-5 using the SUM and DIFF (Difference) connections. A GPS connection is for future application that may require a GPS antenna. A Wi-Fi wireless antenna is supplied with the SQTR-5 and should be connected to the front-panel WIRELESS connection. Front-panel BNC connectors allow connection of an oscilloscope for monitoring of various signals: RECEIVER (FSK allows viewing of demodulated signal coming from UAT and VIDEO allows viewing of UAT data pulse or Mode S reply), UAT TRANSMITTER (Scope sync provides pulse relative to the first pulse of the UAT signal being transmitted by the SQTR-5 and the VIDEO allows viewing of the SQTR-5 transmitted pulse), and MODE S TRANSMITTER (Scope sync provides pulse relative to the first pulse of the Mode S interrogation and the VIDEO allows viewing of the Mode S data pulse).

1.2 Front Panel Description



SQTR-3BB Front Panel		
1	Battery Status	LED indicates status of battery (refer to table next to LED)
2	Battery Charging Switch	Switch to turn battery charging circuit ON (1) or OFF (0)
3	ON/OFF Power Switch	Turns test set ON or OFF
4	Ethernet Connector	Used for connection of Ethernet cable
5	Wi-Fi Wireless Antenna	Used for connection of Wi-Fi antenna
6	Receiver	Detected FSK waveform, UAT or Mode S signal, and LEDs indicating signal activity
7	UAT Transmitter	Scope sync and video display of test set transmitted signal and LED indicating TX activity
8	Mode S Transmitter	Scope sync and video display of test set transmitted signal and LED indicating TX activity
9	GPS Antenna	Provides connection for GPS antenna (possible future application - not required at this time)
10	RF Antenna	Provides connection for variety of RF antennas for TX/RX of signals to/from unit being tested

1.3 SQTR-5 Function

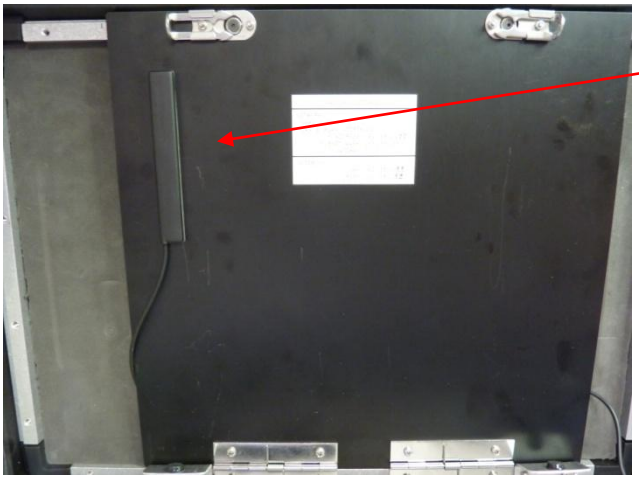
The SQTR-3BB provides capability for generating the following test functions:

- Transmits Mode S 1030 interrogation (UF4 format) to get altitude information contained in the transponder Mode S 1090 reply (DF4)
- Transmits UAT 978 MHz ADS-B squitter for simulation of a single, UAT target that is used to test the UAT receiver and aircraft UAT display system
- Receives UAT ADS-B squitter from the aircraft being tested, decodes the signal, and displays data being received from the UAT transmitter

The SQTR-5 Test Set is controlled via a tablet computer supplied with the test set that communicates via a wireless (Wi-Fi) connection or through a wired network via an Ethernet cable. Selection between wireless or wired connection is done automatically depending on whether the user uses an Ethernet cable or not.

The SQTR-5 and tablet are battery powered and should operate about 2 hours on a fully charged battery. Power cables are provided for charging batteries.

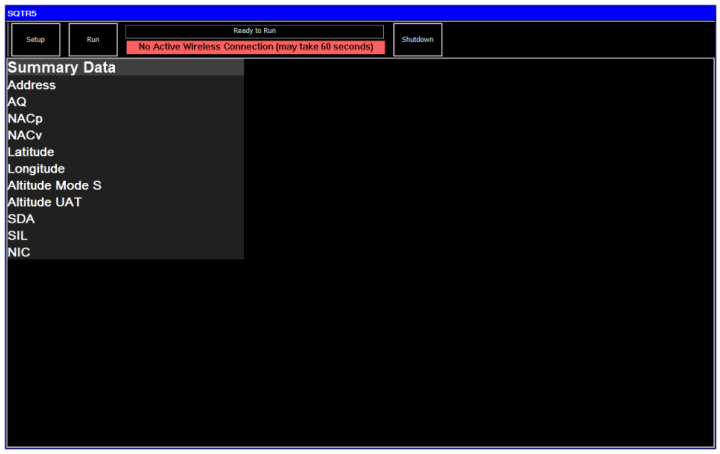
1.4 Initial Setup



RF Antenna mounted on lid -- Antenna Cable stored in lid

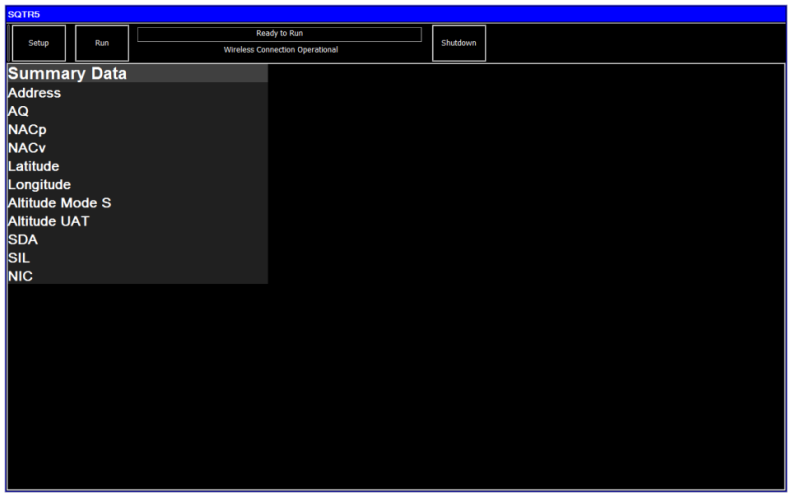
Remove RF Antenna Cable from lid and connect to SUM connector

To test a UAT transceiver in an aircraft, open the SQTR-5 case and remove the tablet computer from the case lid. Connect the RF antenna (mounted on case lid) to the front-panel Antenna SUM connection. Turn the open case of the SQTR-5 so that the lid of the case has a direct, line-of-sight to the UAT and Mode S transponder antennas. Turn on the SQTR-5 **first** and then turn on power to the table computer (the power switch is located on the upper edge of the tablet computer as you face it. The tablet computer uses a Windows operating system and will "boot" up automatically into the SQTR-5 program. The tablet computer can be rotated for use in either landscape or portrait mode.



1.5 Wireless Connection

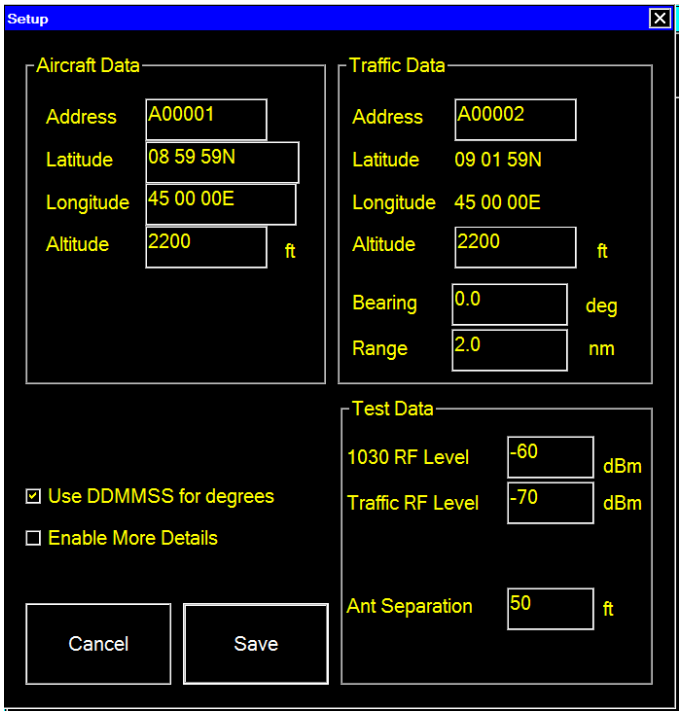
The SQTR-5 will automatically connect to the tablet computer through Wi-Fi. If the SQTR-5 is turned on first, the tablet computer may take up to 60 seconds to establish connection. If the tablet is turned on before the SQTR-5, it may take a couple of minutes to establish a wireless connection. While the tablet computer is attempting to make connection with the SQTR-5, you will see the message NO ACTIVE WIRELESS CONNECTION (MAY TAKE 60 SECONDS) shown with a red background.

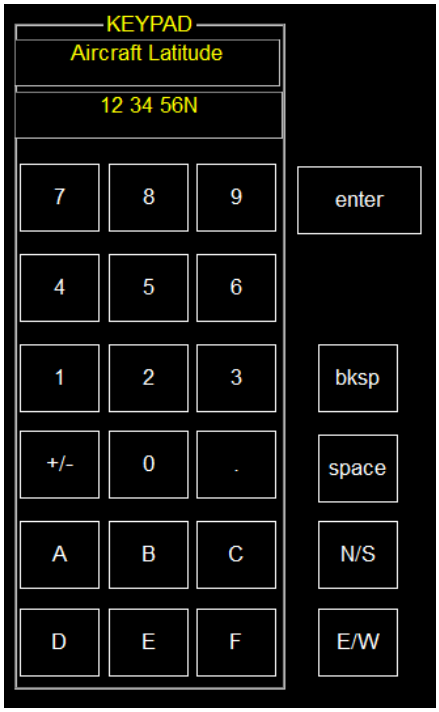


When the Wi-Fi wireless connection is completed, the MAIN SCREEN will show WIRELESS CONNECTION OPERATIONAL at the top of the screen and the READY TO RUN message will be shown.

Prior to testing, press the SETUP key in the upper left-hand corner to access the Setup screen.

1.6 Setup Screen





The Setup Screen is used to set the Aircraft Data for the aircraft being tested, Traffic Data for the UAT target that will be transmitted, and Test Data for setup of the SQTR-5. A keypad will be displayed when one of the fields to be set (e.g. Address) is "touched".

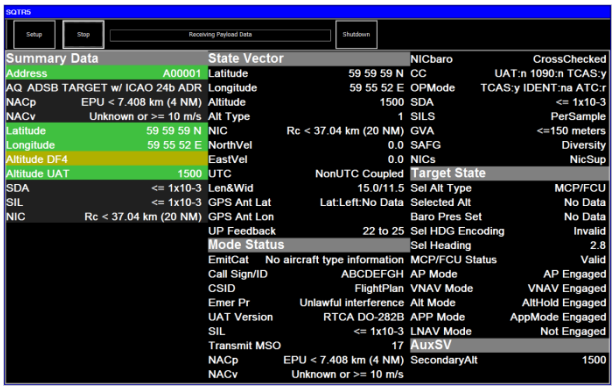
The ICAO Mode S Address (24-bit) of the aircraft being tested is displayed in hexadecimal. To change the address, touch the address field and the keypad will appear if not already displayed. The Address will appear with a "|" at the end of the address on the keypad. Use the backspace (bksp) key to select the part of the address that needs to be changed using the keypad. Press the "enter" key when completed.

The GPS Latitude and Longitude are displayed in DEG:MIN:SEC by placing a **"√"** in the USE DDMMSS FOR DEGREES or in decimal by removing the **"√"**. To change the Latitude or Longitude, touch the field to be changed. For Latitude, a "|" will appear at the end of the data. Use the backspace key to select the data to be changed using the keypad. You must add spaces between DEG, MIN, and SEC plus press the North and South (N/S) key. Press the "enter" key when completed.

The Altitude for the aircraft being tested should be set to standard pressure altitude. The Altitude can be determined by setting the aircraft altimeter setting to 29.92 in Hg. and reading the aircraft altitude on the altimeter.

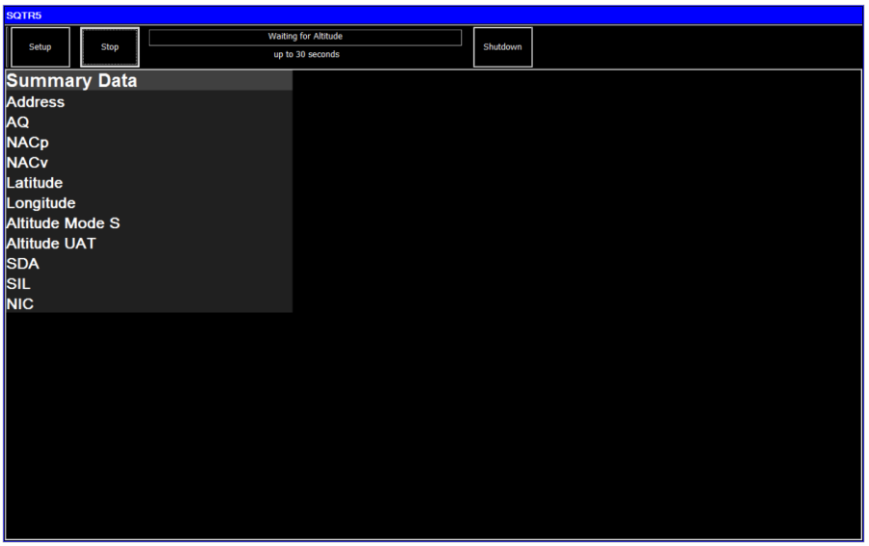
All other fields can be changed the same as Address and Latitude as described above. When all Setup fields are correct, press the SAVE key to return to the Main Menu.

Checking the ENABLE MORE DETAILS box controls the amount of data shown in the MAIN SCREEN. To view the additional data on the MAIN SCREEN, touch the SUMMARY DATA column.



1.7 Main Screen

After setup is completed, the screen shown to the right will appear if the ENABLE MORE DETAILS box was not checked. A READY TO RUN message should appear at the top of the screen. Press RUN to begin testing.



After RUN is pressed, the test set will interrogate the aircraft Mode S transponder with a UF4 interrogation in order to obtain the aircraft altitude. If a DF4 reply is received from the Mode S transponder, the altitude will be displayed. If the SQTR-5 does not receive the Mode S reply with Altitude within 30 seconds, it will advance to the UAT tests. When Mode S is not received, the Altitude Mode S display will have a yellow background. During the UAT test, the MODE S TRANSMITTER 1030 INTR LED will flash at each Mode S interrogation and the RECEIVER MODE S LED will flash at each Mode S reply and squitter.

Next, the SQTR-5 will begin to receive the UAT data or Payload Data from the UAT being tested. The SUMMARY DATA Screen will display the data that is required to be tested to determine if the UAT is transmitting the proper data. The test set will validate UAT Address, Latitude/Longitude, and Altitude values. When not all data is available for Address, Latitude and Longitude, and Altitude, the background color will be black. When data exists to perform a validation, valid data will use a green background and a red background when not valid.

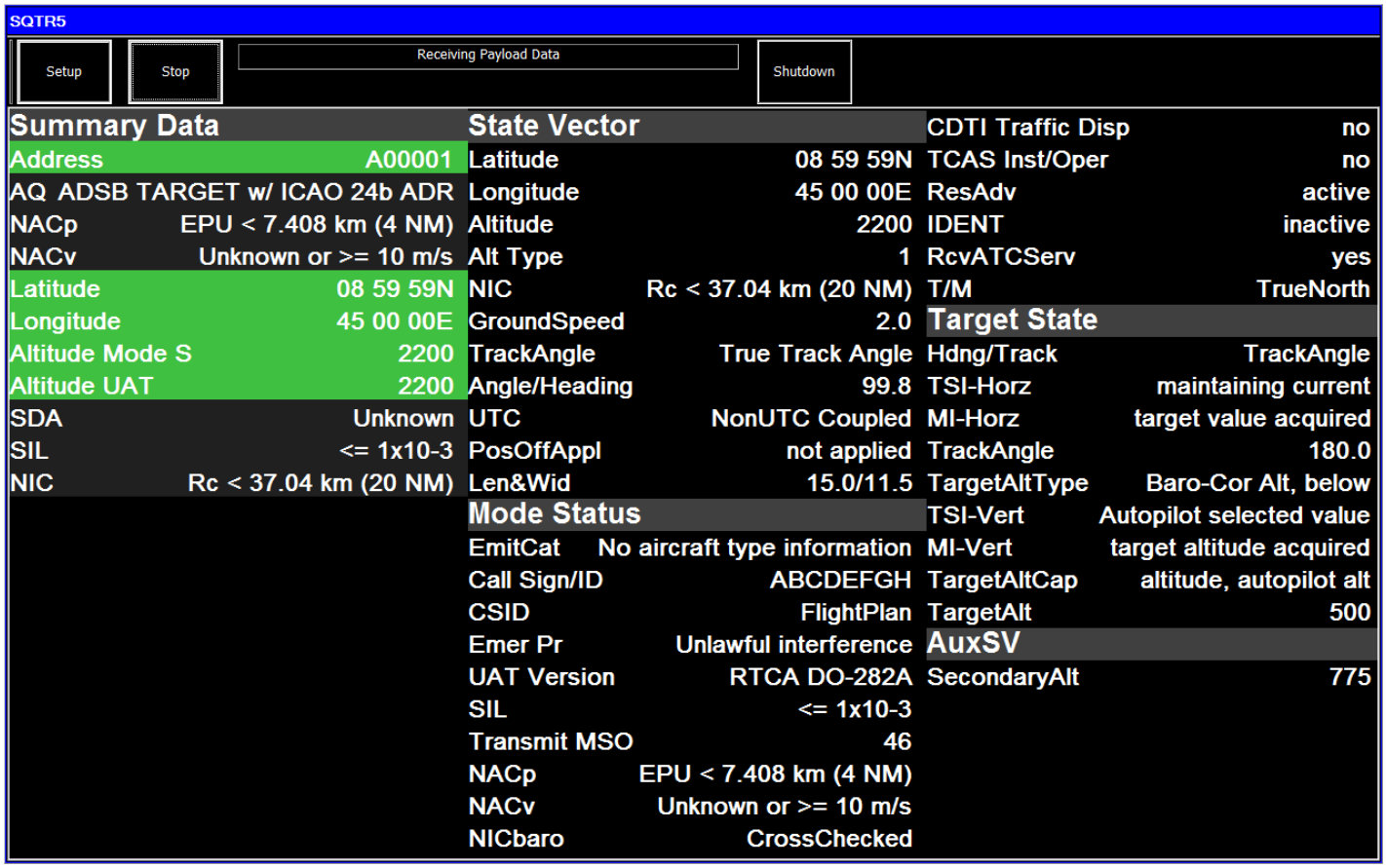
The Mode S Address being transmitted by the UAT will be displayed with a green background if it agrees with the Mode S Address that was entered in the Setup Screen. If the Address does not agree with the Address entered in the Setup Screen, the Address will be shown with a red background.

The Latitude and Longitude being transmitted by the UAT will be displayed with a green background if the distance between the UAT Latitude and Longitude and the Latitude and Longitude entered in the Setup Screen is computed to be within the specified NACp value. If not correct, the Latitude and Longitude will be displayed with a red background.

The Altitude being transmitted by the UAT and the Altitude obtained from the Mode S transponder will be displayed. If the UAT and transponder altitudes agree within $\pm$ 75 ft and the UAT Altitude agrees within $\pm$ 125 ft of the value entered in the Setup Screen, the Altitude fields will be displayed with green background if the Altitude requirement is met or red background if they do not meet the requirement.

Aircraft UAT system data will be displayed including: Navigation Accuracy Category for Position (NACp), Navigation Accuracy Category for Velocity (NACv), System Design Assurance (SDA), Source Integrity Level (SIL), and Navigation Integrity Category (NIC).

1.8 Main Screen (More Details)



If the MORE DETAILS box was checked in the Setup Screen and then touch the column that contains SUMMARY DATA, additional UAT data will be received and displayed including STATE VECTOR, MODE STATUS, TARGET STATE, and AUXILIARY STATE VECTOR. Please note that some of these fields may not be displayed as that data is dependent on the configuration of the aircraft (e.g. aircraft on ground or in the air). Consult your UAT maintenance manual for further information.

1.9 Shutdown

When testing is complete, press the SHUTDOWN button to turn off the tablet computer and then turn off the SQTR-5 using the ON/OFF Power Switch.