

test in accordance with Appendix F. Only an appropriately rated repair station, the aircraft manufacturer (if it installed transponder), and holders of a continuous airworthy program are approved to conduct the procedures. As with many radio-electronic devices, test equipment exists to test airworthy operation of a transponder. [Figure 11-129]

Operating a transponder in a hangar or on the ramp does not immunize it from interrogation and reply. Transmission of certain codes reserved for emergencies or military activity must be avoided. The procedure to select a code during ground operation is to do so with the transponder in the OFF or STANDBY mode to avoid inadvertent transmission. Code 0000 is reserved for military use and is a transmittable code. Code 7500 is used in a hijack situation and 7600 and 7700 are also reserved for emergency use. Even the inadvertent transmission of code 1200 reserved for VFR flight not under ATC direction could result in evasion action. All signals received from a radar beacon transponder are taken seriously by ATC.

Altitude Encoders

Altitude encoders convert the aircraft's pressure altitude into a code sent by the transponder to ATC. Increments of 100 feet are usually reported. Encoders have varied over the years. Some are built into the altimeter instrument used in the instrument panel and connected by wires to the transponder. Others are mounted out of sight on an avionics rack or similar out of the way place. These are known as blind encoders. On transport category aircraft, the altitude encoder may be a large black box with a static line connection to an internal aneroid.



Figure 11-129. A handheld transponder test unit.

Modern general aviation encoders are smaller and more lightweight, but still often feature an internal aneroid and static line connection. Some encoders use microtransistors and are completely solid-state including the pressure sensing device from which the altitude is derived. No static port connection is required. Data exchange with GPS and other systems is becoming common. [Figure 11-130]

When a transponder selector is set on ALT, the digital pulse message sent in response to the secondary surveillance radar interrogation becomes the digital representation of the pressure altitude of the aircraft. There are 1280 altitude codes, one for each 100 feet of altitude between 1200 feet mean sea level (MSL) and 126,700 feet MSL. Each altitude increment is assigned a code. While these would be 1280 of the same codes used for location and IDENT, the Mode C (or S) interrogation deactivates the 4096 location codes and causes the encoder to become active. The correct altitude code is sent to the transponder that replies to the interrogation. The SSR receiver recognized this as a response to a Mode C (or S) interrogation and interprets the code as altitude code.

Collision Avoidance Systems

The ever increasing volume of air traffic has caused a corresponding increase in concern over collision avoidance. Ground-based radar, traffic control, and visual vigilance are no longer adequate in today's increasingly crowded skies. Onboard collision avoidance equipment, long a staple in larger aircraft, is now common in general aviation aircraft. New applications of electronic technology combined with lower costs make this possible.

Traffic Collision Avoidance Systems (TCAS)

Traffic collision avoidance systems (TCAS) are transponder based air-to-air traffic monitoring and alerting systems.

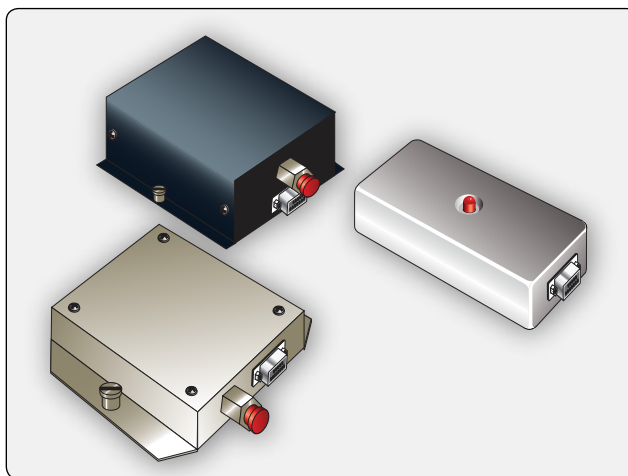


Figure 11-130. Modern altitude encoders for general aviation aircraft.