

# Theory of Operation

## Transponder, XS-855A

Emission type: 10M0P1D

FCC Identifier: GB8XS855A

The XS-855 mode A, C, and diversity Mode S transponder capable of responding to the ATC radio beacon (ATCRBS) Mode A and Mode C interrogations and to Mode S, (mode select) interrogations.

Mode A would be the basic code directed by ATC to an aircraft for tracking and identification. Mode C would give ATC altitude information in 100 ft. increments for that aircraft while in flight. Mode S has also a feature called the "ICAO Address" which gives to the ATC controller a discrete address, common only to that aircraft and allows other features such as flight number to be imbedded into the Mode S coding. Mode S permits discrete addressing of individual aircraft and allows the transmission of messages back and forth between the aircraft and the ground station.

Mode C information is acquired from an air-data unit elsewhere in the aircraft.

Mode S is also a fundamental portion of the traffic alert and collision avoidance system (TCAS).

The transponder uses a "L" band transmitter and has a transmitter power output of 500 watts peak pulse with a minimum of 250 watts and transmits on the frequency of 1090mhz and with a 60mhz intermediate frequency, receives on 1030mhz. The transponder is capable of operating from sea level to 70000 ft.

The transmitter and receiver uses a VCO and phase locked loop to control frequency and to supply the mixer frequency for downconversion of the interrogation signal and for self-test of the RF circuitry.

The transmitter power amplifier is a five-stage narrowband amplifier consisting of transistors Q1 through Q5. Besides providing amplification, Q1 through Q3 also act as RF switches. Q1 is turned on for the duration of the reply envelope. Q2 operates class C and is turned on for the duration of the reply envelope by the RF signal from Q1. Q3 is turned on for the duration of each reply pulse by the modulator. The envelope and pulse modulation signals shape the CW carrier into the reply pulse train. Q4 and Q5 provide high power amplification. The five amplifier stages raise the power level by several orders of magnitude, from 25mw at the base of Q1 to 500 watt pulsed RF at the output of Q5. Maximum power gain is approximately 43db.