

A description of how the Skywatch TRC899 works

The Goodrich Skywatch HP device is designed to aid aircraft pilots to visually acquire other aircraft that may pose a collision threat. It is built in accordance with approved FAA standards. These standards are defined in RTCA DO- 197A.

The device operates by sending out pulse transmissions at 1030 MHz (the characteristics of these transmissions are defined in the RTCA documents). These transmissions cause other aircraft to reply back at 1090 MHz. Our device then listens for the reply signals, and determines the location of other aircraft that may pose a collision threat. The unit consists of a transmitter/receiver/computer unit (TRC) which is installed inside the aircraft. The TRC is connected to an antenna on the outside of the aircraft through RF cables. The threat aircraft are displayed on any one of a variety of displays that our unit is designed to interface with.

Necessary bandwidth calculations.

Our transmitter sends out pulses that are 800 nsec wide and have risetime of approximately 100 nsec.

The Bandwidth designator is **20M0**

The appropriate formula to calculate bandwidth is for unmodulated pulse emissions.

The formula is $BW = 2 \cdot K/t$

$K = 100\text{ns}/800\text{ns} = \text{risetime/pulsewidth}$

$T = 800 \text{ ns} = \text{pulsewidth}$

Based on this formula our required necessary bandwidth is 20 MHz.

The FAA requires that every system has a transmitter that complies with their specification from RTCA document DO-197A. Every unit that is manufactured is tested to ensure compliance with this specification. The specification is as follows:

The spectrum of an active TCAS I Mode –C interrogation shall not exceed the following:

<i>Frequency Difference (MHz from carrier)</i>	<i>Maximum Relative Power (dB down from peak)</i>
<i>Between 0.7 and 5</i>	<i>3</i>
<i>Between 5 and 20</i>	<i>20</i>
<i>Between 20 and 60</i>	<i>40</i>
<i>Over 60</i>	<i>60</i>

Description of emission designator and type of modulation.

The emission designator for this device is **P0N**.

The transmitted signal is pulse modulated signals at 1030 MHz. There are three pulses sent out. Each RF pulse (or burst) is 800 ns wide. The three pulses are sent out over a 23 usec interval. There are a maximum of 7 pulse bursts sent out every second. The amplitude of the pulses may be varied in level. The highest peak power out of the TRC is 500 Watts.

Intended use statements for notifications per 2.975(a)(3). *(A statement concerning the intended use of the device including both the type of use for which the device has been designed and the part(s) or subpart(s) of the rules governing the device).*

This device is to be used on aircraft for the purpose of aiding pilots in locating other aircraft that may pose a collision threat. The transmitter/receiver/computer (TRC) unit is installed inside the aircraft. RF cables are then used to attach the TRC to an antenna, which is located on the outside of the aircraft. The FAA rules governing the device are found in RTCA DO-197A. This document describes the minimum performance requirements for TCAS I collision avoidance equipment. The governing rules for the device from the FCC is Title 47 part 2. The specific technical requirements are found in part 87 subpart D.

Description of circuitry required by 2.1033(b)(4).

The table below names each circuit board and a brief description of what each circuit board does in the system.

BFG Part #	Name	Description of board
007-11901-001	Motherboard	This board provides interconnects between the outside of the box and various boards in the unit. It also provides the interconnections between boards within the system.
007-11902-001	Surveillance Board	This is the computer board in the system. It uses a Motorola 82460 Microprocessor chip operating at 160 MHz. The 160 MHz is generated by an internal PLL that takes in 5 MHz. This board also contains program logic that provides decoding functions. There is a 20 MHz and a 10 MHz clock oscillators residing on this board. . This board also converts 28V to 5 Volts.
007-11903-001	Input Output Board	The input output board receives interface signals from other equipment on the aircraft and formats and processes them to be used by the surveillance board.
007-11904-001	Power Supply	This board converts 28V aircraft DC into the following voltages to be used within the system: +5V, +15V, -15V, -5V, +6V +50 V.
007-11905-001	RF Receiver board	The RF receiver board contains the two RF LO's of 970MHz and 1030MHz. These are used to provide down conversion for the three receivers in the system. Two receivers are fixed tuned to 1090 MHz and the third is fixed tuned to 1030 MHz. This board also contains circuitry to adjust the gain level of the transmitter.
007-11906-001	IF Demodulator Board	This board contains the logarithmic amplifiers used for the three receivers. It also contains the transmitter generation and modulation circuitry.
007-11907-001	Transmitter Board	This board contains the power amplifiers that are fixed tuned to 1090 MHz. There are two class C power amplifiers and one LDMOS transistor that will amplify the 1030 MHz signal to the required signal levels.