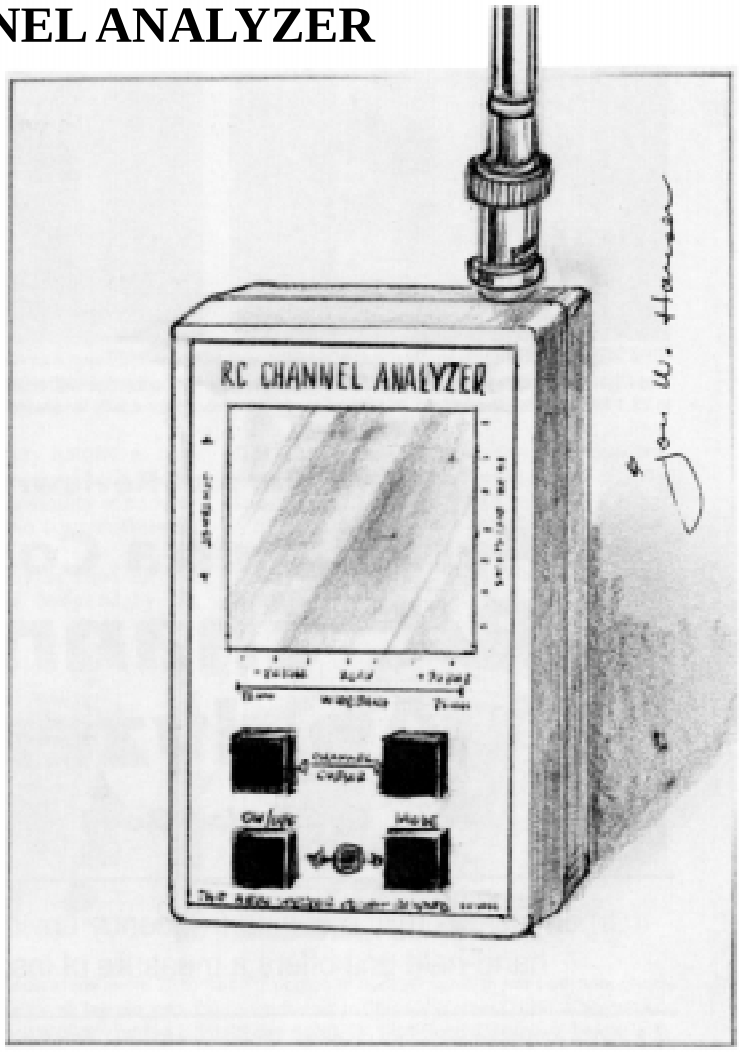
RC CHANNEL ANALYZER



The **AERO SPECTRA corporation RC Channel Analyzer** is a pocket spectrum analyzer designed expressly for the RC hobby community.

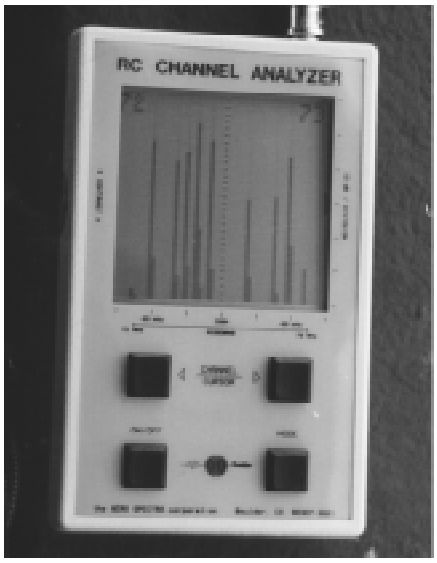
The **RC Channel Analyzer** is extremely easy to use and operate. Control is provided through four buttons which allow the operator to visually search for signals and then zoom in for closer examination. All the numbered RC channels in 50, 72, and 75 MHz, plus the ham RC channels in 53 MHz, may be viewed.

Sensitivity is approximately 1 μV. The displayed dynamic range is 60 dB on a 60 x 60 pixel graphics LCD. The **RC Channel Analyzer** also includes a peak hold mode which is useful for evaluating the occupied bandwidth of RC transmitters.

The **RC Channel Analyzer** has fully synthesized tuning with 1 kHz resolution for accurate frequency determination. The 3 kHz resolution bandwidth tuning filters are exceptional sharp which allows ready identification of weak signals adjacent to strong signals.

Case dimensions are **5.8 x 3.6 x 1.5 inches**. Total weight including antenna is approximately **13 ounces**. More than 20 hours of operation can be expected from a single 9V alkaline battery. There is an auto off feature for battery conservation.

On the next two pages is a very informative article by **Dr. Walter Good** published in the January 1994 issue of **Flying Models**. We are indebted to Dr. Good for his interest in our product. This article has been reprinted with the kind permission of **Carstens Publications**.



The Channel Analyzer can operate in its first mode as a frequency scanner scanning for all signals in the 71.9 to 73.1 MHz bands **(above left).** In second mode **(above right)** it scans for adjacent channel interference.

An FM Product Review:

Aero Spectra Corp's R/C Channel Analyzer

By Dr. Walt Good

In an increasingly crowded frequency environment, this hand-held unit offers a measure of insurance.

The "SAM R/C Winter Fly" at Odessa, FL was held on January 8, 9, 10, 1993 with a large number of flyers competing in more than 15 events under the direction of Fred Mulholland. It was a perfect event at which to test the practical use and value of a Spectrum Analyzer as a monitor at the transmitter impound for ongoing frequency checks.

Most of the transmitters were turned into the Impound during the first hour before the start of official flying. There were 60 transmitters (TX) on each of the first two days and 92 transmitters on the third day. Each was tested to verify that its frequency output was the same as the label on the TX and that its emission signal was truly narrowband and would not interfere with paging stations 10 KHz away or with another R/C channel 20 KHz away.

The spectrum analyzer used at the meet was the R/C Channel Analyzer made by Dr. Jim Hauser at the Aero Spectra Corp. in Boulder, Colorado. We'll call it the "SA" to save space! It's a small box, easily held in one hand, and weighs only 13 ounces.

The SA has three primary modes which are presented on a 2 x 2-inch screen in which the whole 72 to 73 MHz band is presented. Note that eight R/C signals are shown with eight planes in the air. The second mode has been spread out to show only three adjacent R/C channels, which are spaced at 20 KHz intervals. Between these R/C signals are located Paging signals which are only 10 KHz away from the R/C channels-this is the main reason why transmitters and receivers must be narrow band equipment. The third mode shows the actual frequency and the channel number of the transmitter, as well as the signal strength.

Check-in

As the TXs are brought to the transmitter impound, two people measure each TX to verify the RIC channel frequency and bandwidth. The TX antenna is collapsed and the SA antenna is removed, so that the SA will not be oversaturated. The TX and SA will be about one foot apart in this test. We adjust the distance to give about one inch amplitude signal on the SA screen.

The SA cursor is now placed on top of the TX signal and then the SA is switched to the 3-channel expanded mode. Here the operator examines the width of the TX signal to see if it complies with the narrow band requirements. Only one TX was found to be wider than the others, but was still within specs. With the cursor still on the channel, the SA was switched to the frequency readout mode to verify the actual channel number. This whole test sequence takes much less than a minute, once you've had some practice!

I have heard that several contests have found mislabeled TX and EX frequencies

Among the choice of display information, the Analyzer's third mode shows frequency, channel number, and signal strength **(above left)**. As Terry Good (R) reads off the checklist **(above right)**, Dr. Walt Good (L) checks the Analyzer while a transmitter undergoes a test at the transmitter impound area.

which caused the crashes of one or both planes. It is obvious that checking the TX prior to flying will eliminate that problem. It is also clear that the financial loss of such a crash would be more expensive than the purchase cost of the Spectrum Analyzer!

Flight monitoring

Sunday was the busiest day with 92 TX's to be checked before the flying began. Out of the 50 available channels in the 72 MHz band, 33 were used, thus there were many users on the same frequency. For example, channel 24 was most populated with eight users; channels 18, 30, and 52 each had five users; and channels 20, 44, 46, and 56 had four users.

As you might guess, the crowded channels gave the Contest Director the extra chore of hustling the pilots on these overloaded channels. Of course, the 17 unused channels would have helped to speed up the flights if they had been occupied. During the flying we found that continual monitoring with the SA was desirable with as many as ten planes in the air at the same time!

Also, there were several planes that crashed due to unknown causes. When the pilot shouted "I ain't got it", we quickly switched to his frequency on the SA-but no problem was noted in the TX signal. So some other failure was the probable cause.

Another use of the SA arose when we saw a very strong signal on the SA screen. This signal was chased down to a TX which had just been returned to the impound with its switch still on! This happened three times on the first two days. On the third day it was down to zero, so experience paid off!

Continuous monitoring with the SA was done at the same time that we watched the status of the Frequency Pin Board, which showed the active channels. Several times no SA signal was seen even though the pin was active. This was due to the pin not being retrieved from the impound. A call on the loud speaker solved that problem.

One of the strangest observations was on channel 56, when four flyers were registered. Even with all four TXs off, there was still a weak signal on 56. The SA was taken on a tour of the parking area where it found the weak signal on 56. When walking away from that one area the signal got even weaker. Later, the signal disappeared completely and did not bother the flyers. Our best guess was that a TX was left "on" in the trunk of a car and its battery finally died! Fortunately, it did not affect the flying.

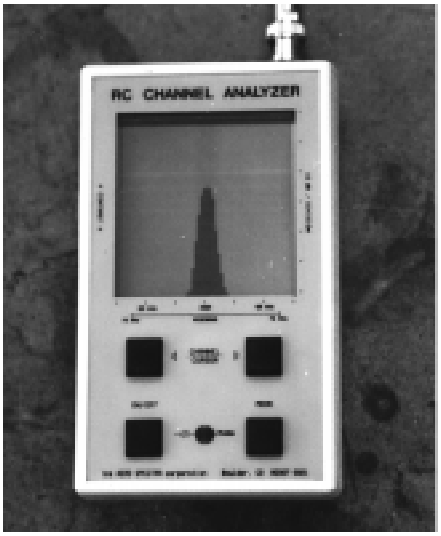
Pagers

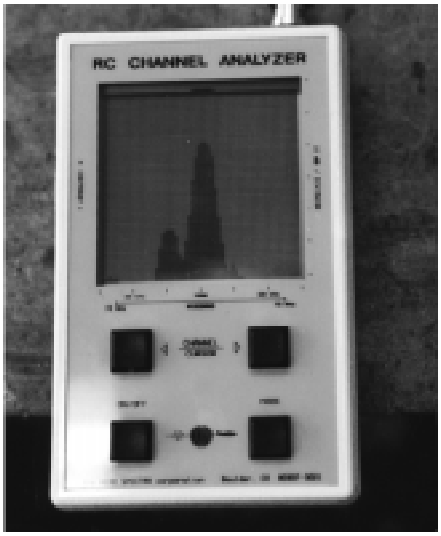
We had seen as many as 17 paging stations in this area on the SA. These stations are spaced between the R/C channels with a frequency offset of 10 KHz. Only two of the 17 pagers showed a strong signal, but they gave the R/C planes no interference.

The SA is also capable of viewing the 50 and 53 MHz Ham bands, which only FCC licensed Amateur Radio Operators may use. There were 15 TXs in these bands which worked well.

The bottom line

Using two persons for frequency monitoring worked well. One would man the spectrum analyzer and the other would record the frequencies and the names of the pilots on the frequency charts.





Operating in its second mode as a spectrum analyzer, the screen displays a signal that exhibits a signal with good narrow modulation **(above left)** with the signal within ±6 KHz. This screen **(above right)** displays a pager signal 10 KHz away from an R/C signal (the larger node).

The SA operation is very helpful at contests to verify the frequency of each transmitter and prevent the possibility of an accidental "shootdown" by two transmitters on the same frequency.

The R/C Channel Analyzer used for the monitoring function was designed by Dr. Jim Hauser and made by the Aero Spectra Corp. at PO Box 3021, Boulder, CO 80307- 3021; phone 303-499-2584.

Many thanks to my son Terry, who has worked with Hewlett-Packard Co. for many years and knows the spectrum analyzer field very well.

Here the analyzer is set to look at the entire 72 to 73 MHz portion of our R/C band. In this particular photo there are two R/C channels on the air **(above left)**, the one to the left is Ch 44, the other Ch 56. A typical display of an R/C transmitter which is clearly narrow band **(above right)**. Dr. Walt Good (C) confers (below) with Terry Good (L) and Mrs. Dale Mulholland during a SAM meet at the Odessa field.

RC CHANNEL ANALYZER
SPECIFICATIONS

Frequency Ranges	49.9 to 51.1 MHz, 52.9 to 54.1 MHz 71.9 to 73.1 MHz, and 74.9 to 76.1 MHz
Tuning Resolution	1 kHz
Spans	1.2 MHz or 60 kHz
Resolution Bandwidth	3 kHz
Baseline Sensitivity	Approximately 1 μV
Dynamic Range	60 dB
Display	60 x 60 pixel graphic TN LCD
Vertical Resolution	1 dB / pixel
Horizontal Resolution	20 kHz or 1 kHz/ pixel
Power	9 V @ l6mA
Size	5.8 x 3.6 x 1.5 inches
Weight	13 oz. including antenna

The **RC Channel Analyzer** is available at **$895** prepaid by check or money order. This includes antenna, operating manual, carrying case, battery, S&H within the U.S., and a one year limited warranty. Allow two weeks for delivery.

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