

# Hammerhead

## Pulse Induction Metal Detector

by Carl Moreland Revision  
www.250.org.ua



"Hammerhead" is a pulse induction (PI) metal detector design. It is intended primarily as a learning platform for experimenters, and as a base design on which to expand. This design is very much like other commercial PI detectors, which tend to have similar circuit designs, so it has the potential for good performance.

Metal detectors generally are not easy projects, especially the induction balance variety, and usually have performance that falls far short of even the least expensive commercial models. Three goals for this design were: make it easy to build, make it flexible, and get decent performance.

Pulse induction is a good choice for a do-it-yourself project because the circuitry is straightforward, and "mono" coils are easy to make. There are also very few critical internal settings — that is, it's not hard to get the circuit to basically work — although final performance will depend heavily on a number of parameter settings. This project includes a layout for a simple single-sided PCB using common through-hole components, as well as a much smaller two-sided surface mount PCB for those with steady soldering irons.

Flexibility is achieved with several build options. They include:

- Passive or active MOSFET turn-off (through-hole only)
- Generic preamp support for NE5534, LM318, and others
- Single-ended or differential integrator
- VCO or non-VCO audio
- Extra component pads around the preamp to support experimentation (through-hole only)

This design also makes most of the important circuit parameters variable:

- Transmit pulse rate
- Transmit pulse width
- Integrator sample delay
- Integrator sample pulse width
- Secondary integrator sample delay
- Threshold
- Sensitivity
- Autotrack speed
- Volume

Any or all of these parameters can also be set to fixed values, simplifying the control interface. The various design options, and parameter adjustments, will be described as we go.

### Circuit

A simplified diagram of the circuit is shown in Fig. 1. It can be divided into five sections: power supply, clocking, transmit plus receiver front-end, receiver back-end, and audio. Each section can be built and tested sequentially. An oscilloscope is useful for probing the circuitry to see what is going on, but

is not absolutely necessary, providing the circuit is built correctly. A digital multimeter (DMM) is needed.

The complete circuit is shown in Fig. 2 and, at first glance, appears to be complicated because of all the options that were designed in. However, the design options really don't add much complexity, and allow for different configurations and performance comparisons. Simplified circuits will be shown in the descriptions of the hook-up options.

### Power supply

Power for *Hammerhead* is provided by a single 12-volt battery pack, preferably an 8-pack of AA's. A 9-volt pack can be used with a reduction in battery life, and even a 9-volt transistor-radio-type battery can be used, with a significant reduction in battery life, providing a proper supply tank is used at the coil switch (I'll discuss this later). Combining the surface-mount circuit with a 9-volt transistor-radio battery, results in a very compact detector, ideal for a hand-

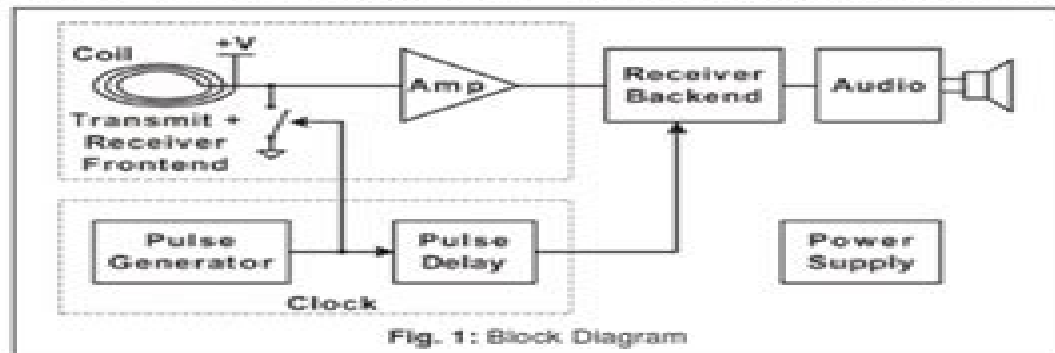


Fig. 1: Block Diagram

# Hammerhead Hhv1p5 Service Manual

**Wolfgang Guggemos**



## **Hammerhead Hhv1p5 Service Manual:**

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In an electronic digital era where connections and knowledge reign supreme, the enchanting power of language has become much more apparent than ever. Its power to stir emotions, provoke thought, and instigate transformation is truly remarkable. This extraordinary book, aptly titled "**Hammerhead Hhv1p5 Service Manual**," published by a highly acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound impact on our existence. Throughout this critique, we shall delve to the book's central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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### Table of Contents Hammerhead Hhv1p5 Service Manual

1. Understanding the eBook Hammerhead Hhv1p5 Service Manual
  - The Rise of Digital Reading Hammerhead Hhv1p5 Service Manual
  - Advantages of eBooks Over Traditional Books
2. Identifying Hammerhead Hhv1p5 Service Manual
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Hammerhead Hhv1p5 Service Manual
  - User-Friendly Interface
4. Exploring eBook Recommendations from Hammerhead Hhv1p5 Service Manual
  - Personalized Recommendations
  - Hammerhead Hhv1p5 Service Manual User Reviews and Ratings
  - Hammerhead Hhv1p5 Service Manual and Bestseller Lists

5. Accessing Hammerhead Hhv1p5 Service Manual Free and Paid eBooks
  - Hammerhead Hhv1p5 Service Manual Public Domain eBooks
  - Hammerhead Hhv1p5 Service Manual eBook Subscription Services
  - Hammerhead Hhv1p5 Service Manual Budget-Friendly Options
6. Navigating Hammerhead Hhv1p5 Service Manual eBook Formats
  - ePub, PDF, MOBI, and More
  - Hammerhead Hhv1p5 Service Manual Compatibility with Devices
  - Hammerhead Hhv1p5 Service Manual Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Hammerhead Hhv1p5 Service Manual
  - Highlighting and Note-Taking Hammerhead Hhv1p5 Service Manual
  - Interactive Elements Hammerhead Hhv1p5 Service Manual
8. Staying Engaged with Hammerhead Hhv1p5 Service Manual
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Hammerhead Hhv1p5 Service Manual
9. Balancing eBooks and Physical Books Hammerhead Hhv1p5 Service Manual
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Hammerhead Hhv1p5 Service Manual
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Hammerhead Hhv1p5 Service Manual
  - Setting Reading Goals Hammerhead Hhv1p5 Service Manual
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Hammerhead Hhv1p5 Service Manual
  - Fact-Checking eBook Content of Hammerhead Hhv1p5 Service Manual
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

#### 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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