



## Engineering Concept Paper

Dear Inventor,

I am Chief Technical Officer, Corwin K. Osborne. Our company has been given the task to review your product from an engineering viewpoint. This research of the mechanical, structural, and functional features of your idea is an important part of the engineering effort to provide the proper presentation to industry. To this end, we have analyzed the critical aspects of your innovation as if we were to be the manufacturer or the end user. While it is up to you as the inventor to make any changes to your product at this stage of the product development cycle, it is helpful to get an engineering opinion to guide your endeavors.

Please understand that this Engineering Concept Paper (ECP), is just one in many steps towards helping a manufacturer visualize your invention's design, structure, and function as a product. Our professionals at Consulting Engineers of Scottsdale understand that you, as the inventor, believe that your product is extremely feasible and potentially marketable. With this in mind, we have evaluated these basic concepts of your product so you may strengthen its presentation to the potential licensors.

- Engineering concepts of the design.
- Anticipated manufacturing techniques.
- Anticipated problems that may occur during the manufacturing of the sub-components.
- Anticipated problems that may occur during the assembly or packaging of the product.
- Availability of off the shelf components that can be incorporated into your product.
- Impact of any applicable governmental or organizational regulations on your product.
- Engineering evaluation of the product design and manufacturing.

We appreciate the opportunity to provide engineering services to you and wish you success in your endeavor.

Respectfully yours,

Corwin K. Osborne  
Chief Technical Officer

## ENGINEERING CONCEPT PAPER

<b>INVENTION NAME:</b>	People/Pet Tracker	<b>DATE:</b> 08/29/00
<b>INVENTOR'S NAME:</b>	Joe Mullenax	
<b>FILE NUMBER:</b>	IPS-3138-HB	<b>STATUS:</b> Patent Pending

### Description of the Innovation:

The "People/Pet Tracker" is an innovative concept for an radio frequency (RF) data link transmitter/receiver system that is used to locate an errant child or pet in a localized area. The device consists of an RF transmitter that sends a digitally encoded signal to the receiver. The RF receiver on the child or pet receives the signal and the microcontroller decodes the transmitted information. Based upon the encoded transmitted information, the receiver assembly generates an audible alarm, a visual signal, or both at once. The audible signal will warble for easy aural discrimination. The visual signal will be strobed for maximum visibility. The units are uniquely serialized so that only the ones that are assigned to the transmitter's serial number are activated. The transmitter and receiver assemblies are to be powered by replaceable batteries and have a range of approximately 150 feet in free space. To operate, the appropriate transmitter button is depressed and the receiver makes the requested response.

### Engineering Concepts of the Design:

The design and construction of this product is an achievable task. The matched transmitters and receivers exist in surface mount form and are available from RF Monolithics in Dallas Texas. They have developed the RF data link primarily for car alarm applications and it is effective over the required transmission distance. The microcontroller manufacturers likewise have surface mounted components and have developed digital encoding schemes in their application notes to operate these simple transmitters and receivers in the On/Off Keying mode. The product must be serialized so the neighbor's tracker will not activate your device. The serialization information, and the requested response data, is included in the digitally encoded transmission word when it is sent to the receiver. The receiver is programmed to only accept instructions from the properly serialized transmitter.

The housings will be assembled from plastic and will be splash proof. If the pet is to be washed, the tracker will have to be removed to guarantee continued operation. The batteries are replaceable and the housings will be held together with non-rusting hardware. The speakers and other openings will be shielded to prevent water intrusion.

The electronic packaging and battery management requirements become the primary electrical engineering challenges but significant application data exists to guide the engineer around these obstacles.

### Anticipated Manufacturing Techniques:

The transmitter and receiver housings are to be constructed from injection molded polyvinyl chloride (PVC) plastic. The transmitter and receiver housings are designed to be splash proof but not

waterproof. These housings are engineered to accept the FR4 double-sided printed circuit board (PCB), which contains all the components required to achieve the designated functions.

The printed circuit boards will utilize 'no clean' pre-fluxed solder paste, which is silk-screened onto the PCB. The PCB will be assembled using commercially available surface mount components, which are mounted on the PCB using programmable 'pick and place' machines. The assembled boards are run through an infrared reflow oven to melt the solder and make the required electrical connections. After assembly and the initial quality assurance testing, the microcontroller software will be loaded and units serialized. Then the PCB's will be installed into the housings and the matched units packaged for shipment. Sufficient quality assurance processes and tests will be conducted to achieve the defined product quality limits.

The larger item bill of materials for each of the devices is listed for manufacturer review. The resistors, capacitors, other passive components are not detailed.

#### Transmitter

- Housing
- Battery
- Locate switch; pushing this switch activates both the visual and aural alarms on the receivers.
- Light switch; pushing this switch activates the visual alarm on the receivers.
- Beep switch; pushing this switch activates the aural alarm on the receivers.
- Microcontroller
- RF transmitter
- Antenna

#### Receiver

- Housing
- Battery
- Antenna
- RF receiver
- Microcontroller
- Dual operational amplifier
- Audio transducer
- Blue LEDs

Example

Evaluation of the above-described manufacturing process has shown it to be of moderate difficulty to manufacture. This means that some specialized tooling and production software most likely will be required to manufacture your product. This is not an issue for qualified manufacturers but is a one-time expense when the product is taken to the production floor.

#### Anticipated Problems that may Occur During the Manufacturing of the Sub-components:

There are no anticipated problems expected to occur during the manufacturing of the sub-components as the assembly processes are well defined. A one time non-reoccurring engineering (NRE) will be required to develop the production software/tooling and plastic tooling for this application. The

balance of the production process is typical for products of this nature and are well within the scope of a world class contract assembler.

*Anticipated Problems that may Occur During the Assembly or Packaging of the Product:*

There are no problems anticipated in manufacturing or packaging the product for shipment. There will be a one-time NRE charge for developing the shipping blister pack for direct consumer sales and master carton for retailer shipments. This is a very small charge and should not be troublesome to the manufacturer.

*Impact of any Applicable Governmental or Organizational Regulations on your Product*

There are no known governmental or organizational problems anticipated in manufacturing and supplying this product. However, because this is a radio frequency (RF) device, there will be an NRE charge for Federal Communication Commission (FCC) testing and approval. This will be required before the product is released for public consumption. The FCC compliance NRE charge is common in the RF electronic assembly community and will be anticipated by a world class manufacturer.

*Engineering Evaluation of the Product Design and Manufacturing:*

After evaluating your project based on the supplied product conceptualization and the described engineering principles, the "People/Pet Tracker" is feasible within the scope of the information provided.

My staff and I have reviewed in detail the essential factors, which you identified in your initial product documentation. . While it is up to you as the inventor to make any changes to your product at this stage of the product development cycle, it is helpful to get an engineering opinion to guide your endeavors. With this in mind, we have evaluated the basic concepts of your product and documented our evaluation so you may strengthen your product for later presentation to potential licensers.