H6 Lifeline USA

Overview

Lifeline is an automatic Man Overboard (MOB) system that uses positive reporting from personnel lifeline tag transmitters operating on 915.5MHz. It is intended for use as part on a H6 navigation system. The Lifeline system consists of upto 4 receivers and upto sixteen lifeline transmitters. A tag transmitter is issued to all personnel on the boat. The receiver listens for tag ID reports from each of the transmitters and an alarm is raised if none from a particular tag are received in about 10 seconds. The loss of the tag signal is indicated on H6 electronic chart on the H6 monitors at the helm position and the time and position of the craft is noted and displayed. Inputs from the boat's GPS provide position and time data. The boat speed is also noted and displayed.

Lifeline Transmitter

The lifeline transmitter (known as the lifeline tag) is a small keyfob device worn by all personnel on the boat (vessel). Activation of the tag is performed by the H6 Navigation system. Once activated, the tag will transmit for a 24-hour period or until deactivated. The H6 navigation system will issue a warning if a tags' 24 hour period is nearing expiry. The user must then re-activate the tag. Deactivation is also performed through the H6 navigation system.

Each tag uses a Radiometrix RX3A FM radio module operating at 914.5MHz. Standard 2 level digital data at 9600bps is used to modulate the FM carrier. The tags message consists of a 2 byte preamble followed by a 10 bit message. The data is Manchester encoded resulting in a message length of 52 bits. This results in a transmission period of 5.42mS, a duty cycle of approximately 0.5%.

The message length has been kept to an absolute minimum so that battery life is maximised and duty cycle is minimised. The data preamble allows the lifeline receiver to synchronise with the incoming message. The data payload consists of the tags identification (tag ID) number and status bits. The tag ID is used by the receiver as an indication that the tag is still onboard the vessel. Status bits are included in the message sent to the receiver, these indicate the tags current status, for example - low battery alarm.

The tags firmware implements a pseudo-random sequence, which ensures that each tag, transmits 10 times in any 10-second time slot. Each tags pseudo-random number generator is initialised with a different 'seed', which minimises individual message collisions between the individual tag transmitters. Battery voltage is measured and if below a 2.5V threshold then status bits are modified. The lifeline receiver decodes these status bits. An alarm will be generated by the H6 Navigation system if the tags battery needs replacing.

Specification

Transmitter
Supply Voltage	: 3V (Lithium 2430 Coin cell)
Transmitter ERP	: 1mW
External Interface	: None
Antennae	: PCB track
Connections	: None
Transmitter Duty Cycle	: 0.5%

Lifeline Receiver

The lifeline receiver is responsible for

- decoding the messages from the tag transmitters
- activating and deactivating lifeline tags
- communicating its status and the tags status to the H6 Navigation system

The receiver utilises two Radiometrix TX3A FM radio receivers connected to two Microchip PIC microcontrollers. Each of these micrcontrollers (known as the slave controllers) is solely responsible for decoding the messages received from the digital data outputs of each of the radio modules. Communication with the H6 Navigation system is performed by another Microchip PIC microcontroller (known as the master controller). These microcontrollers are connected together using an IIC (Inter Integrated Circuit I2C) bus.

Activation and Deactivation of the lifeline tags is controlled by the H6 Navigation system. Communication with the H6 system achieved using an RS232 link operating at 9600bps.

The tag activation sequence is initiated by the H6 Navigation system. The lifeline receiver will respond by driving the electromagnet with an activation signal. Note that the tag transmitter must be placed in the recess of the lifeline faceplate. The tag will decode this signal and commence transmission. The tag will continue to transmit until deactivated or its 24-hour activation period expires. Deactivation follows a similar sequence.

As mentioned earlier, each slave microcontroller is responsible for decoding messages received by its radio receiver module. The antennae's for these receiver modules are connected in opposite orientation, at strategic positions on the vessel. Sampling of the digital output of the radio modules is performed to synchronise the receiver with the incoming message. Once the message has been successfully decoded, the slave indicates to the master controller that it has received a message. The master will then read this message over the IIC bus.

The master controller keeps track of the status of the lifeline system (for example message frequency, number and tag ID's of active tags, any alarm conditions).

The master controller transfers this information to the H6 navigation system on request. The H6 navigation system uses this information to update its displays.

Specification

Receiver
Supply Voltage   : 9-35V DC (12V when connected to H6 NAV System)
Power Consumption   : 0.6W(min), 12W (max)
External Interface   : RS232 (9600 baud, 8 data, no parity & 1 stop bit)
Connections   : 5 way XLR socket, 2 BNC jacks
Antennae   : 2 quarter wave dipoles