Tideland Signal Corp.

featuring Aids to Navigation Products

6.1 Remote Monitoring and Control

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Rev	**Description**	**Date**	**By**

A. Remote Monitoring

Remote monitoring generally means that the location of the person doing the monitoring is sufficiently remote from the location of the AtoN that some electronic communication medium must be employed, e.g., Radio or Satellite. This will normally mean that no local assistance, Keeper or Attendant, is available.

OBJECTIVES OF MONITORING AND CONTROL

Identify failure of AtoN to operate within published specification.

- Compile and maintain a record of operation of AtoN.
- Confirm operation of AtoN within specification.
- Identify faults which reduce redundancy and therefore threaten the AtoN.
- Notify faults within a time period necessary to carry out repairs before failure of the redundant stand-by system.
- Reduce downtime and improve availability through use of remote control resets.
- Verify status of redundant systems through remote control testing.
- Testing of redundant systems using remote control testing.
- Reduce incidence of faults through identification of recurring faults using post mission analysis.
- Assist investigation of cause of faults and failures using additional monitored parameters.
- Assist investigation of cause of faults and failures using historical data.
- Reduce maintenance visits through use of remote control resets.
- Reduce maintenance visits by testing of redundant systems using remote control testing.
- Reduce costs through identification of recurring faults using post mission analysis.
- Provide early warning of negative trends in monitored parameters in order to schedule maintenance before failure

LEVEL OF MONITORING

The level of monitoring and the parameters to be monitored can be categorised as:

- **The AtoN State:** Generally the status (e.g., On or Off) of the AtoN is monitored.
- **The Engineering State:** Additional parameters are monitored to indicate the health of the AtoN including redundant standby equipment and its supporting systems (e.g., fuel level in the case of a diesel generator set).

IMPROVE THE AVAILABILITY OF INFORMATION

To improve the availability of information, the remote monitoring system will generally be capable of obtaining information from the remote location in a variety of ways. Chiefly by:

- Regular scheduled status reports from the remote site.
- Regular polling from the base station and on demand.
- Exception reporting. When a nominated event occurs or preset parameter is exceeded, this report is generated by the remote site and transmitted to the monitoring station.
- A combination of two or more of the above. A typical combination is reporting of normal events, such as light on, by polling with exception reporting for alarms.

AIDS TO NAVIGATION TO BE MONITORED

In general, the provider of AtoN will want to be confident that the latter are operating within published characteristics and will consider providing remote monitoring and control facilities for AtoN, whose importance will determine their priority. AtoN equipment that could be monitored fall into the following categories:

- **Major Lighthouses and Stations:** These will include the main light, standby light, emergency light, sector light, fog signals where fitted, radio beacons with or without DGPS, racons, and ancillary equipment such as power supplies, fuel tanks, intruder alarms and fire fighting and detection equipment.
- **Minor Lights:** Need only be remotely monitored at the discretion of the Operating Authority.
- **Sector Lights:** Sector lights should be monitored.
- **Leading Lights:** Leading lights should be monitored.
- **Light Vessels, Lanbys and Light floats:** These will be similar to those fitted at major light stations with the exception of radio beacons and sector lights and may also include off-station marking.
- **Lanbys and Lightfloats:** May contain AtoN similar to those fitted to lightvessels and should be monitored.
- **Major Buoys:** Those fitted with a light, racon and position-tracking system should ideally be monitored.
- **Other Navigational Buoys:** Need only be monitored at the discretion of the Operating Authority.
- **Offshore Structures:** These will generally be monitored by the operator of the structure.

PARAMETERS TO BE MONITORED

Today's mariner has an extensive array of AtoN to assist his safe passage ranging from buoys (lit or unlit), lightvessels, beacons (lit or unlit) and lighthouses. Each may have a variety of AtoN and hence monitoring and control requirements. Parameters to be monitored and controlled together with their level of importance, are defined below:

Level 1 – Status
The primary aim of any monitoring and control system (MCS) is to indicate the operational status of the AtoN. These are called events, that is, occurrences that take place during the normal operation of the AtoN.

Level 2 – Condition
A further aim of the MCS is to report failures of any equipment and provide additional information that will enable the Operations and Maintenance Staff to identify and determine the reasons for any abnormal conditions that may exist. These are called alarms.

Level 3 – Analogues
This level of monitoring is applicable to a more sophisticated MCS enabling the analogue value of parameters such as voltage and current to be reported. By analysing this data to produce trends, Maintenance and Engineering Staff can review the events leading to a failure, and may also be able to detect the onset of failures, and enable corrective action to be taken to prevent complete breakdown and hence maximize availabilty.

Level 4 – Controls
In order to test certain types of equipment and to reset fault conditions without visiting a station, control facilities may be incorporated in a MCS. This can be used to increase AtoN availability and improve cost effectiveness by reducing maintenance costs. The design of the interface between the MCS and the AtoN must be such as to not interfere with the operation of the AtoN in the event of failure of the MCS.

INTEGRATION WITH OTHER SYSTEMS

Remote Monitoring and Control Systems present the opportunity for other Authorities or systems to have access to AtoN status information.

The increased use of computerized database systems provides the opportunity to perform this integration automatically and remote monitoring systems will form an integral part of the emerging E-Navigation which is under study by IALA and other international bodies.

Some Authorities have already begun this integration with systems under their direct control, for example, repair and maintenance. In addition, integration with VTS and AIS systems is becoming more popular (7.2 AIS and Remote Monitoring Display).

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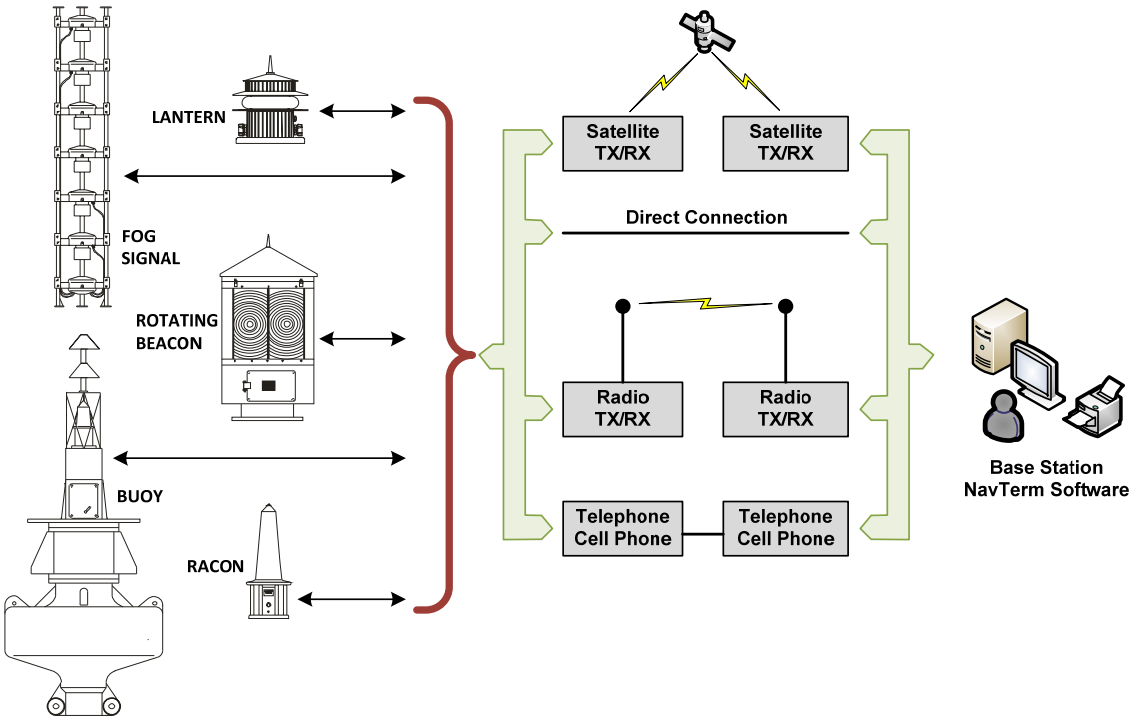
B. NavLink System

The NavLink System is Tideland's comprehensive remote control and monitoring system for aids to marine navigation. The NavLink System can monitor and control, in real time, a combination of lanterns, fog signals, racons, and a number of user-defined devices such as weather sensors and custom-designed aids to navigation.

The NavLink System includes the NavLink field location connected by communications link to a monitoring and control base station. The communications link can be conventional telephone channels, radio transceivers, satellite, or other services. The monitoring and control base station consists of a Windows computer and the NavTerm software.

With the NavLink System an operator at the base station can obtain regular programmed status and performance reports. Additionally, the operator can demand at any time that reports be transmitted and displayed. Remote equipment can also be monitored and controlled at the NavLink field location via a laptop computer. The same capability as in NavTerm allows the operator to change codes, turn equipment on or off, and perform other functions accessible at the field location.



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C. Satellite Remote Monitoring (SRM)

Tideland has developed a Satellite monitoring system that provides remote monitoring information of important aids to marine navigation (AtoN). By utilizing Inmarsat D, a satellite radio is installed on any AtoN and transmits vital information and warnings such as;

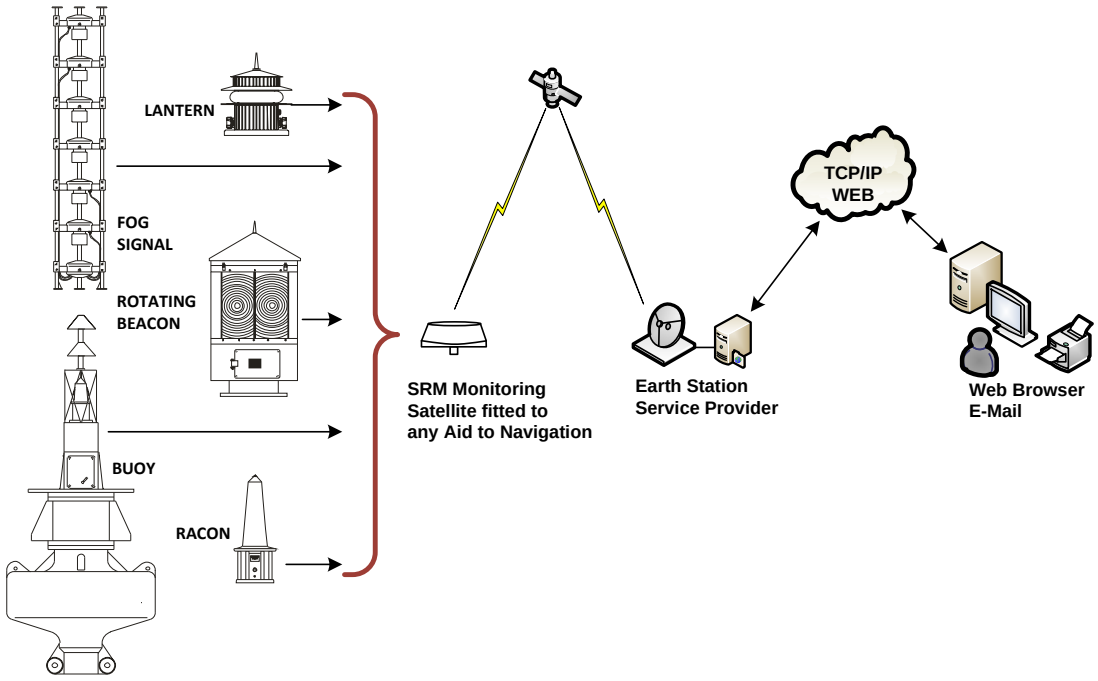
- GPS position
- Selectable geo-fence warning
- Light go/no go
- Battery voltage
- Three optional data inputs (2 x digital, 1 x analogue)

SRM relies on Satellite communication utilizing marine data communications. A buoy, lighthouse, beacon or any AtoN can be fitted with an SRM communication module. Its lightweight and compact design allows it to be fitted to almost any existing AtoN. Due to extensive satellite coverage the unit can be used in almost any location worldwide.

SRM is simply connected to an existing or new AtoN and switched on. Immediate verification of system operability can be obtained.

Operation of the system is via your internet enabled web browser. Data is displayed in a user friendly format and operational parameters are easily changed (geo-fence for example). Warnings such as “buoy off station”, lantern failure” or “low voltage” are sent immediately. Regular polls can be set as user requirements dictate.

Power consumption is approximately 0.2Ah per day when used on a buoy to continuously monitor position.



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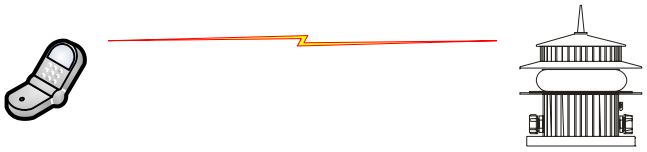
D. Simple Cell Phone Monitoring

Often a simple form of monitoring is all that is required. With improved cell phone coverage this medium suites the purpose well.

A cell phone unit can be activated by the lantern fail terminal and a text message sent warning of the failure. Or, a cell phone can be used to poll the lantern and vital information obtained such as status and battery voltage.

More comprehensive modules are also available with a number of digital and analogue inputs that are designed to supply additional information to meet user's particular requirements.

This form of communication is now widespread and offers a very cost effective solution in areas of cell phone coverage.



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E. Radio or Cell Phone Switching

For many years Tideland has been developing solutions for unique client requirements. A popular development is remotely switching of range lights and other AtoN's.

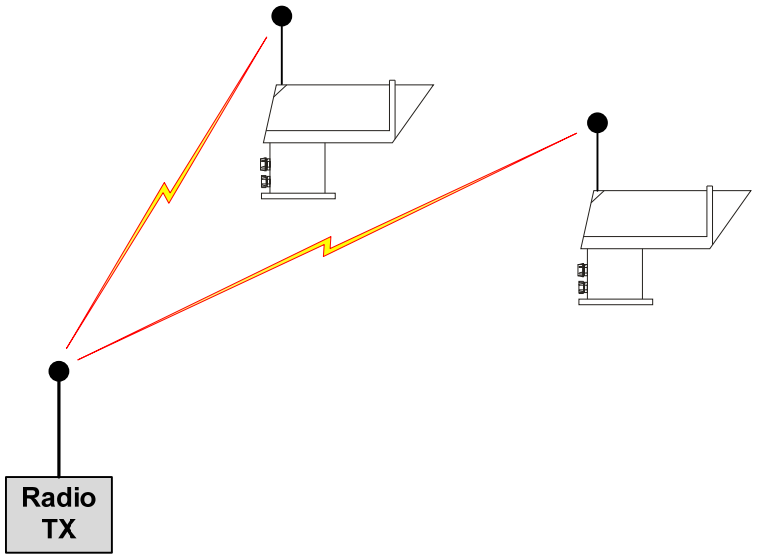
Bright range lights consume a lot of power especially when powered by solar. Range lights are often only required when a pilot is bringing a vessel into port.

Tideland has supplied numerous systems utilizing cell phone and radio communication. A pilot or a harbor master is able to remotely switch range lanterns on and off by pressing a button on a small control panel to activate a VHF/UHF command.

Installation is straight forward. A communication unit is installed on the AtoN and, when activated, it will switch the lantern on or off via the control circuit.

At the harbor master's office a small radio with a control panel is installed designed to run off mains power or DC. The harbor master simply selects an on or off button.

The same system is also available utilizing a cell phone.



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