

Operational Description

This system solves the problem of collecting coherent data automatically from various patient handling equipment, no matter of manufacturer.

The system logs all transfers carried out with a mechanical aid together with time, date and sensor-id.

Ceiling lift



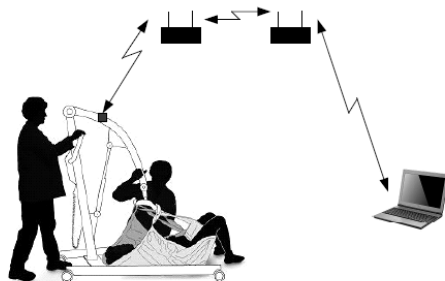
Mobile lift



Air-assisted



Each monitored equipment sensor stands in contact with a radio transceiver at ward level. These radio transceivers forward the data package from the sensors throughout the building to the main control unit, the database server, where it is "stamped" with time and date and stored for further processing.

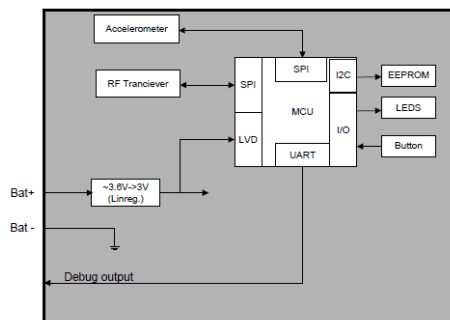


Activity Sensor

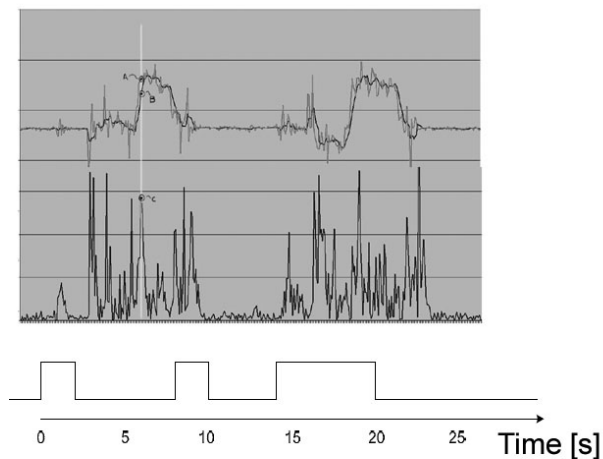
The autonomous battery operated sensor consists of an accelerometer, a radio module and a microprocessor running the algorithm that decides how the sensor acts upon the movements it is exposed to.

The microprocessor also runs a program that determines the different power modes of the unit, based upon accelerometer data, to conserve energy.

This sensor is attached to each patient handling equipment that are to be monitored.



When the sensor is exposed to acceleration, the algorithm filters the signal and determines if the pattern is a valid "activity". If so, the algorithm waits for the end of the "activity" and then it's 'compressed' and represented by a vector consisting of 'timestamps' (0-24 positions) that are put on the stack for radio transmission.



The sensor also transmits a 'heartbeat' message, typically once every day, to tell the database that it's working.

The battery power level is checked, typically once every day, does it become too low, a 'battery low' message is sent to the database to alert the supervisor about the sensor status.

The sensor sends the messages without knowing if any transceiver (REPO+) is listening.

After transmitting the package, the sensor switches to receiving mode.

If the package is received by a transceiver an 'acknowledge', containing the package-id, is sent by the transceiver.

If the sensor doesn't receive an 'acknowledge' in a specific time, it try to send the package another time, typical 3 times before it's dropped.

Transceiver

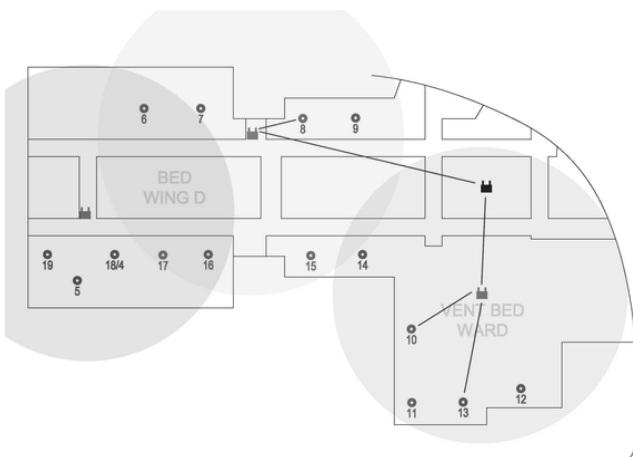
The transceiver have two identical antennas, one for RX and one for TX, they are used on a "one at a time" basis.

The transceiver can take the shape of 3 different operating modes depending on software mode.

- A - the transceiver 'listens' for sensors and repeats the packages to other transceivers in 'mode B or C'. In this mode the transceiver is called "REPO+"
- B - The transceiver 'listens' for transceivers in 'mode A' and repeats the packages to other transceivers in 'mode B or C'. In this mode the transceiver is called "REPO++"
- C - The transceiver 'listens' for transceivers in 'mode A or B' and let the computer, running the database, poll the packages through a wired serial bus connection. In this mode the transceiver is called "D-TECT"



The (mode A) transceivers are placed throughout the building in a way that they are able to 'listen' for all sensors. When a package is received from a sensor this is acknowledged back to the sensor. The package is then re-transmitted to the end destination (mode C) transceiver or another (mode B) transceiver that's placed throughout the building in a way that they are able to 'listen' for (mode A) transceivers and form a chain to the end destination (mode C) transceiver.



Each transceiver transmitting a package waits for acknowledge from the receiving transceiver. If it doesn't receive an 'acknowledge' in a specific time, it try to send the package another time, typical 3 times before it's dropped. No acknowledge is sent beyond one step in the 'chain', packages assumes to reach the end destination.

Intended use:

(System; sensors + transceivers + database)

Log a specific activity pattern together with time and date of the occurrence and store this information together with sensor-id identifying what type of patient handling equipment it was tied to at the activity occurrence and at what ward the patient handling equipment belonged to according to data in the database at the activity occurrence.

Stored activity data to be post processed together with experience values to gain knowledge of what type of activity the patient handling equipment was involved in over a period of time. Examples of activities, but not limited to, that can be estimated; patient transfer, limb holding or transport.

The nature of the system, (for example, but not limited to: accuracy limitations, loss of data, lack of redundancy) prevents its intended use to involve any form of 'care taker' feedback.

This system is solely for commercial use.

Due to the nature of the systems complexity, installation planning, equipment usage estimation etc., this system should only be marketed through the ArjoHuntleigh "Diligent" service in project sales to the end user in order to achieve a successful implementation.