ABB MEASUREMENT & ANALYTICS | TECHNICAL DESCRIPTION

ScreenMaster RVG200
Paperless recorder

Programming the RVG200 to record GPS data in bilge water discharge monitoring applications

Measurement made easy

Monitoring and controlling effluent water discharge

Introduction

MARPOL (Marine Pollution) is the International Convention for the Prevention of Pollution from Ships from either operational or accidental causes. It was introduced in the late 1970s as a response to a spate of oil tanker accidents resulting in serious environmental pollution incidents.

The convention covers a number of different areas – for example:

- Control of pollution by noxious substances carried by sea, in bulk
- Prevention of pollution by harmful substances carried by sea in packaged form
- Prevention of pollution by sewage from ships
- Prevention of pollution by garbage from ships
- Prevention of air pollution from ships
- Prevention of pollution by oil

MARPOL convention

Annex 1 of the MARPOL convention covers a number of different areas relating to the prevention of pollution by oil. There are regulations that apply to all areas of a ship where oil may be found and from where it may find its way into the sea.

Monitoring and controlling effluent water discharge processes (discussed in Application Description AD/RandC/012-EN) applies equally to ships and land-based processes and in the case of ships, water that accumulates in the bilge wells (small compartments in the lowest part of the ship) must be monitored. This is because it's not just water that accumulates here, but also oil, chemicals, sludge and other fluids.

The bilges must be emptied regularly to ensure that the ship remains stable, upright and buoyant. However, because the bilge contents are polluted, they must be treated to ensure that the level of oil in the water is no greater than 15 parts per million (ppm) before being discharged into the ocean.

Further MARPOL legislation describes where the bilge contents may be legally discharged; too close to a land mass or in certain geographical areas is against regulations. Therefore, it is important to maintain a log of what has been discharged and, more importantly, where it was discharged, to prevent legal action being taken against the vessel and crew.

This document describes the use of an RVG200 paperless recorder as a recording device for monitoring the discharge of treated bilge water and, in particular, its ability to record the GPS coordinates of the ship at the point of discharge and how to configure the RVG200 to do that.

GPS tracking

It is important that no effluent of any kind is discharged from a ship within 12 miles of the nearest land or anywhere within the Antarctic circle. But how does a crew know exactly how close they are to land or indeed where exactly they are in the ocean? Today they use the Global Positioning System (GPS) that comprises 31 satellites in orbit some 12,500 miles above the earth. Receivers on earth must have a clear line-of-sight to 4 or more satellites and the signals received enable calculation of the position of the receiver on earth.

Anybody who uses a satellite navigation system in their car will be familiar with this system and, although the technology used at sea is more sophisticated than that used in a car, the theory is the same. The receiver uses the signals from multiple satellites to accurately calculate its position on the earth's surface – see Figure 1.

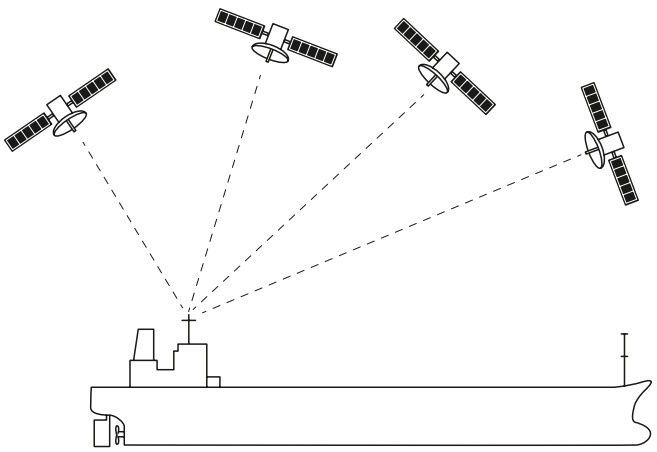


Figure 1 Example of GPS tracking in a marine application

In Marine applications, the location is usually given as a series of numbers known as longitude (the geographic coordinate signifying the east / west position of a point on the surface of the earth) and latitude (the geographic coordinate signifying the north / south position of a point on the surface of the earth). This information is then communicated by the GPS receiver to other systems on the ship to alert them to the vessel's position.

NMEA communications protocol

The National Marine Electronics Association (NMEA) defines and controls a communications protocol that is a combined electrical and communication specification for communications between marine electronics (for example, echo sounders, sonars, auto pilot and GBP receivers). The NMEA protocol uses simple ASCII serial communications to define data transmission across an RS422 hardware port connection, enabling data from one device to be broadcast to multiple devices simultaneously.

The GPS receiver transmits the latitude and longitude coordinates of the ship to the other devices that require that information via the ship's NMEA communications connection – see Figure 2.

In this application, among the other maritime-related equipment, an RVG200 paperless recorder is also connected to the NMEA communications network.

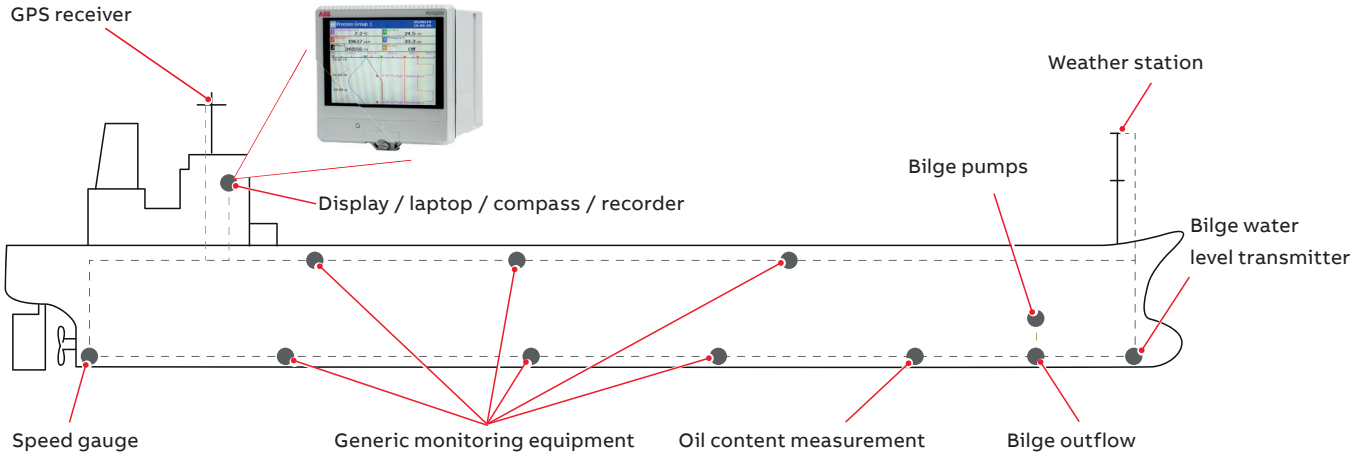


Figure 2 Example of a National Marine Electronics Association (NMEA) layout

RVG200

The RVG200 can receive and record GPS receiver signals transmitted via a NMEA communications network and display the values as longitude and latitude on its touchscreen – see Figure 3.

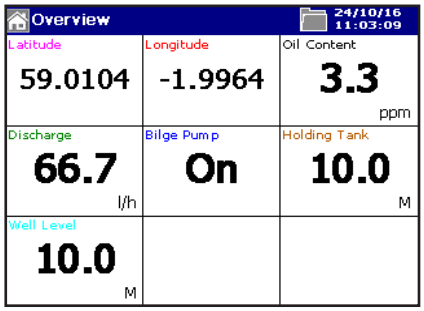


Figure 3 RVG200 indicator view with latitude and longitude being recorded

Assigning those values to recording channels enables regular samples to be taken at user-defined intervals, together with samples of other critical variables (for example, the oil content of the bilge water). All samples are time- and date-stamped and the GPS coordinates are displayed on the chart as annotations (see Figure 4) and entered into the recorder's alarm / event log. The recorded data can be imported into ABB's Datamanager Pro data review software on the PC for permanent storage and review.

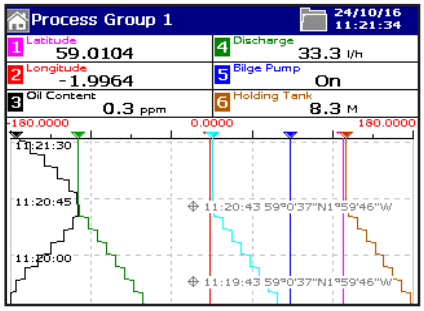


Figure 4 RVG200 chart view with GPS coordinate annotations

Connecting the GPS signal

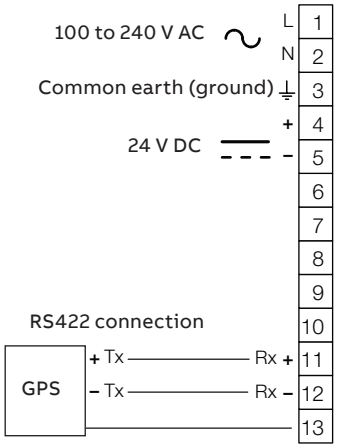
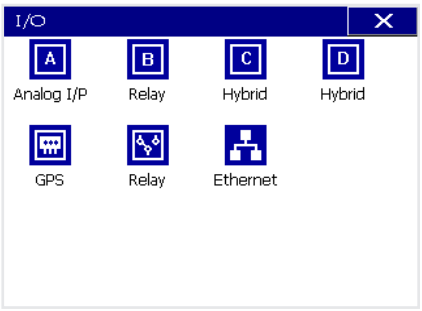


Figure 5 RVG200 connections

Configuring the RVG200

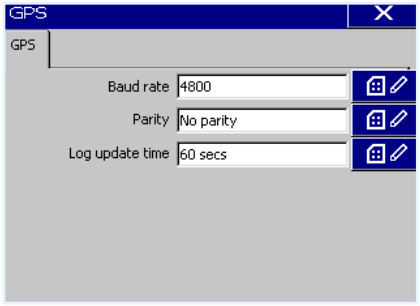
To configure the RVG200 to monitor and record GPS coordinates, it must be equipped with the optional NMEA communications module. To check the option modules fitted to the recorder, enter the configuration level as described in Section 7.3 of the Operating instruction (OI/RVG200-EN) and touch the I/O modules icon ( ) in the main configuration menu:



The NMEA communications module is fitted if the GPS icon ( ) is displayed.

Configuring the GPS module

1 Touch the GPS icon ( ) in the I/O module menu. The GPS configuration screen is displayed:



2 Touch to edit the **Baud** rate parameter, select the required value and touch .

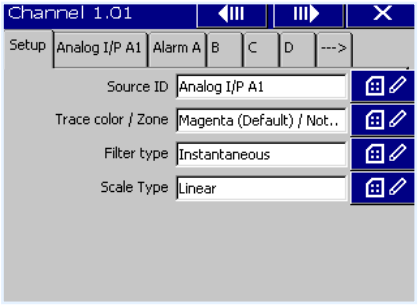
3 Touch to edit the **Parity** parameter, select the required value and touch .

4 Touch to edit the **Log update** time parameter, select the required value (between 60 seconds and 24 hours) and touch .

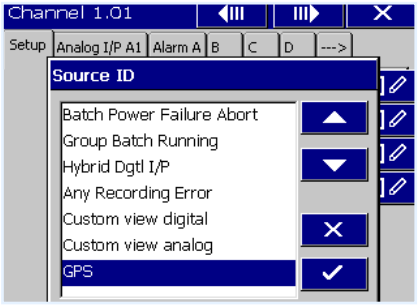
> **IMPORTANT (NOTE)**
> The **Log update time** is the interval at which the GPS coordinates are entered into the alarm / event log.

Assigning the GPS signals to inputs

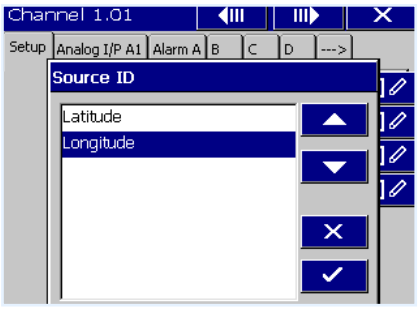
1 Select a channel to configure as described in Section 8.9 of the Operating instruction (OI/RVG200-EN):



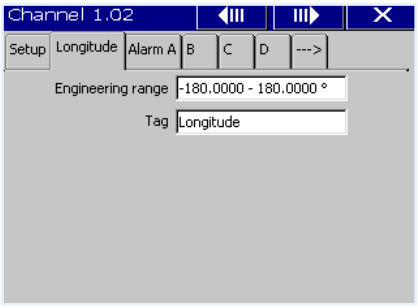
2 Touch to edit the **Source ID** parameter:



3 Select **GPS** and touch :



4 Select either **Latitude** or **Longitude** and touch :



> **IMPORTANT (NOTE)**
> The channel source tab displays the selected parameter and the **Engineering range** and **Tag** parameters are entered automatically and cannot be changed.

5 Repeat steps 1 to 4 to assign the parameter not selected at step 4 to a separat e recording channel.

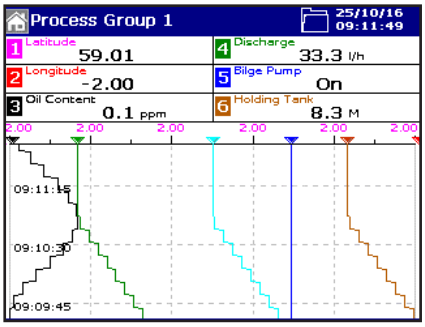
Completion

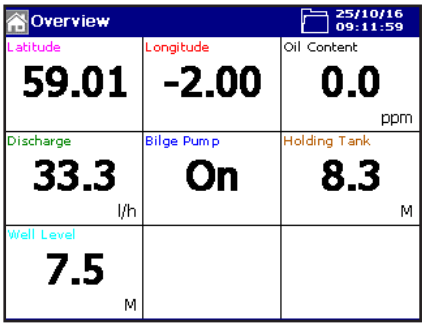
Configure any other associated channels if required for legislative purposes (for example, oil content measurements, flow or tank level) and exit the configuration level as described in Section 7.6 of the Operating instruction (OI/RVG200-EN).

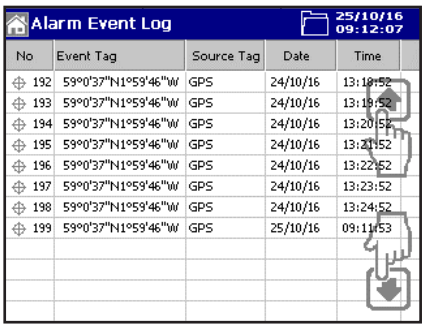
If the configuration is to be used immediately, touch the **Apply Changes** button ( ) on the configuration exit dialog.

To save the configuration for later use, touch the **Export configuration** button ( ) and select a location to save the configuration (either to internal storage or external media).

The ship's position is now displayed in the chart and digital indicator views and recorded in the alarm / event log at the selected time interval:







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