Radio-Tech VHF Transmitter Messages

Version A

Warning: This manual contains important safety and operating information.
Please read, understand and follow the instructions in the manual.

TABLE OF CONTENTS

1 Introduction

The Radio-Tech transmitter messages are of a fixed length of 11 bytes, and have the following common format.

Byte 0: Type code (usually quoted in hexadecimal).

Byte 1: Serial number high byte.
Byte 2: Serial number mid byte.
Byte 3: Serial number low byte.

Byte 4: Status: Bit 7: Set (1) for low battery.
Bit 4 – 6: Depends on transmitter type.
Bit 0 – 3: Firmware version.

Byte 5: Data 1.
Byte 6: Data 2.
Byte 7: Data 3.
Byte 8: Data 4.

Byte 9: CRC low byte. The CRC does not include the type code.
Byte 10: CRC high byte.

2 Transmitter Types

2.1 Type 81_h – Pulse Transmitter (Single and Dual)

Status: Bit 7: Set (1) for low battery.
Bit 6: Not used.
Bit 5: Not used.
Bit 4: Tamper (if available).
Bit 0 – 3: Firmware version.

Data 1 – 3: 24-bit pulse count value (most significant byte first).
E.g. Value 234455_h = 2311253

Data 4: High nibble: Signal strength (between 0-10).
Low nibble: Cumulative counter that increments for each transmission (between 0-15).

The dual pulse transmitter has two consecutive serial numbers, one for each pulse channel. It transmits two messages of the above format, one a few seconds after the other.

2.2 Type 82 h – Temperature Transmitter

There are two versions of the temperature transmitter depending on the firmware version. Version 1 has a 0.5°C resolution. Version 2 onwards adds the capability of 0.1°C resolution readings, but still presents 0.5°C readings in the same way, making it backwards compatible.

2.2.1 Standard Resolution (0.5 °C) Temperature Transmitter

(Firmware Version 1)

Status:	Bit 7:	Set (1) for low battery.
	Bit 6:	Not used.
	Bit 5:	Not used.
	Bit 4:	Not used.
	Bit 0 – 3:	Firmware version, 1.
Data 1 – 2:	Bit 15:	Error.
	Bit 12 – 14:	Not used.
	Bit 0 – 11:	12-bit raw ADC value in twos complement format (high byte first).
Data 3:	Not used, 0.	
Data 4:	High nibble:	Signal strength (between 0-10).
	Low nibble:	Cumulative counter that increments for each transmission (between 0-15).

The temperature in °C is calculated as follows.

Bit 11 indicates the sign.

If bit 11 is clear (0) then the temperature is given by

Temperature = raw ADC value / 2.

If bit 11 is set (1) then the temperature is given by

Temperature = -(4096 - raw ADC value) / 2

Examples

8034_h – MSB set	Invalid Temperature
0032_h = 50	Temperature = 50 / 2 = +25.0 °C
$0FFE_h$ = 4094	Temperature = (4096 - 4094) / 2 = -1.0 °C
$0FE0_h$ = 4064	Temperature = (4096 - 4064) / 2 = -16.0 °C

2.2.2 High Resolution (0.1 °C) Temperature Transmitter

(Firmware Version 2 Onwards)

Status:	Bit 7:	Set (1) for low battery.
	Bit 6:	Not used.
	Bit 5:	Not used.
	Bit 4:	Not used.
	Bit 0 – 3:	Firmware version.
Data 1 – 2:	Bit 15:	Error.
	Bit 12 – 14:	Not used.
	Bit 0 – 11:	12-bit raw ADC value in twos complement format (high byte first).
Data 3:	ADC count remaining, COUNT_REMAIN.	
Data 4:	High nibble:	Signal strength (between 0-10).
	Low nibble:	Cumulative counter that increments for each transmission (between 0-15).

The temperature in °C to a resolution of 0.5°C can be calculated from Data 1 – 2 using the calculation for the standard resolution transmitter above.

The extra resolution comes from the COUNT_REMAIN value in Data 3.

From the temperature sensor's data sheet

$$\text{Temperature} = \text{TEMP\_READ} - 0.25 + \frac{16 - \text{COUNT\_REMAIN}}{16}$$

Where:

TEMP_READ = Temperature value calculated from Data 1 – 2, but with bit 0 truncated.

COUNT_REMAIN = Value in Data 3.

Example

Data 1 – 2 = $0FB7_h$
Data 3 = 02_h

Truncate bit 0 in Data 1 – 2 = $0FB6_h$

Corresponding temperature, TEMP_READ = -74 / 2 = -37

COUNT_REMAIN = Data 3 = 2.

$$\text{Temperature} = -37 - 0.25 + \frac{16 - 2}{16} = \underline{-36.375\ °C}$$

2.3 Type 88 h – Alarm/Status Transmitter

Status:	Bit 7:	Set (1) for low battery.
	Bit 6:	Not used.
	Bit 5:	Alarm/status channel 2 (0 = off, 1 = on).
	Bit 4:	Alarm/status channel 1 (0 = off, 1 = on).
	Bit 0 – 3:	Firmware version.

Data 1 – 3: 24-bit pulse count value (high byte first).
E.g. Value 234455_h = 2311253

Data 4:	High nibble:	Signal strength (between 0-10).
	Low nibble:	Cumulative counter that increments for each transmission (between 0-15).

2.4 Type F1 h – Various Transmitters

The F1 h type is used for new transmitters that do not fit within the existing types. Most of them use extra supplementary messages for additional information.

2.4.1 Analogue Voltage (0 – 10V) Transmitter

Status:	Bit 7:	Set (1) for low battery.
	Bit 6:	ADC Type bit = 1.
	Bit 5:	Not used.
	Bit 4:	Not used.
	Bit 0 – 3:	Firmware version.

Data 1 – 2: 10-bit raw ADC value channel 1 (high byte first).

Data 3 – 4: 10-bit raw ADC value channel 2 (high byte first).

The voltage is given by

Voltage = raw ADC value x 0.0122

2.4.2 High Resolution Temperature (PT100) Transmitter

The temperature transmitter sends two data packets, a main data packet and a supplementary packet with additional type information.

Main Packet

Status:	Bit 7:	Set (1) for low battery.
	Bit 6:	Clear (0), data packet.
	Bit 5:	Not used.
	Bit 4:	Not used.
	Bit 0 – 3:	Firmware version.

Data 1 – 2: 16-bit calibrated temperature value in twos complement format (high byte first).

Data 3 – 4: 16-bit raw ADC value (high byte first).

Supplementary Packet

Status:	Bit 7:	Not used.
	Bit 6:	Set (1), supplementary packet.
	Bit 0 – 5:	Supplementary packet number, 0.

Data 1 – 2: Transmitter subtype, 1 (high byte first).

Data 3: Firmware version major.
Data 4: Firmware version minor.

The temperature in °C is calculated as follows.

Bit 15 indicates the sign.

If bit 15 is clear (0) then the temperature is given by

Temperature = calibrated temperature value / 10

If bit 1 is set (1) then the temperature is given by

Temperature = - (65536 - calibrated temperature value) / 10

2.4.3 Sensus Transmitter

The Sensus transmitter reads the data and serial number from a water meter using the Sensus or Neptune protocol, or leak information from a Permalog+. It sends three data packets, a main data packet and two supplementary packets with additional type and identification information. The format of the main data packet depends on whether it is connected to a water meter or Permalog+.

Water Meter Main Packet

Status:	Bit 7:	Set (1) for low battery.
	Bit 6:	Clear (0), data packet.
	Bit 5:	Not used.
	Bit 4:	Set (1) for meter read error.
	Bit 0 – 3:	Firmware version.

Data 1 – 4: 32-bit meter reading (most significant byte first).

Permalog+ Main Packet

Status:	Bit 7:	Set (1) for low battery.
	Bit 6:	Clear (0), data packet.
	Bit 5:	Set (1) for leak detected.
	Bit 4:	Not used.
	Bit 0 – 3:	Firmware version.

Data 1: Leak noise level.

Data 2: Leak noise spread.

Data 3: Not used.

Data 4: Cumulative counter that increments for each transmission (between 00_h-FF_h).

Supplementary Packet 0

Status:	Bit 7:	Not used.
	Bit 6:	Set (1), supplementary packet.
	Bit 0 – 5:	Supplementary packet number, 0.

Data 1 – 2: Transmitter subtype (2 = Water meter, 3 = Permalog+) (high byte first).

Data 3: Firmware version major.
Data 4: Firmware version minor.

Supplementary Packet 1

Status:	Bit 7:	Not used.
	Bit 6:	Set (1), supplementary packet.
	Bit 0 – 5:	Supplementary packet number, 1.

Data 1 – 4: 32-bit water meter or Permalog+ serial number (most significant byte first).

2.5 Type F2 $_h$ – Pressure/Flow Transmitter

The type F2$_h$ pressure/flow transmitter has two consecutive serial numbers, one for the pressure channel and one for the flow channel. It transmits two messages, the first for the pressure channel and approximately 4 seconds later the second for the flow channel.

Pressure Channel (First Message)

Status:	Bit 7:	Set (1) for low battery.
	Bit 6:	Not used.
	Bit 5:	Not used.
	Bit 4:	Not used.
	Bit 0 – 3:	Firmware version.

Data 1 – 2: 16-bit pressure in decimetres (dm) of water (high byte first).
Data 3 – 4: 16-bit raw ADC value (high byte first).

Flow Channel (Second Message)

Status:	Bit 7:	Set (1) for low battery.
	Bit 6:	Not used.
	Bit 5:	Not used.
	Bit 4:	Not used.
	Bit 0 – 3:	Firmware version.

Data 1 – 3: 24-bit pulse count value (most significant byte first).
E.g. Value 234455$_h$ = 2311253

Data 4: Cumulative counter that increments for each transmission (between 0-15).

HWM-Water Ltd
Ty Coch House
Llantarnam Park Way
Cwmbran
NP44 3AW
United Kingdom
+44 (0)1633 489479
www.HWM-water.com