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FRZ200-1xxx Checkit Connected Automated Monitoring+ Instruction Manual

Checkit Connected Automated Monitoring+ (CAM+)
User Manual and Integration Instructions – For internal use only.
MiWi module: FRZ200-1xxx

Contents

INTRODUCTION

1.1 About This Manual
This integration manual explains how to integrate the Mi-Wi module FRZ200-1xxx into a host device. This module is not commercially available to third partes and is intended for internal use only.

1.2 General Description
This module is a radio data transmiter / receiver using FSK modulation operating on 915MHz for short range telemetry. It has been developed for Checkit in the UK as a component module part of a remote temperature measurement system.

1.3 Warning Notice
The module RF stage is not to be modified in any way without repeating RF compliance testing. The RF and micro-controller stages must not be fed from a DC supply greater than 3.6V. No other antenna apart from the ¼ wave screw on antenna may be used with this module.

1.4 Technical Specifications
Operating frequency 915MHz. RF power output 1dBm (antenna gain up to 2dB, total radiated power up to 3dBm). Modulation FSK 200kHz deviation. DC power supply 3.6V DC. Inputs analogue (0-2.500V) and digital (I 2 C).

1.5 Hardware Description

The module circuit board measures 80mm long x 42mm wide. Height with batery fited is 20mm.

Primary electrical interconnections are via a 9-way FFC connector. There are links for seting options, see 1.6 below, and connections for in-circuit programming of the Processor and reading the unique MAC address back for identifying individual modules.

1.6 Circuit Description

Read in conjunction with transmiter circuit diagram R0929-R130.

The RF chip (IC1, MRF89XA) is an integrated, single chip ISM band sub-GHz transceiver. It has an inbuilt frequency synthesiser clocked by an external 12.288MHz crystal and generates 915MHz radio

frequency. The receiver is zero-IF architecture and has the following components:

LNA, down conversion mixer, channel filter, baseband limiting amplifier and received signal strength indication (RSSI).

IC1 has an internal transmit / receive switch with an external impedance matching network coupling to the screw-on ¼ wave whip antenna. The quality of received data is checked and validated with RSSI and DQI (Data Quality Indicator) blocks built in internally. The RF transceiver chip is controlled through a 4-wire SPI bus from a Microchip controller on the module.

The SPI bus is connected to two focal memory chips, the MAC address chip (IC3) which is pre-loaded with a unique address for each module, and a EEPROM memory {IC2} to store data blocks if the transceiver is unable to communicate with its host for a period.

The Microchip controller (IC4) has two clocks, a standard clock crystal {32.768kHz} for the period timing and an internal 12MHz oscillator for the processor clock.

The controlier has three 10bit ADC ports, a USB port and a I'C serial data port.

A board mounted 3V6 Li-SOC cell is the normal source of power when the module is used with an analogue signai conditioning option board to measure temperature with a probe.

External SV DC power connection when the unit is used in the controller is regulated on the module to 3V3 DC.

The module has three possible modes of operation, as a remote radio data transceiver, a repeater to pass the data through, and a controller which communicates with the remote data transceivers.

These options are set using solder bridges on Lk1 and Lk2

- Remote radio data transceiver — no links
- Repeater radio transceiver — limk Lk2
- Controller for network — link Lk & Lk2

1.7 Board Interconnections

Read in conjunction with transmitter circuit diagram RO929-R130.

Cn 1- Ma threaded fixer for % wave whip antenna.

Cn 2 – Programming header for manufacturing use only.

Cn 3 – Data and power connector for MAC reading and control.

Cn 4 – Panel reset switch — membrane connector.

Cn 5 – Analogue and I2C connections to signal conditioning option boards.

Cn 6 – Connector for temperature and humidity module (Sensiron part).

1.8 System Description

The controller, model number GENII/WARP/200, monitors and stores readings from the remote transmitters, displaying parameters on a 4.3" LCD disptay, with toggle buttons on a panel membrane to view readings from the different remote transmitters. The controller comprises a MiWi module {FRZ200-1400}, an embedded computer module (Re2) and a mother board that holds these two units, provides DC voltage power conversion, and interfaces to the LCD screen mounted on it's rear. The controller is powered by a plug top DC power supply, 1SV SW.

The remote transmitter, model number GENII/FRZ/200A and B, measures up to two temperatures using platinum temperature probes. The remote transmitter comprises a MiWi module (FRZ200-1000) and an analogue signal conditioning option module that can be set to different ranges, Aand B. The remote transmitter is powered by a 3V6 Li-SOCI ceil. Energy saving techniques are used to achieve up to 4-year battery life.

The repeater, model number GENI/SRPT/200, receives remote transmitters in its vicinity and automatically associates itseff with either a controller, or another repeater to pass the data back to the controller. The repeater comprises a MiWi Module {FRZ200-1400) and a battery backup board to provide a 7-hour backup in the event of mains loss. The controller is powered by a plug top DC power supply, 12V 1W.

1.9 Module Operation

A remote radio data transceiver, when first powered up or, whenever the front membrane button is pressed and released, will transmit association data packets based on the unique MAC address factory set in IC3.

The controtler witl receive these data packets and pass them to an embedded computer module which checks that the MAC address of the transmitter module exists within its database.

If the MAC address is not in the embedded computer module table, then it will not respond to the remote transmitter. If the MAC address is in the computer table, then it will transmit an acknowledgement to the remote transmitter and an association communications link is created between the specific remote transmitter and the controller. Up to 120 remote transmitters can be used.

Thereafter, at 60 second intervals, the remote transmitter will wake up, transmit its sensor values to the controller, and wait for an acknowledgement in retum. tf the remote transmitter receives a valid controler acknowledgement, then it will go back to sleep.

If the remote transmitter does not receive an acknowledgement from the controller, then it will re transmit the sensor values. After 3 resends with no acknowledgement received the remote transmitter will jog the sensor values in IC2, and then goes back to sleep.

The remote transmitter will continue to wake up every 60 seconds and repeat the 3 resends sequence, log the data in 1C2, and then go back to sleep.

After 15 consecutive transmit attempts (60 seconds apart) with no acknowledgement from the controller, the remote transmitter will go through its association routine again in and effort to establish new communications link with the controller.

The association routine will be repeated after every 15 consecutive transmit attempts with no acknowledgement received from the controfler.

if during any communications event the remote transmitter receives a valid acknowledgement from the controller, then in addition to transmitting the current sensor values, it will also transmit S historical values from its local memory store.

Thereafter the remote transmitter will continue to transmit the current value plus S historical values to the controller every 60 seconds until the local log memory store is empty.

Each transmitter module is provided with variable timing functions that prevent the occurrence of imultaneous transmissions from more than one transmitter module at a time.

The repeater module's MAC address in C3 is programmed into the controller's embedded computer module table.

A repeater module when first powered up or, whenever the front membrane button is Pressed and released, will transmit association data packets.

The controller and/or any other signal repeater module in the system installation will receive these data packets and transmit their acknowledgement back to the repeater module.

The repeater module wifl assess the RSSI signal strength of each acknowledging device and automatically associate itself with the device that it considers has the strongest signal.

Once the repeater module has associated with either a controller or another repeater module then it will "ping" the associated device every 10 seconds and wait for an acknowledgement in return.

If a repeater module fails to receive a valid acknowledgement after 2 consecutive "pings" then it will consider that communication path is offline and will stop sending acknowledgements to any remote transmitter that may be currently associated with it.

If an acknowledgement is subsequently received from its associated device, then the repeater module will resume sending acknowledgements to all currently associated transmitters.

If a repeater module does not receive a valid "ping" acknowledgement for 5 minutes, then it will re- start the association process. The signal repeater module will once again assess the RSSI signal strength of each acknowledging device and automatically reassociate itself with the device that it considers has the strongest signal.

A transmitter module when first powered up or, whenever the front membrane button is pressed and released, will transmit association data packets.

Acontroller and/or any other signal repeater module in the system installation will receive these data packets and transmit their acknowledgement back to the transmitter module.

The remote transmitter will assess the RSSI signal strength of each acknowledging device and automatically associate itself with the device that it considers has the strongest signal. If the remote transmitter's MAC address is not in the controller table, then it will not respond to the repeater module. If the MAC address is in the controller table, then it will transmit an acknowledgement to the repeater module and an association communications link may be created between the specific repeater module and the controller.

Thereafter, at 60 second intervals, the remote transmitter will wake up, transmit its sensor values to its currently associated device, and wait for an acknowledgement in return.

If the remote transmitter receives a valid acknowledgement from its associated device, then it will go back to sleep.

INTEGRATION INSTRUCTIONS

2.1 General
The MiWi module FRZ200-1xxx must be installed in accordance with this instruction manual and the module must not be modified in any way that could affect the radio operations and invalidate its approvals.

2.2 List of applicable FCC rules
The module FRZ200-1xxx is in compliance with limited single-modular transmiter.

Refer to the approval certificates, grants and declarations of conformity issued for FRZ200-1xxx, and to section "Compliance Statements" for a detailed list of the rules applicable to FRZ200-1xxx.

2.3 Specific Operational Use Conditions
There are no specific operational use conditions for FRZ200-1xxx. Conditions of uses are documented in this manual.

2.4 Limited Module Procedures
The module FRZ200-1xxx is limited to two types of hosts, external powered or batery powered. The external powered host must provide a stable 3.6V DC supply to the module FRZ200-1xxx. For the batery powered host, the module FRZ200-1xxx is powered by a single AA 3.6V batery.

2.5 Trace Antenna Design
N/A

2.6 RF Exposure Considerations
The portable transmiter with its antenna complies with FCC/IC RF exposure limits for general population / uncontrolled exposure. Maximum transmiter output power is 2mW, less than the FCC limit of 65.57mW (60/0.915GHz); RF exposure testing is not required.

2.7 Antennas
The module FRZ200-1xxx is designed to be fited with ¼ wave whip antenna, part number RF SOLUTIONS, FLEXI-M4-868. No other antenna should be fited.

2.8 Label And Compliance Information
Using a permanently affixed label, the host must be labelled with its own FCC identification numbers. FCC ID: 2A9Q3CHKO00471

All statements listed in section "Compliance statements" of this integration manual must be also listed in the user manual of the host device.

2.9 Information on test modes and additional testing requirements
The module FRZ200-1xxx has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the Federal Communications Commission (FCC) Rules. However, the integrator is still responsible for any additional testing and authorization process required for the end product.

2.10 Additional testing, Part 15 Subpart B disclaimer
The module FRZ200-1xxx is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. In addition, the final host product still requires Part 15 Subpart B compliance testing with the module FRZ200-1xxx installed.

2.11 Note EMI Considerations
A host manufacture is recommended to use the FCC "D04 Module Integration Guide" recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module lacement to host components or properties.

2.12 How to make changes
No changes the RF module is permitted that could affect the radio operations and invalidate its approvals.

COMPLIANCE STATEMENTS

3.1 EU
The module FRZ200-1xxx in compliance with the EU directives and regulations as listed in the respective declaration of conformity.

3.2 FCC

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the Federal Communications Commission (FCC) Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

If the equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, we suggest you try to correct the interference as follows:

- reorient or relocate the receiving antenna.
- increase the distance between the equipment and receiver.
- connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- if the above are not successful, consult the dealer or radio/TV technician.

FCC Caution: any changes or modifications not approved by the party responsible for compliance may void your authority to operate the device.
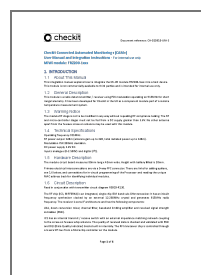
FCC ID: 2A9Q3CHK00471

3.3 RF EXPOSURE COMPLIANCE

The portable transmitter with its antenna complies with FCC/IC RF exposure limits for general population / uncontrolled exposure. Maximum transmitter output power is 2mW, less than the FCC limit of 65.57mW (60/0.915GHz), therefore, SAR testing is not required.

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Documents / Resources

checkit FRZ200-1xxx Checkit Connected Automated Monitoring+ [pdf] Instruction Manual
FRZ200-1xxx Checkit Connected Automated Monitoring, FRZ200-1xxx, Checkit Connected Automated Monitoring, Connected Automated Monitoring, Automated Monitoring, Monitoring

References

- **User Manual**