

# **RFXMeter**

## **RF transmitter**

### **For**

# **Power/Gas/Water/Pulse metering**

[www.rfxcom.com](http://www.rfxcom.com)

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## 1. RFXMeter FEATURES.

The RFXMeter is a device that has an RF transmitter and a microcontroller to count pulses from up to 3 metering modules.

The size of each counter is 24 bits so the maximum count is 16777215 pulses. The counter values of all 3 counters will be saved in non-volatile memory when the RFXMeter is disconnected from the power or a power loss occurs. The counter values are restored when the power returns.

The RFXMeter contains:

- 3 slots for metering modules,
- An RF transmitter with microcontroller to process the metering pulses,
- A 5V DC power supply for the transmitter, the microcontroller and the metering modules.

### 1.1. *RFXPwr power metering module.*

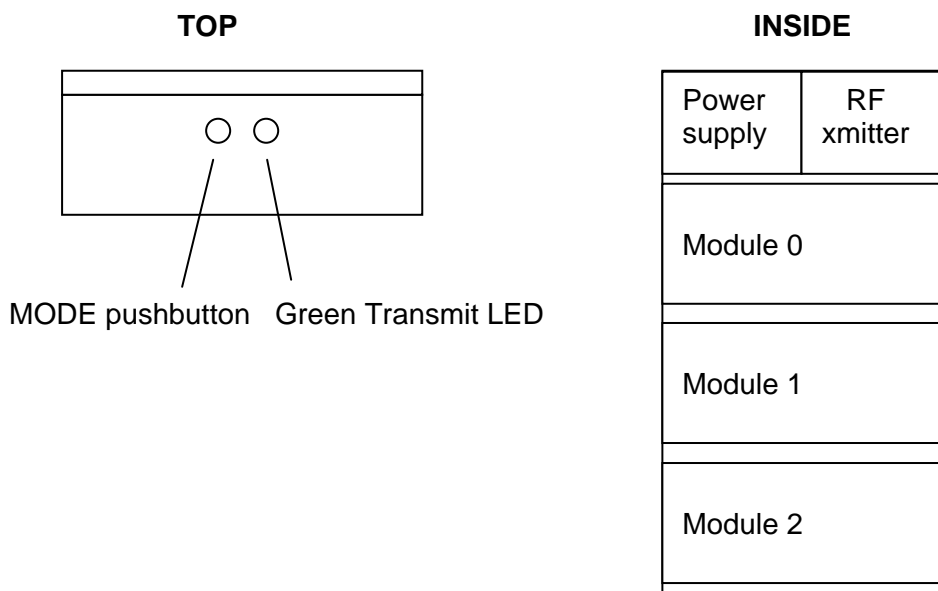
This module can be inserted in the RFXMeter and is able to measure the whole house power usage or a single phase for up to 150A.

### 1.2. *RFXPulse pulse metering module.*

This module can be inserted in the RFXMeter and measures pulses coming from a relay or a photo transistor or a reflective-optical sensor. It can be used for example to count blinking LED's on an electricity meter or the mirror pass by on the Dutch gas meter.

## 2. Technical description of the RFXMeter unit.

### 2.1. *Physical layout.*



## **2.2.    *Powering the RFXMeter.***

The RFXMeter has a power input connector for a power adaptor.

The adaptor output must be:

9V AC – 250mA

or 9 to 12V DC – 250mA (center pin = -, outer contact = +)

The center pin size is 2.1mm.

It is not necessary to use a power adaptor for the RFXMeter unit if an RFXPwr-module is installed at location for Module 0. In this case the 9V AC adaptor of the RFXPwr-module will be used to power the RFXMeter also.

## **2.3.    *Power fuse in the RFXMeter.***

The RFXMeter has a 250mA fuse build in for the 5V circuit. The total maximum load for the 5V power supply is 200mA.

## **2.4.    *Power usage.***

The RFXMeter uses 60mA from the 5V circuit so for the sub-modules a total of 140mA is allowed.

## **3. How to reset an RFXMeter.**

Remove the power for at least 10 seconds.

The counter values will be saved in non-volatile memory when the power is removed.

## **4. How to install a module.**

- Remove the power from the RFXMeter unit and open the enclosure.
- Insert the module.
- Close the enclosure.
- Connect the RFXMeter to the power.

## **5. Configure the RFXMeter modules in the software.**

### **5.1.    *Configure an RFXMeter module in Homeseer - ACRF.***

Use the RFreceiver program to find the ACRF-ID of the RFXMeter module(s).

The ACRF Device ID is the decimal number behind the slash.

In this example the sensor Device ID for the ACRF is 2296.

```
3008F8D25A1809 RFXMeter addr:08F8 = ACRF-ID:2296 RFXMeter: 1626714 bits=48
```

### **5.2.    *Configure a module.***

If the RFXMeter is supported by a software product then check the documentation of this software how to configure the RFXMeter module.

If you want to write your own software to support the RFXMeter modules then have a look in the RFreceiver source how to decode the RFXMeter packets. This source file can be of help and can be found at the download page of [www.rfxcom.com](http://www.rfxcom.com) .

## 6. RFXMeter mode settings and calibration.

The RFXMeter has a MODE pushbutton to set:

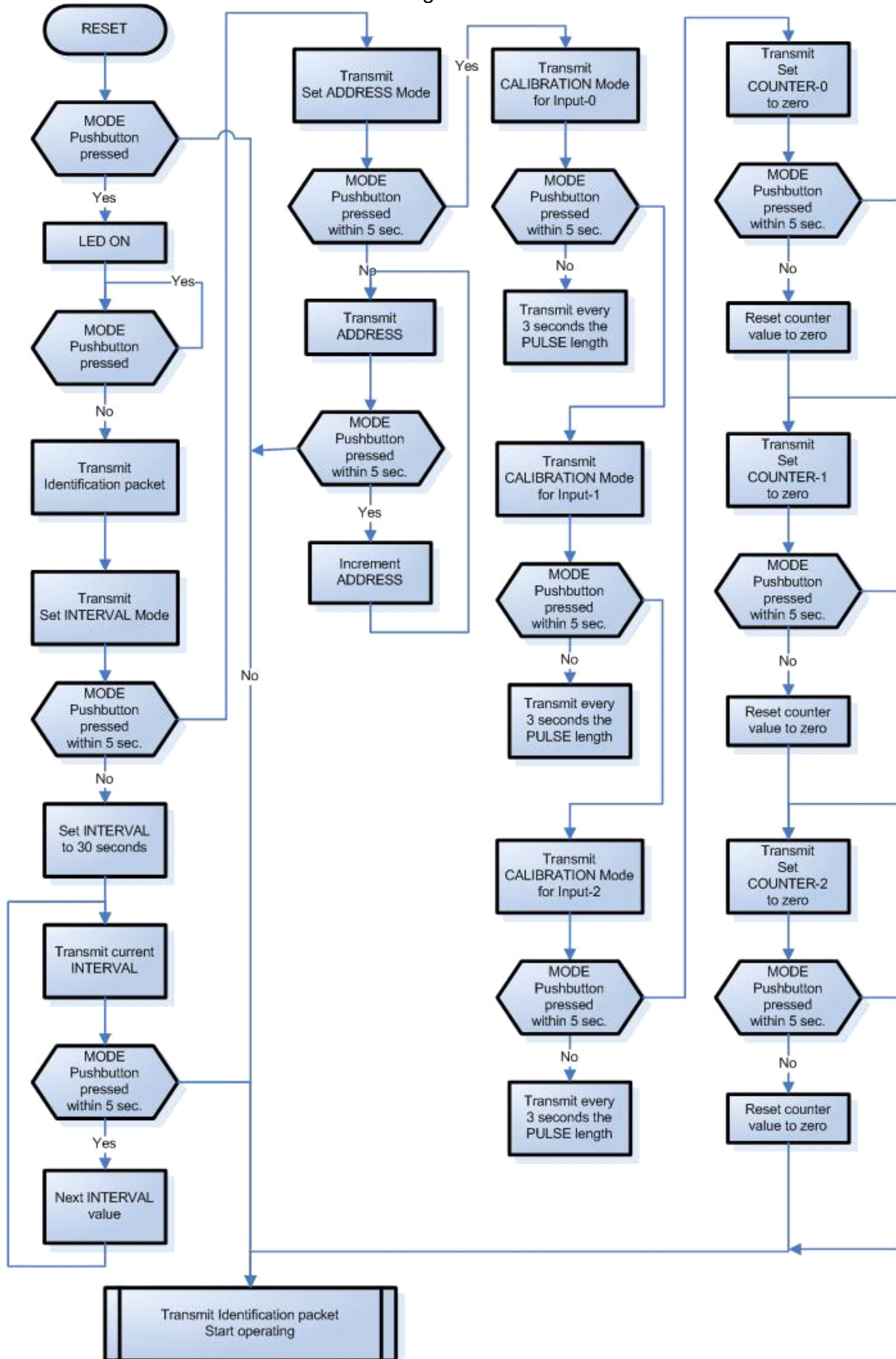
1. The transmit interval of the counter value(s),
2. Set the device address,
3. Enter calibration mode, (note: the device is already calibrated)
4. Reset the counter value(s) to zero.

To enter the settings or enable the calibration mode:

- Disconnect the power from the RFXMeter for at least 10 seconds,
- Hold the MODE pushbutton,
- Reconnect the power to the RFXMeter,
- The green LED will light indicating that the device has entered the settings mode.
- Release the MODE pushbutton.

The full process how to set the modes is displayed on the next page.

## Mode settings and calibration



## 7. How to set the transmit Interval Rate.

- Start the RFreceiver program using an RFXCOM X10 receiver.
- Disconnect the power from the RFXMeter for at least 10 seconds.
- Hold the MODE pushbutton and connect the power.
- The green LED will light indicating that the device has entered the settings mode.
- Release the MODE pushbutton.
- The message **SET INTERVAL RATE** is transmitted.
- After 5 seconds the initial interval value of 30 seconds is set and transmitted.
- When the pushbutton is pressed again within 5 seconds the next interval value is set and the new value will be transmitted. The RFXMeter will return to operation when the pushbutton is not pressed for 5 seconds.

Interval Rates are: 30 seconds, 1 minute, 6, 12, 15, 30, 45 and 60 minutes.

## 8. How to set the base address of the RFXMeter device.

- Start the RFreceiver program using an RFXCOM X10 receiver.
- Disconnect the power from the RFXMeter for at least 10 seconds.
- Hold the MODE pushbutton and connect the power.
- The green LED will light indicating that the device has entered the settings mode.
- Release the MODE pushbutton.
- The message **SET INTERVAL RATE** is transmitted.
- Press within 5 seconds the MODE pushbutton.
- The message **SET ADDRESS mode** is transmitted.
- After 5 seconds a normal data packet with the current address is transmitted.
- When the pushbutton is pressed again within 5 seconds the address is incremented and the new value will be transmitted. The RFXMeter will return to operation when the pushbutton is not pressed for 5 seconds.

## 9. How to calibrate the RFXPwr module.

**Note: The RFXPwr module is already calibrated in factory.**

- Turn the potentiometer R12 a little to the right if the unit runs to slow.
- Turn the potentiometer R12 a little to the left if the unit runs to fast.

The next procedure can be used to calibrate the RFXPwr module using the software. There must be a constant load of at least 8 Ampere (@230V 1840Watt, @120V 960Watt) and the power usage must be measured with a calibrated Watt meter.

- Start the RFreceiver program using an RFXCOM X10 receiver.
- Disconnect the power from the RFXMeter for at least 10 seconds.
- Hold the MODE pushbutton and connect the power.
- The green LED will light indicating that the device has entered the settings mode.
- Release the MODE pushbutton.
- The message **SET INTERVAL RATE** is transmitted.
- Press within 5 seconds the MODE pushbutton.
- The message **SET ADDRESS mode** is transmitted.
- Press within 5 seconds the MODE pushbutton.
- The message **CALIBRATION mode for Input-0** is transmitted.
- If RFXPwr module 0 must be calibrated wait until the calibration mode is entered otherwise press within 5 seconds the MODE pushbutton.
  - The message **CALIBRATION mode for Input-1** is transmitted.
  - If RFXPwr module 1 must be calibrated wait until the calibration mode is entered otherwise press within 5 seconds the MODE pushbutton.
  - The message **CALIBRATION mode for Input-2** is transmitted.
  - Wait until the calibration mode for RFXPwr module 2 is entered.
- Adjust the potentiometer until the power usage measured by the RFXPwr module is equal to the power usage on the calibrated Watt meter.
- When finished, remove the power from the RFXMeter.

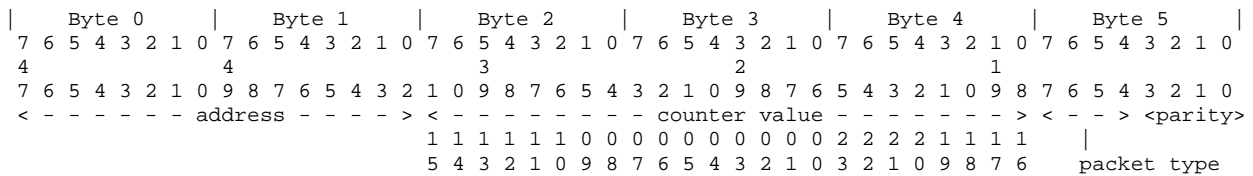


## 10. How to reset the counter value for a module.

- Disconnect the power from the RFXMeter for at least 10 seconds.
- Hold the MODE pushbutton and connect the power.
- The green LED will light indicating that the device has entered the settings mode.
- Release the MODE pushbutton.
- The message **SET INTERVAL RATE** is transmitted.
- Press within 5 seconds the MODE pushbutton.
- The message **SET ADDRESS mode** is transmitted.
- Press within 5 seconds the MODE pushbutton.
- The message **CALIBRATION mode for input-0** is transmitted.
- Press within 5 seconds the MODE pushbutton.
- The message **CALIBRATION mode for input-1** is transmitted.
- Press within 5 seconds the MODE pushbutton.
- The message **CALIBRATION mode for input-2** is transmitted.
- Press within 5 seconds the MODE pushbutton.
- The message **COUNTER for input-0 will be set to zero** is transmitted.
- If the counter for input-0 must be set to zero wait 5 seconds otherwise press the MODE pushbutton.
  - The message **COUNTER for input-1 will be set to zero** is transmitted.
  - If the counter for input-1 must be set to zero wait 5 seconds otherwise press the MODE pushbutton.
  - The message **COUNTER for input-2 will be set to zero** is transmitted.
  - If the counter for input-2 must be set to zero wait 5 seconds otherwise press the MODE pushbutton.
- The RFXMeter will return to operation now.

## 11. RFXMeter RF data format.

Message length 48 bits (decimal)



2 bytes address. Byte 2 = byte 1 with the complement of the upper nibble (bit 7-4). This way max 256 metering modules can be used.

Counter value for an RFXPwr module measures with an accuracy of 0.001kWh and thus a value from 0 to 16777.215 kWh.

Packet type:

- 0000 normal data packet
- 0001 new interval time set.
  - Byte 2 0x01 30 seconds
  - 0x02 1 minute
  - 0x04 6 minutes (RFXPower = 5 minutes)
  - 0x08 12 minutes (RFXPower = 10 minutes)
  - 0x10 15 minutes
  - 0x20 30 minutes
  - 0x40 45 minutes
  - 0x80 60 minutes
- 0010 calibrate value in <counter value> in µsec.
- 0011 new address set
- 0100 counter value reset to zero
- 1011 counter value set
- 1100 set interval mode within 5 seconds
- 1101 calibration mode within 5 seconds
- 1110 set address mode within 5 seconds
- 1111 identification packet
  - Byte 2 = firmware version
    - 0x00 – 0x3F = RFXPower
    - 0x40 – 0x7F = RFU
    - 0x80 – 0xBF = RFU
    - 0xC0 – 0xFF = RFXMeter
  - Byte 3 = interval time (see packet type 0001)

4 bits parity. This is the complement of:

- byte 0 bit 7-4 + byte 0 bit 3-0 + byte 1 bit 7-4 + byte 1 bit 3-0
- + byte 2 bit 7-4 + byte 2 bit 3-0 + byte 3 bit 7-4 + byte 3 bit 3-0
- + byte 4 bit 7-4 + byte 4 bit 3-0 + byte 5 bit 7-4

## 12. DIY options.

The RFXMeter device has 3 slots for RFXCOM modules.  
The user can also create his design for a metering module.

### 12.1. Header connections:

JP0, JP1, JP2

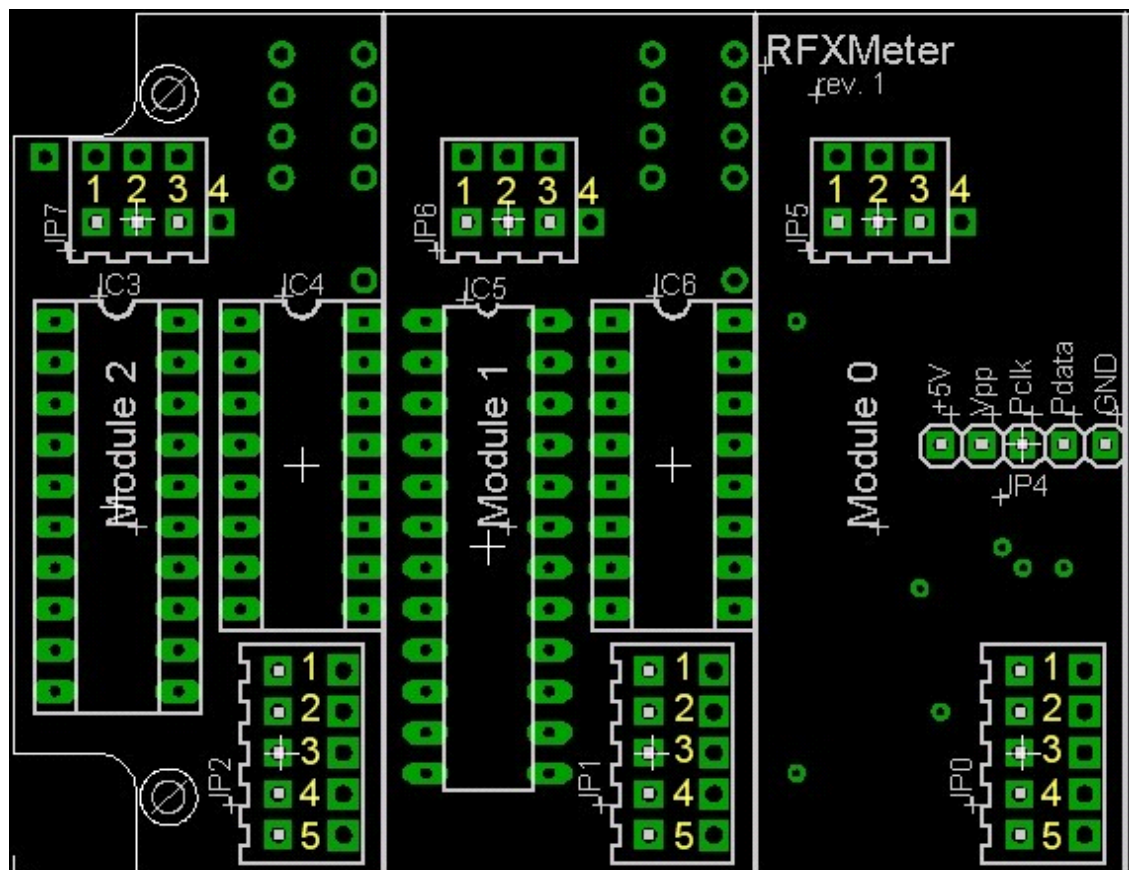
- Pin 1 counter input to the RFXMeter
- Pin 2 not connected
- Pin 3 connected to Pin 3 of JP0, JP1, JP2.
- Pin 4 Ground
- Pin 5 connected to Mode pushbutton.

JP5, JP6, JP7

- Pin 1 +5 Volt in from RFXMeter power supply (total for all 3 modules is max 140mA)
- Pin 2 Ground
- Pin 3 JP5 is 9V AC output to RFXMeter power supply. JP6, JP7 not connected
- Pin 4 not part of JP but connected to voltage input of the RFXMeter power supply.

### 12.2. Board layout.

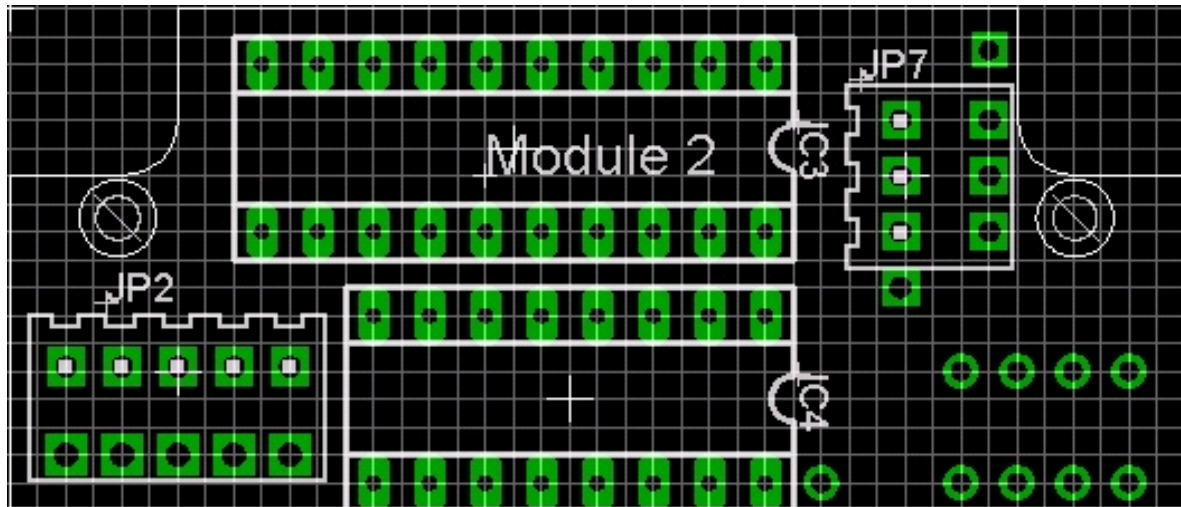
It is also possible to use the free IC3, IC4, IC5 and IC6 locations.



### 12.3. *Module dimensions.*

Grid used is 0.05 inch.

Module dimensions 0.9 inch x 2.1 inch



### 13. **Warnings:**

RF signals are possible disturbed and it has not been justified for this equipment at uses in circumstances where life-threatening or dangerous situations are possible.

### 14. **Copyright notice.**

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### 15. **Revision history.**

Version 3.0 - August 2, 2007

RFXPwr module description moved to a dedicated RFXPwr document.

Text layout changed.