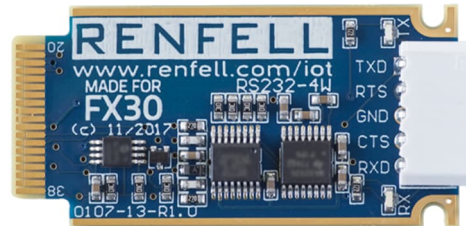


**Renfell Engineering Pty Ltd**

**RS232 4 Wire**

**FX30 Internet of Things card**



## Introduction

The Renfell Engineering RS232 4 Wire IoT card allows the user to add an additional high-speed RS232 serial port to Sierra Wireless products that support the IoT expansion slot – the FX30 programmable IoT Gateway and mangOH™ family of boards. Based around a highly integrated FTDI chipset, standard and non-standard baud rates from 183 baud up to 3Mbaud are available. Separate TX and RX LEDs provide a visual indication of transmit and receive data as an aide to debugging data communications.

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## Important Notice

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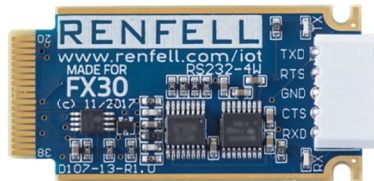
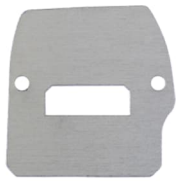

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The FX30 programmable IoT Gateway is a product of Sierra Wireless, Inc. mangOH™, Legato™ and the mangOH™ symbol are Registered Trademarks® of Sierra Wireless, Inc and are used with permission. All other product and company names are trademarks™ or registered® trademarks of their respective holders. Use of them does not imply any affiliation with or endorsement by the respective trademark owners

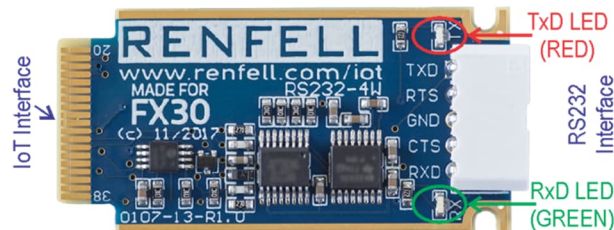
### Items Supplied in the Kit

The following items are supplied in the kit. Please check carefully that all items are present and contact your supplier if any are missing.

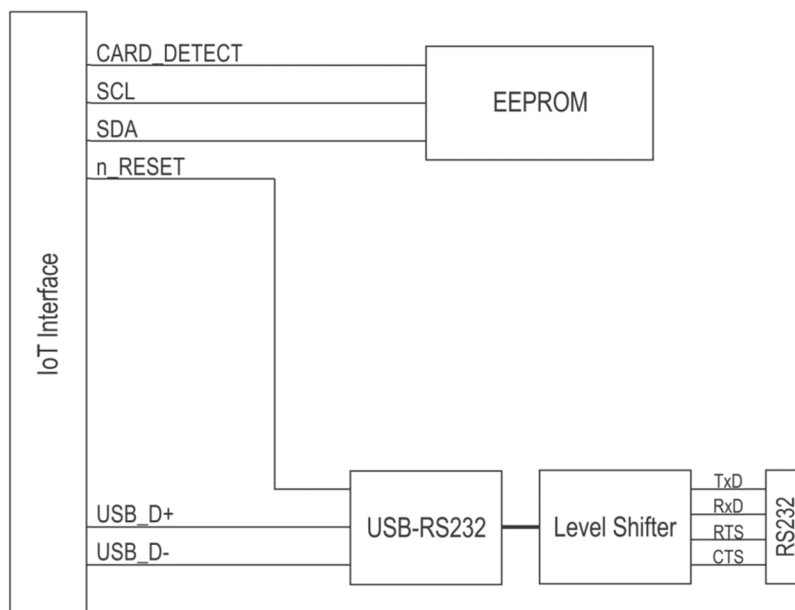
1	RS232 4Wire IoT Card	
2	Aluminium endplate for FX30	
3	2 x M2 x 6 Pan head screws	
4	Identification sticker	

Please note that the Aluminium endplate and M2 screws may be packaged together.

### Board Overview



### Block Diagram



**Connection Details**

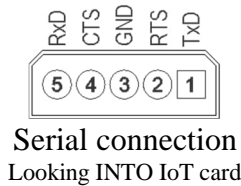
The IoT card is fitted with a 5 way Phoenix Contact COMBICON PTSM 0,5/5-HH-2,5 socket and requires the matching Phoenix Contact COMBICON PTSM 0,5/5-P-2,5 screwless plug (not supplied with the IoT card).

The plug is available in two versions – they are identical except for the colour

Supplier	Order Number (Black)	Order Number (White)
Phoenix Contact	1778861	1704858
Digikey	277-2325-ND	
Element 14	277-6563	
Mouser	651-1778861	651-1704858
RS Components	712-4487	

Your IoT card distributor may also have small quantities of the appropriate connector available for purchase along with the IoT card.

The IoT card is configured as a RS232 Data Terminal Equipment (DTE) interface – the same as presented by a RS232 connection on a PC.



Signal Name	Direction into IoT card	PTSM Pin No	DB9M Pin No
TxD	OUT	1	3
RxD	IN	5	2
RTS	OUT	2	7
CTS	IN	4	8
GND		3	5

**Assembling the IoT card into the FX30**

Some minor electronic and mechanical skills are required to assemble the IoT card and the FX30.

- Skill Level: Easy
- Tools Required: ESD safe workspace  
#1 Phillips Screwdriver

**NOTE:** Both the FX30 and IoT card are sensitive, precision electronic devices and some care is required during assembly. If you are not comfortable doing this assembly, please get a trained technician to do it for you.

**WARNING:** Before commencing work, ensure that the FX30 is completely unplugged from the power supply, Ethernet/Serial connection and the GNSS/CELL antennas.

*Step 1*



Undo the two countersunk M2 Phillips Head screws and set them aside

*Step 2*



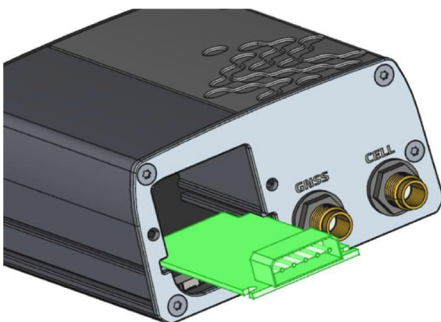
Once both screws have been removed, take the original end-plate off the FX30 and set it aside.

*Step 3*



After removing the end-plate, the IoT slot (and SIM slot) can be accessed

*Step 4*



Carefully line up the IoT card with the slots in the aluminium extrusion.  
Take care that both edges of the IoT card are in the slots – it is possible to put the card in on a slight angle and then it won't seat home correctly

*Step 5*



Gently push the IoT card into the slot. There should be almost no force required at this point.

The IoT card is ready to be seated into the edge connector in the FX30 once the card has about 6 mm left outside the FX30 housing.

Firmly push the card into the FX30 until the end of the card is flush with the outside of the FX30 housing.

*Step 6*



Place the replacement end-plate (supplied with the IoT card) over the end of the connector on the IoT card and line up the two screw holes.

*Step 7*



Use the two Pan-Head screws supplied with the IoT card to screw the end-plate into place.

Take care when starting the screws not to cross-thread them in the FX30 or you will damage the existing threads.

Likewise, do not over-tighten the screws or you will strip the thread in the FX30.

### Usage Example

**Note:** The IoT card MUST be 'enabled' by de-asserting the *n\_RESET* pin on the IoT connector before it will respond to commands

On the FX30 this is done automatically when the hardware and there is no way to manually enable or reset the IoT card

#### Test that the IoT card is recognised by the FX30 board

1. Open a SSH windows to the FX30 board and log in as root.
2. (for FX30 firmware based on Legato 18+), type the following at the shell prompt to load the kernel module/driver:

```
modprobe ftdi_sio
```

3. In the SSH window, type the following at the shell prompt:

```
logread -f | grep -i "usb"
```

4. Insert the IoT card into one of the slots on the mangOH™ board. Something similar to the following should be displayed in the first SSH window:

```
Jan 6 00:05:08 mangoh-57 user.info kernel: [ 301.936181] usb 1-1.3.3: new full-speed
USB device number 9 using msm_hsic_host
Jan 6 00:05:08 mangoh-57 user.info kernel: [ 302.030367] ftdi_sio 1-1.3.3:1.0: FTDI
USB Serial Device converter detected
Jan 6 00:05:08 mangoh-57 user.info kernel: [ 302.050144] usb 1-1.3.3: Detected FT-X
Jan 6 00:05:08 mangoh-57 user.info kernel: [ 302.052891] usb 1-1.3.3: Number of
endpoints 2
Jan 6 00:05:08 mangoh-57 user.info kernel: [ 302.057317] usb 1-1.3.3: Endpoint 1
MaxPacketSize 64
Jan 6 00:05:08 mangoh-57 user.info kernel: [ 302.089546] usb 1-1.3.3: Endpoint 2
MaxPacketSize 64
Jan 6 00:05:08 mangoh-57 user.info kernel: [ 302.093514] usb 1-1.3.3: Setting
MaxPacketSize 64
Jan 6 00:05:08 mangoh-57 user.info kernel: [ 302.101327] usb 1-1.3.3: FTDI USB
Serial Device converter now attached to ttyUSB0
```

Note that the formatting may be different depending on the width of the SSH window.

5. Now remove the IoT card from the mangOH™ board.

```
Jan 6 00:23:40 mangoh-57 user.info kernel: [ 1413.509934] usb 1-1.3.3: USB
disconnect, device number 9
Jan 6 00:23:40 mangoh-57 user.info kernel: [ 1413.518876] ftdi_sio ttyUSB0: FTDI USB
Serial Device converter now disconnected from ttyUSB0
```

To cancel the logread, click in the SSH window and press <CTRL-C> to return to the shell prompt:

```
^C
root@mangoh-57:~#
```

#### Test the RS232 serial connection

1. Open a SSH windows to the mangOH™ board and log in as root.
2. Ensure the IoT card is inserted into the mangOH™ board.
3. Connect the IDC-10 to DB9 Transition Cable (Renfell P/N 34-00012) to the IDC-10 connector on the IoT card.
4. Connect the DB9 to a PC using a DB9-DB9 crossover cable (2->3; 3->2; 5->5)
5. Open a terminal program (such as TeraTerm Pro - <http://ttssh2.osdn.jp/index.html.en> or PuTTY - <http://www.chiark.greenend.org.uk/~sgtatham/putty/>) on the PC.



- In the terminal program, set the appropriate Port and the following serial parameters:
  - Baud: 9600
  - Data: 8 bit
  - Parity: None
  - Stop: 1 bit
  - Flow control: None

- In the SSH window to the mangOH™ board, type the following:

```
echo "Hello, world" > /dev/ttyUSB0
```

The red TX LED should flash briefly on the IoT card, and the text “Hello, world” appear in the terminal program on the PC.

- In the SSH window to the mangOH™ board, type the following:

```
cat /dev/ttyUSB0
```

- In the PC terminal program, type the following:

```
Hello right back
```

and press enter. The green RX LED should flash briefly on the IoT card, and the text “Hello right back” should appear in the SSH window to the mangOH™ board.

- Exit the cat command on the mangOH™ board by pressing <CTRL>-C

```
root@mangoh-57:~# cat /dev/ttyUSB0
Hello right back
^C
root@mangoh-57:~#
```

## Errata

- FTDI Kernel card drivers are only available in Legato Release 16.01 for FX30™ or later
- For FX30 firmware based of Legato 18+, the FTDI drivers are provided as kernel modules, not built into the kernel. The `ftdio_sio` module must be `modprobe'd` into the kernel before the IoT card will enumerate

## References

- Latest product information: <http://www.renfell.com/IoT/index.html>
- mangOH™, FX30 and Legato Tips, Articles and Tutorials: <https://www.littlesliceofmangoh.com>
- USB-Serial converter IC: <http://www.ftdichip.com/Products/ICs/FT230X.html>
- FX30 product page: <https://www.sierrawireless.com/products-and-solutions/embedded-solutions/programmable-iot-gateways-modems/>
- mangOH™ information: <http://mango.io>
- Legato information: <http://legato.io>