

Joey Timing System V1.0



Edition 1, May 2017

Introduction

The Joey Timing System uses UHF Gen 2 RFID technology in the 866-928MHz frequency range. The unit incorporates its own 8.5dBi antenna and has the capacity to connect to a further three external patch antennas. The patch antennas that can be used with the Joey system must be approved types by RFID Race Timing Systems. The unit has been designed to be easy to setup and use.

There are two distinct models depending on the country of use;

1. FCC – Covers the 902-928Mhz spectrum and comes equipped with an internal circular polarised antenna tuned for this frequency.
2. EU – Covers the 865-868Mhz spectrum and comes equipped with an internal circular polarised antenna tuned for this frequency.

The frequency of the internal reader must be set to the same frequency of the model (internal antenna) otherwise the unit will not work as designed. You cannot use an EU model in an FCC environment and such use is illegal with possible heavy fines from government bodies if caught. On ordering, we will specify which model can be used in your country of operation.

Status LED's

1. Mode – The LED will be lit green when in read mode (reading tags) and unlit (default) when not in read mode. The LED will flash red on and off every second when a successful connection to the Outreach server is made (3G or LAN). The LED will flash red and green when in read mode AND Outreach is connected.
2. GPS – Lit red on start-up. Will flash on and off green when a GPS PPS signal is being received. The Joey should be put into read mode only when the PPS signal has been obtained for correct time sync of the clock.
3. Read – Green LED whenever a tag is read. Same output signal as buzzer.
4. Bat – Battery indicator. Green 45-100%, Yellow 25-44% and Red less than 25%.

Read Mode

When the Joey is powered on the internal unit initialises many functions which can take up to 6 seconds. During this period, the unit is unresponsive to commands. After this period, the unit will be in a wait state for any commands. The Joey will not read tags in this state (out of read mode – no green LED). To start reading tags the green start/stop button must be pressed. A double beep will be heard to signify entering read mode and the mode LED will be lit green (flashing red/green if Outreach also connected). You should then test the unit with a spare tag to ensure it reads (and beeps if the buzzer is turned on).

Bluetooth

The Joey is equipped with Bluetooth LE (low energy) communications. Proprietary software from RFID Race Timing Systems is needed to communicate with the Joey. This software is free to download for IOS and Android devices and future devices. The range can be up to 20m line of sight.

Start/Stop Button

Press this button for at least 0.3 seconds then release to start or stop the Joey from reading tags. An audible beep will be heard and it may take up to 3 seconds for the unit to start reading tags as it initialises. Part of the initialising is setting the internal time accurately using the GPS PPS signal. The button is not active until around 8 seconds from turning the Joey on at the power switch. We also highly recommend that the GPS time pulse is being received before starting the Joey reading.

GPS

The GPS sensor and antenna picks up satellites when outdoors to synchronise both date and time to the local area. A time zone is also needed (changed in settings). The GPS receives a very precise pulse each second (PPS) which is used to set the internal clock of the Joey. If the Joey is being used indoors then time can be set manually using RFIDServer or the mobile Bluetooth app. The time is set when pressing the green start/stop button.

Battery Charging and Power

The Joey has an internal 97Whr Li-ion battery that is used for powering the device for up to 10.5hrs on a full charge. This battery is custom made for the Joey and cannot be replaced with a 3rd party battery. New batteries are available from RFID Race Timing Systems. The battery is charged via the AC port using the external supplied AC adapter. No other power source should be connected to the Joey otherwise damage may occur. Charging usually takes around 5-7 hours and the charger can be left attached and powered overnight. You do not need to turn the Joey on to charge the unit. Because the battery is less than 100Whr and inside equipment it can currently be taken as checked in baggage on aircraft (these rules may change at any time depending on the carrier).

External Antennas

The Joey System ships with up to three (3) external antenna outputs using a BNC male connector. The antenna must be compatible with the reader and non-connection will be sensed by an open DC circuit. Some antennas can present a low resistance between signal and ground and not work with the Joey System. RFID Race Timing Systems supplies special antennas that are compatible with the Joey System whilst maintaining the correct power and frequency outputs for the country of operation.

Frequencies

The Joey can currently operate in frequencies for Australia, NZ, Europe and FCC (USA and South America). Other frequencies will be added in the future. The frequency is changed with the Bluetooth app and a password is required to alter this setting. It is not normally changed after leaving the factory.

Connectivity

The Joey System can connect via ethernet to a laptop computer enabling the use of legacy interfaces like RFIDServer (a free download from our website). Both Dynamic and Static IP addresses can be assigned to the Joey. To assign a dynamic IP address a DHCP server (router) is required on the network on turning on the Joey. You can view the assigned IP address using the Bluetooth app. A static IP address is also assigned to the Joey in case a DHCP server is not found. This is set as 192.168.1.90 in the factory and can be changed and saved using the Bluetooth app.

A connection can also be made using our free Bluetooth app which currently is available for Apple IOS and android devices. The app layout is configured for smartphones. The Bluetooth connection is available immediately on power up of the Joey System but settings will not be available for 6 seconds immediately after power on. Only one connection can be made at a time and this includes either one Bluetooth or ethernet connection. If RFIDServer does not respond then check to see if there is an active Bluetooth connection.

Figure 1. The external inputs and outputs of the Joey system V1.0 (underside)



Ports and Buttons

1. Buzzer – Can be set to High, Low or Off via settings
2. Ethernet – 10BaseT connection. For Dynamic IP address cable must be plugged prior to turning on. Can also be connected by static IP set in settings
3. Ext Ant Ports – BNC connectors for external patch and mat antennas (see section on antennas)
4. On/Off – Lit red when unit is turned on
5. Charge/AC – Plug in supplied AC charger adapter
6. Start Stop – Starts and stops the Joey from reading tags. Audible beep will signal on pressing
7. LED's – see Status LED's
8. Bluetooth – Cover over Bluetooth antenna

Top

9. GPS antenna (optional dual GPS/3G antenna)

Figure 2. The external inputs and outputs of the Joey system V1.0 (side)



Inside the Joey System

The enclosure can be opened by removing the two screws at the flange and carefully prising the top antenna cover open as seen below (Fig 3). For ongoing maintenance the operator should know how to locate and change the 3V CR2032 coin cell battery (replace every 3 years), how to attach the power connector initially after receiving a newly shipped unit, and the location of the sim card slot for the optional modem. Electrostatic shocks can damage the unit so be careful to ground the body when touching any electronic parts. A check should also be made for any loose connectors if the unit does not operate correctly. The Joey is water resistant but not waterproof so do not immerse the unit in water. In heavy rain conditions a plastic bag should be placed over the unit for added protection.

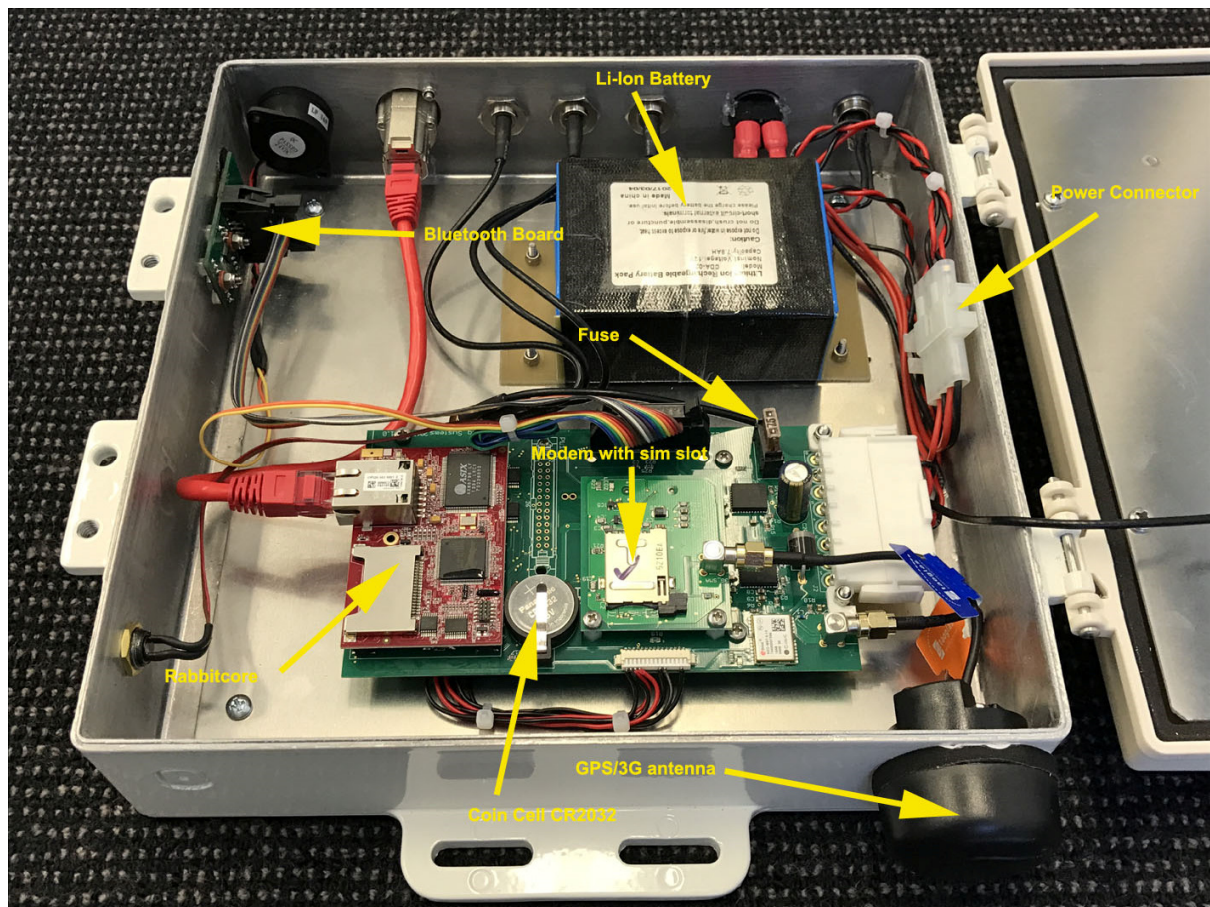


Figure 3. Internal layout of Joey System V1.0

Setting up the Joey System

The supplied clamp and tripod should be assembled so that the joey is at the optimum height with the antenna at the same height as the tags on the athletes. The radiation pattern of the antenna is a cone extending from the middle of the plastic cover outwards. The tripod can be set to any height. For best read performance, the Joey should face the tag at a 45-degree angle so that the tag is in the read-zone for long enough time to ensure pickup. If using a second side antenna it is advisable to

have this point from the other side of the course also facing 45 degrees to the oncoming runner. You can experiment with different heights and angles according to the type and speed of the event.

If you have external antennas these can be placed on either side of the oncoming athlete to improve tag readability. The worst scenario for tag reading is when the tag is obscured by another runner or object as it passes through the read field.

We recommend only using the recommended UHF Gen 2 tags which RFID Race Timing Systems can supply

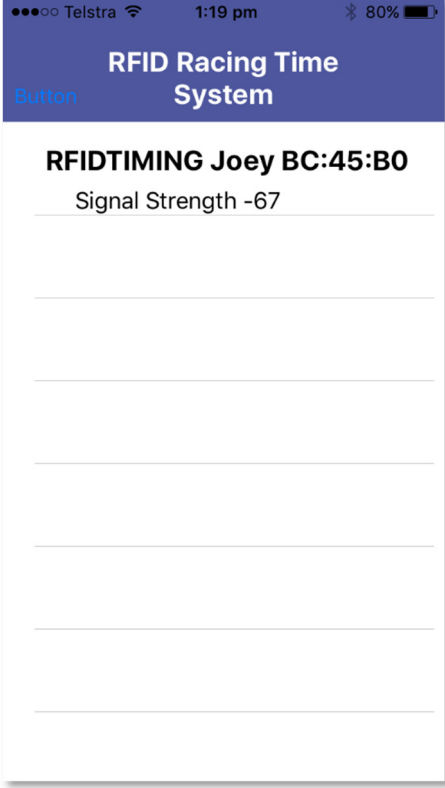
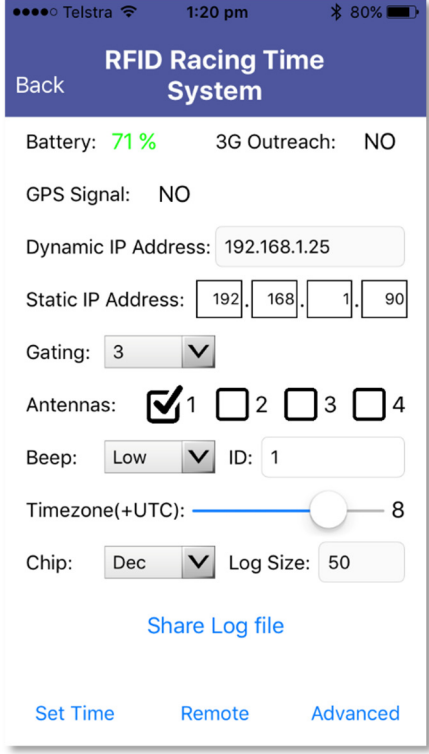
- Smartrac Dogbone Monza r6 on 4mm foam spacer (for running)
- Smartrac Short Dipole Monza r6 or NXP uCode7 (for cycling)
- Hutag XC-2 (for multisport). Must use extra external antennas.

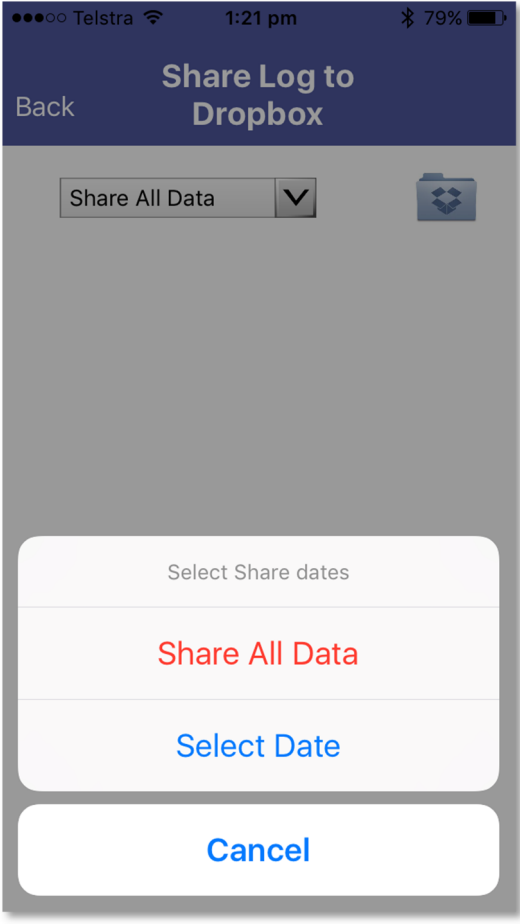
The Joey can be clamped to the supplied tripod using the supplied clamp as per the picture below.



Figure 4. Correct assembly of the supplied clamp onto tripod.

Using the RFID Race Timing Systems App (IOS version shown)

	After opening the app you will get a screen showing all the active Joey systems in the area. We suggest just turning on one Joey at a time but each unit does have their own unique mac address. The mac address is that of the Bluetooth device, not the Rabbitcore. Select the device to open it.
	This screen (the main page) will open and all settings will be populated. The Joey cannot be in read mode and you should also not try to connect to the Joey using RFIDServer and the app simultaneously. - Dynamic IP address is read only and is only available if a DHCP router is on the LAN when the Joey is turned on. A DHCP address will not be assigned if the router and LAN cable is connected AFTER turning the Joey on. - The static IP address can be changed and allows connection via an ethernet cable when directly connecting to a laptop. Make sure the laptop also has a static IP address for correct communication via ethernet. - Gating is the seconds the Joey waits before determining the best read signal from the tag. We suggest using 1 second for cycling and 3 seconds for running. - Antennas can be turned on and off and an antenna will be automatically

	turned off it there is no antenna detected. • The Joey can be assigned an ID from 1-254. • The beeper for chip reads can be turned on and off and two volumes can be selected. • Time zone slider can be changed to add or subtract the hours from UTC time. This is important as the units GPS time sync always reads UTC time to the nearest 1/1000 second. • Chip reads can be saved in decimal or hexadecimal format. Currently decimal is only supported. • The number of records saved is shown in the Log file size. Press the other buttons for the corresponding submenus.
	By pressing Share Log File you can download the saved records to your nominated Dropbox account. The files are saved in the folder RFID RTS Files. On running the app for the first time you will need to give permission to access your own Dropbox account. Subsequently this login will be stored and used. You will need to delete the app and reinstall to change the Dropbox account. All data can be saved or you can save a chunk of data based on a From and To time as data is saved in time series. Note: We advise on deleting the log files after each race as it does take some time to download a large number of records.

Telstra 1:20 pm 79%

Back Set Time

13:20:49 16-5-2017

Set Time

Sat 13 May	10	17	
Sun 14 May	11	18	
Mon 15 May	12	19	am
Today	1	20	pm
Wed 17 May	2	21	
Thu 18 May	3	22	
Fri 19 May	4	23	

The time of the Joey can be set manually but we do not recommend this. The correct procedure is to leave the unit turned on outdoors for at least 1 minute so that the accurate GPS time can sync the internal Joey clock.

Telstra

1:20 pm

80%

Back

Remote

Remote:

3G

▼

Port:

11111

Remote Server:

173

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192

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106

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122

APN:

telstra.internet

Gateway:

192

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168

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1

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1

DNS Server:

192

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168

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1

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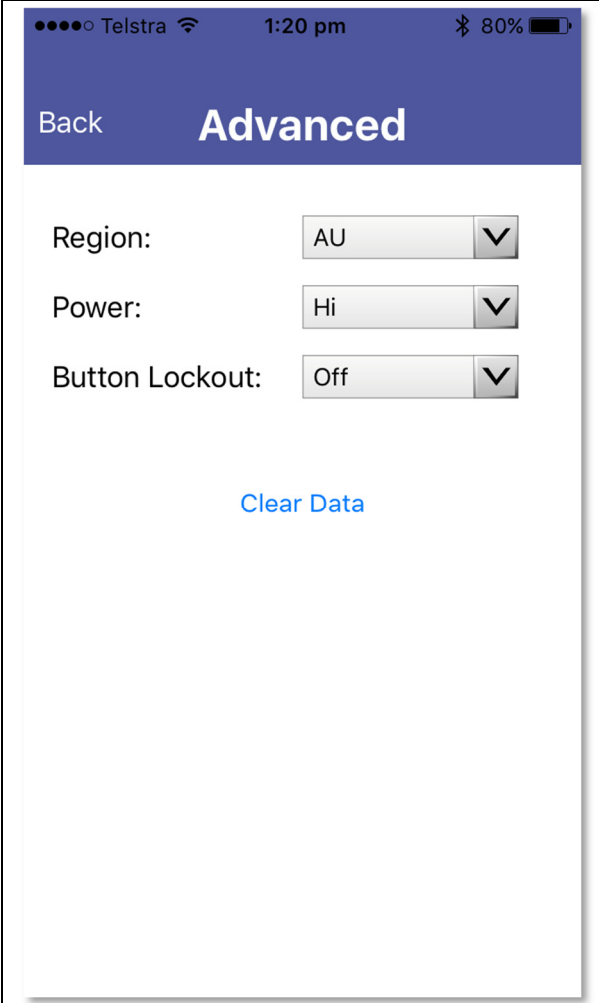
1

Rabbit MAC:

f8:de:89

The Remote page is only used if the Joey is to be used with Outreach. Outreach is our remote relay software that allows the unit to send real-time chip reads to our central servers using an internet gateway.

- The gateway can either be 3G (internal modem using sim card) or an external gateway connected to the internet via LAN (ethernet cable).
- Port should be set to 11111
- The remote server IP address can be obtained from RFID Race Timing Systems and is the public IP address of the Outreach server.
- The APN is unique to the sim card being used when the inbuilt 3G modem is being used.
- If using an external gateway then you will need the IP address of this gateway and DNS server IP address.
- The rabbit mac address is needed when using Outreach on the host computer. It is read only.

	The Advanced page allows access to extra (rarely changed) settings. There is a password protect on the Region. You may not change the region without permission from RFID Race Timing Systems and using the wrong region can result in a hefty fine from a government agency if you are caught transmitting the wrong frequency. Currently you can set the readers to low or high power read mode. In V1.0 of the app the high-power mode is selected by default. The button lockout works by de-activating the green start/stop button on the side of the Joey unit. The only way to stop the Joey reading when this is activated is to turn the unit off. Clear Data is used to clear the log file. The Joey must be turned off after clearing the log file to complete the purging of data.
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