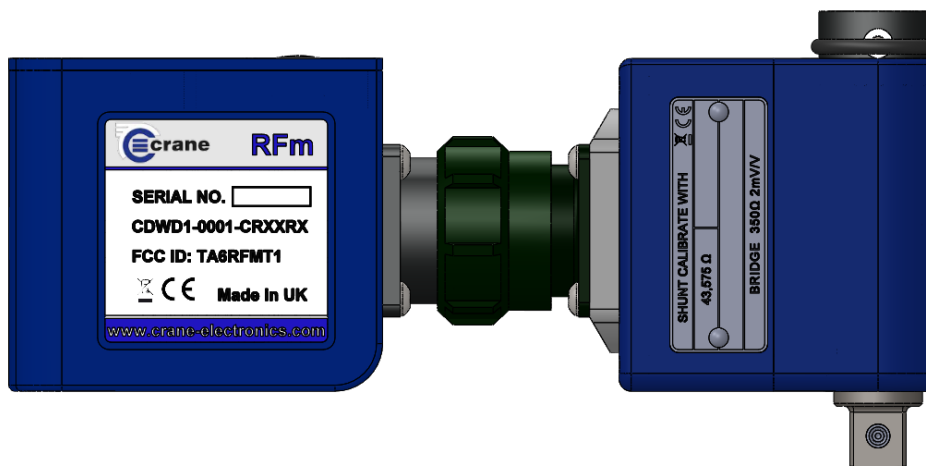


OPERATORS MANUAL

RFm

Manual 1212-01 Issue 1 Draft

Crane Electronics Ltd



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The contents of this manual are subject to change without prior notice.

CONTENTS

Contents	2
CE Marking / Product Disposal	3,4
About this manual	4
Packing List	5
Care & Storage	5
Batteries	5
Warnings	6
Features & Dimensions	7
Overview – RFm	8
Specifications	8,9
Connecting to an RFm	10
Features & Functions	10
Battery Charging	11
Status LED	12
RFm Button	12
IQVu Setup with an RFm	13
Pairing the RFm	16
Loading Jobs	18

CE MARKING

Manufacturer: Crane Electronics Ltd

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Declares that this product has been assessed and complies with the requirements of the relevant CE Directives.



Changes or modifications to the RFm not expressly approved by Crane Electronics Ltd could void the user's authority to operate the equipment.

COMPLIANCE

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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur, in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician to help.

PRODUCT DISPOSAL

Applicable in the EU and other European Countries with separate collection systems



The symbol shown here and on the product means that the product is classed as Electrical or Electronics Equipment and should not be disposed with normal commercial waste at the end of its working life.

The Waste of Electrical and Electronics Equipment (WEEE) Directive (2002/96/EC) has been put in place to recycle products using best available recovery and recycling techniques to minimise the impact on the environment, treat any hazardous substances and avoid the increasing landfill.

For more detailed information about recycling of this product please contact your local authority or the Company where you have purchased the product.

Battery disposal to take place in line with the AMENDED BATTERIES DIRECTIVE 2013/56/EU.

In Countries outside the EU:

If you wish to discard this product, please contact your local authorities and ask for the correct way of disposal.

ABOUT THIS MANUAL

This manual covers the RFm connected to a CheckStar Multi and communicating with an IQVu.

For information on torque transducers or PC software to be used in conjunction with IQVu, please refer to corresponding manuals accordingly.



Actual screen shots represented in this manual may differ slightly from those within the IQVu app depending on version

For information on the operation of an IQVu please refer to its own manual.

Software Version of IQVu app	=	V2500
Software Version of Torque Module	=	V2.0
Software Version of RFm	=	V1.0

PACKING LIST

The following items are supplied with the RFm.

1 x RFm unit
1 x USB Lead
1 x User Manual (CD)

Please ensure all items are present and notify Crane Electronics Ltd immediately of any shortages.

SPARES AND ACCESSORIES

USB Lead	090301
Li-ion Battery	080183
Desktop Charger	080186

CARE AND STORAGE

Operating temperature range	-20 to +50 degrees C
Storage temperature range	-20 to +50 degrees C
Humidity	10-75% non-condensing
IP Rating	IP40 (indoor use only)

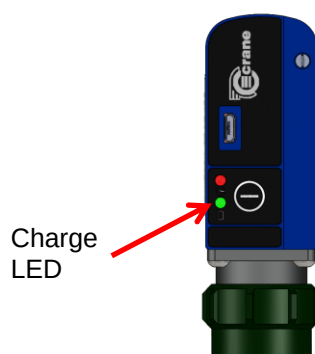
The RFm may be wiped clean with a soft cloth

BATTERIES

The RFm unit has an internal Lithium Ion battery. From fully discharged the unit will require up to a 4 hour charge to attain maximum capacity.

The full capacity of the battery is 600mAh which yields approx. 6 hours of normal use.

When a USB cable is plugged into the socket and attached to an appropriate adapter, the charge indicator LED will illuminate with colour according to the charge status.



LED Status

Red = Charging
Green = Charged

WARNINGS



Maintain unit with care. Keep unit clean for better and safer performance.



Changes or modifications to the RFm not expressly approved by Crane Electronics Ltd could void the user's authority to operate the equipment.



Always operate RFm with approved batteries.



Always operate, inspect and maintain this unit in accordance with all regulations (local, state, federal and country) that may apply.



Do not remove any labels.



Always use Personal Protective Equipment appropriate to the tool used and material worked.



Keep body stance balanced and firm. Do not overreach when operating with the tool. Anticipate and be alert for sudden changes in motion, reaction torque, or forces during the operation.



Ensure work pieces are secure. Use clamps or vices to hold work pieces whenever possible.



Never use a damaged or malfunctioning tool or accessory with this unit.



Follow instructions for changing accessories.



Do not operate this product in explosive atmospheres, such as in the presence of flammable liquids, gases or dust.



This unit contains no user serviceable parts. Only qualified service personnel should replace or fit parts.

BATTERY WARNINGS



Charge the battery before use.



Only use specified charger.



Keep battery terminals clean.



Always store the battery in a dry place.



Do not short circuit the battery.



Do not disassemble the battery.



Do not expose the battery to high temperature.

FEATURES AND DIMENSIONS

Weight 142g

Construction Acetal housing containing a printed circuit board



OVERVIEW

The RFm allows the CheckStar Multi to become wireless when used in conjunction with an IQVu. Previously a CheckStar Multi would connect via a cable to an IQVu or a TorqueStar Opta. This addition to the IQVu family allows the CheckStar Multi to be situated in areas where long lengths of cable would be a hazard, or impractical. The RFm reads the Torque and Angle values in real time and converts them to digital values. The RFm analyses the digital samples using measurement algorithms to calculate properties of the fastening such as Peak or Click. The RFm communicates the final fastening readings to an IQVu using RF giving a range of approximately 10m*. If the RFm loses its link to the IQVu, then it continues to work offline, storing up to 200 readings. It is very easy to pair, (associate the connection), of a RFm with a particular IQVu.

The RFm contains its own power source which is a small rechargeable Lithium Ion battery.

* The RF range depends on the environment in which the RFm and IQVu are being used and the figure quoted is for a relatively metal free work space with the IQVu in line of sight of the RFm.

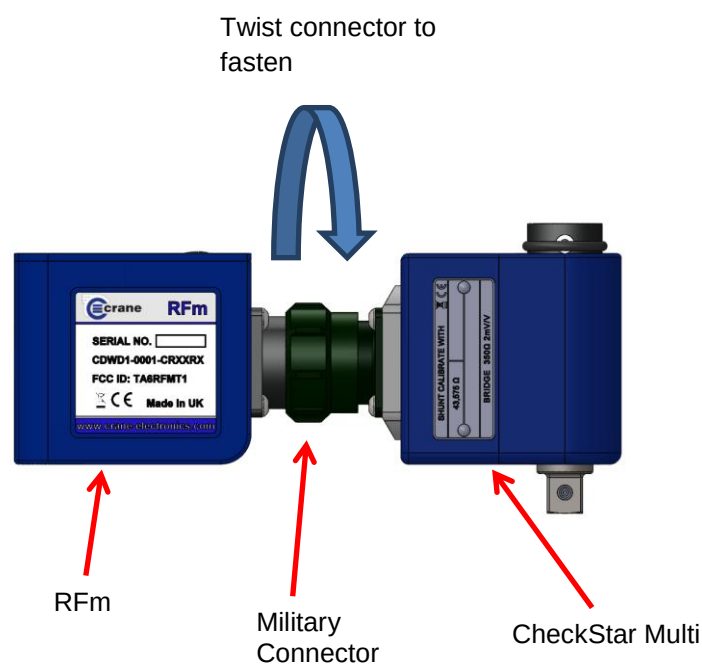
SPECIFICATIONS

Physical Measurement:	Bi-directional torque and angle*, and pulse count * Angle measurement is only available when using a CheckStar Multi with angle encoder.	
Measurement modes :	Peak	Capture of highest torque value during the cycle
	Click	Capture of click point torque during click mechanism operation
	Pulse	Special measurement algorithm for use with impulse tool, incorporating pulse count
Plug & Play:	The following information is read from the memory incorporated in the CheckStar Multi: Torque Range (span), Angle Encoder PPR, Transducer Serial Number, Calibration due date and Torque @2mV/V	
Types of Transducer:	The RFm only connects with CheckStar Multi	
Reading Storage:	The RFm can store up to 200 readings in offline mode.	
LEDs:	The RFm has a: Charge LED used when charging battery internally Status LED Note: the RFm also controls the CheckStar Multi light ring during fastening operations.	
Torque Measurement :	Resolution to 0.006% of transducer span Sampled every 20 micro-seconds (50,000) per second	
Zero Stability:	< 0.1% FSD / °C	
Static Accuracy:	+/-0.2% FSD of connected transducer	
Angle Measurement:	Sample every 1000 micro-seconds (1,000) per second Automatically adapts to PPR of angle transducer using quadrature phase measurement	

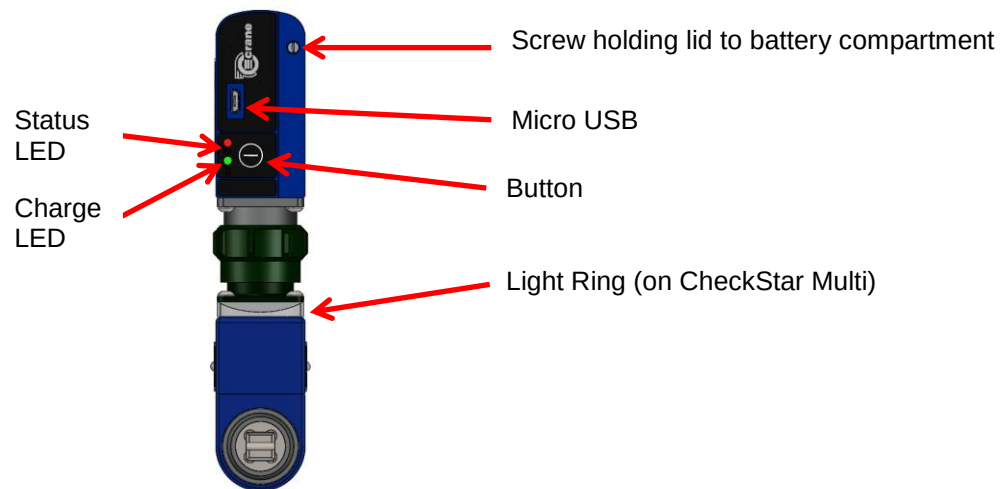
Frequency Response:	A low pass Bessel Filter is employed for conditioning the transducer signal to 'eliminate noise' from the tool measurement User selectable from 75Hz to 4608Hz
Readings:	Readings are organised into subgroups.
Batteries:	Re-chargeable Lithium Ion battery. Capacity 600mAh 3.7V Weight 16g Useable battery life of 6 hours with normal usage
Carrying:	Portable Weight 142g
Dimensions:	30mm (W) x (mean) 91.7mm (L) x 56mm (H) – with military connector 30mm (W) x 63mm (L) x 56mm (H) – without military connector
Ports:	19 pin military connector for connection to a CheckStar Multi USB for diagnostics and battery charging
Communication:	Communicates with an IQVu using 2.400GHz RF
Warranty:	TBC

CONNECTING THE RFm TO A CHECKSTAR MULTI

The RFm connects to the CheckStar Multi via a military connector. The outer shell of the RFm military connector is rotated clockwise to fasten and rotated anti-clockwise to unfasten (when viewed from the RFm towards the CheckStar Multi). The outer shell of the military connector has ribs to help grip during rotation. The action is a bayonet type so during use the connection will not come undone.



MAIN FUNCTIONS AND FEATURES OF THE RFm



CHARGING THE RFm

There are 2 ways to charge the RFm battery.

1. Use the Micro USB lead supplied with the RFm. Connect the Micro B male to the RFm and the USB A male to any suitable USB outlet. The RFm will use the USB voltage to charge the battery taking a maximum of 500mA.

The status of the charging will be shown on the Charge LED:

Red	= Charging
Green	= Charged

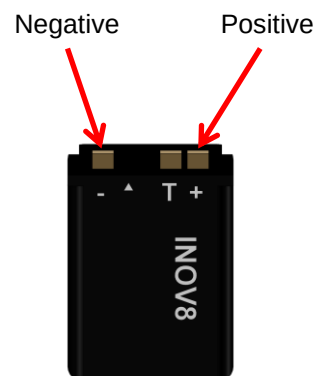
The charging process can take up to 4 hours.

2. ***Please note that the battery charger does not come as standard with an RFm. It is available as an optional extra by contacting Crane Electronics Sales Department.**

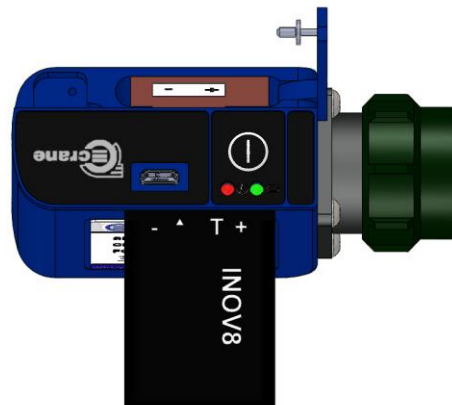
The battery can be removed by releasing the lid screw and pulling the lid back 90°. The battery can then be removed and charged externally in the desktop charger.



Observe polarity of the battery



Follow the instructions supplied with the charger to charge the battery. When the battery is fully charged insert the battery into the RFm and secure the lid with the retaining screw.



RFm STATUS LED

The RFm status LED shows which mode the RFm is in.

Off	= The RFm is powered off.
Blue	= The RFm is On and ready to transmit.
Purple (magenta)	= The RFm is waiting to be paired.
Green	= Diagnostic Mode.
Flashing LED	= Battery power has gone below 10% of capacity.

RFm BUTTON

The RFm button has several functions:

- When the RFm is OFF pressing the button for less than 1s will turn the RFm ON and the status LED will change to blue.
- When the RFm is ON and the button is pressed for approx. 2s the RFm will go into pairing mode and the status LED will change to purple (magenta).
- If the RFm is in pairing mode pressing the button will take the RFm back to normal RF mode and the status LED will change to blue.
- If the RFm is ON and the button is held for more than 5s then the RFm will switch OFF.
- There is a cable diagnostic mode which requires 3 button pushes when in normal RF mode. The status LED will turn green. Pressing the button again will take the RFm back into normal RF mode and the status LED will change to blue.

The RFm will monitor its battery level. If the battery level goes below 10% the status LED will flash. If the status LED starts flashing it is recommended that the readings are immediately finished and the RFm taken back to the IQVu to upload any remaining readings. The RFm battery should be fully charged before using. If the level goes to 0% the RFm will switch OFF.

The RFm will switch OFF after 10 minutes of no activity. It can be turned back ON with a press of the button. No activity means no torque messages from the IQVu and no torque pulled on the CheckStar Multi connected to the RFm.

The RFm will work with all span sizes of CheckStar Multi.

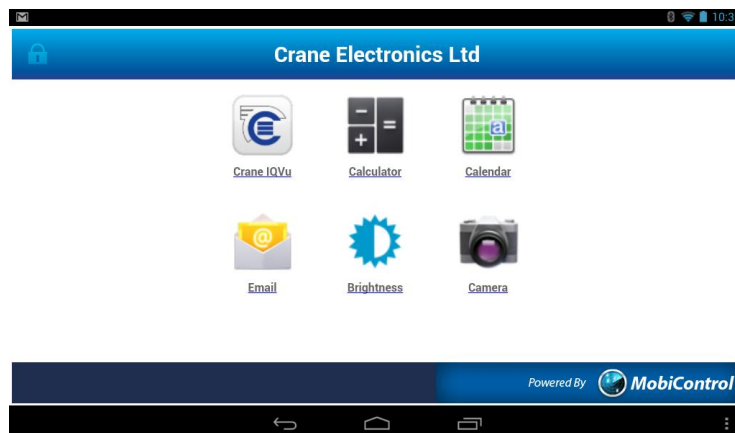
IQVu SETUP WITH AN RFm

Before using an IQVu with the RFm make sure the RFm is connected to a CheckStar Multi.

Turn the IQVu on. Press and release the Power button on top of the IQVu.

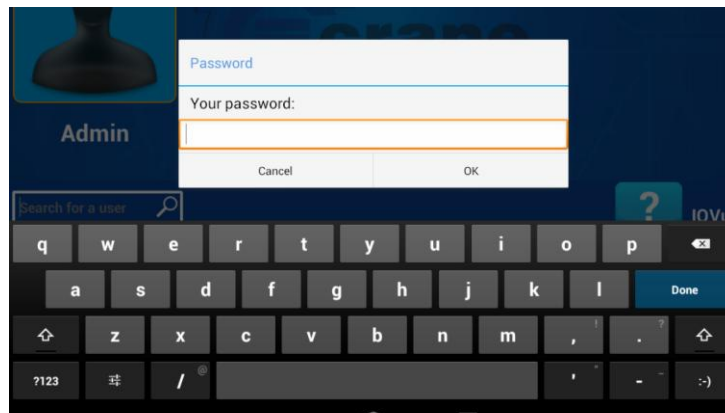


The IQVu is configured with SOTI software in order to provide the most secure environment.

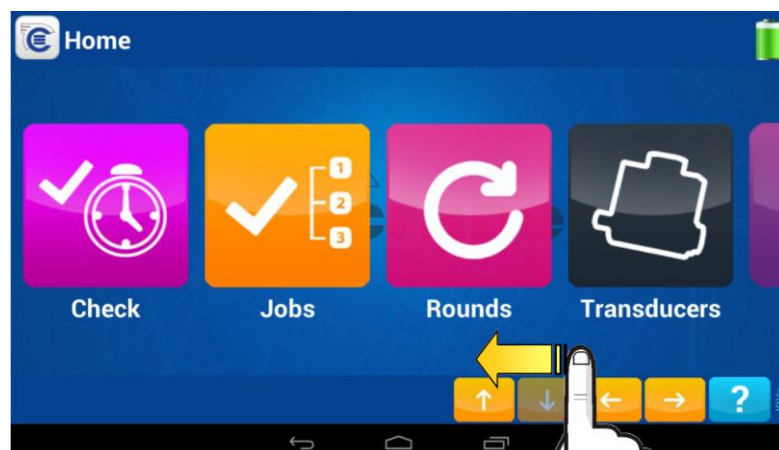


Select the Crane IQVu icon, the app will load and a Crane splash screen will be displayed before entering the login screen.

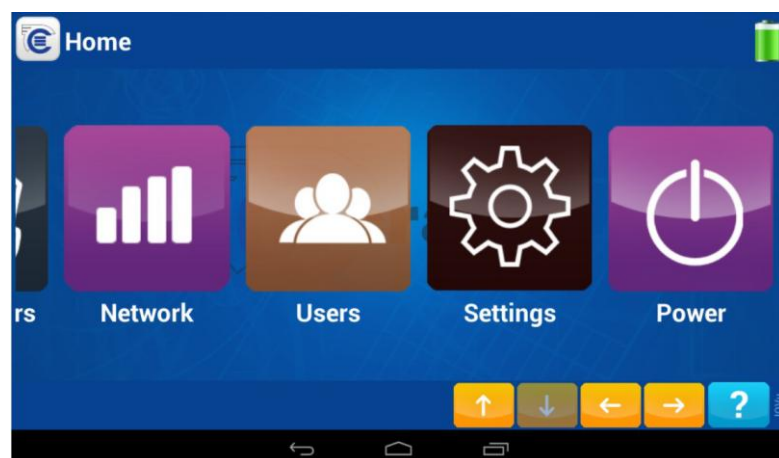
Select the relevant user icon and a virtual keypad will be displayed. Enter the password and click OK.



After logging in the user is taken to the home page menu.



To review more icons simply swipe across the screen and select 'settings'.



Use the right arrow to select 'Settings: 4/9 Connection'.



Select 'GET DATA'. Fields will be filled with default information.

Select the 'RF Address' field. Change the RF address to a unique one for that IQVu and enter a value between 0 and 65535. Do not keep the default address that appears.

Select 'Power' field. The Power level can be 0 – 3 and affects the transmission range. If the Power level is set to 3 then the range will be at it's maximum. If power level is set to 0 then the range will be at its shortest.

Select 'Channel'. Set the (frequency) channel between 0 and 79. Try and make this unique for each IQVu. If there is an interfering source then you can change the channel.

After editing select 'SET DATA'.

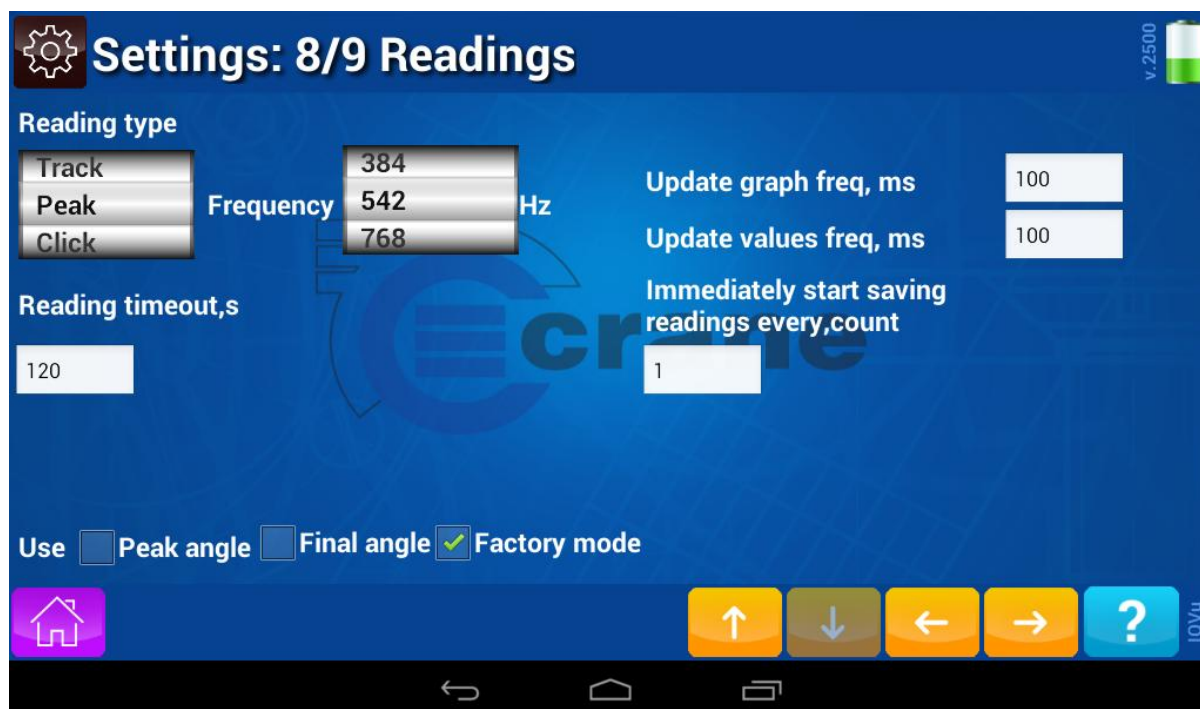
Select  on keypad to return to full screen.

When RFm's are paired with the IQVu, they will be given the same RF Setup as the IQVu so they can all work together. Therefore if these settings are changed on the IQVu, then all previous pairings will stop working and a previously paired RFm would need to be re-paired with the IQVu.

****The IQVu should be re-booted after set up of a new RF address and channel. Press and hold power button. Select 'Power off' then 'Reboot.****

Login and select 'Settings' following previous instructions.

Use the right arrow to go to 'Settings: 8/9 Readings'.



Select the Factory mode box.

Only one RFm can be used at a time with the IQVu. When Factory mode is chosen, you will not be able to choose a cable transducer only an RFm transducer. When Factory mode is not chosen you will only be able to select a cabled transducer.

Once the IQVu is setup you need to pair it with the RFm.

PAIRING THE RFm

Select  icon. Swipe across the screen and select 'Transducers'.

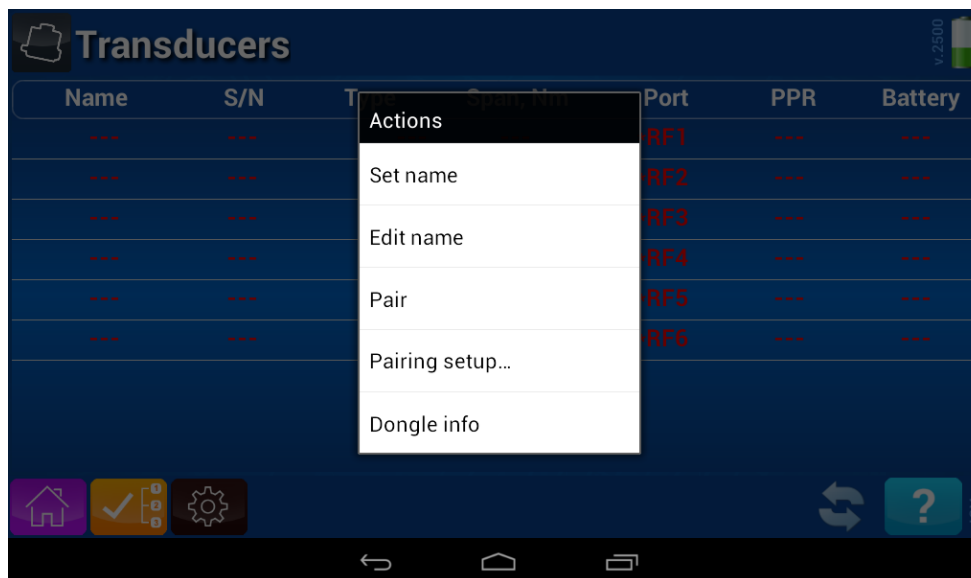


At this stage there is no CheckStar Multi paired.

Switch on the RFm. Press **①** for less than 1s and the RFm will turn ON and the status LED will change to blue.

Press **①** for approx. 2s until the status LED changes to purple (magenta). The RFm is now ready to be paired. Place the RFm and CheckStar Multi close to within 30cm of the IQVu as the pairing process occurs over a short distance.

Select and hold one of the rows on the transducer screen, for example Row *RF1. An 'Actions' box will be displayed.



Select 'Pair' and, if the pairing is successful, within a few seconds you will see the following screen.



The RFm status LED will change from purple to blue. The RFm will now remember it's pairing even if it's turned off.

If pairing is not successful change the channel and repeat the pairing process.

You will see a row of yellow information. It will give:

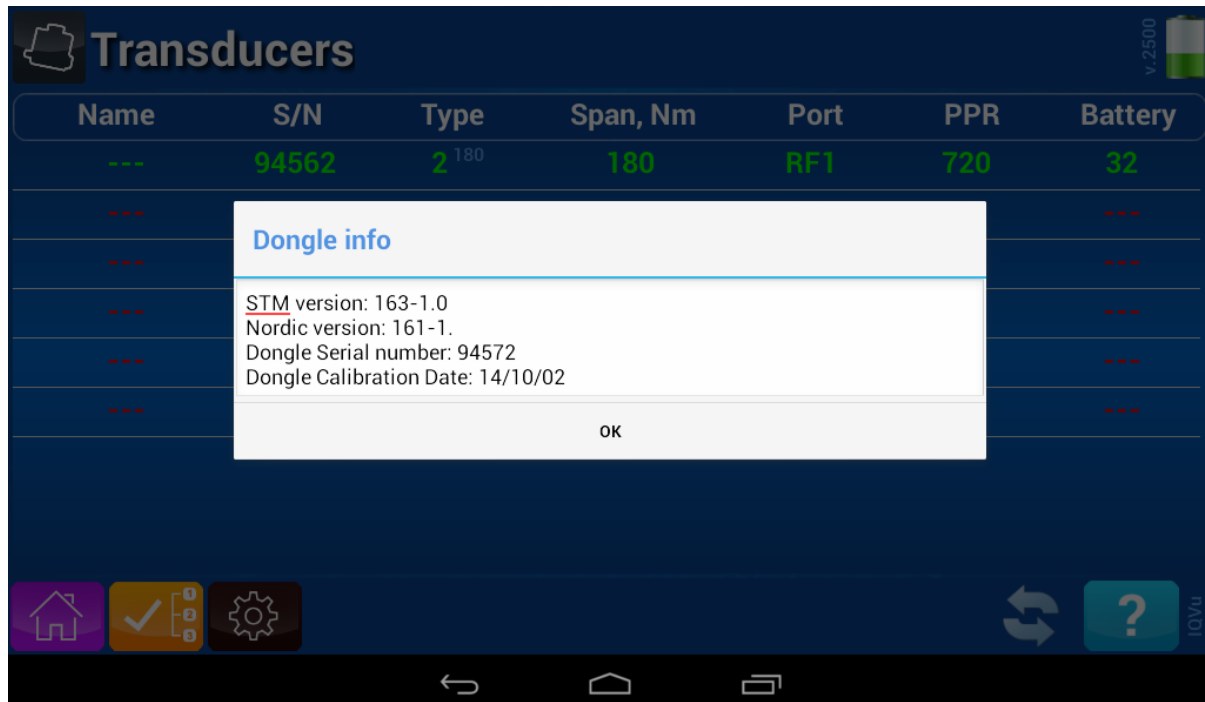
- The serial number of the CheckStar Multi the RFm is connected to.
- The Type '2' indicates it is a CheckStar Multi. (If a number is displayed next to the type, this is the programmed torque @ 2mV/V in the CheckStar Multi).
- The span of the CheckStar Multi which is used in jobs to see if the CheckStar Multi is capable of performing a certain fastening specification.
- Port – The IQVu in the future can potentially talk with up to 6 RFm simultaneously. At present you can just choose one at a time to talk to the RFm.
- PPR is from the attached transducer and is a statement of the angle encoder resolution.

If you select the paired transducer the text will turn to green to show have a connection. The battery level of the RFm will be displayed. If the battery level is below 10%, then you should immediately charge the battery in the RFm.



Name	S/N	Type	Span, Nm	Port	PPR	Battery
---	94562	2 ¹⁸⁰	180	RF1	720	32
---	---	---	---	+RF2	---	---
---	---	---	---	+RF3	---	---
---	---	---	---	+RF4	---	---
---	---	---	---	+RF5	---	---
---	---	---	---	+RF6	---	---

If you select 'Dongle info' from the 'Actions' box the following RFm information will be displayed.



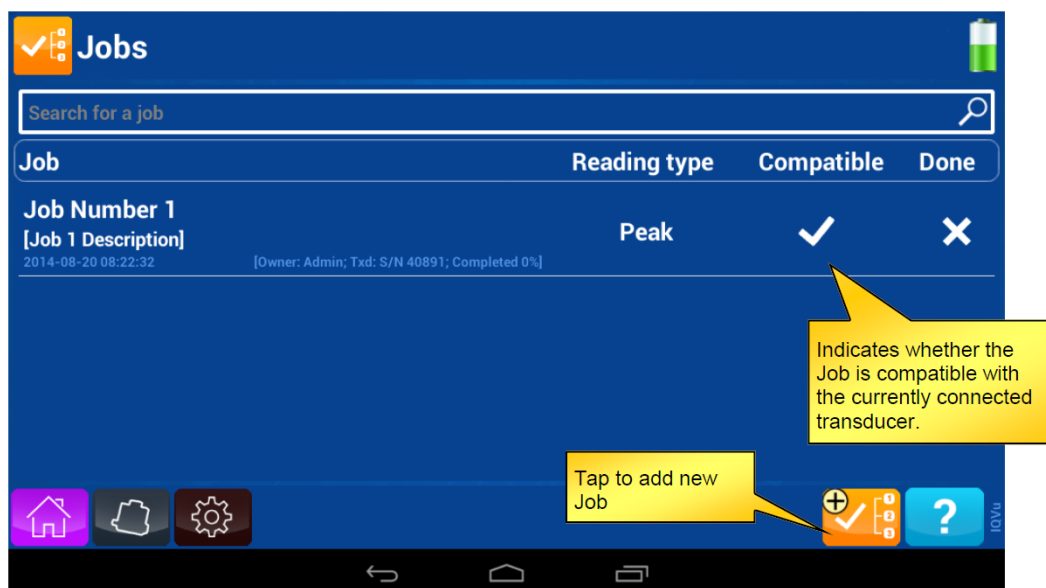
Select 'OK' to return to the 'Transducers' screen.

Select  icon.

LOADING JOBS

Once the RFm is paired and selected, you can enter a measurement screen either through 'Check' or 'Jobs' from the home screen. You can set up the measurement mode. At present the RFm supports Peak (plus angle), Click and Impulse.

To create a new Job select the "Add Job" icon in the bottom corner of the screen. The IQVu will prompt for transducer selection, followed by requiring the user to select a measurement mode. With the mode selected swipe to the left or press the right arrow and configure the settings as required.



Job Input name Input description

Store graph Manual Always Never

Control Angle Torque Angle

Direction CCW CW Auto

Limits Percentage Absolute Percentage

2nd param None Angle None

☐ Comments required for subgroups ☐ Use CL ☒ Use Graph Delete current readings

Retries Type Manual Never Retry

Txd Type Model Exact Any

Readings per subgroup 2 Subgroups per job 2

Tap to save Job

After saving the Job setup IQVu will automatically navigate to the select transducer screen, then to the measure screen.

Select  to save Job.

When you enter the measurement screen, the job will be transferred to the RFm. The RFm can store one subgroup of one job and upto 200 readings for that subgroup.

When the job is transferred, the CheckStar Multi light ring will flash amber, green then red twice.

At this stage you can start taking measurements with the CheckStar Multi. The RFm will locally measure the torque every 20us and the angle every 1ms. It will analyse the measurement with the selected algorithm.

As the measurement is taken, the RFm will control the CheckStar Multi light ring to show the status of the measurement. The primary measurement (torque unless angle control) will display:

Yellow (amber) = Threshold < Value < LSL

Green = LSL < Value < USL

Red (user should stop pulling if they see Red) = USL < Value

If the Secondary value goes greater than its USL you will see a Red light on the CheckStar Multi to warn the user to stop.

At the end of a measurement, until the next measurement starts, the RFm will display the primary measurement status for that joint.



In the case of a click not being found the status will flash (long flash followed by 2 short flashes) amber if the torque reading remains below the USL and flash red if the final torque reading is above the USL.

The RFm is constantly being polled by the IQVu for readings (every 0.5s). If the RFm goes out of range it can continue to take readings, which it will store. Once the RFm is in range of IQVu, the readings will be polled out of the RFm, oldest first.

If the RFm completes the subgroup of the job it will flash amber, green then red twice. When this happens you should take the RFm back to the IQVu so any remaining readings can be uploaded. If required, you can then download the next subgroup.

Check is assumed to be a job subgroup with 200 readings.

The IQVu will show the readings it gathers from the RFm in the standard way. The readings will have their status colour coded as usual. The reading count will show how many readings have been retrieved.

Note:- no traces are stored or can be retrieved from the RFm.

The following screens show examples of readings gathered by IQVu from the RFm using different measurement modes:

Peak plus Angle



Click



Impulse

