I have had an RT4 for a few months and have used it with a number of GNSS devices and my Robotic Total Station. I wanted to take a few moments to write about my experiences and some random thoughts for those who might be considering upgrading.

**Price**

NOTE: When price shopping RT4’s against the Juniper System Mesa 3 be sure to make sure the Mesa 3 has 128 GB of storage space (not 64 GB). Also know that if you choose to purchase any tablet other than Carlson branded hardware, Carlson will not support the device or their software SurvPC running on the ‘foreign’ device. Support has real value, if you decide to purchase from another source to save a couple of hundred dollars, then you probably deserve to be abandoned by Carlson.

It is also worth noting that most of the online closeouts on Mesa 2 tablets are actually MORE expensive than the Mesa 3! I believe that this is because the models and memory do not match up well between the Mesa 3 and Mesa 2. I tested the Mesa 2 a few years ago and found it to be too slow for consideration, I think a Mesa 2 at any price is a foolish purchase.

You are probably most interested in the RT4 price. It is complicated. **Very, very complicated.**

The Carlson RT4 is the same as the Juniper Systems Mesa 3. However, Carlson only sells 3 of the (unknown) number of Mesa 3 variants.

Carlson RT4’s are typically sold with Carlson SurvPC bundled with the hardware. You can also purchase the devices with no software and you may think this would be a good way to compare the RT4 prices against purchasing a Mesa 3 through an online reseller. You would be wrong.

The RT4 is available through the Carlson channel in three different configurations, the differences are highlighted in **yellow** below:

<table>
<thead>
<tr>
<th></th>
<th>Base</th>
<th>Base + Cell</th>
<th>Base + Geo + Cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bluetooth</td>
<td>Bluetooth</td>
<td>Bluetooth</td>
<td></td>
</tr>
</tbody>
</table>
WiFi
8GB RAM
128 GB Storage Memory
Cameras: 2MP Front/8MP Rear
2nd Internal Battery
Removable Battery
30W Universal Power Supply &
International Adapters
Stylus & Tether
Profile Stylus
Hand Strap
Anti-Glare Screen

WiFi
8GB RAM
128 GB Storage Memory
Cameras: 2MP Front/8MP Rear
4G LTE Data Modem
2nd Internal Battery
Removable Battery
30W Universal Power Supply &
International Adapters
Stylus & Tether
Profile Stylus
Hand Strap
Anti-Glare Screen

WiFi
8GB RAM
128 GB Storage Memory
Cameras: 2MP Front/8MP Rear
Ublox M8N GNSS Receiver
4G LTE Data Modem
2nd Internal Battery
Removable Battery
30W Universal Power Supply &
International Adapters
Stylus & Tether
Profile Stylus
Hand Strap
Anti-Glare Screen

Here are the prices if you purchase JUST the RT4 with no software, I have also listed some representative discounted Web pricing that I found by Googling ‘Mesa 3 prices’:

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Base</th>
<th>Base + Cell</th>
<th>Base + Geo + Cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlson Channel</td>
<td>$2,550</td>
<td>$2,850</td>
<td>$2,950</td>
</tr>
<tr>
<td>Web</td>
<td>$2,339</td>
<td>$2,399</td>
<td>$2,755</td>
</tr>
</tbody>
</table>

Again, web shopping is difficult because there are 64 GB and 128 GB Storage models, intrinsically safe and standard models and Android models. (Obviously if you plan on using Carlson SurvPC you don’t want the Android version.) And some of the web advertising for the Mesa 3 does not include the storage specifications so they might be the 64 GB models.

Looking at Kit pricing through the Carlson Channel bundled with SurvPC Total Station, a Pole Mounting Kit and an External Keyboard; vs. purchasing an unsupported SurvPC and a web sourced Mesa 3 I get the first two rows of this table:

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Base + SurvPC TS + Keyboard + Pole Kit</th>
<th>Base + Cell + SurvPC TS + Keyboard + Pole Kit</th>
<th>Base + Geo + Cell + SurvPC TS + Keyboard + Pole Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlson Channel</td>
<td>$4,289</td>
<td>$4,689</td>
<td>$5,089</td>
</tr>
<tr>
<td>Web</td>
<td>$4,639</td>
<td>$4,699</td>
<td>$5,055</td>
</tr>
<tr>
<td>(other)</td>
<td>$4,078</td>
<td>$4,453</td>
<td>$4,828</td>
</tr>
</tbody>
</table>

The final row ‘(other)’ is Bundled Kit price for a fully supported SurvPC + Keyboard + Brackets through iGage (disclosure, I work at iGage.) The ‘saving’ is because of the bundled options and hardware differences like pole mounts.

Let me state again that if you are going to use Carlson SurvPC you absolutely have to purchase a Carlson branded device. Otherwise you will have no support for hardware or software issues. Please don’t consider doing so.

**Ruggedness**

IP68 rating. The RT4 edges and back have medium-soft rubber bumpers. It should survive some dropping abuse.

The screen is ‘Dragontrail’ glass (see [https://en.wikipedia.org/wiki/Dragontrail](https://en.wikipedia.org/wiki/Dragontrail)) which is roughly equivalent to the Corning Gorilla Glass. The front screen is pretty big and if you drop it face down there will probably be a screen disaster. You can insure against this by purchasing an extended warranty (discussed later in this review.)

Four stainless steel mounting rings in the corners allow for attaching stylus and straps:
The charging, USB and headphone jack are protected by a replaceable ($9) rubber cover:

I believe that the device is waterproof with this cover open, however you would want to avoid getting water into the connections when the device is on because the connectors will oxidize.

**Memory**

All RT4s comes with 8-GB of ram and 128-GB of storage (Drive C).

Drive C reports 124,002,496,512 bytes capacity. After installing SurvPC you should have at least 90-GB available for your use on Drive C.

However, there is a uSD card slot under the battery. I installed a 256 GB Samsung EVO Plus Class 10 U3 card in my RT4. It has an estimated read speed of 100 MB/s and an estimated write speed of 90 MB/s ($27). I have already filled up 188 GB of that and wish that I had purchased a 512 GB card.

On this card I installed all of the original GLO Survey Notes and Plats for the extended area where I am working.

In addition, I have installed a copy of the Topo Map program we used to sell (All Topo Maps) and all of the topo maps for Utah, Wyoming, Idaho, Nevada, Arizona, Colorado and Montana with the elevation models and entire Public Land Survey database:

I also installed all of the NGS Datasheets for Utah, Colorado and Wyoming and NGS’s DSWin tool for searching the datasheet compilations.

On the main drive (C:) I have also installed the take home copy of ‘Carlson Survey Desktop IntelliCAD’.

My plan is to have every digital resource that I would ever possibly need available on my data collector so that I don’t have to also carry a Microsoft Surface.
Speed
From the beginning I knew that the RT4 was going to be faster than the RT3 and all the other inexpensive Windows 10 tablets that I have on my bench. Before I received my device, I had written this specification-based comparison: http://igage.com/RT4/RT4vsRT3.htm and had a clue that it would be faster.

It really is significantly faster. I don’t know how to quantify the speed difference, but it is fast enough to quickly plow through Windows Updates. I suspect much of the difference is between the 4 GB of internal ram on the RT3 tablets and 8-GB in the RT4’s. Carlson Desktop products run great. Web browsing is fast and responsive.

Obviously there is a trade off between speed and battery life, they hit a home-run.

Here is a WinSAT output for the RT4:

While I don’t have an RT3 to compare the RT4 against, I do have a few other tablets and the previous tablet I was using had a memory performance of 5186 (RT4 is 2.7 x faster). But the difference between 4 GB and 8 GB of ‘Installed memory (RAM)’ seems to be a big deal.

Battery Run-Time
The specification is 12 to 15-hours and I believe that to be obtainable in real-world field conditions. This seems to be too good to be true, but I think it works. I have my RT4 set to turn off the display after 5-minutes of non-use and to go to Sleep after 30-minutes of non-use when on battery power. At the end of a full day in the field with normal interruptions I have found that the RT4 is typically above 60% charge.

There are two batteries, a smaller built-in non-removable battery (Battery 2) and a larger removable battery (Battery 1). It is possible to remove Battery 1 and run off of the built-in battery without turning off the device. In fact, you can remove Battery 1 and put the back cover on the RT4. With just Battery 2 (internal) at 99%, Windows reports 8 hours 13 minutes expected run time.

Battery 1 (7.2V 6000 mAh, 43.2 Wh, $185) looks similar to the RT3 battery; however, they are not interchangeable and the RT3 battery will not insert into the RT4 because the RT4 battery has an extra rectangular slot on the back side.
With both batteries fully charged, Windows reports:

27-hours of use remaining! These run times seems realistic (in my experience) if you are sporadically using the device as a data collector taking a few shots every once in a while, like you would on a boundary survey.

The Sleep mode seems to be integrated with SurvPC well. When the RT4 is woken up, Carlson reconnects and so far, the process has never failed.

If you are using the RT4 continuously in SurvPC and the screen never turns off I believe that Battery 2 (internal non-removable) will run the device for 4-hours and Battery 1 will run the device for 7-hours for a realistic total time of 11-hours.

As with all battery testing, lower temperatures will greatly decrease run times.

**Battery Charging**

In my testing at 70 degrees Fahrenheit, the RT4 will charge 40%, per hour of charging, up until it reaches 85% then the charging tapers off a little slower. For a charging example:

- From 60% to 70% charge takes about 17 minutes
- From 60% to 99% charge takes about 95 minutes

If you choose to purchase a second battery, there is a $200 external charger available to charge the spare battery outside of the RT4:

The external cell charger does not include a power supply, it uses the RT4 power supply or the 12 Volt Cigarette Lighter cable.

When I got my RT4, I got an extra battery but I am still waiting on an external charger. However, to be honest I don’t think I will ever need or use them. The RT4 charges quickly enough that I can recover from a dead battery (which will be because of my failure to charge in the evening) in 20-minutes and I just don’t work more than 10-hours in a day very often.
Windows 10
The RT4 comes installed with Windows 10 Pro installed:

There are a few major differences between 'Home' and 'Pro' that most of us won’t care about: Bitlocker, Hyper-V, Business Update and Assigned Access. The one thing that I care about Pro over Home is that ‘Remote Desktop’ is available. I tried using ‘Remote Desktop, but have been mostly using the TightVNC server to access the RT4 when it is on the desktop dock so I don’t need an extra keyboard+video+mouse in the office.

Connections
Wi-Fi: both 2 and 5 GHz Wi-Fi channels are supported.
Bluetooth Range: 1,000 feet dependably to GeoMax Zoom 90 Long Range Bluetooth Radio Handle
USB: there is one USB 3.0 connector on the side of the RT4 under the rubber cover.
The docking port adds a standard ethernet connector and 3 additional USB connectors.

Screen Brightness
The 7” 1280 x 800-pixel screen is plenty bright in direct sunlight. Here are some real pictures in full sun brightness at 6,000’ elevation with 8% humidity (so just cloudless bright sunlight):
It would be difficult for me to use CAD in direct sunlight. But SurvPC has big, high-contrast buttons and is easy to use and see in even the brightest sunlight.

**Screen Protector**

Like the Pixel 3a, the RT4 has ‘Dragontrail’ glass. (See [https://en.wikipedia.org/wiki/Dragontrail](https://en.wikipedia.org/wiki/Dragontrail).) This glass is extremely scratch resistant, however since I plan on dropping my RT4 on its face a few times every year, I want to have a screen protector on it.

The RT4 comes with a large JAVOScreen screen protector. Single replacements are available from Juniper Systems’s web store for $27 each, they are also available from Carlson dealers for $29.

You can purchase two screen protectors, the same brand, on Amazon Prime for $14.99 (see [https://www.amazon.com/gp/product/B06XDQQJHB/ref=ppx_od_dt_b_asin_title_s00?ie=UTF8&psc=1](https://www.amazon.com/gp/product/B06XDQQJHB/ref=ppx_od_dt_b_asin_title_s00?ie=UTF8&psc=1)).

When I initially put the screen protector on my RT4, I got a few specs of dust under it. Later I wanted to take some promotional pictures of the RT4 without the screen protector so I removed it and set it stick-side up on a table outside. Soon the screen protector blew off and landed face-down in sand.

I was able to clean the protector in warm water and reapply it to the RT4 with fewer specs of dust than my first attempt by cleaning the screen with window cleaner and a microfiber cloth. But it is not perfect.

The good news is ‘it is good enough.’ With the screen on, I cannot see the protector, or the specs of dirt. After 15 years of selling field data collectors, I still do not have a decent method for applying screen protectors that results in a perfect application.

My suggestion is to purchase a bunch of screen protectors on Amazon and not worry about perfection.

**Stylus’s**

The RT4 comes with a ‘Pointy Hard Stylus’ which I am going to call the PointyStylus, a ‘Rubber Gumdrop Stylus’ which I call the GumdropStylus and it also works with my finger:

The PointyStylus fits in a slot behind the screen on the right side of the tablet when it is in Landscape mode:
There is a tool on the desktop called ‘Touchscreen Profiles’ that selects between different modes:

I have mostly used the Finger + PointyStylus mode. As long as it is not raining or snowing this combination mode works perfectly.

If there is a snowflake or a drop of water anywhere on the screen then the PointyStylus will not work. But my finger continues to work just fine in this case. The GumdropStylus uses the water profile and is as good as my finger in wet conditions.

I don’t like the GumdropStylus. The end of it is huge. But it works with water or snowflakes on the screen. Perhaps if I had to work in the rain, I would like it more. But my finger works just fine in the rain too and I see little advantage to the GumdropStylus over my finger. The other issue with the GumdropStylus is that it exists next to the PointyStylus which is just so dang great.

The capacitive finger touch is substantially better on the RT4 than on the Surveyor2 (Allegro 2) or Mini-2. Much better. Which begs the question why the Surveyor2 can’t be as good as the RT4?

On the Surveyor 2, there is a raised bezel that keeps me from clicking on the screen edge. The bezel around the RT4 screen is flat and large enough that my finger can activate onscreen buttons at the edge of the screen. The bezel is raised at the edge of the device, but probably not enough to protect the screen much when it is dropped face down.

Stylus Conclusion

The PointyStylus is the stylus you have been dreaming of. The PointyStylus is amazing. It has a nice tether connecting it to the side of the RT4. The PointyStylus NEVER fails to register any stylus action. The PointyStylus works perfectly. If you take no other point from this review, please remember that “The PointyStylus is perfect.”

Detachable Keyboard

There is an optional detachable keyboard for the RT4.

Before you read the next sentence, please sit down and make sure you won’t be injured if you pass out:

The detachable keyboard costs $600

Okay, now that we have gotten that out of the way:
1. The keyboard is worth $600
2. The mounting system really works well, the contacts always fully seat. It is unimaginable that the keyboard would ever unintentionally detach and be lost.
3. They QWERTY keyboard layout is brilliant: arrow keys, number keys, positions, function keys, special keys. This is a layout that all manufacturers should take note of.
4. The keys feel as good as any full-sized keyboard and are very responsive.
5. The keyboard is totally field ready. Totally.

When I first started using the RT4, I was using the onscreen SurvPC keyboard which is context sensitive and since I was wearing mittens, I found it was easier to use the stylus between my thumb and fingers than the keyboard. But when it warmed up a bit and I found myself entering long descriptions for corners and quarters I switched to the keyboard and have never looked back.

The key layout and sizing are really well thought out. The shifted special character placement is fantastic. I really am more productive with the keyboard installed. I can type nearly as fast on the RT4 keyboard as I can on a full-sized keyboard and I think the QWERTY layout is much better than the Surveyor2 layout. The buttons are substantially bigger than those on my Ranger 3 or 7 too.

The only complaint I have about the keyboard is the CAPS lock (set by double-clicking the shift button) is cleared when you click on the orange, Ctrl or Alt buttons. This means that if you want to type the description:

```
FND #5 RBC 24" MARKED 'MSILVER PLS #123456'
```

And want it capitalized as shown, you are going to have press the CAPS button 8 extra times. But, if you relax a bit and allow lower-case letters, it is not an issue.

The keyboard weighs 0.458 lbs. (7.3 oz). However, if you add the keyboard, then you don’t need the EZ-Roller bracket for the pole mount which saves 0.194 lbs. (3.1 oz) so the effective weight of the keyboard compared to the EZ-Roller bracket is only an additional 0.264 lbs. (4.2 oz). At 4.2 oz the keyboard is absolutely worth the extra weight.

**Touch Keyboard Note**

The external keyboard is not recognized as a keyboard like a USB attached external keyboard might be. So, Windows will continue to show the touch keyboard when the external keyboard is attached, by default. You can fix this by going to ‘Settings: Typing’ and turning off the highlighted setting ‘Show the touch keyboard when not in tablet mode and there’s no keyboard attached’:

![Touch Keyboard Note](image)

Remember that if you decide to remove the keyboard it is easiest to turn the onscreen keyboard on before you remove the keyboard.
Internal Cameras

The RT4 has an 8 MP rear and 2 MP front facing cameras. The default Windows camera format is: 5.8 MP 19:9 ratio, 3,200 x 1,800 pixel. You can also select these resolutions:

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Ratio</th>
<th>Pixel Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.8 MP</td>
<td>16:9</td>
<td>3200x1800</td>
</tr>
<tr>
<td>3.7 MP</td>
<td>19:9</td>
<td>2560x1440</td>
</tr>
<tr>
<td>2.1 MP</td>
<td>16:9</td>
<td>1920x1080</td>
</tr>
<tr>
<td>7.7 MP</td>
<td>4:3</td>
<td>3200x2400</td>
</tr>
<tr>
<td>4.9 MP</td>
<td>4:3</td>
<td>2560x1920</td>
</tr>
</tbody>
</table>

Here are some sample, raw images in the default 16:9 5.8 MP format:

A section corner at 20% zoom:
U.S. DEPT. OF THE INTERIOR

UNLAWFUL TO DISTURB

12 M 24 L

EUR. OF LAND MANAGEMENT

CADAstral SURVEY

1963

S 224729 X

S 2275526
And 15X, 300%:
The original cut stone at the corner:

Site shot with high and low illumination:

The camera also as a Video mode and a panorama mode.
If you are making a video, the built-in microphone is not fantastic. It works but you will sound ‘tinny’.

**Pole Mount Strategy**
I have settled on placing the pole clamp above the bubble on my pole:
With the bubble on the left I can see over the top of the RT4 and adjust the RT4 to an angle that I can view through the middle lenses on my lined trifocal glasses.

The RT4 actually balances better on the pole than a Surveyor 2 because the weight is distributed evenly left and right of the pole. With a Surveyor 2 or other side-clamped collectors the pole has all the weight on the left or right side in addition to the forward back distribution.

**Warranty / Repairs / Factory Care**

The RT4 comes with a 2-year warranty from Juniper Systems.

You can extend the factory warranty from 2-years to 5-years for $249 per year (as long as the device is still in warranty).

You can extend the Standard warranty to Gold or Platinum Complete Care:

<table>
<thead>
<tr>
<th></th>
<th>1-year</th>
<th>3-years</th>
<th>5-years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold Complete Care</td>
<td>$275</td>
<td>$379</td>
<td>$1,089</td>
</tr>
<tr>
<td>Platinum Complete Care</td>
<td>$459</td>
<td>$565</td>
<td>$1,599</td>
</tr>
</tbody>
</table>

A complete description of the extended care program can be found at these links:

- Complete Care Options: https://www.junipersys.com/support/article/2019
- Complete Care Terms: https://www.junipersys.com/support/article/2316

A service/loaner warning: in the past, iGage has provided a fairly liberal loaner program for data collection devices that fail in warranty or out. The RT4 will not enjoy this benefit from iGage (after the initial 30-day period.) If you want 24-hour repairs, you need to purchase the Platinum Care package and return the device by overnight shipping to Juniper Systems. I suspect that all sources of the RT4 will have a similar support procedure.

**Accessories**

**Pole Mount Accessories**

You can purchase a complete $200 Pole Mount that contains these 4 parts (plus screws):

The device cradle is needed only if you don’t have an external keyboard.

If you are always going to use the External Keyboard then you only need these three parts ($90.25):
The keyboard comes with 4 screws to attach the round plate. 

Hint: The round place attaches to the keyboard rotated 90 degrees from what you think should work:

**Docking Station**

An external docking station is available for $350:

It has three USB ports and HDMI port and an ethernet port. Power is supplied by the charger than comes with the RT4. There is a warning that you may need to purchase a separate 45-watt charger ($80.)

**Powered Locking Vehicle Mount**

There is a powered ($400) and non-powered ($125) vehicle mount available.

The powered mount includes a cigarette adapter and a single UBS port:

**Other Accessories and Replacement Parts**

In the Juniper Systems’ store (https://shop.junipersys.com/mesa-3/?sf_rewrite=1):
Replacement PointyStylus with a tether $19

12-Volt vehicle charger $19

Shoulder Strap with adjustable pad $35

Fitted soft case $99

Four-point harness $75

Replacement Dust Cover (for USB, Power, Earphone) $9

Bale hook (for hanging on Tripod) $75

There are also pistol grips, grounded gumdrop stylus (for better performance in harsh conditions) and some additional straps and carry options.

Some of these accessories are available through distribution, however the price is typically 20% higher so clearly you are encouraged to purchase accessories directly from Juniper Systems or on Amazon.

Conclusions
The summary is:
Just go purchase an RT4 and upgrade to Carlson PC. This is the best data collector available at any price or form factor.

A longer answer is:
Windows Mobile devices are on their last legs.
The misery of getting ‘Windows Mobile Device Center’ running on a modern computer is just too much trouble. You can watch my How-To video: https://youtu.be/VHi4dwVbGbI if you want a demonstration of the misery.

With the RT4, if you setup the ‘Backup and Sync from Google’ or ‘Microsoft OneDrive’ then your jobs and files are just automatically replicated from the data collector to your office computer.

The future is either an Android tablet or Windows 10. If you use Carlson SurvCE, then switching to SurvPC on a Windows 10 tablet will have NO learning curve because SurvPC is exactly the same as the SurvCE, just much faster.

There is a good chance that you will be able load up an RT4 with all kinds of productivity tools and lots of data. Will it last forever? No way. In a few years there will be a faster, better model that smokes the RT4. But for now, it is the best data collector I have ever used and exceeds my expectations for what is possible in 2020.