

Technical White Paper

# **The Review of IEC-3300, a Compact, Rugged, Fanless Box PC for Digital Signage Projects in Transportation**

ARBOR's IEC-3300, introduced June 2015, is a robust, fanless ultra-compact box PC. It's designed primarily for the transportation sector — with numerous deployment scenarios in cars, trucks, buses, and trains — but of interest to numerous other embedded and vertical markets as well. The device is impressively compact — just 6.4 x 4.3 inches and 1.54 inches tall. That's about half the volume of an Apple Mac Mini. And it also only weighs half as much as an Apple Mini. Yet, this is a tough, full-function, Intel Bay Trail-powered industrial Windows computer.



ARBOR's idea here was to create a very light and small industrial PC that doesn't need a fan, yet provides full Windows computing power and a nice complement of standard full-size onboard connectivity, including dual display capability to make it suitable for digital signage applications. The IEC-3300 is powered by either by a dual-core Intel N2807 or a quad-core Intel J1900 processor, both part of Intel's highly acclaimed "Bay Trail" processor platform. The device is available with up to 8GB of RAM, 16GB or 32GB of mSATA solid state disk, and there's a half-size mini PCI-e slot of additional expansion such as WiFi. The image below shows the ARBOR IEC-3300 from the top and all four sides.



In terms of design, the IEC-3300 represents rugged systems simplicity at its best. The housing consists of a rectangular section of 3/32-inch aluminum alloy. The roughly 5.5 x 4.0 inch motherboard is secured onto supports inside that aluminum chassis. The top and bottom of the device consist of identical precisely milled and superbly fitting beveled aluminum alloy covers, secured in place by four small screws each. The pictures below show the insides of the IEC-3300 from the top and from the bottom.



The image on top shows the sole 204-pin SO-DIMM slot that comes with either a 4GB or an 8GB (depending on the processor) DDR3L RAM module; the finned heat sink that easily dissipates the heat generated by either one of the highly efficient Bay Trail processors without even needing to make contact with the aluminum top of the unit; the edge-mounted I/O along the bottom (two USB 2.0, a USB 3.0, HDMI, VGA, and dual RJ45 gigabit LAN jacks); and the additional wired-connected I/O along the top of the device (audio, power, RS232 serial, and another USB 2.0 port). Note the little dollops of silicone glue that keep connectors from coming loose due to vehicular vibration.

The image on the bottom shows the unit's mSATA expansion slot used for solid state mass storage, and below it the empty half-size mini PCIe slot available for expansion.

The two Intel Bay Trail Celeron chips ARBOR offers the IEC-3300 with are both similar and dissimilar. Similar in that both use the same processor architecture, lithography, and also the same integrated Intel HD Graphics. Dissimilar in that the N2807 is a dual-core/dual-thread chip designed for maximum economy, and the J1900 a quad-core/quad-thread chip that's significantly more performance-oriented. The table below shows both the similarities and the differences between the two chips:

Available Intel CPUs	Celeron	Celeron
Model	N2807	J1900
Code	"Bay Trail"	"Bay Trail"
Cores/Threads	2/2	4/4
Lithography	22mn	22mn
Base Clock Speed	1.58 GHz	2.16 GHz
Turbo Speed	2.16 GHz	2.42 GHz
Thermal Design Power (TDP)	4.3 watts	10 watts
Scenario Design Power (SDP)	2.5 watts	NA
Smart Cache	1MB	2MB
Max RAM	4GB	8GB
Integrated graphics	HD Graphics	HD Graphics
Graphics base speed	313 MHz	688 MHz
Graphics max speed	688 MHz	854 MHz
Intel Wireless Display	Yes	No
Intel vPro	No	No

Given that the J1900 is a quad-core design and runs at a high base and burst frequency, and also at a higher graphics speed, will the J1900 version absolutely trounce the N2807 version in terms of performance? Our evaluation IEC-3300 came with the N2807 chip and so we can't say with certainty how a J1900-equipped IEC-3300 will perform. However, we did recently test ARBOR's big 21-inch ASLAN W722C panel PC (see our review) that uses the J1900, and its performance is likely close enough to what users can expect from the J1900-based version of the IEC-3300 to be meaningful. The table below shows both the PassMark and the CrystallMark benchmark numbers for both:

Performance benchmarks	ARBOR IEC-3300	ARBOR ASLAN W722C
Processor	Celeron N2807	Celeron J1900
CPU Mark	781	1,731
2D Graphics Mark	163	203

Memory Mark	380	441
Disk Mark	1,260	1,135
3D Graphics Mark	132	146
Overall PassMark	570	820
CrystalMark ALU	14,827	29,365
CrystalMark FPU	12,422	25,799
CrystalMark MEM	16,577	23,515
CrystalMark HDD	28,269	27,262
CrystalMark GDI	4,336	6,154
CrystalMark D2D	3,735	3,362
CrystalMark OGL	3,674	4,025
Overall CrystalMark	83,840	119,482

So based on comparing the two chips in different (but similarly equipped) devices from the same company, yes, the J1900 version of the IEC-3300 is likely about 50% faster than the N2807 version. That's most noticeable in CPU-intensive operations (because the J1900 has twice as many computing cores), but less so in storage and graphics operations.

Now keep in mind that in embedded systems, and the IEC-3300 can be considered an embedded system, peak performance is of less importance than rock-steady reliability and being able to handle a series of well-known tasks. So if the N2807's performance is up to the tasks in an intended deployment, it may be the preferable choice because it runs cooler, and cooler almost always means more predictable performance and longer life cycle.

So what does that all mean, and what has this ultra-compact ARBOR industrial PC going for itself? First, it's very robust and very simple, and that's a big plus in embedded systems deployments. Second, its low-power processors and good thermal design mean the units can be deployed almost anywhere. Third, there's enough onboard I/O to have the units communicate with almost anything (dual-LAN, USB, legacy serial, etc.). Fourth, its dual display capability (VGA and HDMI) make it ideal for vehicular digital signage applications. And fifth, the price is attractively low.

All of this combines to make the ARBOR IEC-3300 a competent, dependable building block for numerous embedded and vertical market systems projects in the transportation sector and beyond.



## Specifications ARBOR IEC-3300

Status	Added 11/2015
Form-factor	Fanless Box PC
OS	Windows 7 32-bit/64-bit, Windows 8.1 32-bit/64-bit, Linux
Processor	Intel Celeron "Bay Trail" N2807 Intel Celeron "Bay Trail" J1900
CPU Speed base	Intel Celeron N2807: 1.58GHz Intel Celeron J1900: 2.00GHz
CPU Speed burst	Intel Celeron N2807: 2.16GHz Intel Celeron J1900: 2.42GHz
Graphics	Intel HD Graphics
Standard/Max RAM	Up to 8GB DDR3L 1600MHz in one 204-pin SO-DIMM slot
Disk/drive	16GB or 32GB mSATA SSD
Card slots	1 x half-size mini card
Keyboard/scale	Optional external USB keyboard
Operating temperature	-4° to 131°F (-20° to 55°C)
Sealing	NA
Vibration	3 Grms/5Hz ~ 500Hz/random operation
Humidity	10 to 95% non-condensing
Shock	40G, 11ms duration (operating)
Housing	Aluminum alloy, wall mount and VESA mount
Size (WxHxD)	6.4 x 4.3 x 1.54 inches (163 x 109 x 39 mm)
Weight	1.3 lb (0.6kg) barebone
Power	12VDC
Watchdog Timer	1~255 levels reset
Interface	3 x USB 2.0, 1 x USB 3.0, 2 x RJ45 10/100/1000, 1 x RS232, 1 x VGA, 1 x HDMI, audio in/out
Wireless	Optional Atheros AR9462 802.11a/b/g/n WiFi plus Bluetooth 4.0 + HS
List price	Inquire
Web	<a href="#">ARBOR IEC-3300 product page</a>
Data sheet	 <a href="#">ARBOR IEC-3300 spec sheet</a>
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(by Conrad H. Blickenstorfer from RuggedPCReview)

## About ARBOR

ARBOR Technology Corp., founded in 1993, is a leading IPC supplier of embedded computing products and services. With more than 20 years of experience in providing customer-driven, high performance, and industrial strength computing solutions in various industries, ARBOR strives to provide a complete solution from board to system level in healthcare, transportation, industrial automation, mobile computing, digital signage, POS & Kiosk and intelligent applications. ARBOR is ISO-9001, ISO-13485 and ISO-14001-certified and commits to deliver high quality products with international standards and well-defined production process. More information about ARBOR is available at [www.arbor-technology.com](http://www.arbor-technology.com)