FROSTBITTEN

We torture-test seven of the best-selling 12V fridges to see who keeps their cool in the heat of battle

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AUSTRALIAN 4WD ACTION NO-BULL TEST!

FRIDGE COMPARO

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A RELIABLE AND EFFICIENT FRIDGE ON BOARD IS MORE THAN JUST A LUXURY – IT'S A NECESSITY

For us 4WDers who frequently head bush, a 12V fridge is one item we can't do without. It lets us store perishable foods safely for extended periods, so our 4WD adventures can be had with the luxury of fresh food and an ice-cold drink to clear a dusty throat after a long day's 4WDing. Fridge manufacturers use energy efficiency and other technical terms to dazzle you in an attempt to make their product seem better than the competition. There are many important factors that make one fridge better than another for our own needs including price, so we have considered all of these and more when planning this comparison. After all, there's no point bagging a bargain if it doesn't suit your needs.

Not only have we recorded some interesting scientific data, all the fridges were tortured in the same place you expect them to work best – in the bush. We also tested them all in the lab to prove who's who. If we can help you guys buy the right fridge, then every cent we've spent has been worth it.

So let's find out which fridges kept their cool and which ones lost it...

WHY REFRIGERATE?

While the obvious answer is to keep your food and, more importantly for some, your drinks cold for extended periods of time, refrigeration decreases the activity of the bacteria present in all foods, thus prolonging its use-by date and freshness. Dairy and meat products can be spoiled within a few hours without refrigeration when sufficient numbers of particular types of bacteria, or their toxins (called pathogens), are present in the food you eat. This commonly leads to food poisoning.

Foods with preservatives such as breads tend to last longer without refrigeration depending on the amount of preservatives added. However, your local Big Mac dealer can supply food with enough preservatives that it'll never need refrigeration. But, if you're anything like us, you prefer your food fresh and tasty, making a fridge very useful, practical and healthy.

At the extreme end of food preservation, freezing food stops the progress of bacteria all together. However, some foods are prone to 'burning' due to prolonged exposure of sub-freezing temperatures. In any case, freezing allows all foods to be stored for many months at least, beyond their original use-by date without risking further contamination.

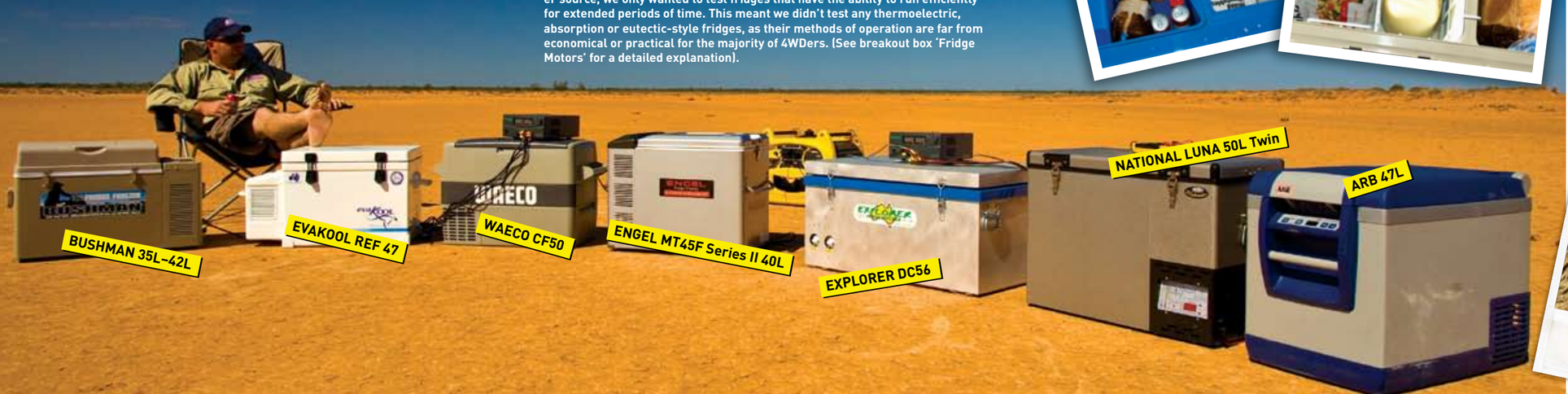
FRIDGE SELECTION CRITERIA – WHO'S IN AND WHO'S NOT

Previous fridge tests *4WD Action* has done have already proved that larger fridges using the same-size motors will consume more power to achieve the same temperatures. This is simply because the motor has to run for longer periods of time to cool a larger volume. We saw no need to prove this again, and instead we decided to test the best-selling fridge from each manufacturer. This meant our fridges ranged in internal capacity from 40L through to the 56L – a size range commonly found in the back of most 4WDs.

Needless to say, this didn't leave us short of contenders and we were more interested in the quality of testing rather than the amount of fridges we could get. There were two companies we weren't able to include – these were Primus, which was due to release a new fridge onto the market in the coming months but couldn't supply one in time for testing, and Trailblazer, which declined to take part because previous testing hadn't gone in their favour.

Regardless, the other fridge manufacturers were more than happy to back their products and supply them for testing. To this extent, our final line-up includes seven of the best fridges from seven market-leading manufacturers, and they are...

NOTE: Because a 12V fridge has to run off your batteries that are a limited power source, we only wanted to test fridges that have the ability to run efficiently for extended periods of time. This meant we didn't test any thermoelectric, absorption or eutectic-style fridges, as their methods of operation are far from economical or practical for the majority of 4WDers. (See breakout box 'Fridge Motors' for a detailed explanation).



Inside the German made Danfoss compressor. A unit that's proven to be a solid performer

FRIDGE MOTORS

There are several methods used to power fridges. Some work well in all conditions, others are more suitable to specific applications and there are different power supply requirements needed depending on the fridge's design. 12V fridges using compressor style motors are renowned for their durability, versatility and power consumption efficiencies, and this makes them ideal across a broad range of 4WDing applications.

Below is a brief description of the four common methods used to power portable fridges...

THERMOELECTRIC: In its simplest terms, thermoelectricity produces heat or cold at the junction of two dissimilar metal conductors while a direct current (12V DC) is flowing through them. The direction of current determines whether it heats or cools.

Because the conductors need a continual supply of current to remain in operation, a thermoelectric appliance needs a constant power source. Their ability to keep foods hot or cold is also largely dependent on the outside ambient temperature.

EUTECTIC: The term 'eutectic' refers to a mixture that allows as low a melting point as possible and is a mixture that will crystallise from a liquid solution. A eutectic fridge uses a compressor motor to crystallize the eutectic solution that surrounds the fridge cabinet and this can take up to 12 hours operating time.

Upon doing so, it's able to remain in the crystallised (frozen) state without further assistance from the compressor for some time. However, the initially long period of time required to fully crystallise the solution, and the additional hours of operation needed to maintain full crystallisation make power consumption excessive for most 4WDers.

ABSORPTION: This type of fridge relies on the cooling effect of a liquid (ammonia) when it evaporates into a gas. The heat is generated by either 240V, 12V or gas powered naked flame. Absorption fridges are commonly referred to as a three-way fridge.

This system needs to be reasonably level during operation and requires a constant power source. LPG is the most economical power source for people who travel to and stay in one location for extended periods.

COMPRESSOR: Our fridge test saw three types of compressor motors – Engel uses the Sawafuji Swing Motor, Bushman uses the ACC – GD30FDC compressor, while the Danfoss BD-35 compressor is used in the other fridges we've tested. They all achieve the same result and run on 12V DC or 240V AC, but they do differ in design and performance.

Let's take a look at the differences...

Sawafuji Swing Motor: Made in Japan, this is a true reciprocating compressor where the piston is the only moving part that's connected to an electro-dynamic device powered by magnetic fields. This eliminates the need for bearings, cranks or conrods to greatly reduce the chances of failure. The low friction loss created by having only one moving part makes this compressor highly efficient, as it has no high start-up current draw.

Unlike other rotary-type compressors that must perform a complete cycle and need much more current to start, the Sawafuji Swing Motor slowly increases the distance the piston travels until it reaches full stroke – you could call it a soft start feature.

The Sawafuji Swing Motor is located inside a tall, narrow compressor casing with pins locating in rubber bushes then suspended in between shock absorbent springs. This allows it to operate at angles up to 30 degrees and on rough off road tracks.

Danfoss BD-35: Made in Germany, this compressor uses a piston, connecting rod and crankshaft to pump the refrigerant. It's operated by an electrical control unit that has specifically designed circuitry that tells the compressor when to cycle. This control unit has been upgraded to Series II in recent years, giving the Danfoss compressor excellent reliability.
Because crankshaft-operated motors need to complete full revolutions, the Danfoss compressor is prone to high-current spikes when starting up under load. It is important to note that this is for only a fraction of a second, and the Danfoss compressor has proved to be reasonably efficient over all.

The Danfoss compressor is located in a wide, egg-shaped casing with plastic covered pins locating in steel bushes. The compressor is retained by the refrigerant lines crossing over the top and shock absorption is via the rubber washers used to mount the compressor base to the fridge framework and can operate at angles up to 30°.

ACC – GD30FDC: Made in Spain, this compressor utilises an almost identical design as the Danfoss, yet it's claimed to be more power efficient than the Danfoss BD-35 found in many 12V fridges, even though it's the equivalent to the larger Danfoss BD-50 compressor used in large capacity 12V fridges. A big heart in a small package you could say. The compressor is mounted to soft rubber bushes and is also able to operate up to 30°.

HOW WE TESTED THEM

Like all product tests and comparisons 4WD Action does, our aim is to always do it better than last time. Just like car manufacturers improve each model by improving on their previous best, we reviewed previous fridge tests to make this one even better. So, let's have a look at the first of two test procedures we did...

TEST 1 & 2 – CLIMATE CHAMBER TESTING

The first test saw the fridges delivered to VIPAC's NATA-approved climate-controlled chamber. The aim was to best simulate each fridge being operated in a very cold and very hot environment – just like you'd use it.

We did this by subjecting each fridge to two temperature extremes over two 24-hour periods with both current and internal cabinet temperatures monitored as the chamber temperature varied. Not only did we measure current draw, we also measured fridge temps inside to see how they handles constantly changing temperatures.

But before you skip to the results, here's a rundown on how we did it...

1) All the fridges were placed in the chamber together, evenly spaced on timber crates to ensure even temperature distribution.
2) They were then connected to 12V, 40A DC power supplies to simulate being run off a car battery just like you'd use them.
3) Each fridge was then packed with 2L milk, one loaf of bread, 250g butter, six cans of soft-drink, 1.25L water and 450g sausages. Those fridges with freezer compartments had a bag of frozen peas added to ensure it was cooling more than just hot air.
4) Temperature sensing thermocouples were placed in the centre of each fridge and freezer compartment and resistors were wired into each fridge's power supply to measure current draw.
5) The fridges were set to 4°C based on their temperature controls or dials and left to run over night to ensure even temperature saturation. (4°C is the recommended temp for foods requiring refrigeration).
6) The temperature for each fridge was fine-tuned to suit the readings from each thermocouple. Because of the different locations of each fridges thermostat, we had to settle on a discrepancy factor of +/- 2°C which is within the tolerances allowed by NATA.
7) The temperature chamber was then set to run from 25°C down to 0°C over 10 hours, at which point 0°C was held for two hours before ramping back up to 25°C over another 10 hours. From here, the fridges were allowed to stabilise at 25°C for two hours before ramping up over 10 hours to 60°C which was then held for 2 hours, before returning back to 25°C over ten hours again allowed to stabilize for another two hours.
8) Current draw was measured every half second and temperature was constantly measured.

HOW DOES REFRIGERATION WORK?

Now we know what refrigeration is, why we need it and the different types of operation, let's take a look at how a compressor-style fridge does it's job. There are five essential parts to compressor-style refrigerators and how they work...

1) Refrigerant – the liquid that is pumped through the system to keep stuff cold.
2) Compressor – this compresses the refrigerant gas that raises the refrigerant's pressure and temperature.
3) Heat-exchanging pipes – a coiled set of pipes outside the compressor dissipates the heat of pressurisation.
4) Expansion valve – as the refrigerant cools, it passes through the expansion valve that converts the gas from high to low pressure, causing it to expand and evaporate.
5) Evaporator – the evaporated refrigerant flows through the evaporator that surrounds the fridge. The evaporator transfers the heat from inside the cabinet to the evaporated refrigerant where it's removed as part of the refrigerant's cycle. Some evaporators form the interior walls of the fridge, others are incorporated inside the wall linings and some have a panel fixed to the interior of the cabinet.

TEST 1 & 2 RESULTS

Because our aim was to replicate two climate extremes, we have listed the results based on each fridges performance in each climate. Additionally, the total results for each fridge across both tests have been included in the third chart, as this gives you a better overall result. This way, regardless of the climate you live or holiday in, the performance of each fridge is easily compared.
Here's a brief description of what the charts tell you.

MIN. MAX / AVG TEMP: This is the minimum, maximum and average temperature achieved inside each fridge and freezer compartment.

TOTAL POWER CONSUMPTION: This is the total amount of current (amps) each fridge drew over a 24hr or (48hr as listed in third chart). It is **NOT** the amount of current used **per** hour. This should also be considered with the average cabinet and ambient air temp.

AVERAGE POWER CONSUMPTION: This is an average current draw of each fridge during its ON cycle. This should also be considered with the average cabinet and ambient air temp and the listed internal volume.

Additional clarification for results in table 3

MAX COMPRESSOR ON TIME: The maximum amount of time each compressor cycled continuously before turning off during the entire test.

MAX COMPRESSOR OFF TIME: The maximum amount of time each compressor remained in the standby mode before cycling back on during the entire test.

COLD CLIMATE RESULTS: 25°C > 0°C > 25°C (AVERAGE AMBIENT TEMP 17°C)

FRIDGE	INTERNAL CAPACITY (LITRES)	MIN → MAX / AVG TEMP	TOTAL POWER CONSUMPTION Ah/24hrs	AVERAGE POWER CONSUMPTION
ARB	47L	-1 → 4 / 1.5	8.52A	0.37A
BUSHMAN	42.5L	0→5 / 2.5	5.73A	0.24A
ENGEL	41L	2 → 4 / 3	5.20A	0.22A
EXPLORER	56L	FRIDGE: 2 → 6 / 4 FREEZER: -16 → 1 / -7. 5	14.16A	0.59A
EVAKOOL	45L	FRIDGE: 5 → 9 / 7 FREEZER: 0 → 3 / 1.5	3.77A	0.16A
NATIONAL LUNA	47.5	FRIDGE: 2 → 6 / 4 FREEZER: -13 → 6 / -3.5	8.80A	0.37A
WAECO	46.5	1 → 9 / 5	3.95A	0.16A

HOT CLIMATE RESULTS: 25°C > 60°C > 25°C (AVERAGE AMBIENT TEMP: 37°C)

FRIDGE	INTERNAL CAPACITY (LITRES)	MIN → MAX / AVG TEMP	TOTAL CONSUMPTION Ah/24hrs	AVERAGE POWER CONSUMPTION
ARB	47L	1 → 8 / 4.5	38.97A	1.62A
BUSHMA	42.5L	4 → 8 / 6	31.64A	1.32A
ENGEL	41L	2 → 11 / 6.5	45.25A	1.89A
EXPLORER	56L	FRIDGE: 4 → 10 / 7 FREEZER: -12 → 2 / -5	61.52A	2.56A
EVAKOOL	45L	FRIDGE: 9 → 18 / 13.5 13.5FREEZER: 0 → 4 / 2	31.10A	1.30A
NATIONAL LUNA	47.5	FRIDGE: 2 → 6 / 4 FREEZER: -12 → -2 / -7	54.56A	2.27A
WAECO	46.5	0 → 10 / 5	38.33A	1.60A

COMBINED CLIMATE RESULTS FOR TEST 1 & 2: 25°C > 0°C > 60°C > 25°C (AVERAGE AMBIENT AIR TEMP: 28°C)

FRIDGE	TOTAL POWER CONSUMPTION Ah/48hrs	AVERAGE POWER CONSUMPTION	MAX COMPRESSOR ON TIME at 0°C	MAX COMPRESSOR ON TIME at 60°C
ARB	47.49	0.99	NIL	1hr 47min
BUSHMAN	37.37	0.78	NIL	48min
ENGEL	50.45	1.05	NIL	2hrs
EXPLORER	75.68	1.58	NIL	2hrs
EVAKOOL	34.87	0.73	NIL	53min
NATIONAL LUNA	63.36	1.32	NIL	1hr 35min
WAECO	42.28	0.88	NIL	1hr 35min

TEST 3 – REAL WORLD

Not content to let the scientific data tell the whole story, it was time to step outside the class room and into the big wide world of reality, where these fridges really get used. Looking for the kind of country that punishes anyone ill-prepared, had us travelling over 2500km just so we could see if these fridges could hack it in some of the toughest conditions known to man and beast.
It was in the harsh outback sun on the western outskirts of Burke that all the fridges were run for 72 hours straight. While our testing and data recording was simple to say the least, the results were in the extreme. The aim was to track how each fridge handled the long hot days, warm evening and cool nights.
Here's a breakdown of what we did...

1) Drive to the back of Burke and deep into the harsh, unprotected clay pans where daily temps exceed 40°C on a cool day.

2) Let Tommy, our gun photographer, take some ripper photos, while I sort refuge from the sun under a wet towel.

3) Connect all fridges to the 12V DC power supplies via an invertor generator and run all fridges at their coldest setting. We used the same food content in each fridge as we used in the first test.

4) Starting at 10am, we left the fridges to run non stop for 72 hours. During this time all the lids were opened for 1min at random times to better replicate them being used and keep the compressors working hard.

TEST 3 – REAL-WORLD RESULTS

We knew from our testing at VIPAC and the highly accurate results that followed, that any other method of data recording would be less than acceptable or reliable. Despite this, our real world testing showed that all of the fridges tested are more than capable of keeping your food and drinks icy cold. And because all the fridges were set to their coldest setting, they even managed to burst a few cans of drink.

Performance wise, all the fridges ran without incident, despite being made to operate unprotected in searing daytime temperatures. Structurally, the fridges suffered no ill effects from the heat and all fixtures and fittings remained operable at all times. In summing up our real world testing, it's fair to say all the fridges performed faultlessly and without incident. While our climate chamber testing showed some to use more power than others, it's clear to us that when it comes to asking each fridge to perform when needed, they all do it with ease.

ARB – 47L

HIGHLY RECOMMENDED

BEST OVERALL

EXTERNAL: The ARB fridge is lined on the outside with powdercoated zinc steel and the injection-moulded lid is tough enough for a big bloke like me to sit on. The lid didn't have that annoying free play other fridges have and the quick release mechanism is actually quick, easy and positive locking.

The lid is secured by an over-centre cam latch that takes of bit to getting use to, but definitely had the most positive locking action of all fridges tested. It is important to note that upon returning from testing, ARB had sent us a newly revised handle that now makes opening and closing the lid extremely easy. The recessed steel handles keep the unit compact, and while the design does restrict the way you carry the fridge this wouldn't affect most users as the fridge is permanently mounted in the vehicle. Regardless, the handles are super tough and able to be used as tie down points. The control panel proved easy enough to use and the green LED power light changes to orange when the compressor isn't cycling.

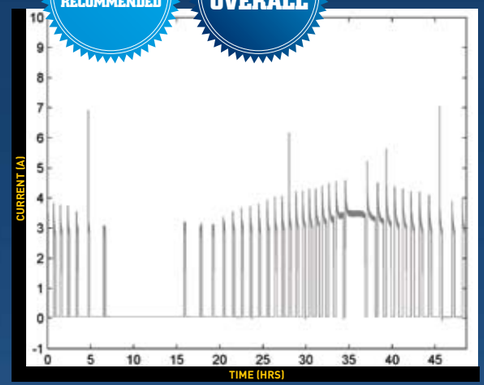
INTERNAL: Inside, the ARB fridge uses an integrated evaporator that not only helps keep your food and drinks cold, it also prevents food scraps getting wedged, thus making it easier to clean. A flush fitting internally mounted drain plug further aids cleaning and the interior light was enough to give you some idea where your beers are hidden.

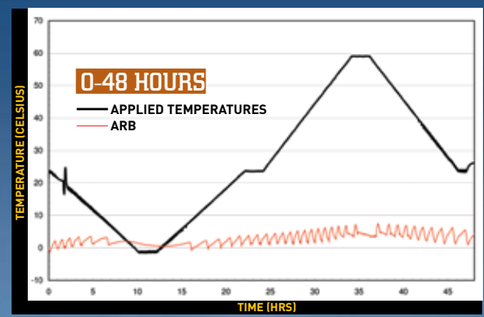
The reversible internal basket is lower at one end so you can store longer items or turning it around allows you to create a separate soft goods compartment for fruit and dairy etc. The internal layout makes for easy food storage and repeat access, meaning you aren't constantly repacking the fridge every time you get something out.

OVERALL: The ARB fridge has great features like the reversible basket, integrated drain plug, separate soft food shelf and the compact, rugged outside design will surely be a winner for many. The latch system shouldn't be mistaken for a handle – because it's not.

Performance-wise, the ARB fridge has proved it can maintain internal cabinet temperatures in extreme environments, proving it's sure to have an ice-cold thirst quencher ready whenever you are.

NOTE: At the time of printing, all new ARB fridges will be supplied with the new handle design. Customers with the earlier design handle are able to upgrade to the new handle free of charge.





ARB – 47L
COMPRESSOR: Danfoss BD35
WEIGHT: 22kg
POWER SUPPLY: 12/24V DC and 100–240V AC
BATTERY PROTECTION SYSTEM: Yes
FUSED: Yes
MADE IN: China (Australian designed)
PRICE: $1199
WARRANTY: 3 years
LISTED INTERNAL CAPACITY FRIDGE/FREEZER: 47L
4WD ACTION WATER TEST OF FRIDGE/FREEZER: 47L
EXTERNAL DIMENSIONS: H508mm x W380mm x L705mm

BUSHMAN 35L/42L

BEST VALUE FOR MONEY

HIGHLY RECOMMENDED

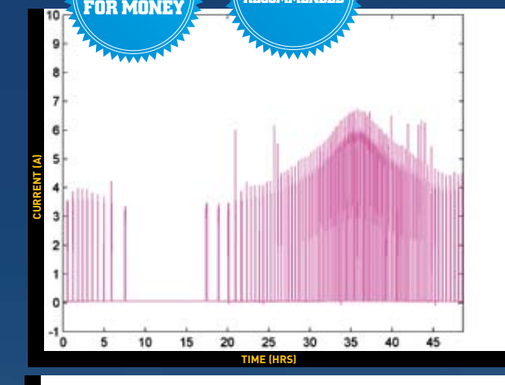
EXTERNAL: A powdercoated steel cabinet and motor housing form the tough exterior around 35mm insulated walls and 45mm insulated floor. The plastic handles, secured with steel pins are suitable for use as a tie point, they will easily handle the weight of a full load.

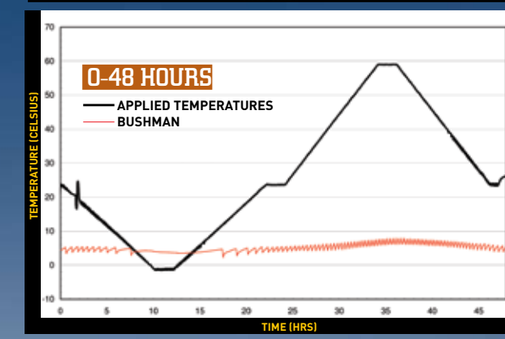
The electronic, digital control panel, powered by two AA batteries, is easy to use and the LED illumination makes it easier to monitor the temperature at night. The Bushman comes with two lid options that are easily swapped and the taller lid allow large bottles to be stored upright, with both lids made from high-impact poly carbonate. The lid uses two chrome-plated steel hinges and is secured by two stainless steel latches. A 10L collar is also provided to increase the capacity to 52L.

INTERNAL: Inside, the Bushman uses a white polycarbonate liner that covers a full surround evaporator. It comes with three different-sized baskets that offer a range of storage options – especially with the larger lid fitted. A sticker conveniently reminds the user of the best way to store different food groups and at what temperatures.

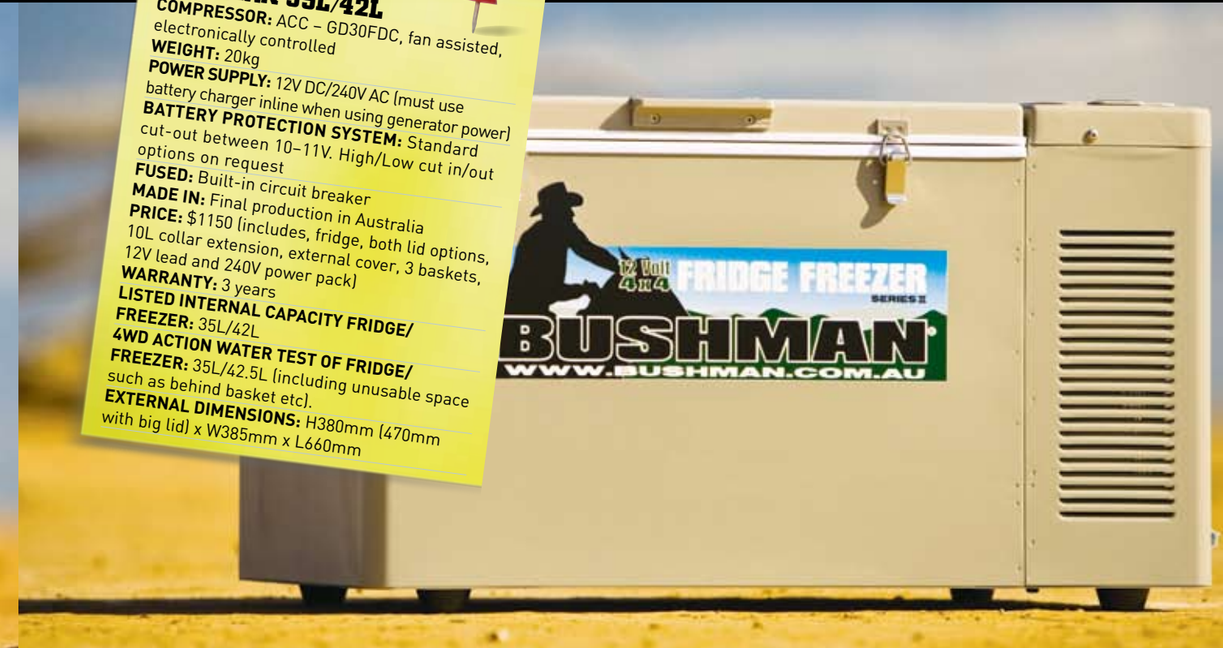
OVERALL: The Bushman is a fridge that's definitely feature packed. Despite a slight shudder from the motor upon start-up, its solid performance shows it to be more of a roar to life than its last breath.

The Bushman fridge was the fastest fridge to reach a given temperature and its digital display was within 0.5°C when checked with VIPAC's high-tech testing equipment. The Bushman is the cheapest fridge tested and comes with the added accessories other companies expect you to pay extra for. This definitely helped it to earn the 'Best Value for Money' award.





BUSHMAN 35L/42L
COMPRESSOR: ACC – GD30FDC, fan assisted, electronically controlled
WEIGHT: 20kg
POWER SUPPLY: 12V DC/240V AC (must use battery charger inline when using generator power)
BATTERY PROTECTION SYSTEM: Standard cut-out between 10–11V. High/Low cut in/out options on request
FUSED: Built-in circuit breaker
MADE IN: Final production in Australia
PRICE: $1150 (includes, fridge, both lid options, 10L collar extension, external cover, 3 baskets, 12V lead and 240V power pack)
WARRANTY: 3 years
LISTED INTERNAL CAPACITY FRIDGE/FREEZER: 35L/42L
4WD ACTION WATER TEST OF FRIDGE/FREEZER: 35L/42.5L (including unusable space such as behind basket etc).
EXTERNAL DIMENSIONS: H380mm (470mm with big lid) x W385mm x L660mm



ENGEL MT45F Series II 40L

MOST RUGGED

RECOMMENDED

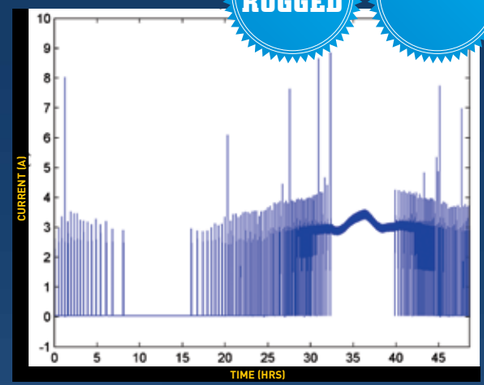
EXTERNAL: Engel uses a powdercoated steel outer casing that also forms a sturdy ventilated cover around the compressor compartment. Steel tube handles bolt securely to the steel frame and are perfect as tie-down points. The fuse and plug assembly are recessed at the rear and both plugs fit firmly in position.

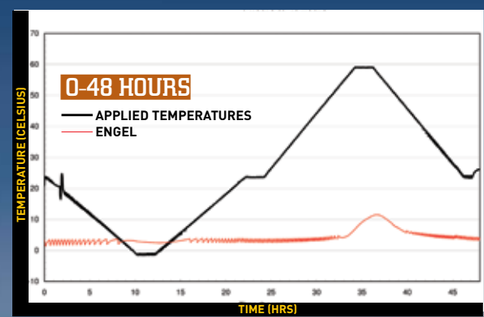
The steel lid is mounted on detachable hinges and an easy to use single latch keep it firmly sealed. The control panel is mounted on top, making it easy to see and utilises a digital temperature display, LED power light and simple thermostat control dial.

INTERNAL: A seamless, gloss white, fibreglass interior houses a single basket with a rubber mat to protect the base from damage. The evaporator is surface mounted and wraps around all four walls. There's enough visibility from the interior light to see where the snags are and the large single space makes it easy to store a range of different-sized goods.

OVERALL: Engel has been around for over 40 years and many of its original models are still going today. This is simply a reflection of their solid build quality and no-fuss design. The removable evaporator makes it easy to replace unlike those with built-in evaporators that aren't repairable. The ventilated metal motor housing ensures the mechanical's are well protected.

During laboratory testing, the Engel managed to maintain a reasonable cabinet temp and its overall amp draw was reasonable considering it ran nonstop during the two hour phase at 60°C. The overall performance and toughness of the Engel shows why it continues to be a top-selling fridge and winner of the Most Rugged award.





ENGEL MT45F Series II 40L

COMPRESSOR: Sawafuji Swing Motor
WEIGHT: 24kg
POWER SUPPLY: Built-in 24V AC / 12V / 24V DC
BATTERY PROTECTION SYSTEM: No
FUSED: Yes and thermally protected
MADE IN: Thailand
PRICE: $ 1299
WARRANTY: 3years
LISTED INTERNAL CAPACITY FRIDGE/FREEZER: 40L
4WD ACTION WATER TEST OF FRIDGE/FREEZER: 41L (including unusable space such as behind basket and evaporator etc).
EXTERNAL DIMENSIONS: H508mm x W631mm x L360mm

EVAKOOL – RFE 47

MOST POWER EFFICIENT

AUSTRALIAN MADE

EXTERNAL: The Evakool utilises their Evakool Polyal-ISO SPF high-density refrigeration foam that's protected by a tough fibreglass outer skin. The motor housing is also made of fibreglass as well but not as solid, while two vents supply fresh air to the motor. The tough plastic handles mould to the hand easily and are used to secure the fridge in place.

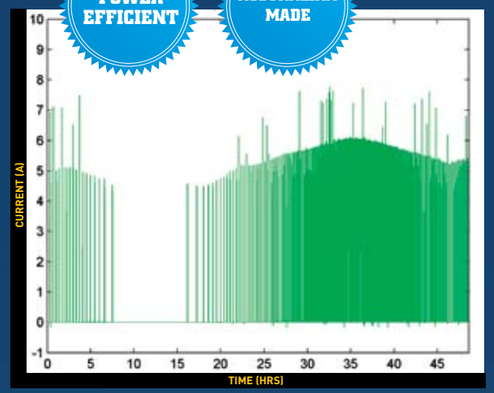
The lid is also made of fibreglass tough enough to use as a seat. It uses two heavy-duty plastic hinges that are made to pull apart, which is a great idea to prevent damage to either lid or cabinet, and they easily snap back on firmly.

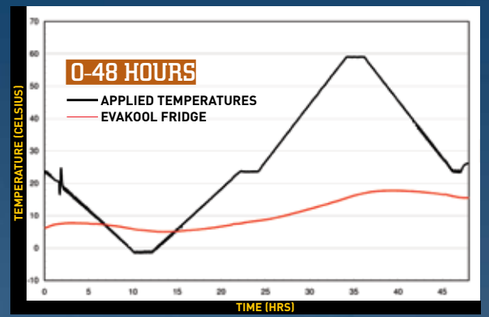
Two durable elastic-style latches firmly retain the lid shut. The control panel is user-friendly and the built-in circuit breaker is within easy reach, while LEDs show its current state of operation. The Evakool was the only fridge that came with a screw-on power cable that would never come loose on corrugated roads.

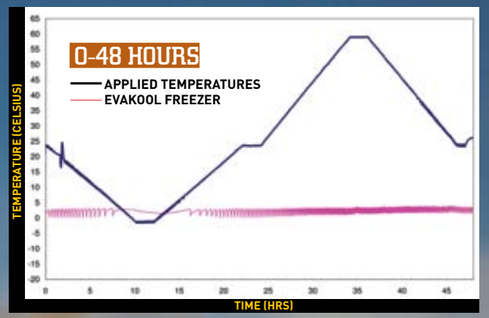
INTERNAL: Evakool uses a fully moulded fibreglass interior that has a surface-mounted evaporator situated in the freezer compartment. An adjustable divider is used to separate the fridge and freezer compartments and a perspex lid helps seal the freezer section. There is no interior light. but it does come with a digital internal / external temp gauge, making it's application very flexible.

OVERALL: The Evakool fridge was noticeably light, making it easy for one person to move around. The motor is also quiet in operation, although the limited coverage of the internal evaporator seemed to be its Achilles heel when trying to maintain the temperature in the fridge compartment.

However, this is easily overcome by either removing the divider to use as a fridge only, or simply turn the knob to "colder" on warmer days. After all, this fridge proved to be the most power efficient so you can confidently crank it up without draining the battery.







EVAKOOL – RFE 47

COMPRESSOR: Danfoss BD35
WEIGHT: 19.5kg
POWER SUPPLY: 12V / 24V DC or 240V AC via adaptor
BATTERY PROTECTION SYSTEM: Low-voltage protection/self-diagnostic
FUSED: 15A circuit breaker
MADE IN: Australia
PRICE: RRP $1199
WARRANTY: 5-year nationwide, including Danfoss compressor, electronics, cabinet and fittings subject to yearly inspections after the first two years
LISTED INTERNAL CAPACITY FRIDGE/FREEZER: 47L
4WD ACTION WATER TEST OF FRIDGE/FREEZER: 45L (including unusable space such as behind basket and evaporator etc).
EXTERNAL DIMENSIONS: H430mm x W445mm x L725mm

EXPLORER – DC56

USER FRIENDLY INTERNAL DESIGN

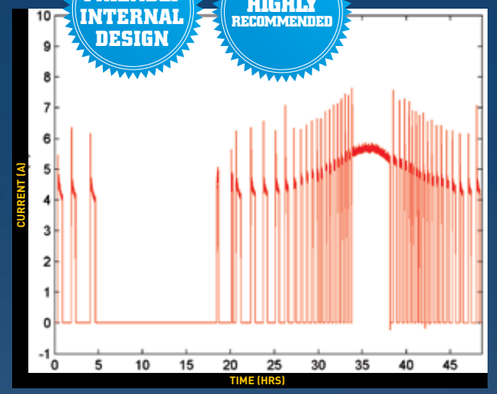
HIGHLY RECOMMENDED

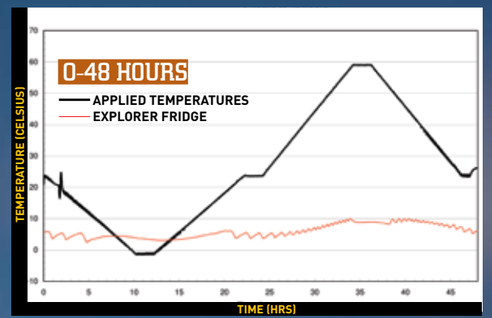
EXTERNAL: Explorer fridges use a marine-grade aluminium outer skin that covers up to 100mm of polyurethane foam. The control panel is recessed behind the outer casing, protects the two thermostat controls, while two LED lights indicate its state of operation.

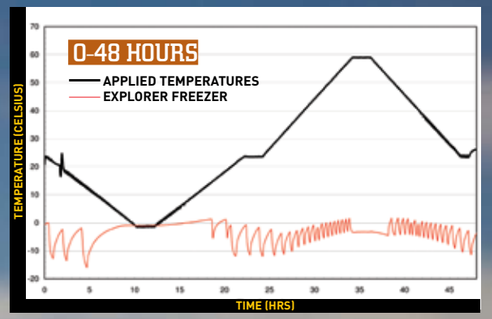
On the ventilated motor housing is the built-in circuit breaker and the economy and power switch that are also recessed. Two folding handles at each end make it easy to carry for two people and can be used to secure the fridge. Two adjustable steel latches keep the lid firmly shut.

INTERNAL: A fully moulded, blue fibreglass interior makes it easy to keep clean and the fridge compartment is split into a large main storage area and a soft produce shelf. The freezer section is fully self-contained and is sealed by a hinged aluminium lid.

OVERALL: You can't help but be impressed with the build quality of this fridge. It maintained its temperature very well throughout testing, and while it did use noticeably more power, it was the largest fridge tested. There is no digital readout and the handles aren't spring loaded and it's the most expensive fridge tested. However, you do get a product that's super tough, reliable, and capable of keeping the beers cold when everything else around it starts to melt. - if you can keep the power up to it, it's a fridge worth serious consideration and that's what makes it my personal favorite.







EXPLORER – DC56

COMPRESSOR: Danfoss BD35f
WEIGHT: 23kg
POWER SUPPLY: 12/24V DC & 240V AC using Explorer power pack 240V convertor
BATTERY PROTECTION SYSTEM: Yes
FUSED: 10A built-in circuit breaker
MADE IN: Australia
PRICE: $2100
WARRANTY: Private: 3 years manufacturing/1 year compressor and electrics
Commercial: 1 year manufacturing, compressor and electrics
LISTED INTERNAL CAPACITY FRIDGE/FREEZER: 36L/20L
4WD ACTION WATER TEST OF FRIDGE/FREEZER: 36L/20L
EXTERNAL DIMENSIONS: H420mm x W520mm x D850mm

NATIONAL LUNA – 50 TWIN

EXCELLENT BUILD QUALITY

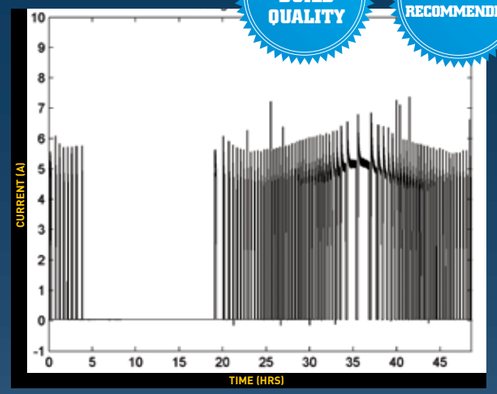
HIGHLY RECOMMENDED

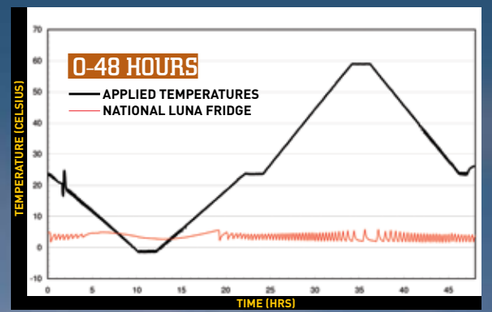
EXTERNAL: The National Luna fridge uses a robust, textured aluminium outer casing with a spring-loaded handle at each end. The lid pivots on three heavy-duty plastic hinges and two stainless steel latches keep the lid shut. The control panel is the best of all fridges tested, allowing the user complete control over fridge temp, battery voltage cut-out with alarm and a range of LEDs identifying battery voltage level and overload warning indicator.

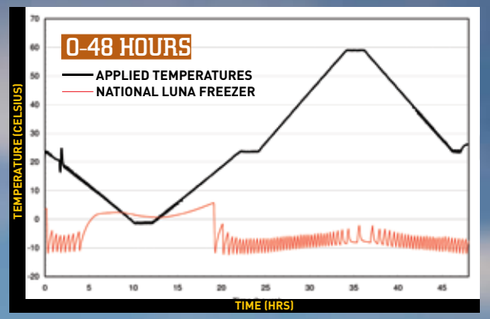
INTERNAL: A smooth aluminium finish is used internally and the freezer is fully self-contained, complete with its own lid. The fridge compartment has no basket supplied, but easily stored all our food during testing. A lid activated light shows what's in the fridge but not the freezer.

OVERALL: The National Luna fridge is definitely the best-dressed fridge we tested, but that tough exterior is definitely backed by a fridge that's proved it'll keep your food cold no matter what season you use it in.

It did have the second-highest power consumption, but this is still within the realms of a decent deep cycle battery. The most interactive control panel ever seen on a fridge is easy to use, and while no baskets are supplied, the interior design is very practical. Where every other fridge simply turns off below a certain voltage, the National Luna also sounds an alarm so you immediately know what's going on.







NATIONAL LUNA – 50 TWIN

COMPRESSOR: Danfoss BD35
WEIGHT: 22.6kg (aluminium model)
POWER SUPPLY: 9.5V → 15V DC / 170V → 270V AC (automatic switching)
BATTERY PROTECTION SYSTEM: Yes. 3 stage/14-point battery monitor with LED indicator, adjustable low-voltage cut-out and audible alarm
FUSED: 15-amp blade fuse
MADE IN: South Africa
PRICE: $1845
WARRANTY: 3 years
LISTED INTERNAL CAPACITY FRIDGE/FREEZER: 40L/10L
4WD ACTION WATER TEST OF FRIDGE/FREEZER: 37L/10.5L
EXTERNAL DIMENSIONS: H845mm x W385mm x L710mm

WAECO – CF50

HIGHLY RECOMMENDED

RUNNER UP

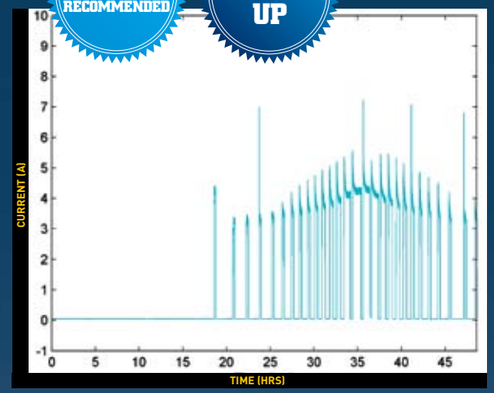
EXTERNAL: The Waeco fridge uses a polypropylene outer shell that is the same plastic used to make wheelie bins so it's built bush tough. The motor surround is more flimsy, but made of the same material. Steel handles are mounted to heavy-duty plastic moulded end caps, making them an ideal fridge anchor point.

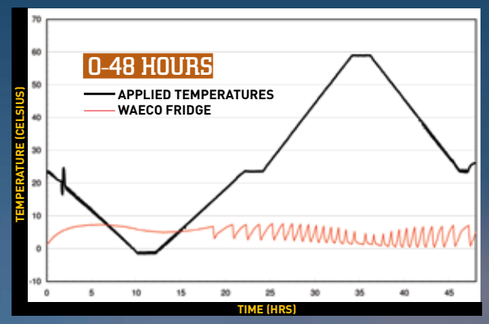
The lid is made from polyethylene and uses a simple, quick-release hinge system. The lid is secured by a built-in press-button latch system that was the easiest to use of all fridges tested. A nylon cord is used to prevent the lid from opening past 90°. The lid was more than tough enough to sit on without any deformation. The digital control panel is easy to use and well protected from bumps and knocks.

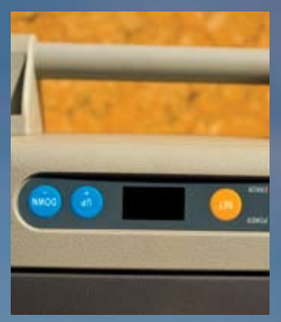
INTERNAL: The Waeco CF-50 is well laid out inside, consisting of a main storage area with a single large basket that can be sectioned off using the divider so tall items can be stored vertically without falling over on the first bump. A separate, self-contained shelf allows you to store more delicate for frequently needed foods. The LED light makes it easy to see at night.

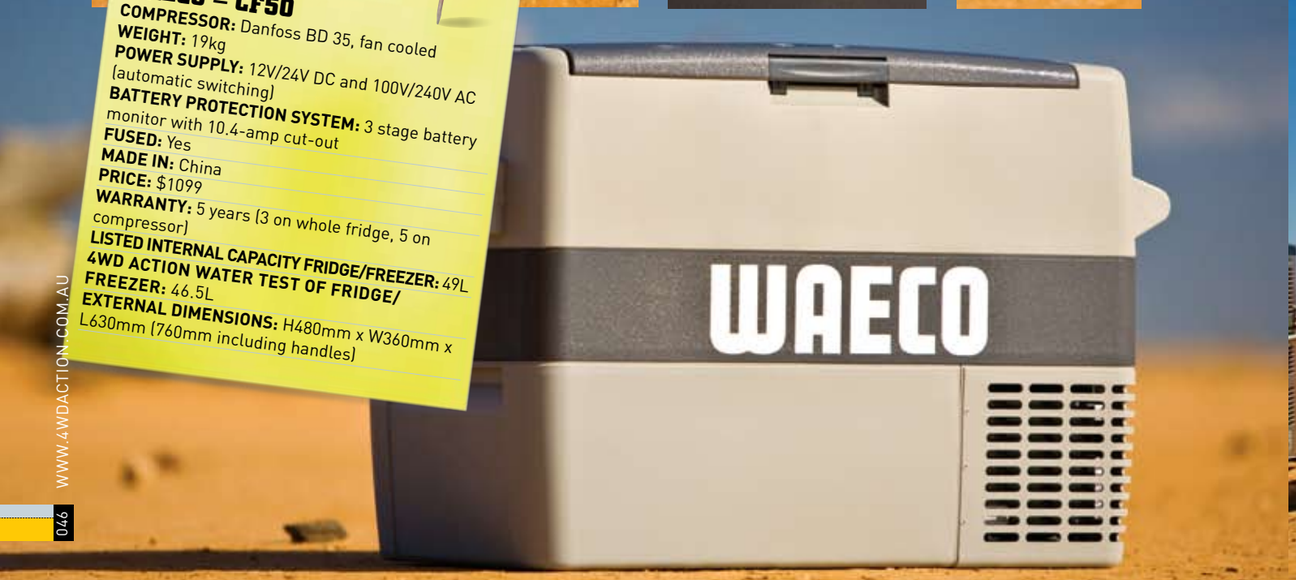
OVERALL: It's not until you thoroughly test any product that you can form a genuine opinion. In this case, the Waeco CF-50 may be a mass produced, made in China product, but no-one could argue with its very impressive performance in all areas of testing. This fridge is well built and designed and is sure to suit many 4WDers.

The outer casing resists scratching and easily absorbs decent knocks commonly experienced bouncing around off-road. With the third lowest overall power consumption and maintaining an average internal cabinet temp of 5°C when the ambient temp soars, the Waeco is definitely great value for money.









WAECO – CF50

COMPRESSOR: Danfoss BD 35, fan cooled
WEIGHT: 19kg
POWER SUPPLY: 12V/24V DC and 100V/240V AC (automatic switching)
BATTERY PROTECTION SYSTEM: 3 stage battery monitor with 10.4-amp cut-out
FUSED: Yes
MADE IN: China
PRICE: $1099
WARRANTY: 5 years (3 on whole fridge, 5 on compressor)
LISTED INTERNAL CAPACITY FRIDGE/FREEZER: 49L
4WD ACTION WATER TEST OF FRIDGE/FREEZER: 46.5L
EXTERNAL DIMENSIONS: H480mm x W360mm x L630mm (760mm including handles)

MAXIMUM FRIDGE POWER

There are several ways to improve a fridge's power consumption and thermal efficiencies, and when done collectively, you will ensure that your fridge will run at its maximum potential for many, many years. Let's have a look at each improvement in detail...

CABLES AND CONNECTORS: The cables supplied with each unit are more than capable of handling the rated current supply over the length of the lead. Where trouble usually starts is when it's plugged into the vehicle's standard lighter socket that is unable to handle the fridge's current draw.

A fridge compressor that doesn't have the right power supply will run for longer periods of time on less current to achieve the same result. Not only does this use more power overall, it can also be the source of fuses blowing and potential fires. If the cable is warm when running at full load (excluding indirect heat sources), there's a good chance you're losing significant power due to undersize cable.

To overcome this issue it is best to run at least 6mm², power and earth cable direct from the battery terminals to the fridge with the power cable suitably fused at the positive terminal of the battery. Avoid grounding the earth cable to the vehicle's body as this is generally a poor source of ground.

Use the factory-supplied 12V cable fitting at the fridge end to connect your new power supply cables to the fridge. As an alternative, the same wiring system from the battery can be used, but terminated at a specially designed junction that the factory supplied lead can plug directly into and be easily removed.

Remember, having the best cabling in the world means nothing if the connector used keeps falling out. Ultimately, the less joins and interference in the power supply, the more efficient the fridge motor will be.

Make sure to check out page 123 for our DIY guide to installing a heavy-duty fridge outlet.

BATTERY SELECTION: Ultimately, you should have a good idea of the accessories you plan to run with the ignition off before you plan your dual-battery system. While a dual battery system is something many 4WDers fit ASAP, knowing what the real power requirements are and budgeting for it is much cheaper than taking short cuts and doing it twice. This includes starting, deep cycle and hybrid batteries alike.

It should be noted that a battery only has a useable range of between 13.8V and 10.5V, and operating batteries below this point even occasionally will greatly shorten their life.

If you plan to operate your fridge off your starting battery, do so with extreme caution. Discharging a starting battery below 10.5V more than 3-4 times will destroy it, so ensure your fridge is fitted with a voltage cut out of at least 11.8V. On the other hand, running your fridge off a true deep cycle battery allows you to draw down to 10.5V hundreds of times without potential damage.

Another benefit of deep-cycle batteries is they are ideal for continuous current draw, and while a slower charge time is needed, you can be sure the fridge will have a steady power supply.

The best way to calculate this is to find the rated Amp Hour for all the appliances you plan to operate at once without the engine running, then match this to a suitably sized battery, allowing for a 50% reserve A/H capacity; ie: a 100A/H deep cycle should be matched to an estimated power consumption of 50A/H. In new vehicles especially, space is a premium and you may need to consider alternative power supplies such as solar or generator power when camping in one place for longer periods.

Heat is the number-one killer for all things electrical ,so where possible, mount your batteries in a cool area for years of trouble-free operation.

INSULATION: By better controlling the amount of heat that can transfered in and out of the cabinet walls, the less the motor will need to run to maintain a given cabinet temperature. To this extent, protecting the fridge from direct sunlight and ensuring the fridge has sufficient cool airflow around the unit will do wonders for improving a fridge's overall efficiency.

On super-hot days where in-car temps can soar very quickly, parking in the shade with the windows down will help and you can even place a damp towel over the unit for added benefit – just don't block the motor vents. If your fridge already has a fan fitted to the condenser, do not add extra fans as this will create turbulence around the condenser and actually reduce the ability to dissipate heat. Specially designed fridge covers are also available, but while they do help to retain a given temperature, they can make it difficult for the fridge to shed unwanted heat.

PACKING AND OPERATION: One trap many fridge users fall into is letting a fridge run for several hours to cool down, and then fill it with warm food and drinks. All the power used to cool it down has been wasted because that dense volume of cold air has just been displaced with a warm dense load.

The smart way is to refrigerate all food and drinks you intend taking in the household fridge or plug your 12V fridge into a 240V power supply with all your gear in it. Operating your fridge on its coldest setting doesn't use more power to maintain that temperature, it will just run for a longer period initially to reach it. Also, make sure the latch is secure.

When using your fridge in the bush, aim to open the lid only when necessary. This doesn't mean you should sit there looking at it dying of thirst for fear of letting out the cold air, it just means you should try to avoid opening and closing the lid every five minutes when you can get what you want in one go. Likewise, when restocking with warm goods, try to do it just before you start driving. That way, you won't lose valuable power because the batteries will have a constant charge off the alternator.

THEIR METHODS OF OPERATION ARE FAR FROM ECONOMICAL OR PRACTICAL

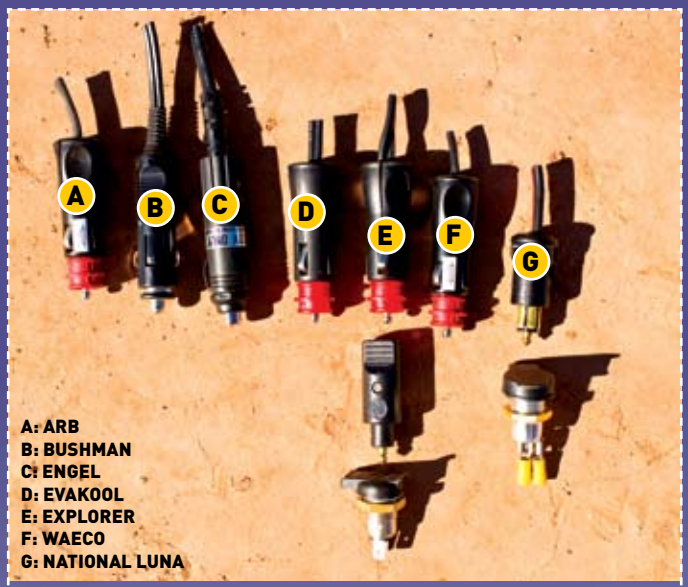
SUMMING UP

As our testing shows, there's more to choosing a fridge than its power consumption and cooling efficiency. Both areas are easily improved by ensuring your 4WD is equipped with suitably sized, good quality deep-cycle batteries and mounting the fridge so it's protected from direct sunlight with good ventilation. Of course, smaller 4WDs are extremely limited for space and they can't make the same compromises larger 4WDs can. None of the seven fridges tested showed any significant performance or feature advantages over the other. That's not to say there weren't a few stand outs and we must give due credit to those manufacturers...

Best value for money fridge has to go to Bushman. Performing well in all tests, it also comes with a range of accessories that other manufacturers charge extra for. Its ease of use, efficient power consumption, and practical internal design all add up to a budget winning combination.

Waeco scores second place with a fridge that is power and thermally efficient, wrapped in a tough exterior. Again, internal design is very good and the control panel easy to use. Our testing has proved the Waeco can easily handle any climate without sucking your battery dry.

First place and congratulations must go to ARB for designing a fridge that has a range of operational features that make it suitable for many users. While the new handle design gives it the most positive locking action of all, it's also power efficient and able to keep internal cabinet temps stable across a range of temperatures. The tough build quality makes it ideal for punishing off-road use, all the while keeping your food and drinks icy cold. Being realistic about what you what in a fridge, where it'll fit and how you intend using it will ensure your final decision results in a fridge that gets on with the job while you sit back and relax.



While they all use a cigarette lighter-style plug, they do differ in quality and this will ultimately determine how reliable the power supply will be. The additional plug options supplied with the Explorer and National Luna fridges offer a very positive connection. Regardless, you can't beat the reliability if hard wiring it direct to the battery where possible.

The rubber bushes that are used to mount the compressor to the body are prone to wear when exposed to constant vibrations over time. Worn bushes allow excessive movement in the compressor housing and can contribute to premature failure.

CONTACTS

ARB: www.arb.com.au
BUSHMAN: www.bushman.com.au
ENGEL: www.engel.com.au
EXPLORER: www.explorerfridgefreezer.com.au
EVAKOOL: www.evakool.com.au
NATIONAL LUNA: www.dolium.com.au
WAECO: www.waeco.com.au

AUTHORISED FRIDGE REPAIRER:
www.alternategasfridges.com.au

Thank you to the following companies for their assistance with this comparo:
PIRANHA OFFROAD www.piranhaoffroad.com.au
JAYCAR ELECTRONICS www.jaycar.com.au
GENQUIP GENERATORS www.genquip.com.au

SCORE SHEET

Each fridge has been given a score out of 10 in nine categories that best represent what really should be considered when buying a fridge. Your specific application will determine what order of priority you rate each category. The ideal conclusion when deciding what fridge suits you best would involve choosing a fridge that had an internal layout and size that suits day to day use, with control panel features that are easy to use. Power consumption really should be the last consideration as most 4WD's can be easily upgraded to suit. After all, there's no point choosing the smallest, most power efficient fridge if it can't refrigerate enough food for four people during a week's camping.

FRIDGE	POWER CONSUMPTION	THERMAL EFFECIENCY	INTERNAL LAYOUT	COMPACT DESIGN	HANDLE DESIGN	LID DESIGN AND FUNCTION	OVERALL RUGGEDNESS	CONTROL PANEL DESIGN	VALUE FOR MONEY
ARB 47l	7	10	10	10	8	10	9	9	9
BUSHMAN 35l-42l	9	10	9	10	6	9	7	10	10
ENGEL MT45F SERIES II 40l	6	10	8	10	10	10	10	7	8
EXPLORER DC-50	4	10	9	10	8	10	10	6	7
EVAKOOL REF47	10	8	8	8	8	9	7	7	8
NATIONAL LUNA 50L TWIN	5	10	8	10	9	9	10	10	7
WAECO CF50	8	9	9	10	10	8	8	9	9