



harman/kardon HD990

CD Player

harman/kardon's HD990 is incredibly full-featured for a CD player, though you wouldn't know it by looking at the tastefully minimalist front panel. It has both balanced and unbalanced analogue outputs, as well as optical and coaxial digital outputs... but, most surprisingly, it also has optical and coaxial digital inputs as well, so you can use it to 'upgrade' the performance of older digital components, or plug in the digital output from a multi-room computer-based system, such as a Sonos ZonePlayer (particularly useful!).

However, the do-it-all HD990 has yet a further ace up its sleeve, which is that it has an 'HRS-Link' port that allows it to send digital signals that are completely free of jitter to similarly-equipped amplifiers or home theatre receivers. At the time of writing, only certain harman/kardon amplifiers were HRS-Link-equipped, but this doesn't mean the circuit will be limited to products bearing the h/k brand name.

The Equipment

As you can probably see from the photograph accompanying this review, the HD990 CD player is a 'half-height' component, measuring only 63mm from top to bottom. While this makes it easy to slip the player into even the most overcrowded equipment rack, I think I would have preferred Harman's engineers to specify a somewhat higher chassis, in the 90–110mm range. And, while they're at it, it didn't seem too good an idea to me to put the On/Standby indicator right on the corner of the front panel. (Embossing a silver harman/kardon logo on the top surface of the casing also seemed to be to be little unnecessary—not least because if you do place the player in a rack or cupboard, no-one will ever see it!)

After chucking so many brickbats at the design of the chassis, I can offer Harman's engineers at least one bouquet, which is that despite the incredibly light weight of the HD990 CD player (3.8kg), the chassis is extraordinarily stiff, which turned out to be because of the unusual and very clever use of a series of interlocking panels, rather than the usual 'bucket and lid' approach to chassis construction.

The push-button controls on the front panel are very, very narrow, and have such a short range of travel that I actually thought twice about calling them 'push' buttons in this review. It seems that all you have to do is touch them lightly and they'll trigger. When they do, what they'll do is, from left to right, control Power on/off, Play, Pause, Stop, Skip/Search (Previous), Skip/Search (Next) and Display Brightness (Full, Half, Off.) And just in case you were wondering, the essential drawer Open/Close button is over near the disc drawer, which is the best place for it.

All these same transport controls are also fitted to the remote control that comes with the HD990, but the remote is the 'doorway' that reveals the full extent of the HD990's extensive range of user-controllable functions. It's from this remote that you access the track programming menu, the various play modes (Repeat, Random, A–B), direct track access modes (with the puzzling +10/–10 button that for some reason moves you ten tracks forward, or ten tracks back), 'Folder' buttons so you can navigate through MP3 tracks that are stored in Folders, and an 'Info' button that is used to display information stored as CD-Text or ID3 data. (As you should have gathered from the foregoing description, the HD990 not only plays back conventional CDs but also CDs containing Text, as well as CD-R and CD-RW

discs coded with standard Red Book files or with MP3 files, which it not only plays, but can also display any embedded ID3 tags.)

The remote control is fairly large, vaguely paddle-shaped and the most important controls are large and made from soft shaped plastic, so you can easily 'feel' which control does what simply from its shape, without having to look at the control. This means that sight-impaired owners will be able to use the remote straight away, without having to memorise the physical location of the buttons, and that everyone will be able to use the control in the dark. But speaking of the dark, the buttons on the remote appeared to me to be made of luminescent plastic but no matter what I did, I couldn't get them to glow!

The rear panel of the HD990 contains not only ordinary unbalanced analogue outputs (via gold-plated RCA terminals) but also the superior balanced analogue outputs, via three-pin XLR sockets. The presence of these 'professional' sockets, along with the duplicate identifying labels for each of the terminals (one label right-side-up, the other 'upside-down') made me think that Harman has intended that the HD990 should find its way into recording studios, radio stations and other professional sound environments. If this is true, it would be yet another reason for the provision of both digital outputs **and** inputs—though, as I said in the beginning, the usefulness of the digital input for home users, and most especially in the context of a computer-based multi-room home audio system, would be reason enough. The other unusual sockets on the rear of the HD990 are for the HRS-Link connection and for remote control connections. (You can connect an external IR sender, enabling the HD990 to be hidden away in a cup-

board yet still able to be controlled remotely, and also link the HD990 to similarly-equipped h/k components.

Listening Sessions

Some hi-fi components hide their light under a bushel, so it's only after extended use that you come to understand and appreciate the full extent of their abilities. The HD990 is not one of these components. Its sound quality is nothing short of amazing, so that you'll be gob-smacked from the instant the first notes burst forth from your loudspeakers. It's that good. The music leaps out from the speakers without distortion or compression, and as fresh and immediate as the day it was recorded. It's so lively and fresh that you may even wonder whether you're listening to a re-mastered version of an old favourite, rather than the same old disc that's been sitting in your collection for the past couple of years.

Initially, I thought this dramatically-improved audio quality was mostly due to the HRS-Link connection, because local distributor Convoy International had thoughtfully sent over one of h/k's new HK990 integrated amplifiers as well, so I'd done them the courtesy of inserting that into my system as well. However, when I decided to test this theory by connecting the HD990 (via its balanced outputs) to my current fave integrated, the Gryphon Attila, the sound remained every bit as good. So good, in fact, that initially I could not hear any differences at all. However after several weeks, once I had become completely familiar with the sound of the HK990 (and with the knack it had of making all the CDs in my collection sound so much better!) I thought I'd try the old A-B test again, this time comparing the HD990's sound with and without the HRS-link using just the HK990 amp, so as to limit the number of variables. This time around I was just able to hear that the HD990's sound quality when HRS-Linked was indeed superior to when it wasn't so linked but, as should already be evident, the differences are so small that I don't think you'll hear them even over a single, extended audition... they're sufficiently subtle as to require extreme familiarity.

One of the first discs on which the HD990 wrought its magic was actually the CD layer of a new SACD from Melba, 'The Galant Bassoon', which sees Matthew Wilkie (bassoon),

Neal Peres Da Costa (harpsichord) and Kees Boersma (double bass) joining forces to deliver transcriptions of works by Bach and Telemann. Listen to the CD layer via the HD990 and you will indeed wonder whether SACD (or at least two-channel SACD, but that's another story) was worth all the effort. There is a complete absence of noise, and the sounds at low levels are more than pristine—they're immaculate. The tonal qualities and articulation that Wilkie extracts from his bassoon are nothing short of miraculous, particularly in such difficult movements as the *allegro* from Bach's *Sonata for Flute and continuo in E Minor BWV 1034 (A minor for the bassoon)*. The way the h/k manages the balance between the three instruments is salutary, though some credit is no doubt due to Melba engineer Tony David Gray. I am usually no great fan of transcriptions, but listening to the bassoon play parts originally intended for flute, viola da gamba, and recorder turned out to be a truly inspiring and revealing musical experience. The opening phrases of Telemann's *Sonata in F Minor*, for example, are delivered so beautifully, and so perfectly, as regards both performance and sound quality, that my heart leapt to my mouth, and perhaps for the first time I realised that never before had a movement been so aptly named.

As with all the most-revealing high-end components, the HD990 sometimes revealed things I didn't really don't want to hear, such as the previously imperceptible wow and flutter effects audible in the piano backing to the Carpenters' extremely unusual cover of Lennon/McCartney's *Ticket to Ride*. (Once you get past the speed irregularities, you should take time to wonder at the marvel that was Karen Carpenter's voice: not only its tonal beauty, but the perfection of her pitching, which is exploited to dramatic effect in this re-arrangement.)

The clarity with which the HD990 reveals vocals was demonstrated beyond any shadow of a doubt on X&Hell's 'Million Dollar Sex Party'. On lesser players, the rapidly-paced rap-like vocal lines can be difficult to discern, but via the h/k, every expletive came through explosively and confrontingly clear. Despite the exploitative title, it's actually a great CD with incredible drive and energy (particularly in the bass!) and you gotta admire a lyric like

LAB REPORT

Readers interested in a full technical appraisal of the performance of the harman/kardon HD990 CD Player should continue on and read the LABORATORY REPORT published on the following pages. Readers should note that the results mentioned in the report, tabulated in performance charts and/or displayed using graphs and/or photographs should be construed as applying only to the specific sample tested.

the one that opens *Good Girl*: 'We can have day sex/have night sex/we can even have fight sex/have a little bit of light sex...'

And speaking of sex, if you like a bit of Jimmy Barnes, you'll love the way the HD990 handles 'The Rhythm and the Blues' (Liberation) and if you love a bit of old-fashioned rock 'n roll, you'll also love the older, somewhat cleaner-cut Jimmy, who's obviously looking for a bit of retro action. Listening to this new album is like visiting the 50s, but with 21st-century virtuosity and recording techniques.

Try as I might, I could not fault the HD990. The only thing that sometimes annoyed me was that it takes quite a long time to load a disc, but for this type of performance, I'm happy to wait 12 seconds. Hell, I'd probably even wait a whole minute!

Conclusion

So how good is Harman's new h/k HD990 CD Player? It's so good that if Harman had put all it into a bigger, heavier, fancier case and attached a sticker price ten times higher, I'd have still bought it like a shot... and no, I didn't buy my review model, because it had to go back to the distributor. I instead went out and bought it at full retail—I was so keen to get it back home that I didn't even try to bargain.

 Peter Croft

harman/kardon HD990 CD Player

Brand: harman/kardon

Model: HD990

Category: CD Player

RRP: \$999

Warranty: Two Years

Distributor: Convoy International Pty Ltd

Address: PO Box 970, Botany NSW 1455

T: 1800 817 787

T: (02) 9700 0111

F: (02) 9700 0000

E: info@convoy.com.au

W: www.e-hifi.com.au



- Superb performance
- Digital inputs & outputs
- Balanced & unbalanced



- Height
- Slow CD loading
- Standby light location



Test Results

Newport Test Labs reported the harman/kardon HD990 as returning excellent performance in every one of its tests. The only minor discrepancy was when testing for harmonic distortion at a recorded level of 0dB (*Graph 1*), where it appeared the analogue output stage was being driven a little too hard, resulting in the production of second and third-order harmonic distortion components. However, the levels were exceedingly low: -108dB for the second harmonic component, equivalent to 0.0003% THD, and -110dB for the third harmonic component, also equivalent to

ing ordinary music CDs. While you're looking at this graph, note that that h/k's noise floor is mostly sitting down at -130dB . You can see at the extreme left of the graph that noise does increase at very low frequencies as you'd expect (mains-power related) but even this low-frequency noise is still around 110dB down.

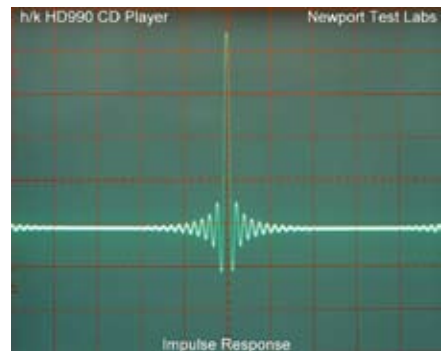
Graph 3 shows the output spectrum with a -20dB recorded signal and you can see there is no distortion visible in the output at all, despite the fact that the noise floor is still at -130dB . This is excellent performance on both counts. *Graph 4* shows output at -60dB . The first thing to note on this graph is that

“Newport Test Labs reported the harman/kardon HD990 as returning excellent performance in every one of its tests.”



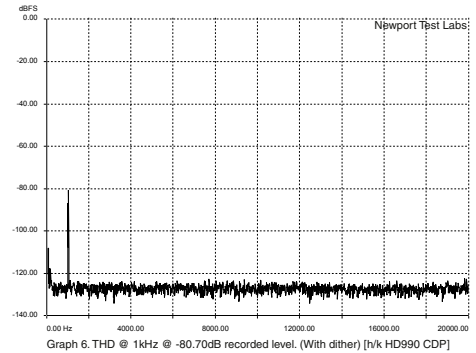
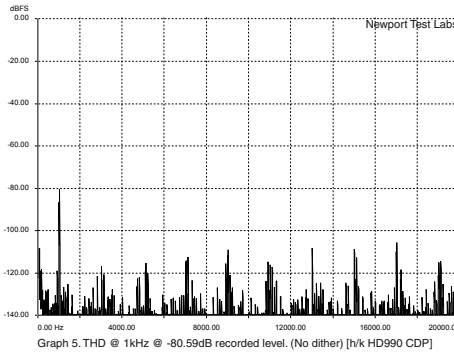
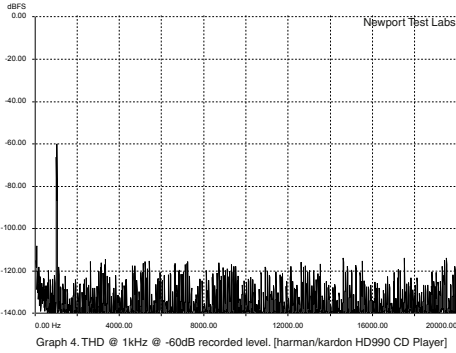
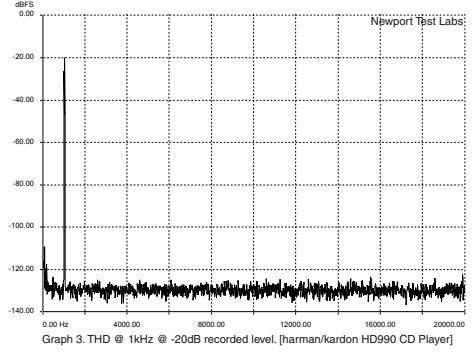
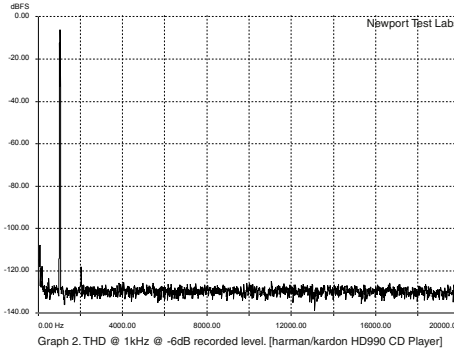
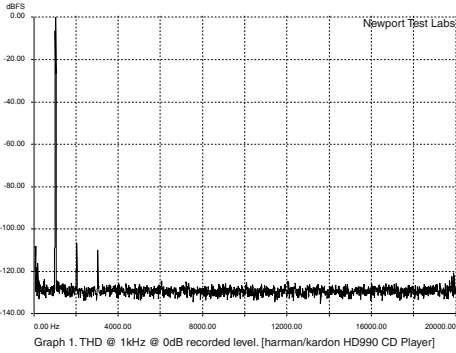
0.0003% THD. (Note that the percentage figure is the same because I am rounding the figures up to stop the number of digits from becoming unmanageable. If you'd like the exact figures, you can work them out yourself using the excellent dB to percentage calculator at www.sengpielaudio.com/calculator-thd.htm.) As I have pointed out many times before, Harman is likely pushing the upper output voltage limit in order to maximise the player's measured signal-to-noise ratio, because there are no commercially-available music discs that contain music signals recorded at 0dB, so in some ways it's not sensible to design players to handle this output level. You can see that at a -6dB recorded level (*Graph 2*) there's only a single second harmonic distortion component at -118dB , or 0.0001% THD, so you can expect this type of performance or better when play-

ing the output is sitting at exactly -60dB , which shows the excellent linearity of the HD990, which I'll discuss further on in this analysis. The second thing to note is that the signals that stretch across the bottom of the graph are caused by jitter, due to the test signal at 1kHz being undithered, and there being some interaction between this signal and the jitter products themselves. However, this is not a true representation of what you'd hear from a music disc either, since it would be dithered. You can see what I mean by comparing *Graph 5* (which shows an undithered 1kHz test signal at a level of -80.59dB) with *Graph 6*, which shows a dithered 1kHz test signal at an almost identical level (-80.70dB). Note that on *Graph 5* there are fewer 'spikes' along the bottom of the graph than in *Graph 4* because of the lower level of the test signal itself. You can see that



the dithering raises the noise floor to around -127dB , but at the same time completely removes all the jitter-related products, especially the higher-level ones clustered around the odd-harmonic points (3kHz, 5kHz, 7kHz, etc).

The effect on distortion at low level is even more pronounced down around -90dB , where *Graph 7* (no dither) shows clear harmonically-related distortion components—albeit all at levels of between -100dB and -120dB , equivalent to THD of between 0.001% and 0.0001%, and all of which vanish completely once dither is added to the signal (*Graph 8*). Although this is impressive performance from the HD990, what's even more impressive is that the level errors at these low levels amounted to just 0.13dB without dither, reducing to just 0.07dB with dither. If you look at the tabulated figures showing linearity errors from -60dB down, you'll see this excellent performance is typical of all playback levels. And at levels above -60dB , any errors that might have been present were too small to be measured reliably. While you're checking the linearity stats, look above at the de-emphasis error results. You will see that these, too, are exemplary, but the most important thing to note is that unlike a great many modern CD players, the HD990 actually HAS a de-emphasis circuit, so you can correctly replay any CD ever manufactured. (CD players that don't have a de-emphasis circuit will play back CDs manufactured in the 80s incorrectly, with a prominent high-frequency response.) You should also note that the 0.378dB error noted at 16kHz is not actually a de-emphasis error as such, but is instead caused by the fact that the HD990's frequency response rolls off very slightly (and very slowly) above 2kHz, so that it's around 0.1dB down at 10kHz, after which the roll-off becomes a little steeper, so the response ends up 0.38dB

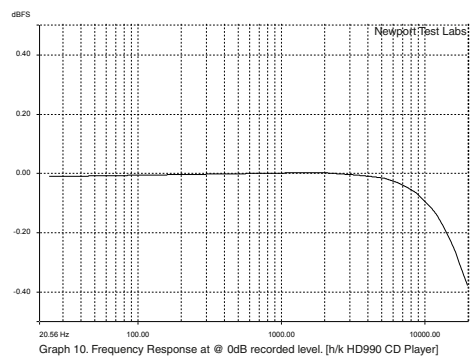
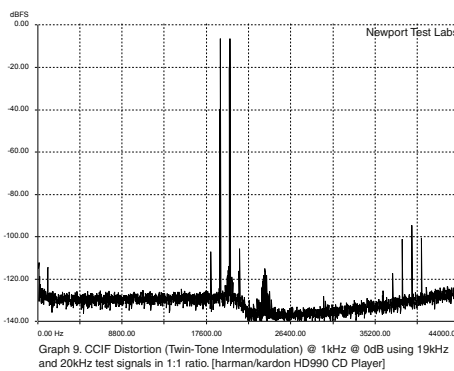
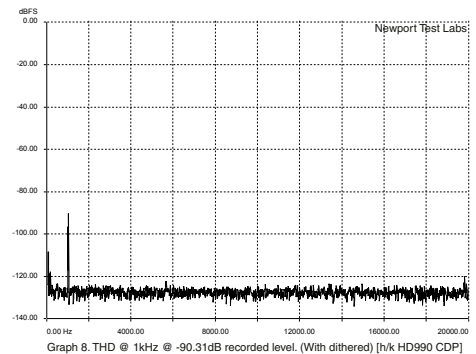
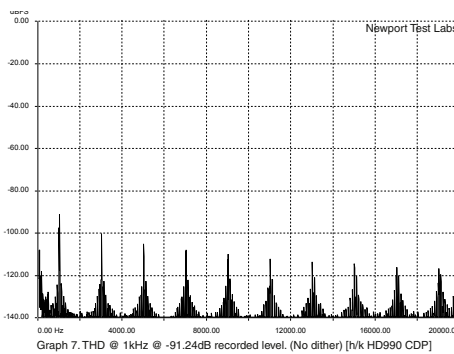


down at 20kHz—all of which is shown on *Graph 10*. You can see on this graph that below 2kHz, the response tracks the reference 0dB centre-point exactly down to 300Hz, where it starts edging slightly downwards to be about -0.01dB at 22Hz. The small bit missing between the 22Hz and the lower graph limit of 20.56Hz is simply due to a momentary lag between the sweep signal starting (from CD) and the test equipment acquiring the signal, so should be ignored. Overall, the frequency response of the h/k HD990 was measured by *Newport Test Labs* as being 5Hz to 20kHz ± 0.19 dB.

Separation between the left and right channels was excellent, as shown in the tabulated results, with the HD990 returning test results of 127dB at 16Hz, 139dB at 1kHz and 111dB at 20kHz. They're all good results, but the result at 20kHz is particularly good—the channel separation of most CD players usually falls well below 100dB at this high test frequency. Balance between the two channels was also great: 0.027dB!


Heading back to *Graph 9*, which shows CCIF intermodulation distortion (twin-tone, using signals of equal amplitude at 19kHz and 20kHz) shows very low level sidebands at 18kHz and 21kHz (both almost 107dB below signal level), but also a very low level of regenerated signal at 1kHz (the difference frequency). You can see this signal at the far left of the graph, sitting at around -115dB. Excellent performance. The inevitable CD format-related higher-frequency sampling by-products up around 44.1kHz are also nicely suppressed: the few by-products visible down around 40kHz are all so low in level (-100dB) and so high in frequency that they're of no consequence.

Output voltage for a 0dB signal was around



2-volts, as you can see from the tabulated test results, which is a very appropriate voltage that will be compatible with all other components to which the HD990 could conceivably be connected. The fact that it's a little lower than many other manufacturers, who are running their outputs 'hot', puts the measured signal-to-noise ratio (94dB A-weighted) in a better light as well, since it's coming off a lower reference voltage, so the HD990 will be even quieter than it looks on paper.

Group delay was not only very low, but also exactly equal in both channels, which is not only highly unusual, but also an excellent result. Indeed so far as I can recall, the HD990 returned the best result in this particular test that I have ever seen. Also extremely low—and once again, I think these are the best figures I've seen from a CD player—are the jitter test results, with the HD990 recording errors of less than 1.4nS for both jitter measurements.

Power consumption testing revealed that the HD990 already conforms with the new standby power consumption regulations, due for introduction in 2012, recording a figure of just 0.92-watts.  **Steve Holding**

Test Results: harman/kardon HD990 Compact Disc Player

Analogue Section	Result	Units/Comment
Output Voltage	2.0561/2.0495	volts (Left/Right)
Frequency Response:	+0.0dB/-0.38	dB (20Hz-20kHz)
Channel Separation:	127/139/111	dB @ 16Hz/1kHz/20kHz
THD:	0.006	@ 1kHz @ 0dBFS
Channel Balance:	0.027	dB @ 1kHz @ 0dBFS
Channel Phase:	0.37/0.01/0.07	16Hz/1kHz/20kHz (degrees)
Group Delay	5.45/5.45	degrees (1k-20k/20k-1k)
S/N Ratio (No Pre/emphasis)	80/94	dB (unweighted/weighted)
De-Emphasis Error	0.003/0.001/0.378	(1kHz/4kHz/16kHz)
Linearity Error @ -60.00dB/-70.00dB	0.03/0.01	dB (Not Dithered)
Linearity Error @ -80.59dB/-85.24dB	0.08/0.08	dB (Not Dithered)
Linearity Error @ -89.46dB/-91.24dB	0.11/0.13	dB (Not Dithered)
Linearity Error @ -80.70dB/-90.31dB	0.02/0.07	dB (Dithered)
Power Consumption	0.92/14.29	Standby/On
Mains Voltage During Test	241 - 254	Volts Min-Max
Digital Section	Result	Units/Comment
Digital Carrier Amplitude	103mV	Audioband
	1.44V/4.52V	Differential/Common Mode
Audioband Jitter	1.4/0.007	nS (p-p) / UI (p-p)
Data Jitter	1.3/0.008	nS (p-p) / UI (p-p)
Deviation	+13.5	ppm
Frame Rate	44100.595	
Eye-Narrowing (Zero Cross)	1.3/0.005	nS (p-p) / UI (p-p)
Eye-Narrowing (200mV)	4.4/0.026	nS (p-p) / UI (p-p)
Absolute Phase	Normal	Normal/Inverted
Bit Activity	23	At Digital Output

Notice to Advertisers

Each advertisement is accepted for publication by the Publisher on the basis that the Advertiser warrants to the Publisher that the advertisement and its contents are true and correct in all respects; that they are in no way misleading or deceptive; that they contain no representations and/or statements prohibited by Section 53 of the Trade Practices Act; and that publication will not constitute misleading or deceptive conduct prohibited by Section 52 of the Trade Practices Act. This warranty is deemed to include each advertisement submitted for publication in Australian HI-FI & Home Theatre Technology, the Australian HI-FI Yearbook, Best Buys, and any other magazine produced by the Publisher.

The term 'Advertiser' used in these conditions includes the Advertiser's Agent, if any.

The Advertiser acknowledges awareness of the provisions of the Trade Practices Act 1974, and recognises that the said Act imposes duties on everyone, individual and Corporation alike.

Two important provisions of the Act are set out as follows:

Section 52.

(1) A Corporation shall not, in trade or commerce, engage in conduct that is misleading or deceptive or is likely to mislead or deceive.

(2) Nothing in the succeeding provisions of this Division shall be taken as limiting by implication the generality of sub-section (1).

Section 53.

A Corporation shall not, in trade or commerce, in connection with the supply or possible supply of goods or services or in connection with the promotion by any means of the supply or use of goods or services:

- falsely represent that goods are of a particular standard, quality, grade, composition, style or model or have had a particular history or particular previous use;
- falsely represent that goods are new;
- represent that goods or services have sponsorship, approval, performance, characteristics, accessories, uses or benefits they do not have;
- represent that the Corporation has a sponsorship, approval or affiliation it does not have;
- make a false or misleading statement with respect to the price of goods or services;
- make a false or misleading statement concerning the need for any goods or services; or
- make a false or misleading statement concerning the existence, exclusion or effect of any condition, warranty, guarantee, right or remedy.

Please note that infringement of the Act can result in substantial fines for both individuals and Corporations. In addition to the criminal sanction arising from a breach of Section 53, a Corporation or an individual infringing Section 52 or Section 53 is liable to proceedings for injunction and for damages.