Chassis design of the Fada *Bullet* range of radios

by Stef Niewiadomski

The Fada* Bullet, or Streamliner, series of radios are highly valued and avidly collected for their brightly coloured Catalin cabinets. The streamliner shape is evocative of high-speed trains, cars and motorcycles being designed all over the world in the 1930s: Fada's innovation was to apply this to a radio. I believe that Fada did use the word 'streamliner' to describe their creation, but probably not 'bullet' which has negative undertones, but it's the latter word which tends to be used today to describe this shape.

Figure 1: The classic pose of a Fada Bullet radio: a model 116 - short and medium wave, five-valve superhet. Photo courtesy of Carl Glover.

In Reference 1, John Sideli (who was a dealer in modern antique collectables) wrote of the early days of Catalin radio collecting, in the US in the 1980s: 'For me, the radios were like warm and wonderful blocks of color in an infinite variety of shapes to be played with and put together in various combinations like an ever-changing collage of color, line and form. I used to tell people that it was totally incidental to me that they were radios, and I think that in large part this was really true. It was the material I was in love with – fabulous colored boxes in Deco and Moderne designs – and certainly not the fact that you could plug them in. I always hated those ugly electrical cords'. Eloquent words: everyone is entitled to their own opinion about any object, and this explains well why the demand for these radios, and hence the price, is so high. Vintage radio enthusiasts - who presumably don't hate the electrical cords - are in competition with collectors of stylish plastic objects, of which radios are just one example.

Many pictures of these radios are available in books and on the internet, but the chassis and detailed internal designs are not so well documented, possibly because the owners are hesitant to remove the chassis and risk damaging the cabinet. There is even conflicting information on the internet on what exactly went on inside these bright cabinets. Their electrical design is regarded as being very minimalist in the 'all american five' genre, and of little interest in itself. I disagree with this view: the chassis of the Bullet evolved 'behind the scenes' as radio design and valve technology changed. In this article I want to redress the balance and publish details and pictures of the chassis used inside these radios, to resolve any ambiguities, and to set the record straight.

A Little about Catalin and Fada

Catalin is the trade name of a thermosetting polymer plastic formulation purchased by the Catalin Corporation from Germany, which it then licensed to Fada and many other radio manufacturers. Catalin was transparent, almost colourless, and it could be dyed using bright colours or even marbled if the dye liquid was swirled into the body material, rather than fully mixed. The hot syrupy liquid was poured into lead moulds and oven baked to harden into its final shape. Once set the casting was removed from the mould, and it then needed considerable de-flashing and polishing to achieve the final clean shape and bright finish. Although the production process was still largely manual, it was less labour intensive than making wooden cabinets, and therefore didn't have to result in an expensive radio. Fada coined the term 'FADA-lucent' to refer to their Catalin cabinets, and described them as 'resembling precious stones'. Since the mixing in of colours was a human activity, every cabinet was unique, and that adds to the attractiveness of these radios to collectors today.

Although we tend to concentrate on the use of Bakelite, Catalin and other plastics in radios, it should be remembered that these materials were revolutionising how clocks, pens, jewellery, cameras, electrical fittings, kitchen utensils, toys and any number of other everyday objects were

*Footnote: I believe Fada was pronounced 'fader', at least in the Long Island, New York area, where the radios were made.

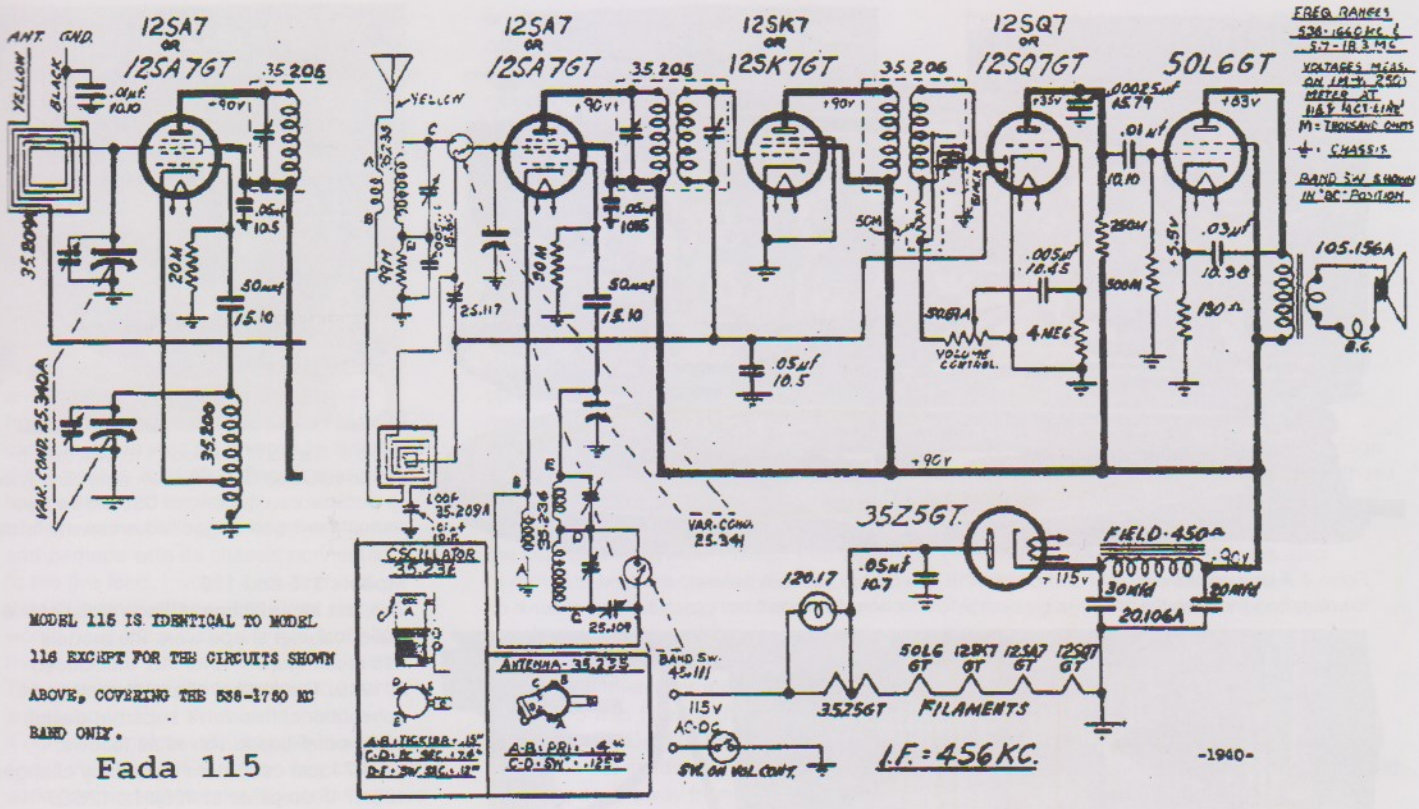

Figure 2 (above): The model 115 schematic, which includes details of the significant difference between the 115 and the model 116. I think this schematic is ambiguous as to which model is equipped with short wave coverage, as well as the medium wave band, and has led to some confusion on the internet.

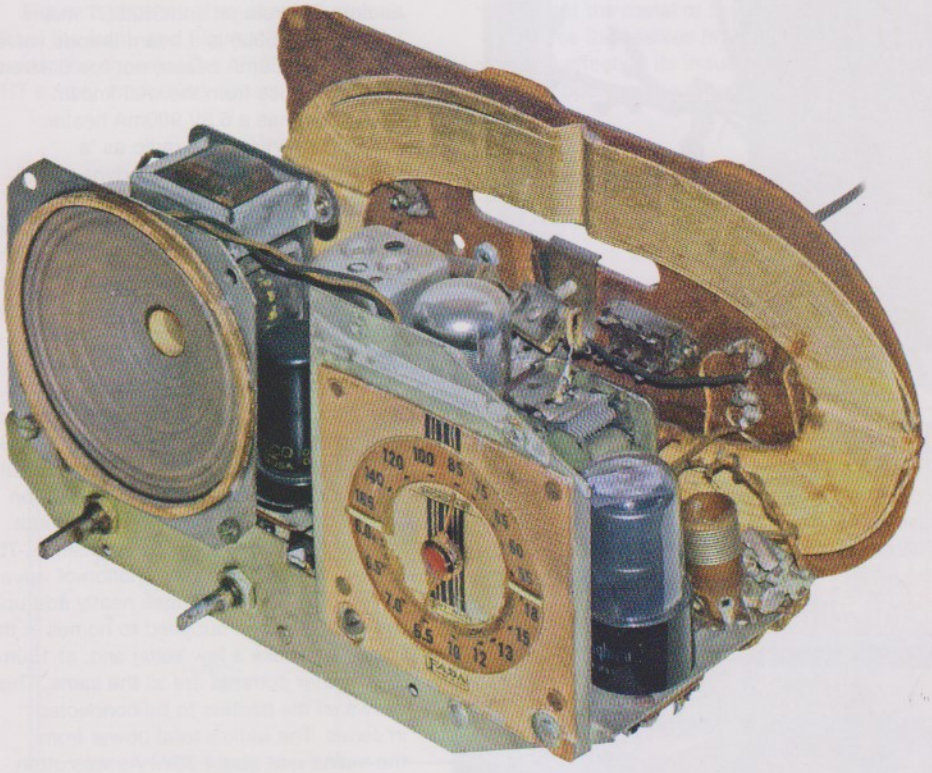

Figure 3 (left): Three-quarter front view of the model 116 chassis.

produced from the 1930s onwards.

Catalin seems to have been the saviour of the Fada company. A victim of the Great Depression, it had filed for bankruptcy in the mid-1930s, been saved by new investors, and struggled on into the second half of the decade. The company offered mainly wooden-cased radios (along with hundreds of other radio manufacturers), and some in brown and ivory 'plastic' and Bakelite cabinets. It used Catalin for the first time with the model 5F50 in 1938, and then evolved the sales strategy of offering several striking colour versions (typically five) for each model, with the 5F60, also launched in 1938. All of these early Catalin radios, a mixture of TRFs and superhets, and using large envelope valves are very collectable today. By the time the first Bullet model was launched in 1940, consumers had accepted the use of Catalin, and expected to be able to choose their radio from several colour schemes: it was the dynamic shape of the Bullet that excited the market. Reference 2 shows a large selection of Catalin and Bakelite radios, and seems to be kept up-to-date with current auctions of these objects.

One drawback of Catalin was that it was prone to cracking, especially at stress points such as control and screw fixing holes, and this caused some early mortality and returns from dealers and purchasers. Even today, collectors are wary of inducing cracks in their Catalin cabinets, and are careful not to over-tighten screws, or to stress the cabinets in any way.

From a colour stability point of view, Catalin was not a great success, though it's not clear (to me at least) how quickly changes in surface colour started to occur after manufacture, and what the owners of these radios thought about this process at the time. Presumably it depended on exactly where in the house the radio was located with respect to the windows, heat sources and so on. The colour changed drastically over the years, and because of these changes, there appear to be more colour combinations around today than were ever manufactured, and some original colours are very rare. The colour change is a surface effect caused by the UV in daylight. Some collectors strip back the surface by chemical means to reveal the original colour, while others are happy with the altered colours. Ultra keen (and well off) collectors like to have one example of each on their shelves.

The original colours were indicated by a two letter code after the model number: for example a model 115AR had an alabaster (white) with red cabinet.

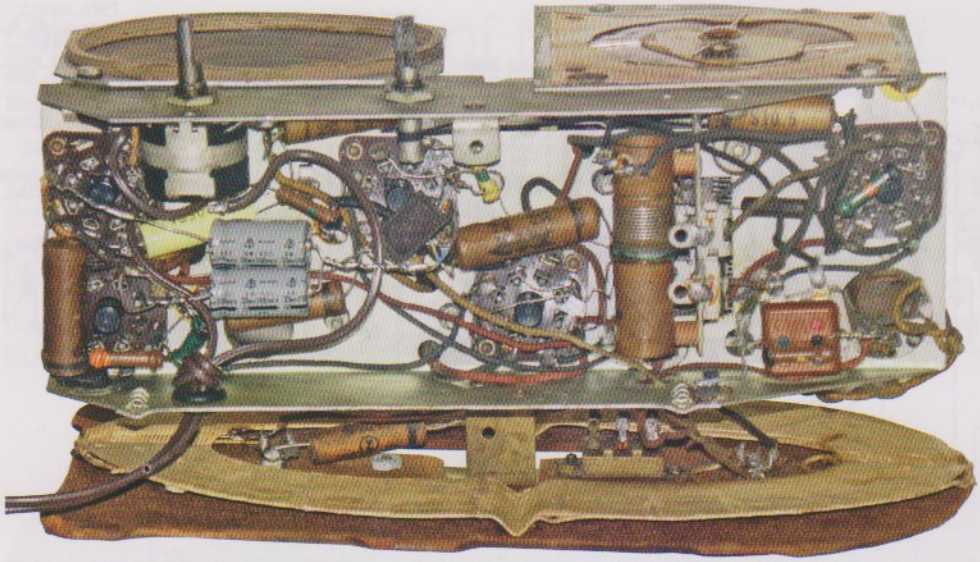

Figure 4: A view under the chassis of the model 116. The chassis has been restored, with some of the capacitors (including the power supply electrolytics) replaced by modern components.

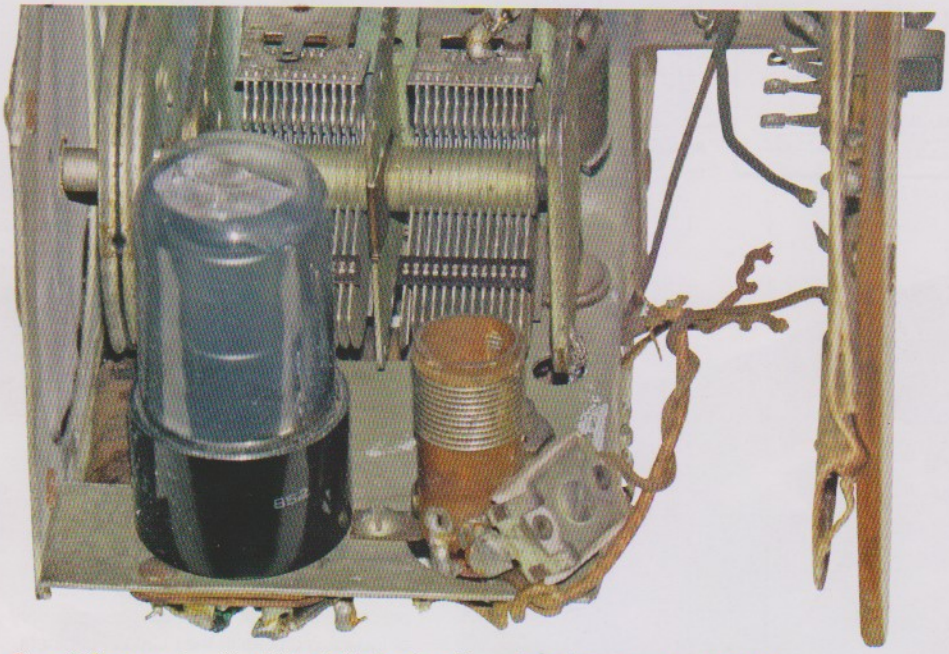

Figure 5: Close-up view of the left-hand side (as viewed from the rear) of the model 116 chassis. The hole to the right of the frequency changer valve (a 12AS7GT) is the subject of some debate, as to whether it was intended that it should eventually accommodate an RF stage, or was there simply to pass wires between the coil and the bottom of the chassis. The equal sized gangs on the tuning capacitor and the wave change slide switch (unconnected on this example) can also be seen.

Figure 7: An example of a model 200 on eBay: you can clearly see the hole next to the rather rusty tuning capacitor, still vacant and waiting for an RF amplifier to be fitted.

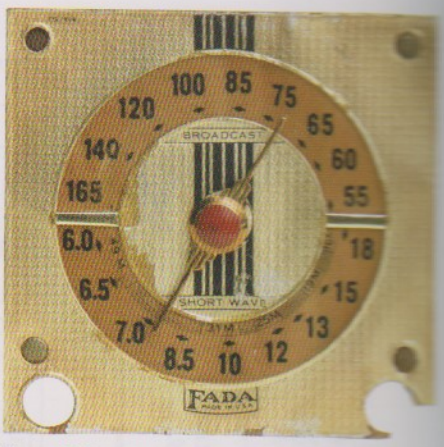

Figure 6: The dial of the model 116, with the top section calibrated for the medium wave band (known as the 'broadcast' band in the US), and the lower section showing short wave frequencies and bands.

Models 115 and 116

The first incarnations of Fada's distinctive Bullet cabinet shape were the models 115 (see Figure 1) and 116, introduced in 1940. The radios' chassis employed a conventional five-valve superhet design using octal-based valves as follows: 12SA7 local oscillator / frequency changer; 12SK7 IF amplifier at 456kHz; 12SQ7 detector / AVC / AF amplifier; 50L6GT audio output stage; and 35Z5GT mains rectifier. The 50L6 is a beam tetrode valve with a 50V 150mA heater, not too different in performance from the well-known 6L6, which has a 6.3V 900mA heater.

Fada advertised the radio as 'a powerful 5 tube superheterodyne with 7 tube performance', referring to the valve performing the combined detector, AVC and AF amplifier functions. They used this valve line-up for other very similar contemporary chassis designs, for example in the models 148 and 220, both of which used more conventional brown bakelite cabinets.

Figure 2 shows the 115/116 schematic. The transformerless power supply allowed operation from AC or DC mains at the US nominal voltage of 117V (the wide operating range of 105V-125V is often specified on a label on such a radio), which no doubt varied greatly from location to location. The clever aspect of this combination of valves is that their heater voltages neatly add up to the mains voltage supplied to homes in the US (give or take a few volts) and, at 150mA, their heater currents are all the same. This allows all the heaters to be connected in series. The radio's total power from the mains was about 30W. As was often used in radios at the time, the inductance of the field winding of the loudspeaker was used to smooth the HT supply.

The circuit design was so optimised that considerable thought was even given to how the dial lamp was powered, and rectifier valves were designed to facilitate this. The dial lamp specified was a 6.3V 150mA 'type 47' which was very commonly used on similar radios. The 35V heater on the 35Z5GT is tapped at the 7V/28V point and the dial lamp is connected across this 7V potential. As the heaters warm up, although the current through them initially surges

and then settles down, the voltage across the 7V portion of the rectifier's heater stays more or less constant and so doesn't blow the bulb. I believe the circuit also allows the bulb to be blown, and the radio to still work without stressing the valves too much. The user of the radio was supposed to fit a new bulb as soon as possible, but at least the radio could still be used, while a replacement bulb was being tracked down.

Chassis removal

Removal of the chassis from the cabinet is a simple task: the two knobs pull off, and three screws need to be removed from underneath the cabinet. As far as I can see, there was no attempt to isolate these screws from stray fingers that might have attempted to pick up the radio while it was still plugged into the mains and perhaps with its chassis connected to the live feed. I would think that with the US mains voltage of 117V or so, you would have felt a distinct tingle, but not the same bite you get from the UK mains. The chassis then slides backwards - a tilt is needed to clear the handle – and out it comes complete with its built-in aerial and 4-inch loudspeaker. The very compact audio output transformer is accommodated on top of the frame of the loudspeaker.

Figure 3 shows a view of a 116 chassis from the front, and Figure 4 is a view under the chassis. The 30µF and 20µF HT supply smoothing capacitors were originally housed in an above chassis can, which is missing on this example, having been replaced by modern components fitted under the chassis.

The chassis is 9½-inch long by 3¼-inches deep by 5¼-inches high, and as would be expected from such a midget receiver, it is well-packed, above and below deck. The use of octal valves allows close packing of the valves, as their envelopes are slightly narrower than their bases, which wasn't the case with previous generations of valves. The hole to the right of the frequency changer stage (see Figure 5 for a close up view) carries wires from the short wave aerial coil and the bandswitch to the underside of the chassis. The diameter of the hole is 1-inch, which is the right size for another octal valve socket to be added. There is only one small hole - to the side of the big hole - which was used to mount a bracket carrying the coil, and so a valve socket could not have been simply dropped in and fixed with rivets without at least slightly modifying the chassis - see later for more about this hole.

The 115 was fitted with a built in aerial called the 'FA-DA-SCOPE', a loop aerial wound on the inside of the back cover. This is spaced away from the rear of the chassis by about 1½-inches, presumably to prevent the metal of the chassis and the valves themselves from damping the coil and affecting its inductance. If you need to open up the rear of the radio, for example to change a valve, the aerial has to be unsoldered because of the short wires connecting it into the chassis, unless you have very long and thin fingers. Fada adopted the slogan 'Plug-In, Play' (evocative of the 1995 Intel and Microsoft Windows mantra of 'Plug and play' for easy use of peripherals with PCs) showing how easy the radio was to use since it did not need an external aerial.

With its drop-down handle, in itself an innovation which was soon copied by other manufacturers, the radio was designed to be transportable. The hope was that users would carry the radio around from room to room, but eventually see the inconvenience of this, and get to the stage where they purchased extra radios for these rooms. I doubt that modern day owners of Bullets carry them around by the handle.

The FA-DA-SCOPE aerial was also fitted to the 116, as well as a wire dangling out of the back for connection to at external aerial for short wave reception. A slide-action wavechange switch was mounted on the back panel.

Dial markings

The dial markings of the 115 were calibrated with kilocycles in the top segment, and meters in the bottom segment (rather like the dial of the model 1000, see later). Unlike on most UK-manufactured radios, no station identifications were shown on the dial, reflecting the fact that the radio

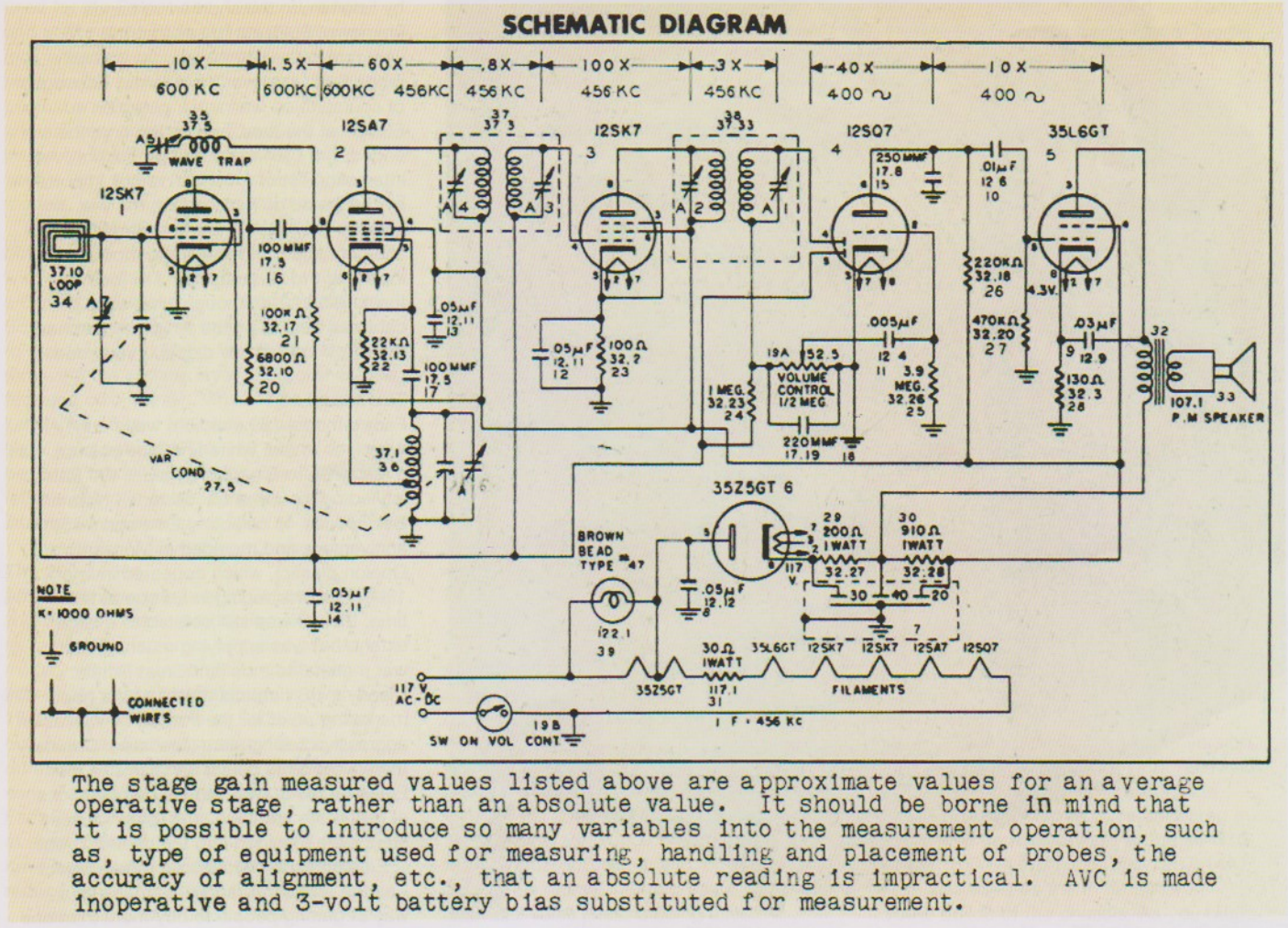

Figure 8: The schematic of the model 1000. The same basic circuit was used for the variants of the model 1000 chassis, using octal, B8B loctal and B7G valves, details of which can be seen in Table 1.

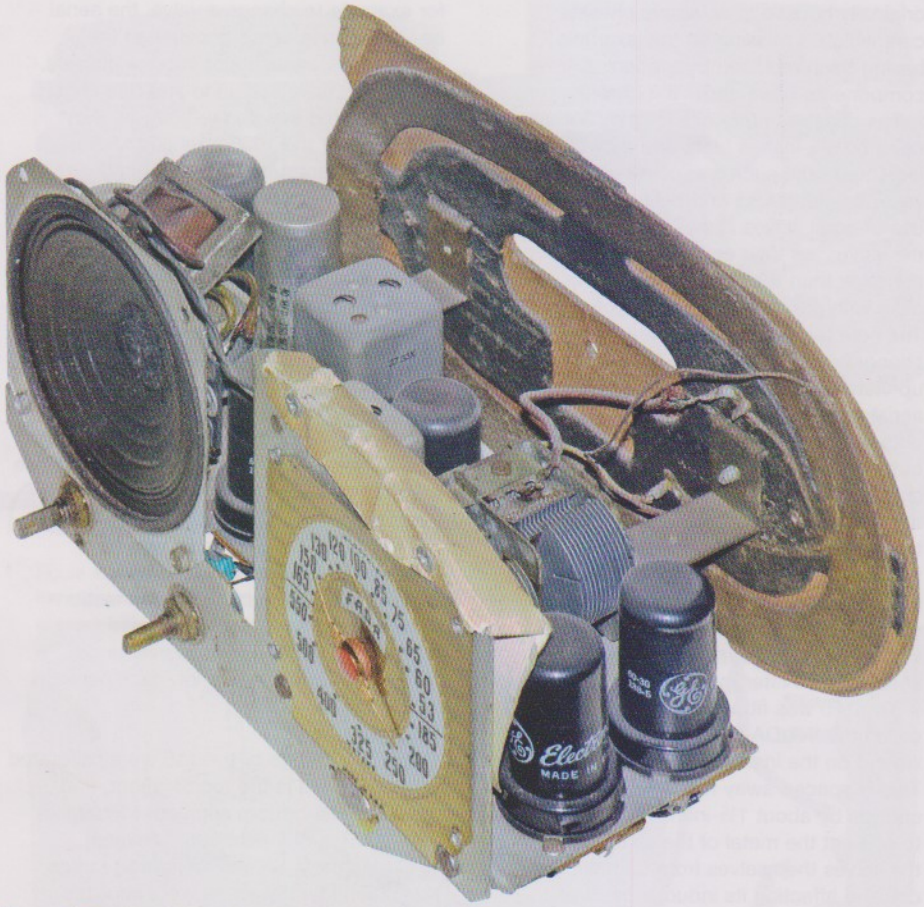

Figure 9: Top chassis view of an all-octal valve 1000-series radio.

Figure 10: Close up of the RF amplifier and frequency changer stages of the 1000-series radio. You can see the different size plates (and hence the different capacitances) on the two gangs of the tuning capacitor, which make it easy to achieve good tracking across the single band covered.

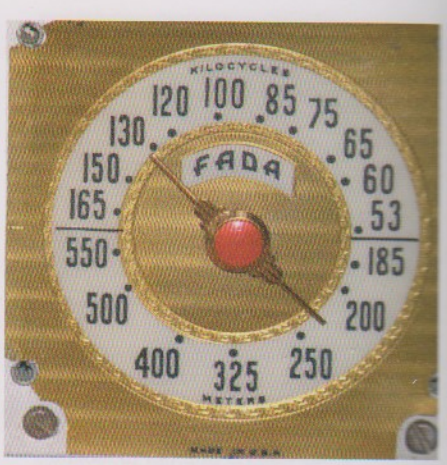

Figure 11: The medium wave only markings on the dial of the model 1000, indicating frequency and wavelength.

could be sold anywhere in the US, and station names and their frequencies would be quite different around the country.

The medium wave coverage of the 116 was slightly less than the 115, and a short wave band - between 5.7MHz (about 56m) and 18.3MHz (about 16m) - was added. This gave access to the 49m, 41m, 31m, 25m, 22m, 19m and 16m broadcast bands - these bands are marked on the radio's dial. The top section of the dial was calibrated for the medium wave band (known as the 'broadcast' band in the US), and the lower section showed the short wave frequencies, see Figure 6. Whether the 116 was intended for export, or simply for use in the US by listeners to the short wave bands is unknown. Suffice it to say that the 116 is very rare in the UK, so very few actually made their way over the Atlantic, although of course there was a war going on in Europe at the time, and by the time the war ended, the 116 was out of production. An interesting list of American radios imported by the Board of Trade during the war, given to me recently by Carl Glover, shows a large number of makes and models, including the Fada models 115 (but not the 116) and 200, though what state their cabinets were in by the time they reached the UK, if indeed any did, is unrecorded.

The model 189

Fada's model 189 (medium wave only) All American in red, white and blue colours, was a response to Emerson's model 400 Patriot (styled by the industrial designer, Norman Bel Geddes, to celebrate Emerson's 25th anniversary, and moulded in Monsanto's Opalon plastic), which appeared in late 1940. War was raging in Europe at the time: the US was still isolated to a large extent, but was supplying much needed war material to a defiant Great Britain. Clearly a US patriotic theme was a good marketing point for the Patriot, as well as an aggressive selling price (see later). Originally there were three colour variations of the Emerson radio, with various combinations of red, white and blue, and rather cleverly, stars were moulded into the control knobs.

Emerson soon introduced more colours - as the Aristocrat range - perhaps as a way of getting people to buy more than one

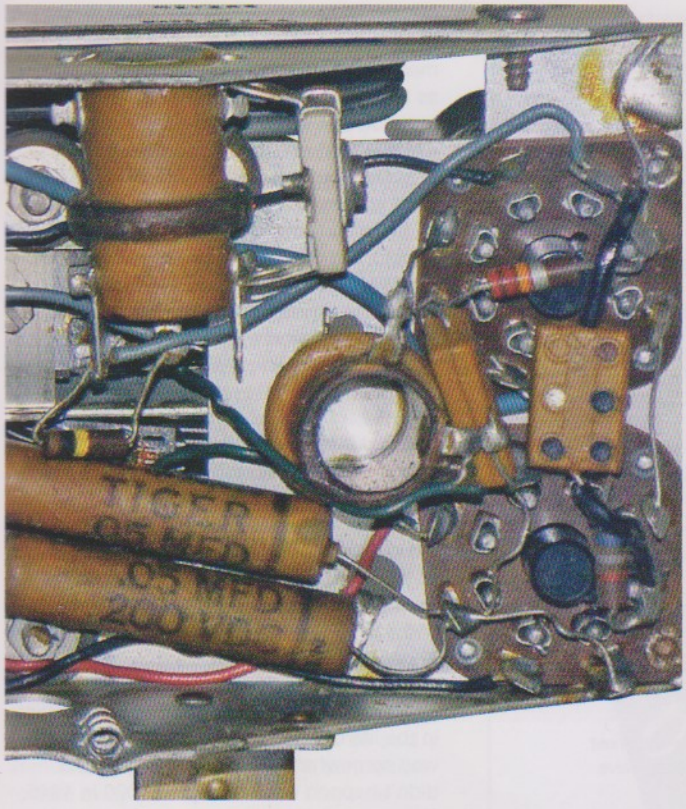

Figure 12: Partial under chassis view of the 1000, showing the area around the RF amplifier and frequency changer valves. The coil and trimmer to the upper left is the IF trap (inductor L35 and trimmer capacitor A4), and the coil to the immediate left of the valve sockets is L36, the local oscillator coil.

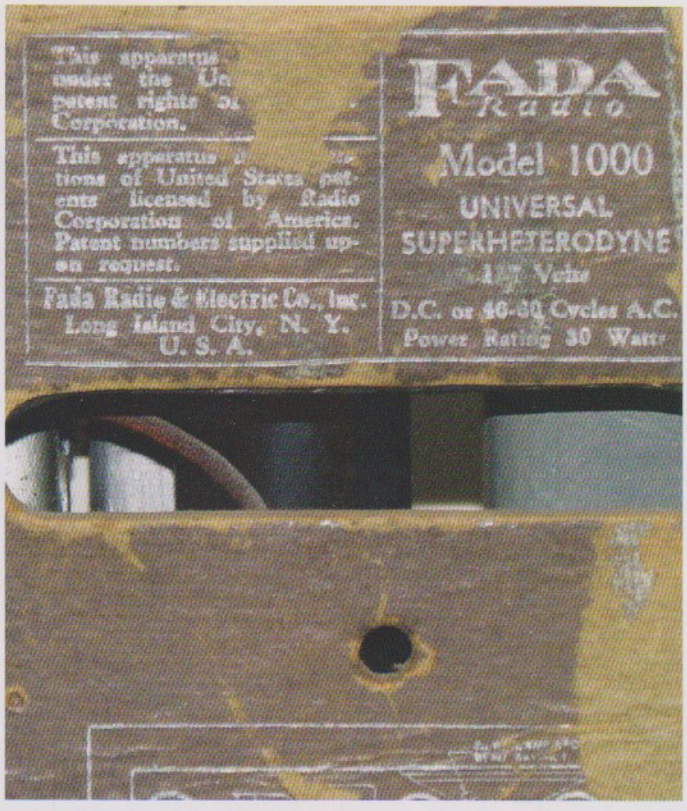

Figure 13: Detail from the back panel of the model 1000. The radio's model number and six valve line-up is printed on the panel. Previous models, and some examples of the 1000, had a label stuck onto the bottom of the cabinet containing this information.

radio of the same model. Catalin was not used for the Patriot and Aristocrat radios and unlike most Fada radios, the original red, white and blue (and other) colours have stayed stable over the years. The original combinations can still be found, and are very collectable. If you had looked inside an Emerson 400 you would have seen a very similar chassis to the Fada models, with the same five valve line-up.

Most 189s you now see have a butterscotch yellow (originally white) cabinet, with a marbelised green (originally blue) ring around the dial, and red knobs and handle. Some examples have been restored back to their original colours, which involves removing the surface layer and polishing the revealed colour finish, while some collectors keep their 189s in the state to which they have aged naturally. The 189 seems to have been the model designation specifically for this patriotic colour scheme, and its internals were almost identical to the 115.

The 200-series

America entered the war in December 1941 and domestic radio production slowed as radio manufacturers switched over to military projects. In some literature the 200-series year of manufacture is given as 1942, which is feasible as Fada squeezed out their last domestic radios for the duration, and war production ramped up early in that year. I'm assuming here that Fada did stop domestic radio production at some point during the war, but it may have been that this continued at some reduced level throughout this period.

I believe this was the first time that Fada used the word 'series' to indicate that a range of colours was available for that model. 200-series radios are very rare today, especially in the UK, and it seems likely that only a small number were produced. A single example of a 1942 Bullet radio carrying a model 189 label with a marbelised cabinet – you would expect this to have been labelled as a model 200 - has been seen on an internet auction. Perhaps Fada were using up all the cabinets, chassis, labels, etc they had in stock, before they shut down domestic radio production until 1945.

There seems to be some uncertainty (on the internet at least) as to whether Fada used the 'old' model 115 chassis for these models, or an updated six-valve chassis, as was used for the model 1000 starting in 1945. In the pictures for a couple of eBay auctions of 200-series Bullets I've seen evidence that it used the five valve chassis. See Figure 7 for a photo of the rear of a model 200 on eBay: you can clearly see the hole next to the tuning capacitor, still vacant and waiting for an RF amplifier to be fitted in a later incarnation of the radio.

Fada may have been introducing a permanent magnet speaker at this time, which would have meant a slightly modified power supply from that in the 115, but otherwise the chassis was identical. If anyone reading this has a model 200, perhaps they can open it up (or at least check the label on the bottom) and verify whether it's a five or six valve chassis, and let me know. Reference 3 advises the use of the model 115 schematic for servicing 200-series radios, inferring that it's the five octal valve chassis being used.

Wooden-cased Model 200

As the supply of Catalin dried up, Fada even produced a small number of model 200s in wooden cabinets, finished in red and ivory lacquers to make them resemble shiny Catalin. Even the bezel, grill, and knobs were formed from wood. The wooden cabinet was slightly bigger (perhaps an inch in each dimension) than the Catalin version, but the spacing of the dial and knobs was kept the same, and so the same chassis could be used. The photograph at Reference 4 shows a red and ivory coloured wooden model 200 alongside a Catalin-cased 115.

The 1000-series

When Fada restarted Bullet production after the war, they gave its chassis a refresh to reflect modern practice, and launched the radio as the 1000-series. The radio employed a six-valve superhet design, still with an IF of 456kHz. [As far as I can tell, Fada never got round to adopting the almost universally used (in the US and Japan, at least) intermediate frequency of 455kHz]. The radio was equipped with octal valves of types 12SK7, 12SA7, 12SK7, 12SQ7, 35L6GT and 35Z5GT.

The new sixth valve was an RF amplifier stage, using an octal 12SK7 (in its metal-cased version) in the 1945 version. This migrated to the loctal B8B 12B7/14A7 (dual marked) valve and finally to the B7G 12BA6 when this valve appeared in 1946, and carried forward to the all-B7G model 1000 in 1947-ish. The 12B7/14A7 was also used as the IF amplifier in some builds of the chassis. As you might

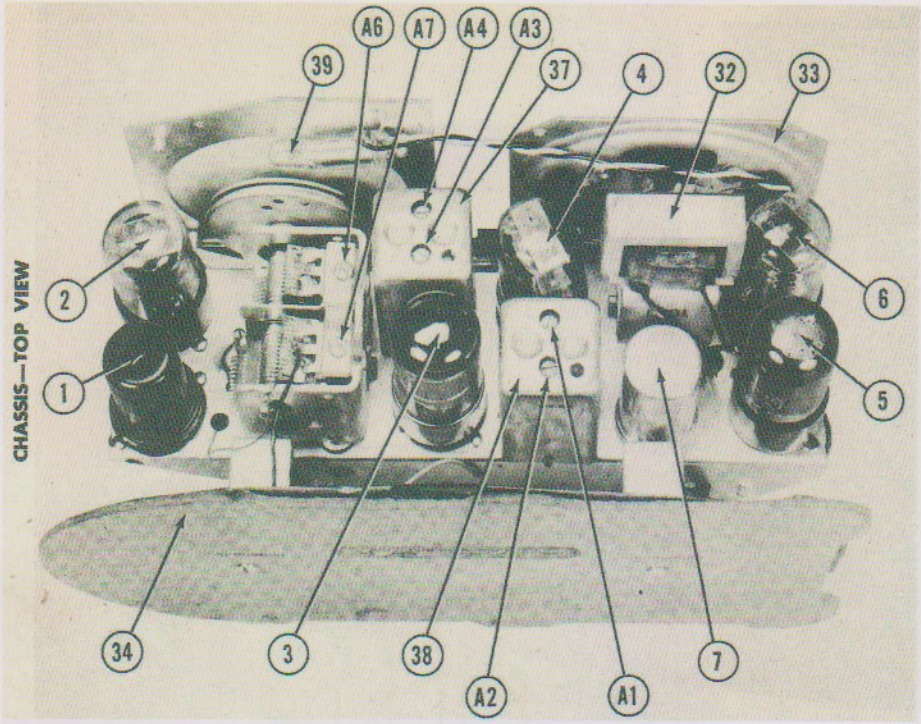

Figure 14: Top of the chassis photograph of the model 1000 from the Photofact Folder service sheet. Note the use of GT octal valves, apart from the RF amplifier which uses a metal-encapsulated valve.

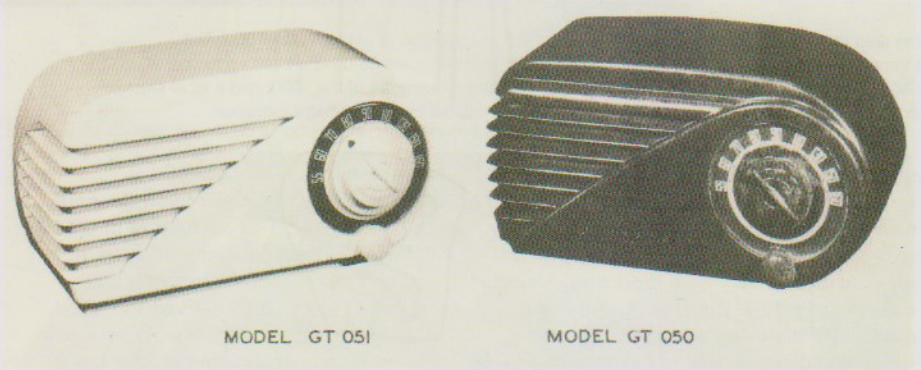

Figure 15: Front page of the Photofact Folder for the Farnsworth models GT-050, 051 and 052 models.

expect, Fada claimed that the six valves gave the radio '8 tube performance'.

See Table 1 for how this evolution to an all-B7G line-up happened. On the internet you sometimes see the model numbers 1000A and 1000B for the variants using B7G valves: I don't believe Fada used these designations. On the back of any of these variants the purchaser would simply have seen 'Model 1000', though presumably Fada themselves must had had some way of distinguishing between the different builds of chassis. In the table I've shown four different valve line-ups for the model 1000, occurring over about two years: there may well be others that I haven't spotted yet. I checked the pinouts of the octal and loctal valves and their B7G substitutes and in some cases they are quite different: this would have meant some juggling of the component positions and the wiring, and the generation of new production drawings.

Re-documenting and re-tooling for the different valve line-ups would not have been a trivial task, and so the volumes of radios being built must have justified the use of at least four different valve line-ups in about two years, presumably for cost savings or to resolve supply shortages.

Schematic

Figure 8 shows the schematic of the model 1000. By this time the speaker had become a permanent magnet type and its field winding was no longer available for use in the power supply circuit. Three capacitors (accommodated in an electrolytic can) and two resistors smoothed the HT lines.

The inclusion of an extra 12V valve in the heater chain meant that the audio output valve's heater voltage needed to be reduced by about the same amount, hence the use of the 35L6GT, which is in fact 15V lower than the 50L6GT. Of course the current through the heater of the 35L6GT was still the same, at 150mA. The lower heater power for the 35L6GT meant that it was capable of about 25% less audio output power than the 50L6GT, which was probably not noticeable in this radio. A 30Ω 1W resistor was also included in the heater chain to drop the extra few volts, and to limit the switch-on current surge.

The RF amplifier seems to have been added to increase the model's sensitivity: an untuned link from the RF stage to the frequency changer stage kept the number of tuned circuits to two, so that the radio needed no more RF coils and still only required a two-gang tuning capacitor, as used in the previous five-valve models. This meant that selectivity was still the same as the five-valve chassis, but presumably more distant stations could be received, which was probably a good selling point in such a large country as the USA, and local stations were louder. In their adverts, Fada emphasised 'the noise reducing RF stage'. The Photofact Folder for the 1000 series shows a gain of x10 for the RF stage. I presume this is voltage gain, that is, what you would see on a 'scope if you probed before and after the stage. An IF wave trap was positioned between the two stages to prevent breakthrough in the vicinity of 456kHz from reaching the frequency changer, and hence the IF amplifier.

There was a convenient position on the chassis to accommodate the new valve, next to the frequency changer, in the form of the hole that carried wires between the top and bottom of the chassis in the models 115 and 116. This hole is too big simply to carry these wires and it's reasonable to assume that the Fada designers always intended to fit this extra valve at some point in the life of the chassis, which of course was somewhat delayed by the war, and didn't happen until the model 1000 in 1945. This may or may not be true, but there was certainly a convenient space on the chassis in the right place into which the RF amplifier stage could be added without disrupting the successful original layout too much.

Figure 9 shows a three quarter view of the front of the model 1000 chassis, and Figure 10 shows a close up of the 12SK7 RF amplifier (to the left) and 12SA7 frequency changer (to the right) stages. You can see the different size plates (and hence the different capacitances) on the two gangs of the tuning capacitor, which make it easy to achieve good tracking across the single band covered, and saves a few cents because no padding capacitor is required.

A closer view of the dial is shown in Figure 11. I like the clear labelling of frequency and wavelength, and as with most US-produced radios, there is an absence of station names.

Figure 12 shows an under-chassis view of the RF amplifier and frequency converter stages in the model 1000. The coil and trimmer to the upper left form the IF trap (inductor L35 and trimmer capacitor A4) and the coil to the immediate left of the valve sockets is L36, the local oscillator inductor.

A small area of the back panel of a model 1000 is shown in Figure 13. This particular example has the radio's model number and six valve line-up printed on the panel. Other examples of the model 1000 (and previous models) had a label stuck onto the bottom of the cabinet, but this seems to have been a more permanent way of recording this information on the radio.

In Figure 14 I have scanned part of the Photofact Folder service sheet for the model 1000, showing how the publisher included a good-quality photograph of the top of the chassis. An under chassis view was also included, as well as a schematic, alignment details, parts list, a voltage and resistance chart, and dial cord stringing details.

Prices

The 115 sold for $19.95 in its first year, and the short wave band on the 116 cost you about an extra $3. $16.95 seems to have been a popular price for many radios with similar specifications, but with plainer cabinets than these Fada models. The Emerson model 400 Patriot sold for a very competitive $15 on its introduction.

In 1939 RCA were selling the 45X1 'Little Nipper' (a name that was used on many of their models), with a brown plastic cabinet, for $9.95, which may have been a loss leader aimed at damaging the competition rather than at making a profit for RCA. In those days you could get about $4.43 for £1, and so $9.95 equated to about £2 5s in old money, which sounds very cheap.

By the time the Bullet shape was re-introduced in 1945, with the model 1000, Fada could ask about $35 for the radio. It now came with one more valve compared to the 115 and 116 models, and so prices had to rise to cover this extra cost. Inflation had run at widely different rates in the US during the war, with annual rates as great as 13.2% in mid-1942, and all this added to the price at which a radio had to be sold immediately post-war. I think the conclusion to take away from this is that Fada were not able to demand huge premiums for these very stylish radios. They had a following because of the radio's styling, but as always in the US radio market, brisk competition forced prices downward.

Impersonations

The Fada streamlined cabinet was such a success that it attracted look-alike competition, for example, in the form of the Farnsworth medium wave only GT-050, 051 and 052 models, introduced rather belatedly in 1948. Figure 15 shows the front page of the Photofact Folder for these three Farnsworth models. With an octal valve line-up of 12SA7, 12SK7, 12SQ7, 50L6GT and 35Z5GT, this was a rather dated chassis in 1948, and made no use of the new B7G valves. As noted earlier, the Fada 1000 now included an RF amplifier stage in front of the frequency converter, which these Farnsworth models did not have.

As far as I can tell, the three Farnsworth models used identical chassis, and differed only in their cabinet and knob colours. The GT-050 had a standard mahogany coloured cabinet with a black outer circle for the dial; the GT-051 was a jazzed-up version, with a 'gleaming white' cabinet, again with the black outer circle for the dial; and I believe the GT-052 was a two-tone green colour.

The cabinet was made of 'modern' (for the time) plastic, rather than bakelite or Catalin, and was about half an inch bigger in each dimension than the Fada 1000-series. Farnsworth referred to the shape as 'teardrop', and these radios are also rare and very collectable today. It may be that by 1948 Farnsworth (and others) had seen the drawbacks of using Catalin for radio cabinets and may have advertised their use of 'modern' plastics, with better colour stability and being less prone to cracking, as a selling point. For me, the design doesn't quite work: the curves look great, but the tuning knob being concentric with the dial leaves only the on/off/volume control to be accommodated and it doesn't look quite right below the dial, but what do I know?

At the time, Farnsworth also made more conventionally-shaped radios (that is, with more upright rectangular cabinets) such as the GT-061, but also offered them in various bright colours, as allowed by the plastic technology they were using. For the more conservative purchaser there was also generally a 'safe' mahogany or ebony coloured version available.

Fada 700 'Cloud'

In 1946 Fada released the model 700 Cloud radio, in a Catalin cabinet, and with a range of at least five colours. This is regarded as Fada's first true post-war cabinet design. Its curves were somewhat similar to the model 1000, but the symmetrical design loses something of the movement of the Bullet's cabinet, and although sought after, is now regarded by collectors as being inferior. The knobs and dial are placed in similar positions and the chassis design is very similar to the model 1000, using the six same B7G valve types (and therefore having an RF amplifier stage), and with medium wave only coverage.

For purchasers who didn't take to the Bullet shape (or maybe they already owned one) Fada offered the Catalin model 652 Temple at the same time as the model 1000, and for about $1 more. The 652 used a similar six valve circuit as the 1000, with an RF stage. Figure 16 shows the model 652 alongside the model 1000 (and other Fada radios) in a trade advert in the March 1946 issue of Radio & Television Retailing magazine.

There was no standing still in this cut-throat industry, and later in 1946 Fada produced the model 711, still with a Catalin cabinet, and of course available in lots of colours. The 711 used a five valve chassis, very similar to the Bullet model 115, but used B7G valves rather than the

Figure 16: Fada's advert in Radio & Television Retailing for March 1946 (by kind permission of the Radiomuseum). The 652-series of radios also use a Catalin 'Fada-Lucent' cabinet.

Model Number	Date Introduced	Frequency Range	RF Amplifier	LO / Converter	IF Amplifier	Detector / AGC / AF Amp	Audio Output	Rectifier
115	1940	538-1750 kHz	Not fitted	12SA7 / 12SA7GT (Octal)	12SA7 / 12SK7GT (Octal)	12SA7 / 12SQ7GT (Octal)	50L6GT (Octal)	35Z5GT (Octal)
116	1940	538-1660kHz and 5.7-18.3MHz	Not fitted	12SA7 / 12SA7GT (Octal)	12SK7 / 12SK7GT (Octal)	12SQ7 / 12SQ7GT (Octal)	50L6GT (Octal)	35Z5GT (Octal)
189	1940	MW only	Not fitted	Same as 115				
200 series	1941/42	MW only	Not fitted	Same as 115				
1000 series	1945	528-1680kHz	12SK7 (octal	12SA7 (octal)	12SK7 (octal)	12SQ7 (octal)	35L6GT (octal)	35Z5GT (octal)
	1946?	528-1689kHz	12B7/14A7 (B8B Loctal)	12SA7 (octal)	12B7/14A7 (B8B Loctal	12SQ7 (octal)	35L6GT (octal)	35Z5GT (octal)
	1946?	528-1689kHz	12BA6 (B7G)	12BE6 (B7G)	12BA6 (B7G)	12AT6 (B7G)	35L6GT (octal)	35W4 (B7G)
	1947?	528-1689kHz	12BA6 (B7G)	12BE6 (B7G)	12SK7 (octal)	12AT6 (B7G)	35B5 (B7G)	35W4 (B7G)

Table 1: Summary of data on the Fada range of Bullet models.

octal ones used back in 1940. When the modern plastic model 845 Cloud, using a six valve (all B7Gs) chassis, appeared in 1947, the 711 became the last of the Catalin designs ever produced by Fada.

Why no long wave band?

It may seem strange to us that these US-manufactured radios are not equipped to receive what we call the 'long wave', that is the range of about 150kHz – 285kHz. In Europe, stations broadcasting in this range typically use very high power and are capable of covering a much wider area than medium wave stations. This means that many European broadcasts could have been heard along the Atlantic seaboard of the US during autumn and winter, and a few long wave stations from Asia would have been heard on the Pacific Coast at certain times of day. Clearly this didn't seem to produce a demand on radio manufacturers to include long wave reception into their radios, except when they were producing a model for export.

In the US, this frequency range was (and still is to some extent) used for military communications (for example, to be activated in anticipation of a nuclear attack – though this was never fully implemented) and other, non-public broadcasts. It may even have been illegal to listen to certain broadcasts on this band, and so presumably radio manufacturers were encouraged to prevent listeners from doing this.

Summary and conclusions

The five models of bullet-shaped radios produced by Fada are but a subset of all the Catalin-based radios they manufactured over the ten years or so from about 1938. Many other radio manufacturers also used this material as they brightened up their cabinets, and added colour to the final years of the Depression. They didn't just replicate the old wooden cabinets, but thought hard about what could be achieved with this new material, and produced some revolutionary shapes, all of which are very collectable today. The reference books described below show some excellent examples of these radios, and they are well covered on the internet.

Whenever I come across a radio, after a few seconds of knob twiddling, I always want to turn it round, take the back off, and take a look inside. There's always something interesting to be seen even in designs that are considered to be standard, and even boring. The chassis lurking inside the Bullet radios were minimalist in their implementation, but certainly not static in their design. As the new B7G-style valves became available after the war, the chassis evolved from being a fully octal-based 'all american five', and with the final design inside the 1000-series of radios, it acquired an extra valve in the form of an RF amplifier. This was not a trend unique to the Fada Bullets, but was seen generally with Fada radios at the time, and those of other manufacturers. American valve companies always co-operated with the radio manufacturers in offering sets of valves whose heater voltages added up to the nominal US mains voltage.

I've speculated to some extent on how Fada produced the model 189 and the 200-series in the early months of the Pacific war, as radio manufacturers switched over to war production. Perhaps I can ask owners of 189s and 200s to take a quick look inside their radios and confirm (or refute) my conclusion that they all used the 115 chassis, or something very similar.

I may be asking the question in the wrong country, and about 70 years too late, but do any readers have any knowledge of how quickly Fada made the transition to war work, and what they actually made in the war? According to Google Earth, a factory still stands close to the railway tracks at 30-20 Thomson Avenue, Long Island, New York, which is Fada's original address. It would be interesting to know if this is the original factory used to manufacture these radios.

Today, Bullet radios, especially the model 1000 in its various chassis variants, come up for sale quite often, and are still highly prized, and hence highly priced. Collectors largely ignore the state of the chassis (as long as it is there) in the collectability and value they attribute to the radio.

The Bullet shape has been copied many times over the years, in modern transistor radios and in non-working miniature replicas. For example, the Crosley CR2 (see Reference 5) was an AM/FM radio and cassette deck designed in the mid-1990s which used ABS plastic for its cabinet. This radio can still be bought in the US for about $80. At that time, Crosley produced a range of 'Made-in-China' plastic replicas of many of the most popular Catalin radios of the 1930s and 1940s.

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I'd like to thank Carl Glover, Mike Barker and Jim Hambleton for their help with the preparation of this article.

Sources of data for US radios

There is a series of service sheets called Photofact Folder, published by Howard W Sams & Co, in the US, similar to the Trader sheets that were published in the UK. Scanned versions of these are available on-line and many originals can be found on eBay. It's worth buying one or two of these originals and seeing their excellent production quality, usually including a couple of photos of the chassis being described. Although the Fada 1000-series Photofact Folder is commonly available, I was unable to locate the document (if it ever existed) for the other Bullet models.

In the US there was also a series of annually-published booklets called 'Manual of 1940 Most Often Needed Radio Diagrams', and so on for each year, with a gap for some of the war years. These contained a single-page condensed version of the schematic for typically 200 radios each year, and sometimes included the chassis layout and dial cord arrangement. Original versions of these can be bought on eBay.com, and scanned on-line versions can be found on various websites.

The Switzerland-based Radiomuseum at: http://www.radiomuseum.org/ contains descriptions, photos and schematics of many radios with Catalin cabinets, as well as uncountable numbers of other radios from all over the world. I'd like to thank the museum for giving me access to the jpg used for the advert in Figure 16.

Numbered References

Reference 1: 'Classic Plastic Radios of the 1930s and 1940s' by John Sideli, published in 1990 by E P Dutton, New York. A very worthwhile book on Catalin-cased radios, with many excellent colour photos of models from many US manufacturers.

Reference 2: A large selection of Catalin and Bakelite radios can be found at: http://www.collectorsweekly.com/radios/catalin-bakelite

Reference 3: The Universal Schematic Locator advises the use of Riders 12-6 (that is, the model 115 schematic) for the 200-series radio.

Reference 4: A red and ivory lacquered wooden model 200 posed alongside a Catalin-cased 115 can be seen at: http://uv201.com/Radio_Pages/wood_fada.htm

Reference 5: The Crosley CR2-Y, a modern replica of the Fada 115, can be seen at: http://www.aurorahistoryboutique.com/Q000086.htm

Other References

'Bakelite Radios: a Fully Illustrated Guide for the Bakelite Radio Enthusiast' by Robert Hawes, in collaboration with Gad Sassower, published by Chartwell Books, New Jersey in 1996. The author uses 'Bakelite' as a generic term, including Catalin and other plastic materials. Robert was a member of the BVWS and editor of the Bulletin. Sadly, he died in 2014. The book's 128 pages contain many colourful pictures of this type of radio, including Midgets, from all over the world.

'Bakelite Radios', published by Grange Books in 1999 (there is also a 2002 edition). The 64 pages of content is an abbreviated version of Robert Hawes' book (above), and the pictures are printed in a rather smaller format. Second hand, it can be picked up on Amazon for little more than the cost of postage.

'Classic Plastics' by Sylvia Katz, published by Thames and Hudson in 1984, and reprinted in 1988. This book contains many pictures, most in colour, of classic plastic objects. A relatively small number of radios are included, but the book shows the versatility of plastics, starting with pre-Bakelite materials, such as amber and shellac, and working through all the plastics of the 20th century.

An interesting description of various pre-war plastics used for radio cabinets can be found at: http://www.decoradios.com/text.htm#catalin

The chemistry behind Bakelite and videos of the production process can be seen on YouTube. Videos of several Catalin radios, including those made by Fada, can also be seen on the website.

'The Fada 740 – An Amazing American Midget' by Roger Grant, published in the summer 2011 issue of The Bulletin. This radio is a B7G-valved superhet in a Bakelite cabinet.

Roger Grant described his restoration of an American Midget in 'The Air King 23X – An unusually austere American Midget', published in The Bulletin for winter 2010. This radio is a four valve TRF.

'Blonde or Brunette. The Fada 790' by Gary Tempest, published in The Bulletin for autumn 2003. Gary described the restoration of his two AM/FM radios from 1949, with different cabinet colours.

'The Fada Bullet' by Mike Barker, published in The Bulletin for summer 2003. Mike's brief article showed some small photos of Bullet chassis, as well as some Alba and Dulci midget radios.

'An Emerson Midget is Re-Born' by Colin Boggis, published in The Bulletin for summer 2002. Colin's article described the restoration of a five valve Emerson TRF of about 1939 vintage.

A rather basic book on the subject of the AA5 is: 'The All-American Five Radio - Understanding and Restoring Transformerless Radios of the 1940s, 50s, and 60s' by Richard McWhorter. Published in 2003, with a later edition in 2011, by Sonoran Publishing.

Pictures from Golborne

by Greg Hewitt