THE MEISSNER 5 INCH KIT AND THE ANDREA KTE-5:

Dr. Hugo Holden 2012.

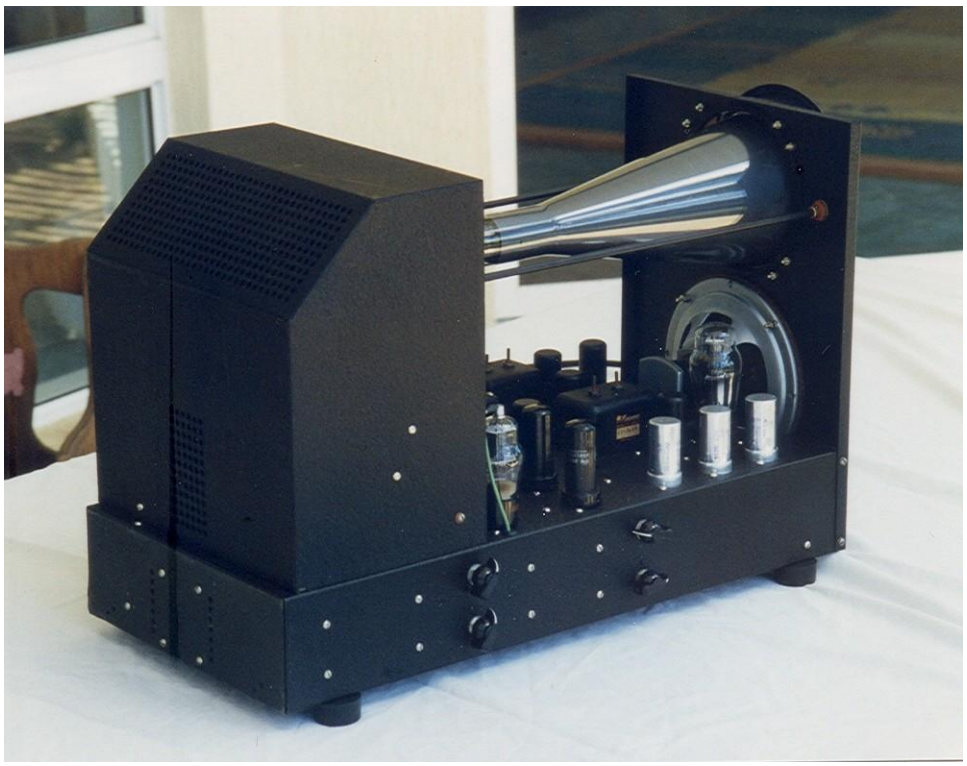
These 5 inch pre war television set were both manufactured in the USA in 1939.

They were a fantastic idea, a kitset TV's or "Build your own" television set.

Photos of the restored sets which I restored over 10 years ago:

ANDREA KTE-5:

MEISSNER Model 10-1153



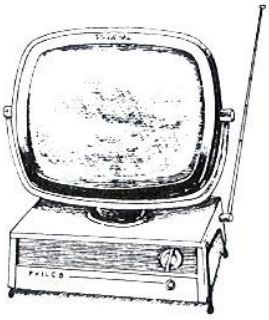
Both these sets use electrostatic deflection CRT's. The Meissner uses a 5BP4, also called an 1802-P4. This CRT was simply a common 5BP1 oscilloscope tube screened with a P4 phosphor. The Andrea uses a 5AP4 which was a special shortened 5BP4 made for Andrea by the CRT engineers at National Union.

The EHT voltages for these CRT's are very low at around 2000 to 2200 volts. They do not have a final anode cap, so the EHT is introduced near the other connections on the base and this limits the total amount possible without arcing.

Therefore the images on these CRT's were never very bright and the sets were viewed in subdued lighting. Also good 5BP4's are difficult to find. Most wartime 5BP4's are gassy.

The Meissner set in the photo above is fitted with a late 1950's manufacture RCA 5BP4 which has excellent emission. The Andrea is fitted with a new old stock 5AP4. The KTE-5 also came as a pre-built factory version with a full cabinet called a model 1-F-5. Meissner also had a full cabinet available with an art deco look to it:

The restoration articles relating to these two sets were published in the OTB (the official journal of the American Antique Wireless Association). The Meissner article was in Vol 40, may 1999. A scan of this article is shown below:



TELEVISION

EDITED BY **RICHARD BREWSTER**, 145 LITTLE PECONIC BAY ROAD,
CUTCHOGUE, NY 11935 *PLEASE INCLUDE SASE FOR REPLY.*

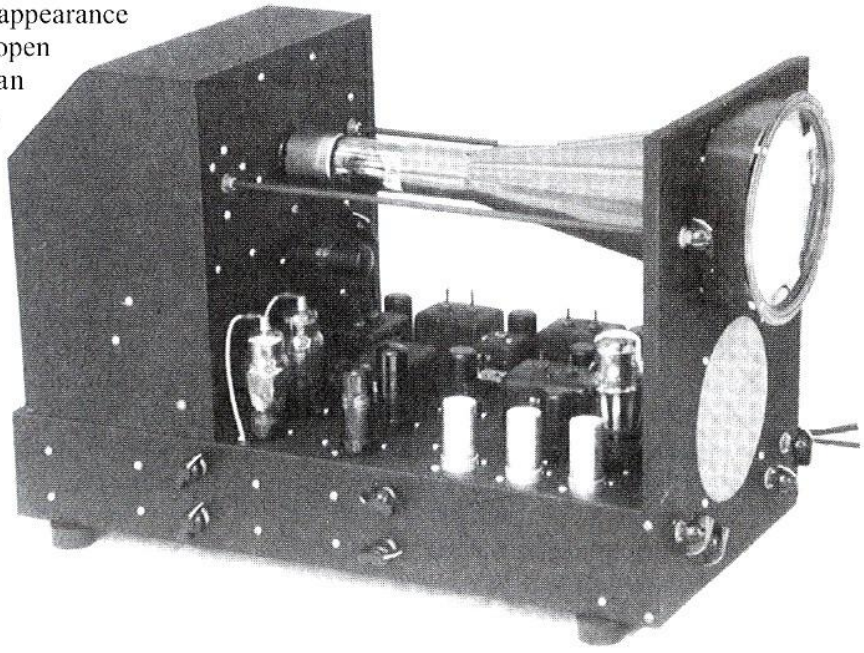
Restoration of The 5" Meissner TV KIT

Dr. Hugo Holden, Maroochydore, Queensland, Australia. Email hugo@sun.big.net.au

The Meissner Model 10-1153 (circa 1939) is a 5" television set that was sold in kit form. Along with the Andrea Model KTE-5 (my restoration of which was covered on these pages in the February, 1999 *OTB*), it represented a revolution in TV kit design. As I describe my restoration of this Meissner set, I'll be comparing it with the Andrea KTE-5 chassis.

Meissner, a "household word" among electronics enthusiasts in the USA., was a manufacturing company located in Mt. Carmel, Illinois. They designed and produced radio and TV kits, as well as a large number of coils and RF assemblies. Clearly their forte was coil design, and prior to World War II they were producing high quality coils with ferromagnetic cores (ferrocart) having exceptionally high Q values. Many of Meissner's chassis and assemblies were finished in an attractive fine crinkle black paint.

The Meissner kit TV was probably a competitor of Andrea's KTE-5. As can be seen from the photographs the overall appearance of this set is much like an open frame oscilloscope with an added speaker. This very mechanistic design was certainly created with the engineer or hobbyist in mind. The wooden faceboard and chassis of Andrea's KTE-5 is lavish and decorative by comparison. However the attractive crinkle black finish of the Meissner chassis is a very appealing feature.



The restored Meissner 10-1153 looks as if it had just come off the original builder's workbench.

Meissner Circuit Design

The overall design is very similar indeed to that of Andrea's KTE-5. The tube lineup with exception of the CRT and the video amplifier, and one 1853 pentode, is identical, and aside from a few details to be discussed, so is the schematic.

The four-channel VHF tuner incorporates a 6J5 local oscillator and 1852 mixer tube. Sound is picked off prior to the first video i.f. transformer and passed to the tuned grid circuit of the 1853 pentode (Andrea used the 1852) which is under AGC control by the sound detector output. The 1853's anode is passed to a bandpass coupling arrangement type of audio i.f. on 8.25 MHz, then on to the 6SQ7 detector/audio amplifier and 6V6 audio output amplifier.

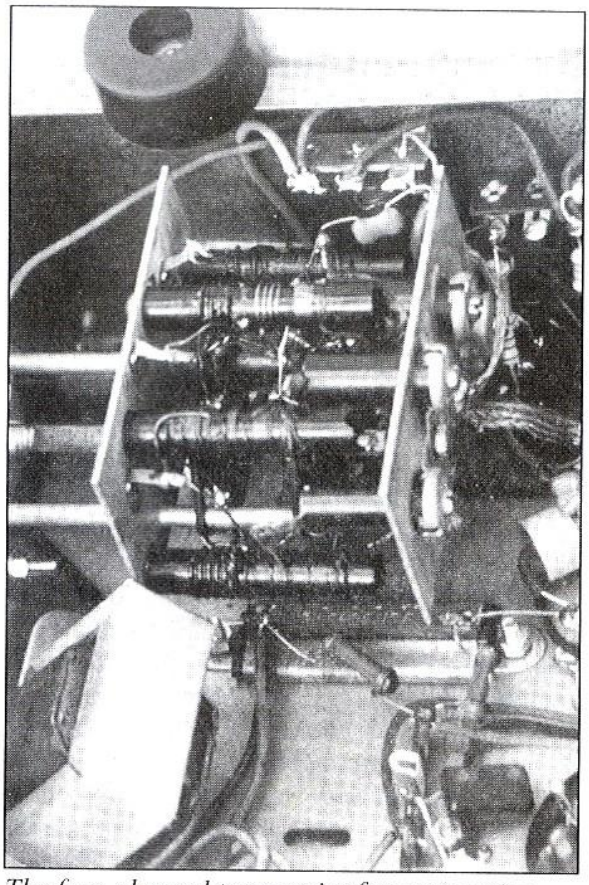
The video i.f. signal, on the other hand, is passed from the mixer anode via another twin-tuned bandpass i.f. transformer (with ferrocart cores) to the first i.f. amplifier (1852 pentode). Another stage of similar amplification and two twin-tuned i.f. transformers are provided before the signal is passed to the 6H6 sync pulse and video signal detector. This type of bandpass-coupled twin-tuned i.f. allows a broad band twin-peaked response for each i.f. stage. The final two i.f.s are tuned (with a combination of the slug cores and the "top" coupling capacitor) for peaks at 12 and 10 MHz and the first i.f. tuned for a more central response at around 11 MHz to fill in the central dip in the response curve. This results in an overall band-pass characteristic of about 2.5 to 3 MHz.

Donald Fink (1940) says that 5" tubes have a spot size of approx 1/75 inch, so with a 4-inch wide picture only 300 picture elements can be supported. This corresponds to a bandwidth of about 2 MHz. Therefore more bandwidth in the i.f. above 2.75 to 3.0 MHz is of no value. This helps explain why sets like the Andrea KTE-5 and the Meissner kit have comparatively few i.f. stages compared to more modern sets, or sets with larger diameter tubes that could support better resolution. As the bandwidth is not much greater than 2.75 MHz, then more gain is obtained for a given number of stages than if the bandwidth was greater.

Comparing the two sets, it is fair to say that the Meissner i.f. transformers are superior to the fixed, non-adjustable Andrea ones, which are air cored rather than ferrocart. Overall, for the same set bandwidth, I have found that the Meissner i.f. out-performs the Andrea for gain.

After the video signal is filtered it is passed to the video amplifier. The tube used here remains a minor mystery. A circuit for the Meissner set from one of the company's instruction assembly manuals specifies (both on the schematic and in the parts list) an 1852 pentode. This runs the tube at a no-signal anode current of 20 ma, twice its figure in an RF application. However in the text of their manual, Meissner refers to the tube as a 6F6. Another one of Meissner's brochures of the time definitely specifies a 6F6 as the video output tube. Yet another interesting finding is that the internal wiring of the tube electrodes on the Meissner schematic suggests the tube is a 6AG7 (not 6AC7=1852), which is a better choice.

I suspect that Meissner initially used a 6F6 but later changed to a 1852 to keep more of the tubes in the set the same and for economy of design. They may have also used the superior



The four-channel tuner unit after restoration.

6AG7 at some later stage. The way the socket is wired, either a 6AC7 or a 6AG7 can be plugged in. A 6AG7 was found installed when the set was received.

Video signal passes to a 5BP4 (alias 1802-P4). This is a longer tube than the 5AP4 used in the Andrea. Both run on 2000V anode potential. The 5BP4 is a modification of the familiar 5BP1 oscilloscope tube. The 5PB4 appears to perform a little better that the 5AP4. With the greater length and narrower deflection angle the 5BP4 has better deflection sensitivity and more even focus across the face-plate. It is easier to obtain a linear sweep at lower peak saw-tooth deflection voltages.

In the Andrea KTE-5 the 6F8 deflection amp is driven with a larger voltage and has a larger anode voltage swing. The linearity is not quite as good as when the same deflection circuit is driving the 5BP4 at a lower voltage swing.

Fortunately the 5BP4 is easier to find than the 5AP4. Since the 5BP4 was used extensively during the war in radar applications, there are still some surplus tubes available. However, after testing a number of 5BP4s I have found that only about 50% of them are serviceable for television. Many have absorbed gas and, though they would function satisfactorily in a radar or oscilloscope

single line display application, the focus is degraded in television service.

The circuits of the power supplies (5V4, 879), sync separator (1852), scan oscillators (6N7s) and scan amplifiers (6F8s) are practically identical in the Andrea and Meissner sets.

Electronic Restoration

The Meissner featured in this article was acquired from Mr. Richard Brewster. He had looked after this set well and it arrived in exceptionally good and original condition after its long trip from the U.S. to Australia. There are two phases to the restoration, electronic and cosmetic, and I'll describe each in some detail.

As is usual with early tube equipment the components with the primary problems are wax paper and electrolytic capacitors. All of the wax paper capacitors and all of the electrolytics were faulty/leaky. One of the electrolytics "exploded" a short while after turn-on. Another tested well, showing no leakage and only mildly reduced capacity. I was tempted to leave this one, but when I slipped it out of its paper tube I found a hole corroded through the aluminum wall. The bottom line is that 50-year-old electrolytics are an accident waiting to happen.

The electrolytics in paper tubes were replaced with new ones fitted inside the original housings. The metal can electrolytics were replaced with ones of the same size and shape, but with better voltage and capacity ratings. These Aero type M twist-mount cans are again being manufactured and supplied by AES. One again, as with my Andrea restoration, AES supplied a perfect selection of new metal tubes, tested and rust free, with perfect paint and logos. I've never been disappointed with the quality and pricing of tubes received from Antique Electronic Supply, and I recommend them highly.

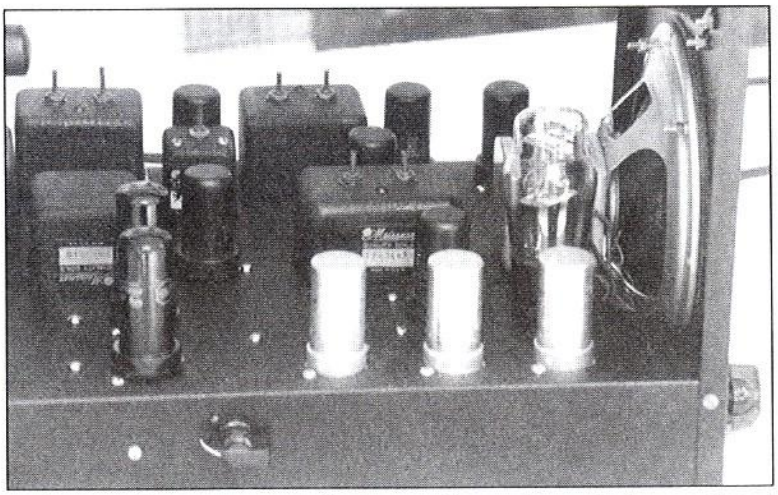
The leaky wax paper caps caused various faults, especially in the high voltage sections. One capacitor in the vertical scan oscillator/saw-tooth generator exhibited the "two exponentials phenomena." This resulted in a non-linear vertical scan. The effect is believed to be due to the paper insulation absorbing water over the years and, in conjunction with salts and metal oxides, developing some "electrolytic" properties.

The description of this phenomenon and the restoration of wax paper capacitors are the subject of a separate article. However, new capacitors of superior voltage rating were placed inside the old paper tubes and the ends re-sealed with polyester resin. Most of the resistors in the Meissner were in good order, though I did replace a few, which had increased in value or become electrically noisy.

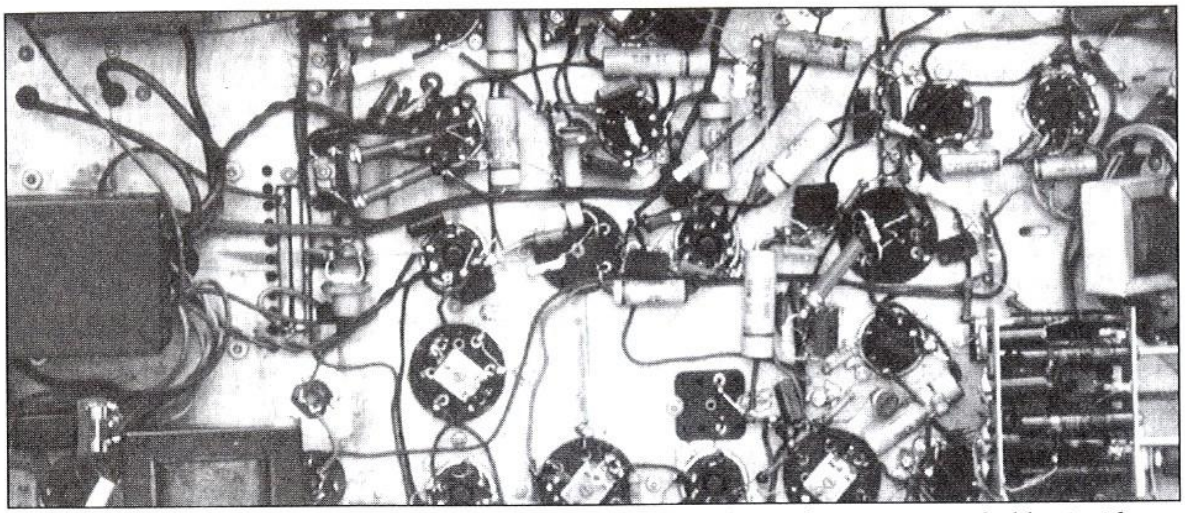
Once the parts were replaced, the set was aligned. This consisted of setting up the tuner for the four original VHF frequencies: 44 to 50 MHz, 50 to 56 MHz, 66 to 72 MHz and 78 to 84 MHz. For example, channel 1 had a 45.25 MHz picture carrier and a 49.75 MHz sound carrier. With the local oscillator (6J5) running at 58.0 MHz the i.f. frequencies are (58 - 49.75)= 8.25 MHz sound and (58 - 45.25) = 12.75 MHz video. The video i.f. was swept and adjusted in the usual manner for the correct band-pass response.

The sound transmission in Australia is spaced 5.5 MHz from the vision so the audio i.f. was tuned down to about 7.25 MHz to allow for this. Also the sound system in this set is designed for AM reproduction, however it will demodulate FM quite well with the use of slope detection.

This simply means de-tuning a little from center frequency so that the sound i.f. frequency falls on the center of the slope of one side of the audio i.f.'s response curve. Changes in frequency of the carrier are then converted to changes in amplitude at the detector. When operated like this the sound detector has poor AM signal rejection but in practice I have found that the audio in these sets is surprisingly good. This way the original circuit can be preserved. The line and frame rate controls easily had enough range to pull into our local 25 frame (50 Hz) 625-line (15,625 kHz) scan rates.



Side view shows new metal tubes and can electrolytics, replated chassis screws, and twin-tuned i.f. transformers.



Here's a peek under the restored chassis. All wax capacitor sleeves have new caps hidden inside.

Cosmetic Restoration

Overall the paint-work on this set was good for the age, however crinkle finish paint has a habit of absorbing dirt in its crevices. In other places the paint had faded and lost its "blackness." When restoring this type of paint you need to be very careful. Although crinkle paints are still available it can be very difficult to duplicate the type of very fine crinkling that Meissner was so good at.

Never apply polishing compounds or cleaners with abrasive agents as they collect in the "crevices" and cannot be removed. Clean as much dirt out of the paint as possible. Clear window cleaner works very well. When the paint is as clean as possible it can be lightly over-sprayed with automotive lacquer (not enamel) as sold in small aerosol cans. Black or clear lacquer can be used.

On surfaces having no stickers, rivets or other items that must remain paint-free, a fine spray of black gloss restores the crackle to a new condition. The low surface tension of the lacquer (compared to enamel) allows it to spread finely and evenly without obscuring the crinkles at all. Clear lacquer will also produce a similar effect, and is very useful where there are features that must not be painted. Because the lacquer has the optical property of "wetting" the surface, there is an increase in apparent blackness and luster.

It should be noted that the spray is only applied sparingly. If excessive amounts are applied it could possibly obscure the crinkles. Another approach that can be used to improve the finish of faded crinkle paint-work is the application of a silicone based polish/oil such as Armorall etc. This will improve the appearance but has the disadvantage of leaving an oily surface making later touch up painting nearly impossible.

The next step in improving the appearance of the Meissner was removing and replating most of the rusted chassis screws. The very tidy and clean overall effect can be seen from the photos.

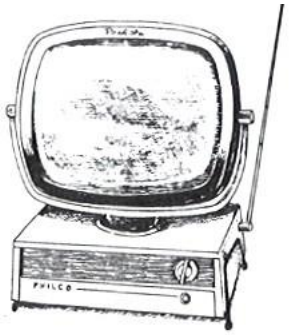
The picture tube escutcheon on the Meissner appears to be very similar to a radio dial glass and pressed brass surround. This set came with a cabinet option and obviously these parts were intended for fitting to the cabinet. The front of the 5BP4 is supported by strong rubber bands surrounding posts projecting from the front panel rather by a custom designed tube mask as in the Andrea.

Summary

Both the Meissner and the Andrea KTE-5 are fascinating and wonderful television sets. They are both incredible achievements of late 1930s television technology. Most of the technical problems of "electronic" television had been solved. Aside from a few details such as lack of FM sound (shortly to come courtesy of Major Armstrong), a somewhat inadequate tube high voltage supply, lack of an aluminized crt faceplate and narrower video bandwidth, little if anything is greatly different from a "modern" monochrome TV set.

As we know, electrostatic deflection was ultimately abandoned in favor of magnetic deflection, however it persisted after the war in many small sets using the 7JP4 picture tube. It strikes me that even for 50 to 60 years after the Meissner and Andrea sets (and those of other makers such as Transvision) were released, it was not a common thing to be able to walk into a shop and buy a kit-set television. This in itself is another extraordinary accomplishment of the time.

EDITED BY **RICHARD BREWSTER**, 145 LITTLE PECONIC BAY ROAD,
CUTCHOGUE, NY 11935 *PLEASE INCLUDE SASE FOR REPLY.*



Restoration of an Andrea KTE-5 Kitset

By Dr. Hugo Holden, Maroochydore, Australia

About the KTE-5

Frank A.D. Andrea was a radio pioneer, and was apparently the first radio manufacturer to market (in 1939) a line-of-sight and sound television receivers using the new 441 line standard.

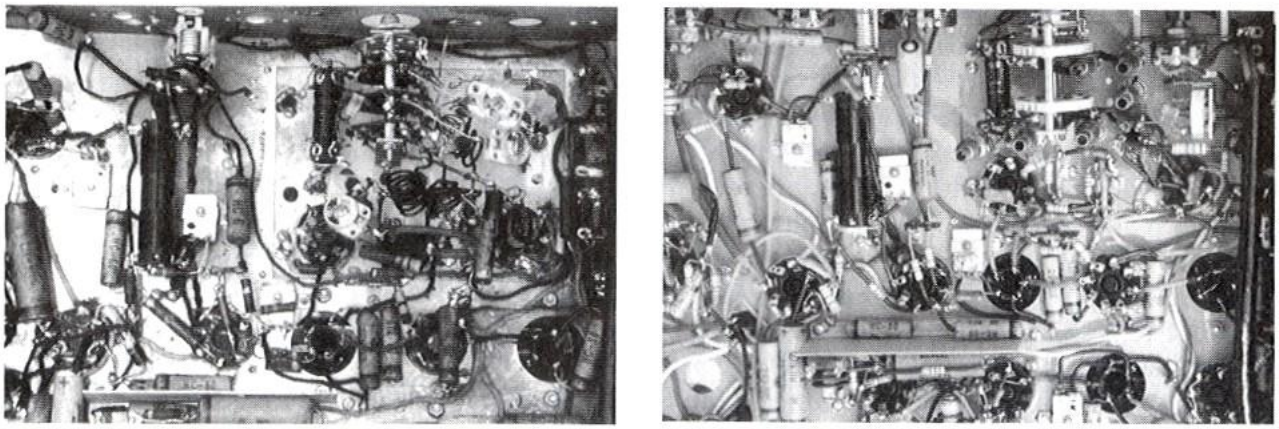
The model 1-F-5 was the fully built up cabinet version, while the kit version was known as the KTE-5. Both sets use the 5AP4 (1805-P4), a version of the 5BP4 (1802-P4) that was shorter by four inches. It was developed by the National Union Company, working with Andrea engineers, in order to reduce cabinet depth.

These sets conformed to the then-new RMA standard of vestigial sideband transmission with a channel width of 6 MHz. The video carrier frequency was spaced 4.5 MHz below the sound carrier. The video carrier is 1.25 MHz above the low frequency end of the channel and the audio carrier 0.25 MHz below the high frequency end. This standard specified 441 lines per frame, 30 frames per second, 2:1 interlaced, with a field frequency of 60 Hz. The picture aspect ratio was defined to be 4:3 and the sound was specified to be AM.

The vestigial sideband arrangement allowed for better use of the available channel width, improving bandwidth of the video carrier resolved at the receiver to around 3.5 MHz. Since the spot size (1/75 inch) on the 5 inch crt limited the visible resolution at the tube faceplate to less than 3 MHz, this was ample.

Incoming signals are presented via the tuned antenna coil to the grid of modulator (mixer) tube 1852 along with the signal generated by the 6J5 local oscillator, and introduced with the technique of inductive link coupling. The video and sound IF signals are selected via the first IF transformer where the sound is picked off at 8.25 MHz and video at 12.75 MHz. The sound IF is very traditional with a simple AGC, AM demodulation, and audio amplification by a 6SQ7. Interesting to note is the use of a bias battery in the 6SQ7 grid. This is essentially a mini carbon zinc cell which allows the cathode to be grounded, favorably affecting the AGC function. Audio is passed to a standard 6V6 output stage.

The video IF is interesting in this set in that the bandpass characteristic is not adjustable. The coils were selected at the factory for correct response. This was done deliberately to avoid problems with adjustment by the constructor. On sweeping this IF, I was very impressed with its



The KTE-5's tuner section before (left) and after restoration.

textbook-perfect bandpass response. Traps are provided to filter out the adjacent channel sound carrier that comes through this IF, if present on 14.25 MHz.

After the video IF signal is passed via the two 1852 tubes it ends up at a 6H6 which functions as a sync separator and video detector. Composite video signals are presented to the video output, another 6V6, and passed to the grid of the 5AP4 via a state-of-the-art shunt series peaking coil arrangement for good high frequency response.

The sync signals pass to a 6AC7 sync amplifier and are processed by the appropriate filtration to synchronize the horizontal and vertical scan 6N7 multivibrators of the cathode-coupled configuration. 6F8s are used as deflection amplifiers for the sawtooths produced by the multivibrators. One half of each drives other half, resulting in antiphase sawtooth waves to produce the raster.

The high voltage for the CRT (approximately 2000 volts) is generated with a separate transformer and 879 diode, while the B+ for the set is derived via a 5V4 in the usual way.

Interesting features of this circuit are:

1) The tuner uses very large body ceramic trimmers and is very mechanically stable.
2) The video output stage is run at zero bias, allowing a signal DC restoration function to occur at the grid/cathode of the 6V6 obviating the need for the proverbial DC restorer.
3) The presence of the bias battery for the 6SQ7.

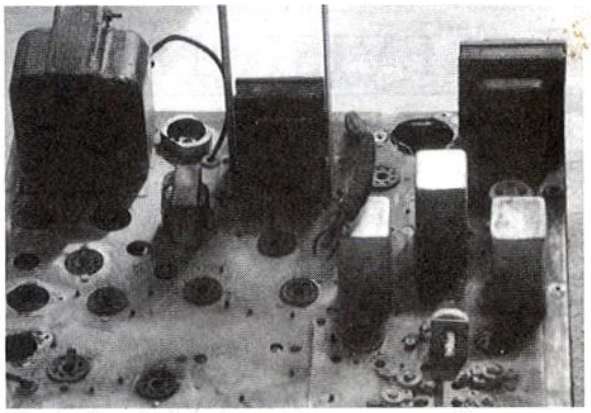
Otherwise the circuit conforms to many of the norms of the time.

About the Restoration

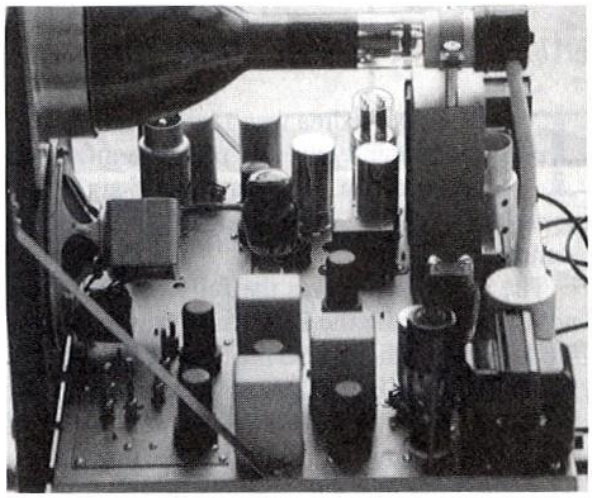
I was very lucky to be able to acquire this set, and would like to thank Mr. Harry Poster for providing it. He stocks a wide range of TVs and is very helpful.

All sets of 3Os vintage have been exposed to wear and tear, corrosion, and sometimes rusting. Leaking wax paper capacitors are common and often the electrolytics are leaky low capacitance.

In this particular set, extensive corrosion of the octal pins had occurred and, in the post-war period, the tuner had been extensively modified in a very messy way. The antenna (mixer) coil had been stripped of two of its original windings, the original oscillator coil was missing, and the coils to replace it were dangling in free space without forms. The original large ceramic piston-shaped trimmers were also missing. The person who had modified it had placed the fine tuning control on top of the tuner panel so a shaft to adjust it could project through an extra hole drilled in the face-board. The tuner was going to be a challenge to return to original order.



Top side of chassis, prior to restoration, was a sorry sight.



After restoration, top of chassis looks crisp and new.

The antenna coil was repaired by rewinding to conform with manual photos and marks left behind in the lacquer on the form where the original windings had been. The oscillator coil was duplicated on an original ⅝-inch sized form with 5 pins, and designed from first principles with the aid of *Terman's Radio Engineers Handbook*. Fortunately, it turned out that the large piston-shaped trimmers had been used in pre-war Australian radios so I was able to get replacements.

The plan in any vintage set restoration is to preserve, as much as possible, all original materials and replace only what is absolutely necessary. The octal tube sockets had the tube type numbers engraved on them, so they needed to be preserved. Fortunately they had standard sized pins in them and these were easily replaced. All the components, wiring, sockets, and tag strips were removed from the chassis. All tag strips were preserved and cleaned up for re-use.

All wax paper capacitors tested leaky bar one or two; therefore the resin was removed from the ends and the capacitor pushed out of the wax paper tube. The tubes were cleaned up and new tubular capacitors inserted in them of the same value, but higher voltage ratings for extra reliability. The ends were sealed with polyester resin, pouring each end on different days. Fortunately, the vertical deflection output coupling caps were in good order as these 0.05uF 2500V can caps on the chassis would have been difficult to replace. Also the filter for the CRT high voltage supply was in good order.

Once the chassis and brackets had been fine-glass-bead blasted to remove all oxidation and rust, they were re-electroplated. All the original chassis self-tapping ¼-inch screws were preserved and re-electroplated. The re-pinned octal sockets were mounted and all original tag-strips were re-fitted.

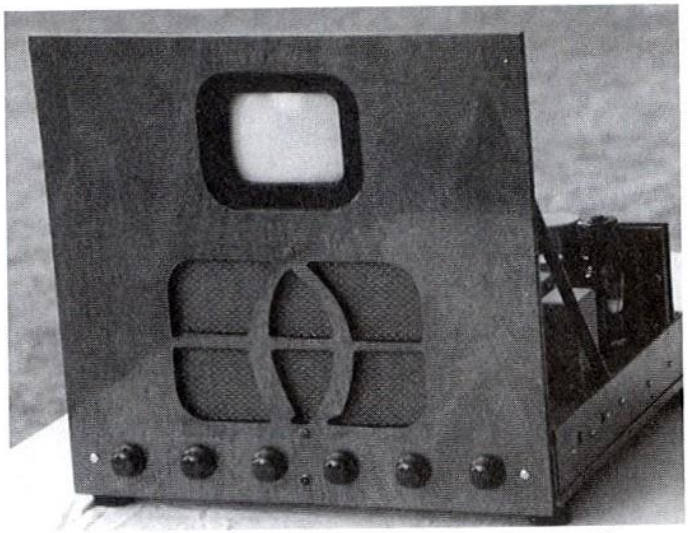
The chassis was then re-wired to the original configuration using fabric covered wire supplied by Antique Electronic Supply, as the original wiring was disintegrating and unreliable. For the high voltage section, rubber covered wire rated at 2500 volts was used. Where an original capacitor was missing, a modern substitute was used without attempt to disguise it. All the resistors were widely out of specification (except the wire-wounds) and these were replaced with new carbon resistors.

The bias battery was dead and only came up to 0.9v with the introduction of some water. Therefore it was repaired by placing a small watch battery inside it, so that it still looks original. This battery has a very distinctive flying saucer shape.

The power transformer was repainted with a semigloss coating closely resembling the original black finish. The dented aluminum IF cans were repaired by careful hammering, followed by filling with automotive body putty and coating with silver spray lacquer.

The original picture tube escutcheon was missing from the set. These were made of a rubber-like material, and it was common for them to warp and disintegrate with age. After obtaining the original dimensions, a new one was machined out of aluminum, and lined with rubber.

The final challenge was the repair of the wooden face-board. The original panel was quite warped, the veneer was badly damaged, and an extra hole had been drilled in the panel. To solve these problems, the 3-ply panel was delaminated by placing it in warm water to dissolve the water-based glue. The middle section was discarded and replaced with a panel of thin 3-ply. A press was made from two thick pieces of timber and used to clamp the three panels back together with epoxy resin glue. Then a fret saw was used to cut the center panel out. This also helped repair the hole drilled in the panel. Finally, the panel was re-veneered and lacquered.



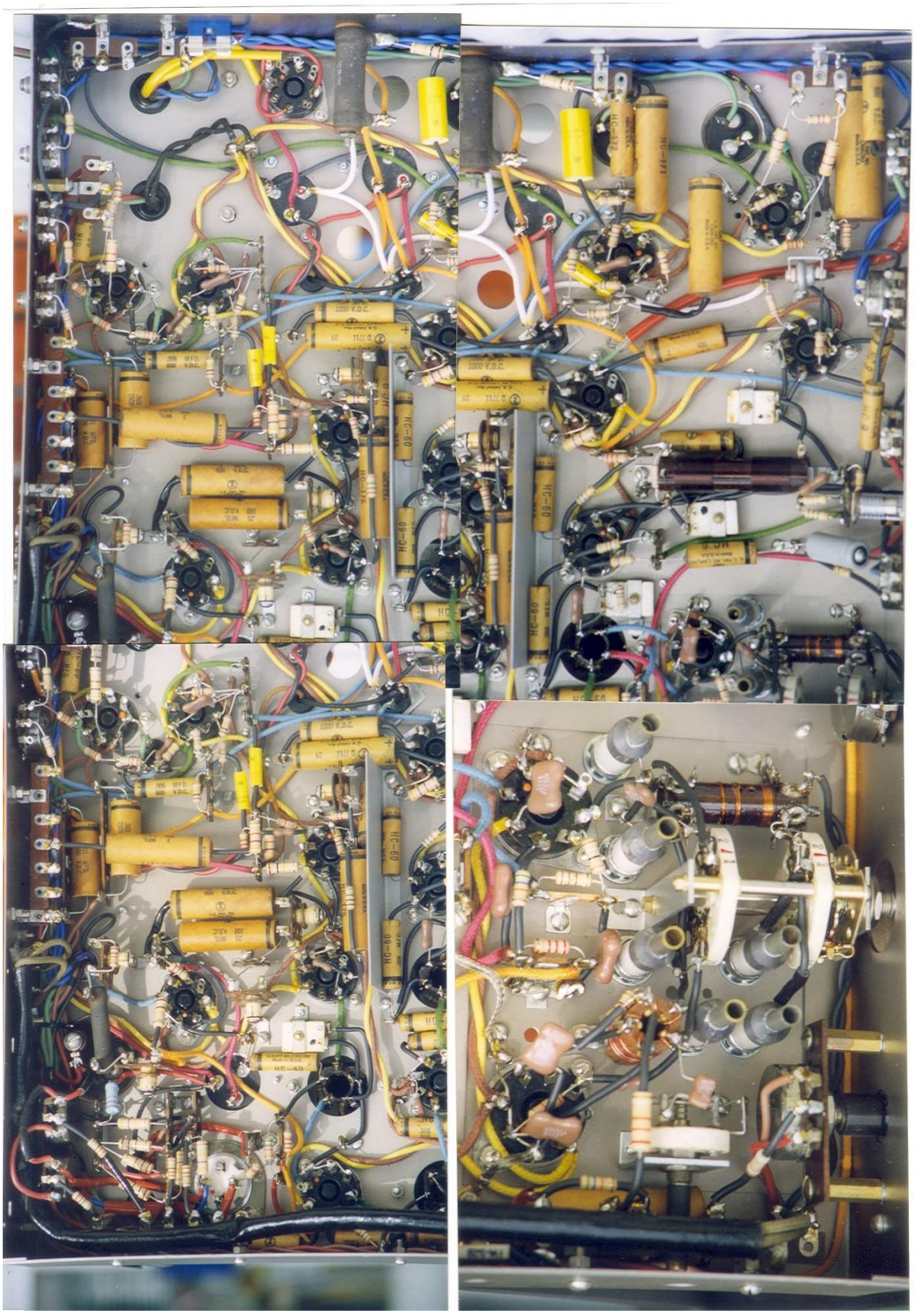
The completed restoration is indeed a thing of beauty, though it still lacks one detail — an engraved line to be added around the perimeter of the faceboard.

The speaker cloth was replaced with new cloth supplied by AES. As the final touch, a new set of tubes was installed. Most of these are of the metal type, and were supplied with perfect paint and RCA logos from AES. The final result looks very good indeed.

The set was easily tuned to Australian VHF channels 0 and 1, and the picture quality and sound reproduction are very good. Although the sound detector is AM, the set demodulates FM well with the phenomenon of slope detection, as the sound channel bandwidth is fairly broad. In this part of the world, the sound carrier is 5.5MHz from the picture carrier, so it was necessary to adjust the sound IF down from 8.25 MHz to 7.25 MHz. The horizontal and vertical scan rate controls have a broad range and are easily adjusted to the 25 frame/ 625 line system used in Australia.

Restoring a set like the KTE-5 can be a big job and take the best part of a year to do, however the final result is well worth it. I have total admiration for the engineers who designed the KTE-5 and for their pioneering efforts in the field of television.

These sets were subject to the same quality of restoration as the HMV904 and the RCA621TS. The KTE-5 was re-wired with replica fabric wire and all of the capacitors re-built. The scan below is a film photo collage of the underside of the KTE-5:



The restoration of the Andrea KTE-5 and the Meissner set were the subject of the 2002 AWA J.P.Taylor award for restoration of two pre war television receivers.

The AWA also kindly awarded me the 2003 Albert J Moore award for the series on the restoration of the HMV904:

An interesting footnote:

The days would be impossible to sell such a wonderful product like a home build TV kit with a CRT due to the high voltage electric shock possibility from the cathode ray tube's EHT generators and the risks of product liability litigation.

A scan from the original KTE-5 manual (1939) explains the somewhat different attitude at this time in history back in 1939:

(I especially like the remark about standing in the bathtub with your finger in the light socket)

High Voltage Hazard: The question is asked frequently: "What hazards are present in a television receiver, due to high voltages?" This is a natural question, since television sets use 2,500 to 7,000 volts, compared to 250 to 750 volts in ordinary broadcast receivers.

Fortunately, it is possible to give a reassuring answer. No one is ever endangered by the voltages used in broadcast receivers. Yet, if you go prying into them you can manage to get a serious, or even fatal, shock. But you just naturally wouldn't do it.

As far as that goes, you can injure yourself just as seriously, and more easily, by getting hold of the terminals of the cord you use for your toaster or coffee percolator. Perhaps the simplest way to electrocute yourself, if you are determined to do so, is to stand in the bath tub and play with the electric light fixture.

Manufacturers of television receivers have provided automatic safety switches and special cover plates which make it impossible for you to come in contact with parts carrying the high voltages. The moment you open the set, before you can get at the cover plates to remove them, automatic switches cut off the current. These protective devices, which you do not have on ordinary broadcast receivers or household appliances, make television sets actually safer to handle than the appliances you use every day in your home.

FROM ANDREA KTE-5 assembly manual
Look & Listen pg 41 by M.B. Sleeper.