

HELLSCHREIBER
HELLSCHREIBER

POST-WW2 FELD-HELLSCHREIBER BUILT IN HUNGARY
POST-WW2 FELD-HELLSCHREIBER BUILT IN HUNGARY



Rudolf

Hell

The Hell

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[\[Introduction\]](#)

[\[The HTG-1\]](#)

[\[Radios used with the HTG-1\]](#)

[\[References\]](#)

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INTRODUCTION

During WW2, the Royal Hungarian Army (RHA) used standard German Feld-Hell machines, possibly with Hungarian legends/labels. Overall, the RHA used Hellschreibers from 1939 until 1958.



Fig. 1: Field telephone exchange unit of the Hungarian army, with "Klappenschrank" switchboard and a German Feld-Hell machine

(source: ref. 3, 1941; Hungarian switchboard model 30-M with 30 lines, HIR = Honvéd (Homeland Defense Force) Infantry Regiment)

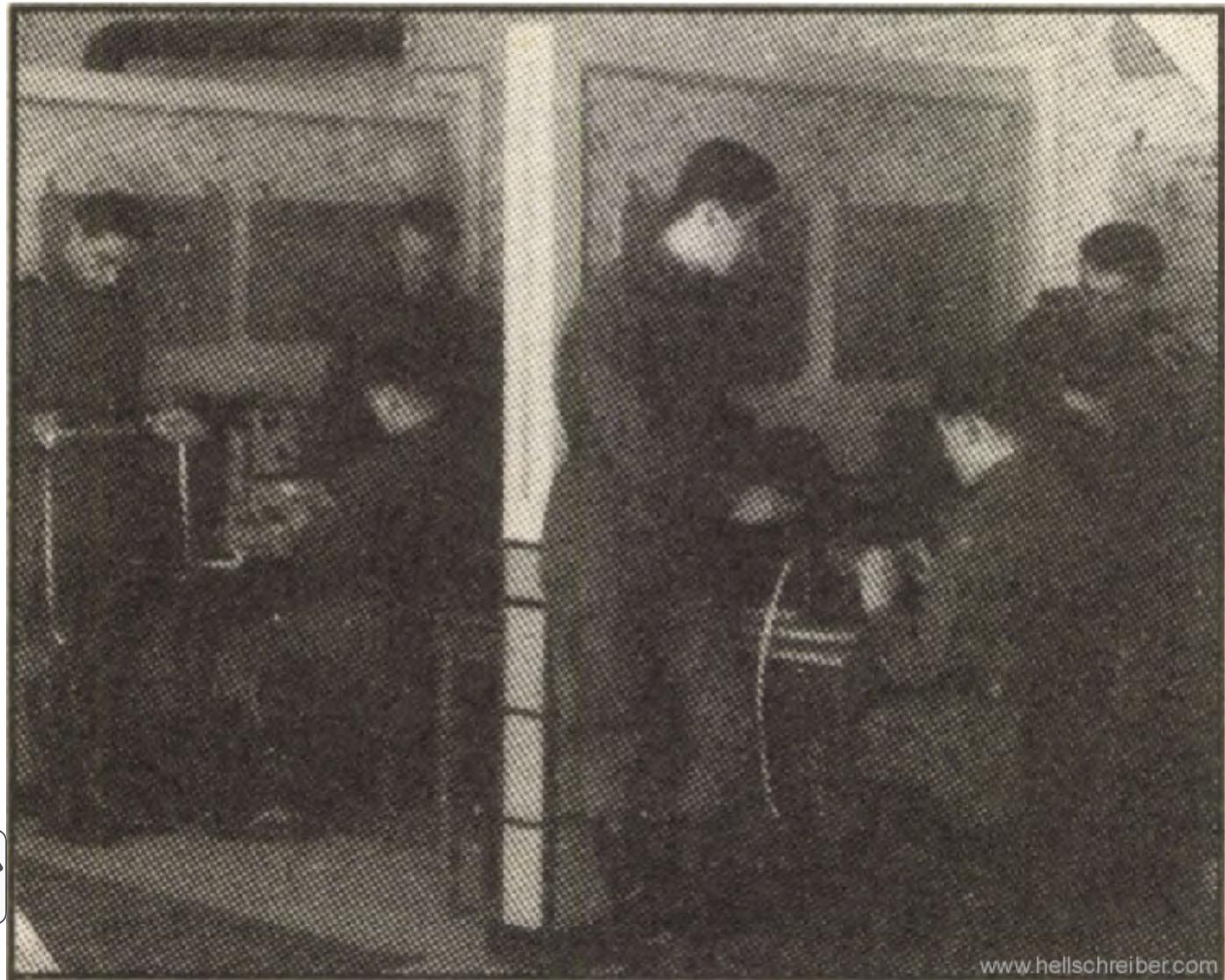


Fig. 2: German Feld-Hell machine (pre-1940 model) being used by a unit of the Hungarian Army

(source: collection of the Postal Museum in Budapest/Hungary)

Standard German Siemens-Halske Feld Hell machines were also manufactured in occupied Hungary by the *Telefongyár* company ("Telephone Factory"), starting in 1939. In Hungary, these machines are referred to as "39 M" (Model 39), see ref. 4.

During the fall of 2011, László Veres (HA7XK), brought to my attention the existence of a post-WW2 Feld-Hell model that was built in Hungary. Note that this is not simply a standard German Hell Feldfernschreiber. This model actually dates to ca. 1948. However, the design, including the electronic circuitry and construction, very closely follows that of the "[standard Feld-Hell](#)". It was also manufactured by the *Telefongyár* company - from 1948 to 1954 (ref. 7) - using left-over components from the war-time Siemens-Halske Feld-Hell production. The designator of this Hungarian model is HTG-1, where "HTG" = **Hellschreiber Távirágép** = Hellschreiber ticker-tape machine. Two of these machines are in the collection of the [Museum of Military History](#) (Hadtörténeti Intézet és Múzeum) in Budapest/Hungary (one is exhibited).

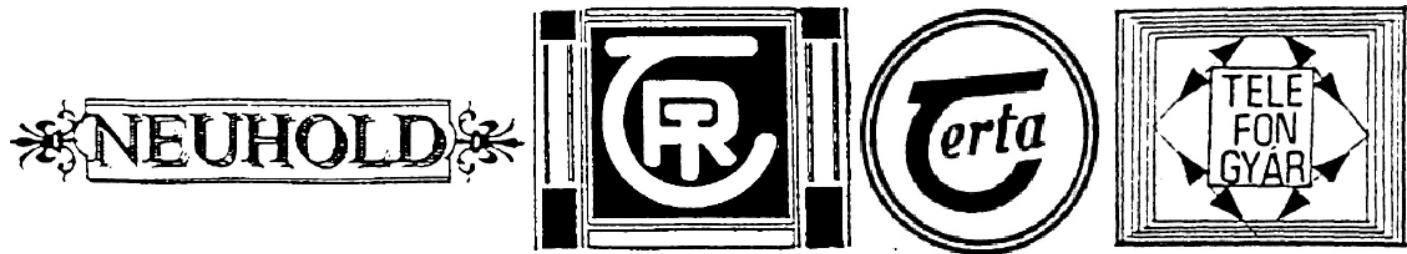


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Fig. 3: Teleprinter training at the Signals Officers School, 1955, Hell teleprinter on the left, an STG on the right
(source: Figure 8 in ref. 5A)

The history of the *Telefongyár Rt.* (TRT, Terta) company goes back to the end of 1876, when János Neuhold officially registered his railway and Morse telegraphy equipment repair activities in Budapest/Hungary. During the following ten years, his repair business gradually expanded with production of telegraph equipment, a variety of small military equipment items, and railway safety/signalling equipment. At that time, the company name was *Vasúti szerelvény és elektrotechnikai gépgyár* ("Railway assembly and electrical engineering factory"). Around 1890, Neuhold received the first orders from the Hungarian national postal company for telephones. After taking his company public 1891, the name was changed to *Neuhold Vasúti Szerelvények és Elektrotechnikai Gépgyár Rt.* ("Neuhold Railway Fittings and Electrical Engineering Factory"). After a steady decline in business and unsuccessful refinancing, Neuhold abandoned the company mid-1894. He started a new company later that year: *Neuhold és Társa Vasútfelszerelési és Villamossági Gépgyár* ("Neuhold and Co. Railway and Electrical Equipment Factory"). In 1900, they were acquired by the German company *Telephon-Fabrik AG vormals J. Berliner* (TEFAG, "Telephone Factory Ltd. formerly J. Berliner", founded by József Berliner, Jakob Hanover, and Hahn Miksa). Starting in the early 1900s, the Budapest company received large orders for

telephone and signalling devices for the Royal Hungarian State Railway. By then, the company was commonly referred to as *Telefongyár* ("Telephone Factory"). János Neuhold died in 1904, while on a business trip to the *Telephon-Fabrik AG* head office in Hannover/Germany. His son, Kornél Neuhold, took over the management of the company. In 1911, *Telefongyár* became an independent Hungarian company. Its activities cover the manufacture of telecommunication and telegraphic equipment, mechanical engineering, metal industry, electrical engineering and related products.



During WW1, the company produced military items such as guns, ignition devices, snowshoes, and boots, as well as light bulbs and small radios. After that war, Hungary was occupied by the Soviet Union, and the company was confiscated. Between WW1 and WW2, the company continued with railway signalling devices and telephones (incl. a handset under license from *Telefunken*), and expanded with batteries, radios, headphones, rail cart air brakes, fuel meters, audio recording equipment, and odd items such as potato-, tomato- and fruit-pulp thickening machines, zippers, spark plugs, refrigerators, and small boat engines. In 1928, the *Standard Elektrizitätsgesellschaft* (SEG, German part of the huge *International Telephone & Telegraph Corporation* (I.T.T.) conglomerate, see [here](#)) acquired a majority share in the company, but sold its share to the British *Standard Co.* in 1933. In 1939, the company was once again converted to produce war material, while telephone production continued. Early 1945, the company was placed under Soviet military command for about 6 months. In 1949, it was nationalized and renamed to *Telefongyár Nemzeti Vállalat* ("National Telephone Factory Company"), shortly thereafter simplified back to *Telefongyár*. Products included telephone and telegraphy equipment, telephone exchanges, movie projectors, audio amplifiers, radio equipment, manufacturing machining, audio tape recorders, TVs, and pipeline inspection equipment. In 1990, *Telefongyár* entered into a joint venture with *Siemens-Hungary*. It was privatized in 1991 and became a wholly-owned subsidiary of Siemens. Ref. 8, 9. Note that Siemens & Halske already established its presence in Budapest in 1887, with a tramway company. Siemens has been present in Hungary ever since, ref. 10 and ref. 14-18.

During the late 1930s, the *Magyar Államvasutak* (MÁV, Hungarian State Railways) conceived a nationwide longwave radio network for communication between the central office in Budapest, the regional/district head offices, and major hub rail stations. I.e., not to communicate with, or broadcast to, trains. Radio equipment was procured for 29 radio stations. From December 1940 through 1944, 18 of the planned stations became operational (see Fig. 2 in ref. 21A). Six frequencies in the 295-370 kHz segment of the long-wave band were allocated to the MÁV; 370 kHz was used as the principal frequency (ref. 21B). This telegraphy network was also used with the Hellschreiber system.

The German companies Telefunken and C. Lorenz AG supplied the original radio equipment (ref. 21A):

- Telefunken model AS33 longwave transmitter: 100-1000 kHz, 0.5-1 kW, modulation modes A1, A2, and A3 (keyed-carrier telegraphy, tone-modulated telegraphy, amplitude-modulated voice); ref. 25.

- Lorenz longwave transmitter and receiver: 100 & 200 W, 167-1000 kHz. Exact model numbers unknown.

In 1948, MÁV started to rebuild the network and upgrade/modernize the radios (ref. 22A, 24), with:

- Transmitters from the *Gép és Villamossági Szövetkezet* (GVSz, "Machine & Electrical Cooperative", with Siemens engineers): a cabinet with a longwave transmitter (1000 kHz - 1 MHz, output 500 W), a short-wave transmitter (1-5 MHz, power unknown), and a shared power supply between them.
- Receivers, also from GVSz.
- German Luftwaffe war-time "surplus" aircraft radios *FuG 10 SL* (= **S**ender, **L**angwellen = longwave transmitter) and receiver *FuG 10 EL* (= **E**mpfänger, **L**angwellen = longwave receiver), both 300-600 kHz, and made by C. Lorenz AG. The transmitter had an output power of 40 W (AM telephony) or 70 W (telegraphy). Ten custom transmitter/receiver sets were built for the MÁV. They comprised an *SL*, an *EL*, a power supply, a clock, a telephone handset, and an interface panel. See Figure 2 and associated text in ref. 22A.
- General-coverage receiver model E44, made by the Swiss company Autophon AG (see the [radios section](#) below). One such radio is shown in Fig. 4 below.
- Hungarian military shortwave receiver R/7 and the post-war military transmitter R-50 (built by *Magyar Philips Művek Rt.* (Hungarian Philips Works Co.). See the [radios section](#) below.



Fig. 4: An HTG-1 (removed from its carrying case) at the train station at Széchenyi Hill near Budapest

(source: ref. 23; the radio in the background is an Autophon E44, see the "[Radios used with the HTG-1](#)" section)

The MÁV longwave network was terminated during the spring of 1958 (ref. 22).

THE HELLSCHREIBER TÁVÍRÓGÉP HTG-1



*Fig. 5: Hellschreiber model HTG-1 (left) and the standard Feld-Hell
(all original unedited HTG-1 photos on this page: courtesy László Veres; used with permission)*



Fig. 6: Hellschreiber model HTG-1 (left) and the standard Feld-Hell - paper tray cover opened

The amplifier box shows some major differences with respect to the standard Siemens-Halske Feld-Hell:

- The motor-generator turns at 3840 rpm (vs. 3600 in the S-H Feld-Hell).
- The nominal generator voltage is 150 volt DC (vs. 165 in the S-H Feld-Hell)
- There is a volume control for the modulated *output* pulses, not only for the input signal.
- Interfaces:
 - There is no rectangular bakelite connector block
 - There is no 12-pin round connector, but 3 pairs of binding posts (wire or banana plug) - more practical!
 - There is a 3-position toggle switch for the interface configuration / operation mode.
- The electronics are based on four tubes of type *6AU6* and *6AU8* - instead of four *RV12P4000*.
- The monitoring/headset output ("Mithören" in the Siemens-Halske Feld-Hell) is not transformer-isolated; instead, it is connected to the anode of the pre-amplifier tube, via a blocking capacitor.
- There is no separate phone jack for a field telephone.
- The push-button to select the range of the voltmeter (battery vs. anode voltage) is a separate switch in the front panel. In the S-H Feld-Hell, the switch is integrated in the bezel of the instrument.
- There is no equipment label with serial number, year of manufacture, etc.

Interestingly, the "battery / power-supply" toggle switch - on top of the unit - has been retained.





Fig. 7: front of the amplifier box



Fig. 8: front of the amplifier box - annotated

Item nr.	Legend in Hungarian	Translation / Function	©2011 F. Dörenberg
1	KI KÉSZEN ÜZEM	= Main rotary switch "Off - Standby - On" (as on regular Feld-Hell)	
2	ADÓSZAB. (Adószabályozó)	= Output audio gain/volume (does not exist on regular Feld-Hell)	
3	K.R.ADÓ (Kemény Radio Adó) M.R.ADÓ (Modulált Radio Adó) K.R.VEVŐ (Kemény Radio Vevő)	= Connector block with 3 dual binding-posts (left to right): ▪ keying output to CW transmitter ▪ tone pulses output to AM/SSB/FM transmitter ▪ "hard" reception input (direct keying)	
4	VEZETÉK M.R.VÉTEL (Vezetékes Modulált Radio Vétel) M.R.AD. (Modulált Radio Adás) K.R.ADÁS (Kemény Radio Adás)	= toggle switch for op. mode/interface configuration (not on regular Feld-Hell) ▪ up: tone from phone line or radio receiver ("Empfänger" on Feld-Hell; A2 mod.) ▪ center: tone radio transmission; output of tone pulses (A2 mod., ASK) ▪ down: "hard" (un-modulated) transmission; keying output to CW TX (A1 mod.)	
5	VEZETÉK M.R.VEVŐ	= dual binding-post for tone reception from phone line ("Leitung" on regular Feld-Hell)	
6	VEVŐ SZAB. (Vevő szabályozó)	= Input audio gain/volume ("Verstärkung" on regular Feld-Hell)	
7	HALLGATÓ	= monitoring ("Mithören" output to headphones on regular Feld-hell)	
8	SZÜRŐ 900 HZ	= 900 Hz filter	
9	KI	= OFF position of the toggle switch for the 900 Hz audio filter	
10	ANÓDFESZ. (Anódfeszültség)	= Anode voltage (on regular Feld-Hell, this pushbutton is in the rim of the voltmeter)	

Fig. 9: translation of the labels & legends of the switches and connectors

Hungarian is a difficult language - for foreigners. Basically, signal names and switch positions that begin with a "K" (for "Kemény") have to do with transmitter on/off "keying", those beginning with "M" (Modulált), with modulated tone pulses.

The only item that has a label on it, is the motor-generator:



Fig. 10: Label on an HTG-1 motor-generator
(source: courtesy K. Czirják (HA1UK), used with permission)

In the photo above, "Sz" (= soroztszám) is a 6-digit serial number. It is actually a three-part number. The first digit indicates a version or modification level, "54" is the year of manufacture, and "095" is the actual serial number. Roughly 1500 machines were produced (ref. 7), but not more than nine are currently (2021) known to have survived (ref. 6).

The two diagrams below show the close similarity between the schematics of the standard Feld-Hell and the HTG-1. A detailed schematic of the HTG-1 is provided in ref. 1A.

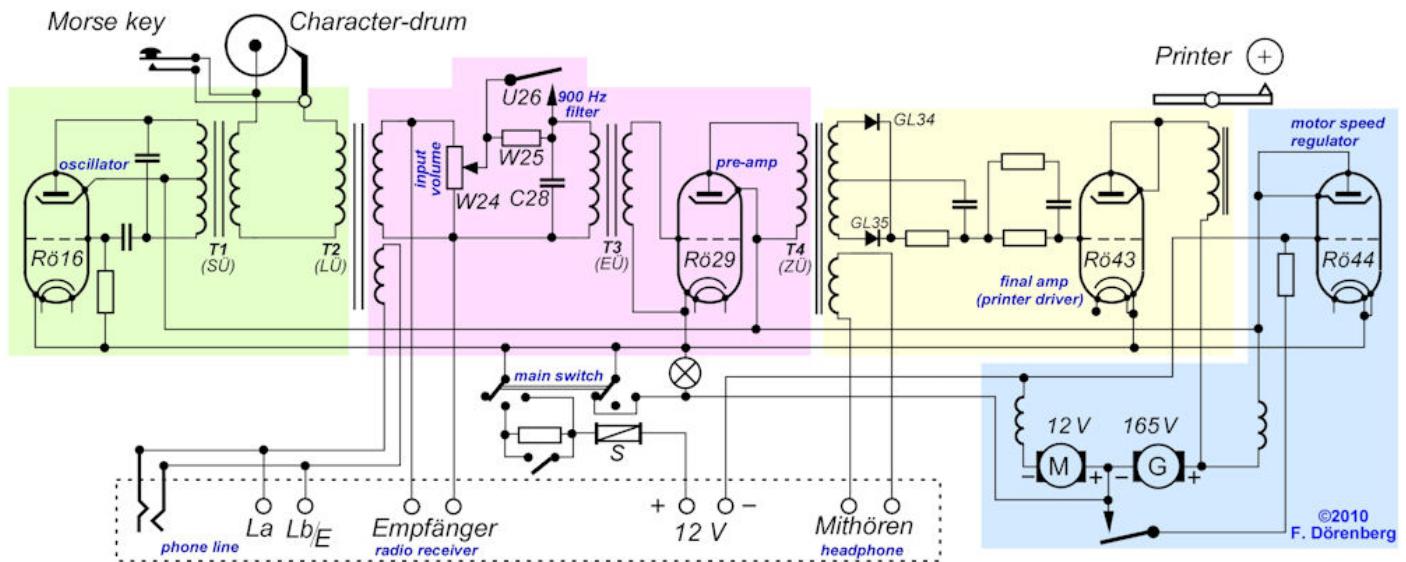
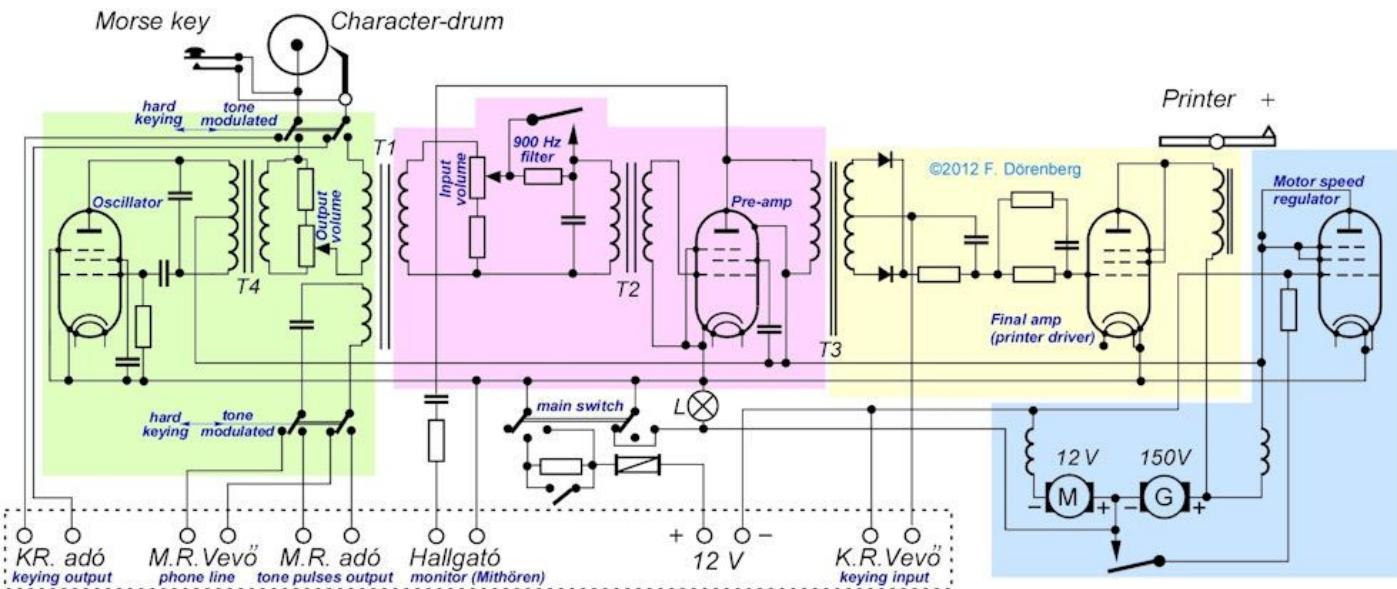
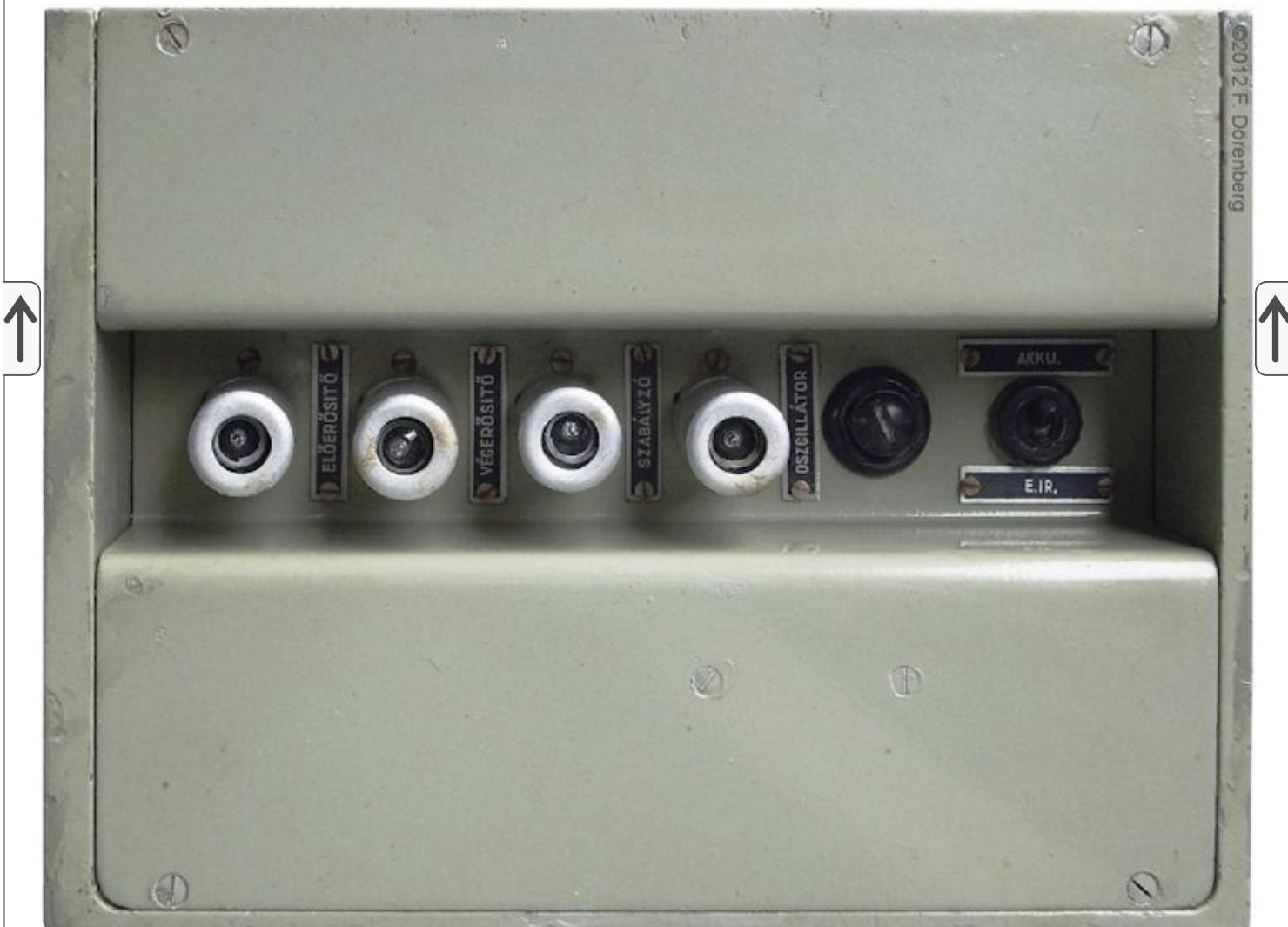


Fig. 11: simplified schematic of the standard Hell Feldforschreiber

**Fig. 12: simplified schematic of the HTG-1****Fig. 13: top of the HTG-1 amplifier box - tubes, fuse, and toggle switch are easily accessible**

Legend in Hungarian	Translation / Function
ELŐERŐSITŐ	= pre-amplifier
VÉGERŐSITŐ	= power-amplifier (printer solenoid driver)
SZABÁLYZÓ	= regulator (motor speed control)
OSCILLÁTOR	= oscillator / tone generator
AKKU. (akkumulátor)	= battery
E.I.R. (egyenirányító)	= DC power supply

Fig. 14: labels next to the vacuum tubes in Fig. 8 above (left to right)

The **6AU6** tube is a post-WW2 7-pin miniature pentode (RCA, October 1945). Ref. 2. It was typically used in AF and RF amplifiers, e.g. in television sets. Equivalents are the *CV2524* and *EF94*, and it is similar to the *EF85*. Tungsram in Hungary also manufactured this tube (under license). The tube has a large *transconductance* (4000-5000 μmho , depending on anode voltage), but a relatively low amplification factor of only 36.

- *Transconductance* is a measure of the change in anode *current* to a change in grid *voltage*, with anode voltage held constant; units: mho (old; "ohm" spelled backward), siemens.
- (Static) *amplification* is gain, expressed as the ratio of the change in anode *voltage* for a change in grid *voltage*; units: mu (μ).

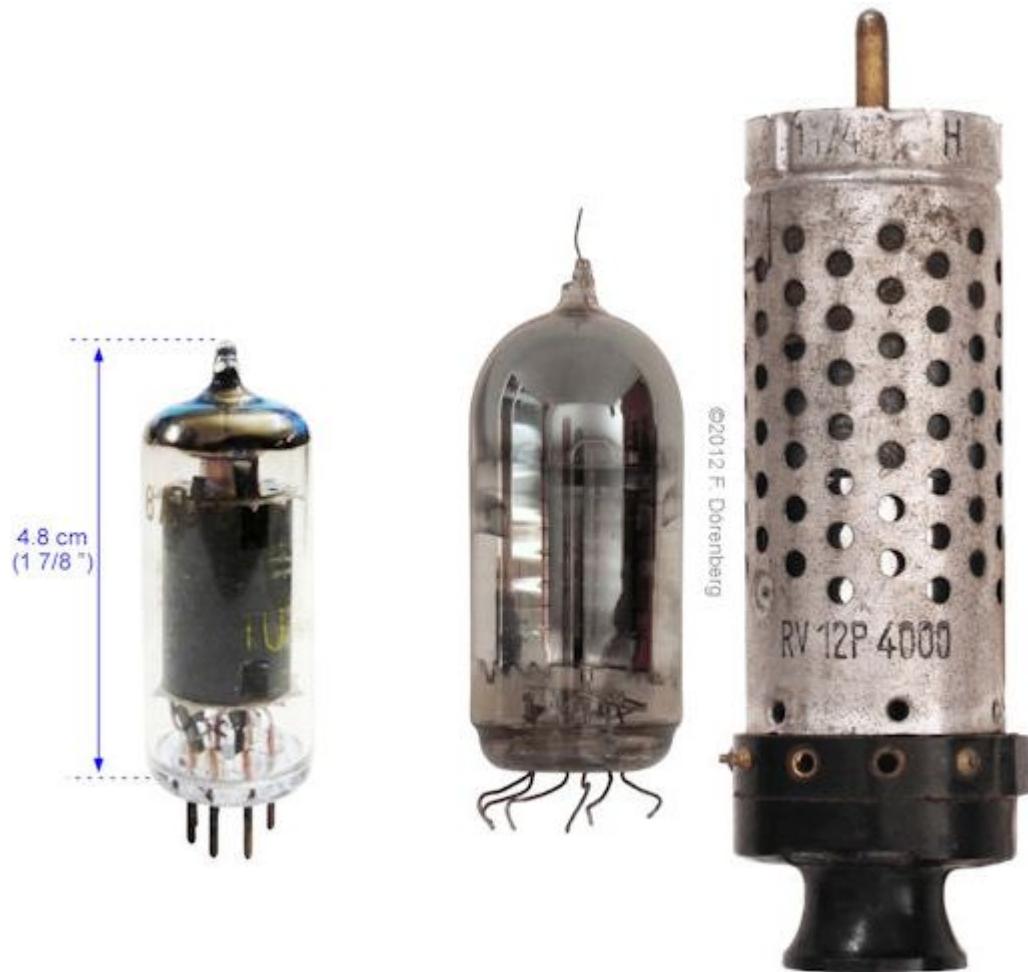


Fig. 15: the "6AU6" compared to the "RV12P4000"

The **6AU8** tube is a 9-pin miniature triode-pentode (RCA, 1947). The pentode part is used for the tone oscillator. The triode part is not used. Ref. 1A.

The *RV12P4000* tube of the standard Feld-Hell has a large static gain (4000 max) as well as a large transconductance (2300 μmho). The Royal Hungarian Army (RHA) may also have used Tungsram tubes of type *HP1220* in their German Feld-Hells, as a substitute for the *RV12P40000*. The **HP1220** is a high-frequency pentode with 12 volt heater voltage and $20 \times 10 = 200$ mA heater current.

Other components (capacitors, resistors, potmeters, possibly also the transformers) in the HTG-1 Hellschreiber were made by the company *REMIX Radiotechnikai Vállalat* [Radio Technology Company] in Budapest/Hungary. The company was founded in 1932 and changed its name to simply "REMIX" in 1937.

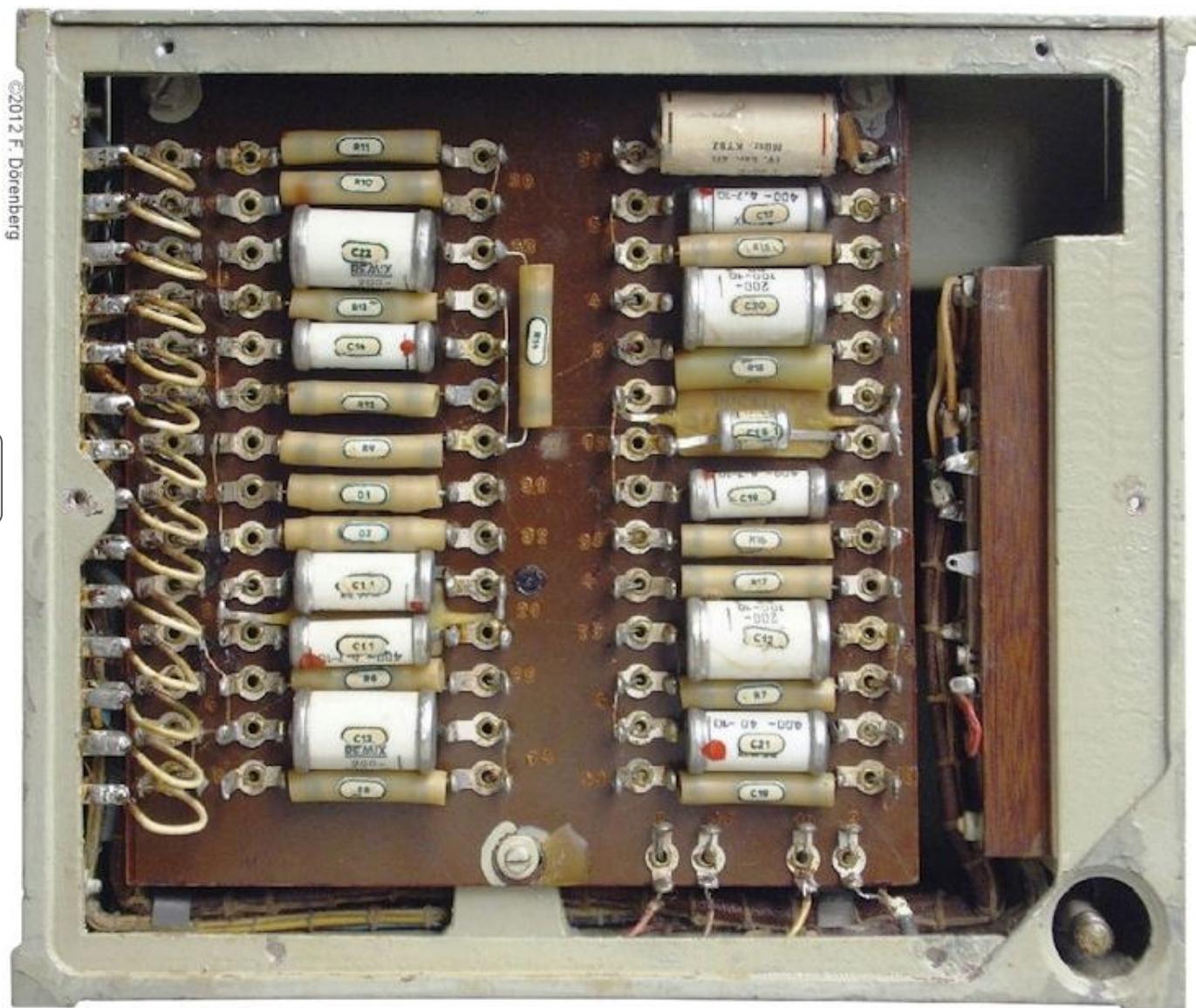


Fig. 16: rear of the HTG-1 amplifier box - cover removed

As in the Siemens-Halske Feld-Hell, all components have a small sticker with the component number from the schematic. However, here, the signal numbers are not screen-printed onto the circuit card, but stamped into the card. Resistors and diodes have a plastic sleeve.

As in the standard Feld-Hell, the vacuum tube sockets are mounted in a heavy U-shaped profile, to which the circuit card is also attached:

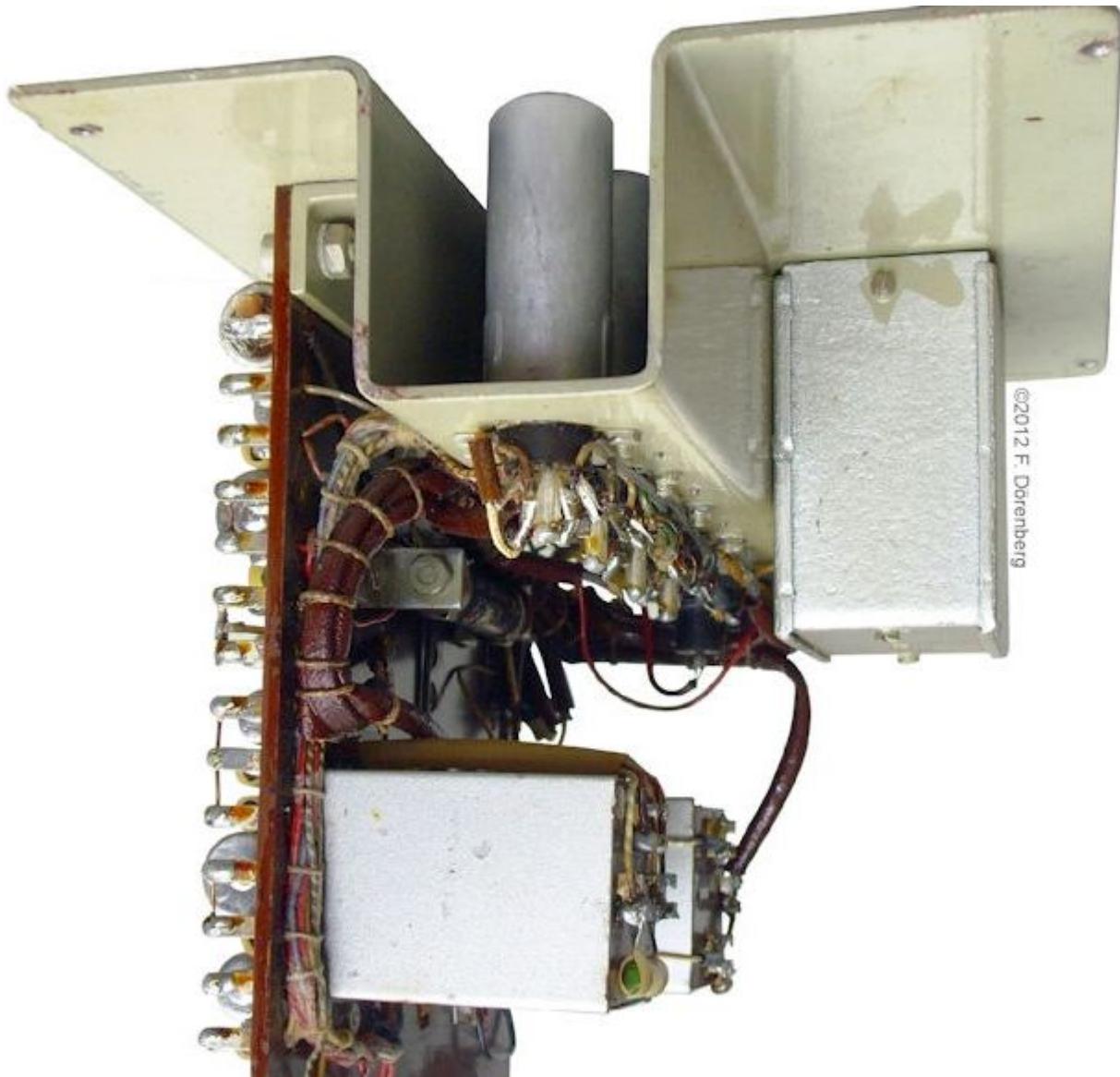


Fig. 17: the HTG-1 circuit card module, removed from the amplifier box

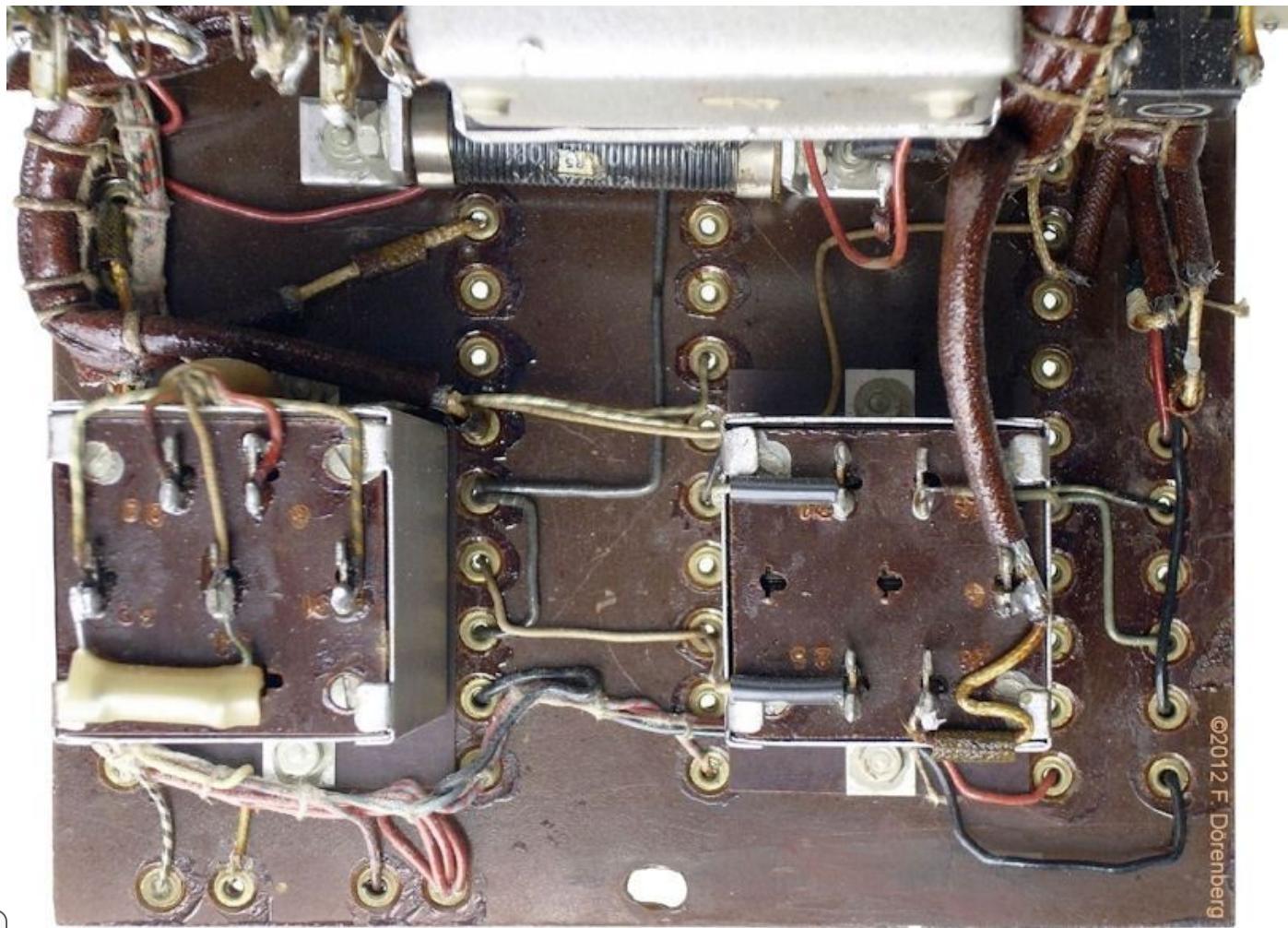
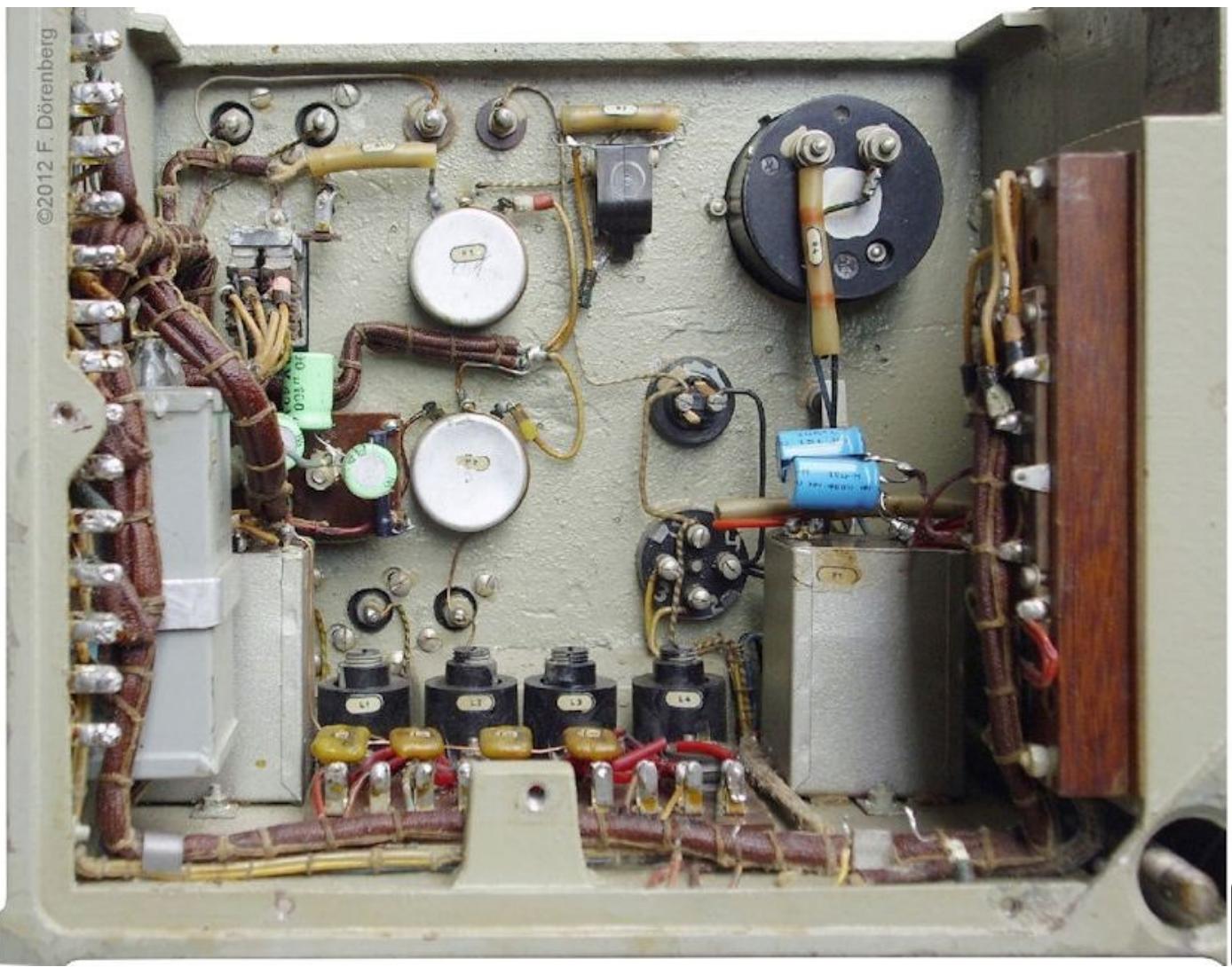
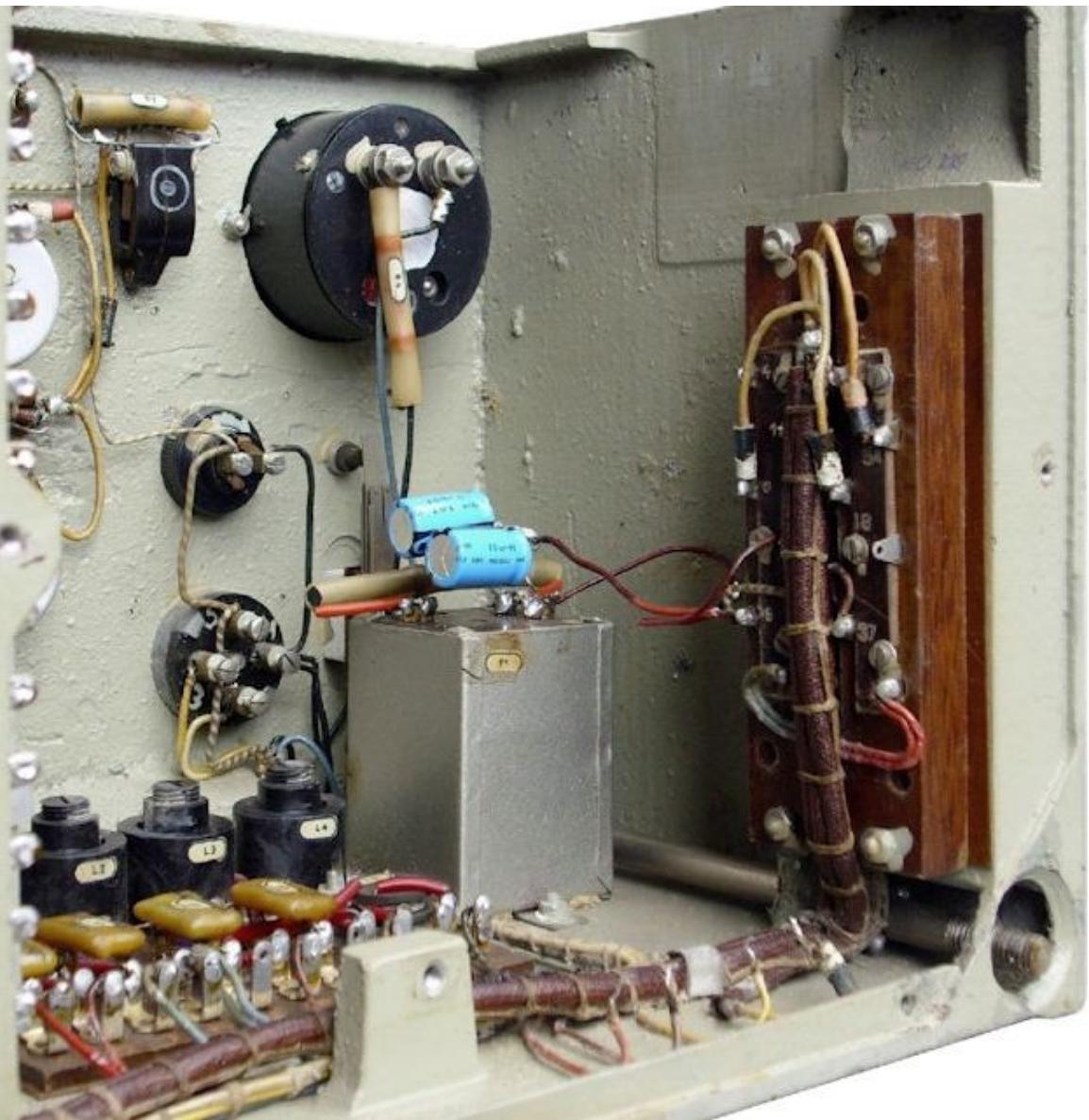


Fig. 18: the other side of the circuit card, with two audio transformers





**Fig. 19: looking into the HTG-1 amplifier box from the rear - circuit card module removed
(the green and blue electrolytic capacitors are modern replacements)**



**Fig. 20: looking into the HTG-1 amplifier box from the rear - right-hand side of the box
(the blue electrolytic capacitors are modern replacements)**

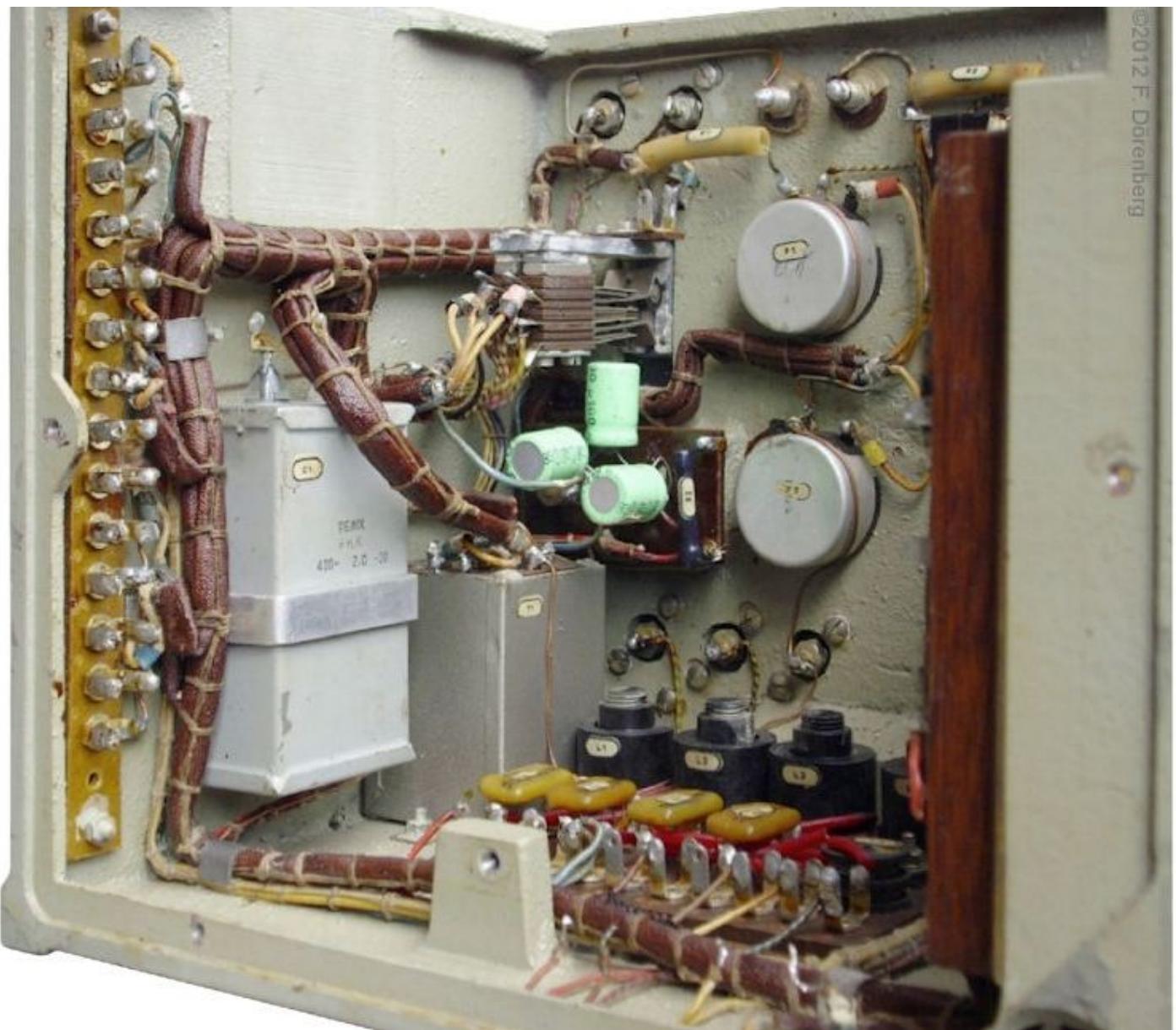


Fig. 21: looking into the HTG-1 amplifier box from the rear - left-hand side of the box
(the green electrolytic capacitors are modern replacements)

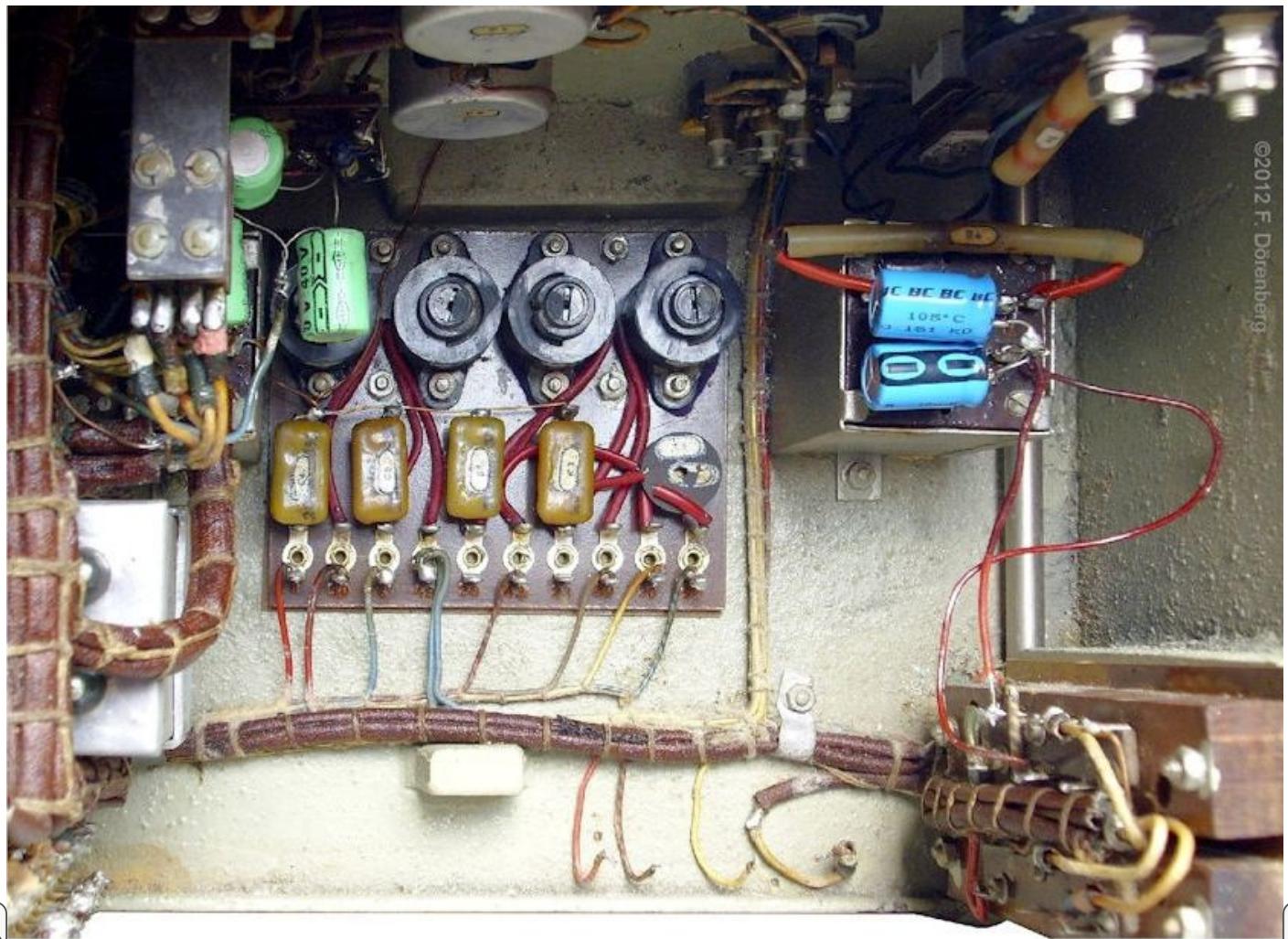


Fig. 22: looking into the HTG-1 amplifier box from the top - circuit card module removed



Fig. 23: side of the HTG-1 amplifier box with two connectors for cables to motor-generator & keyboard-drum
(same as standard Feld-Hell, though the latter also identifies each connector (and matching plug) with a colored dot)



Fig. 24: keyboard and printer-head of the Hellschreiber model HTG-1 - same as Feld-Hell

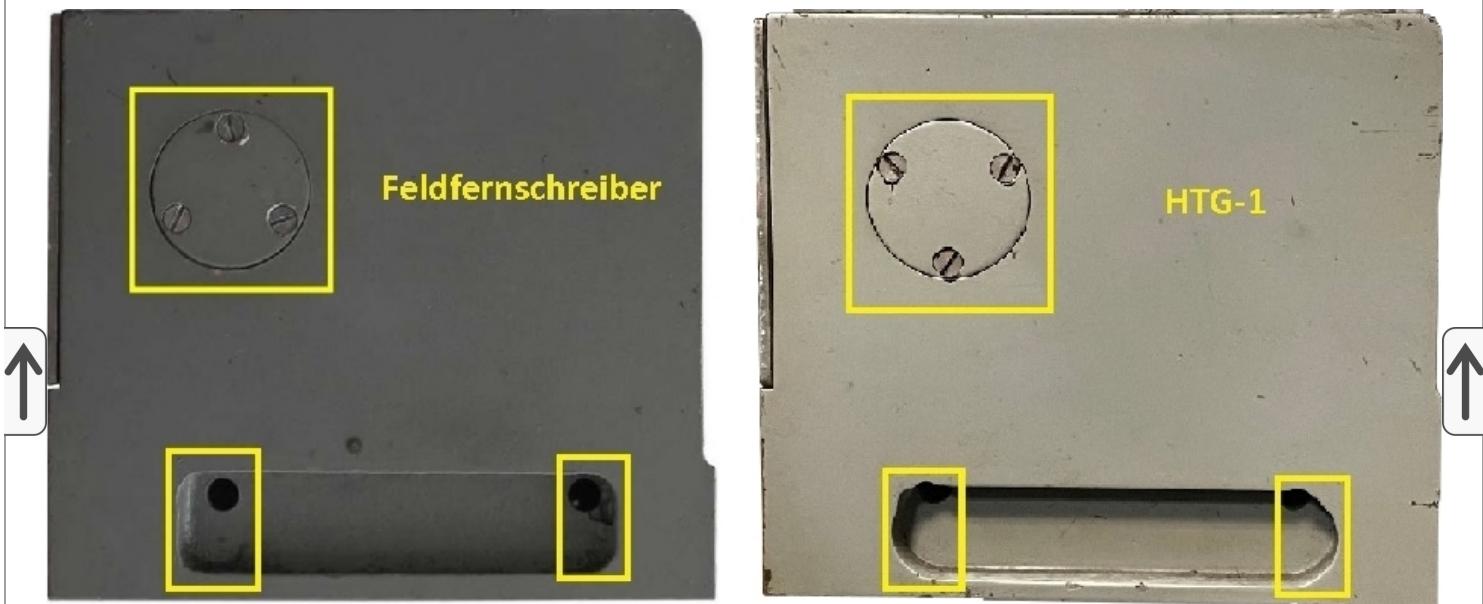


Fig. 25: Minor differences on the left-hand side (= gear box) of the machines
(source: courtesy Istvan "Pista" Kovari (HA2EBA))

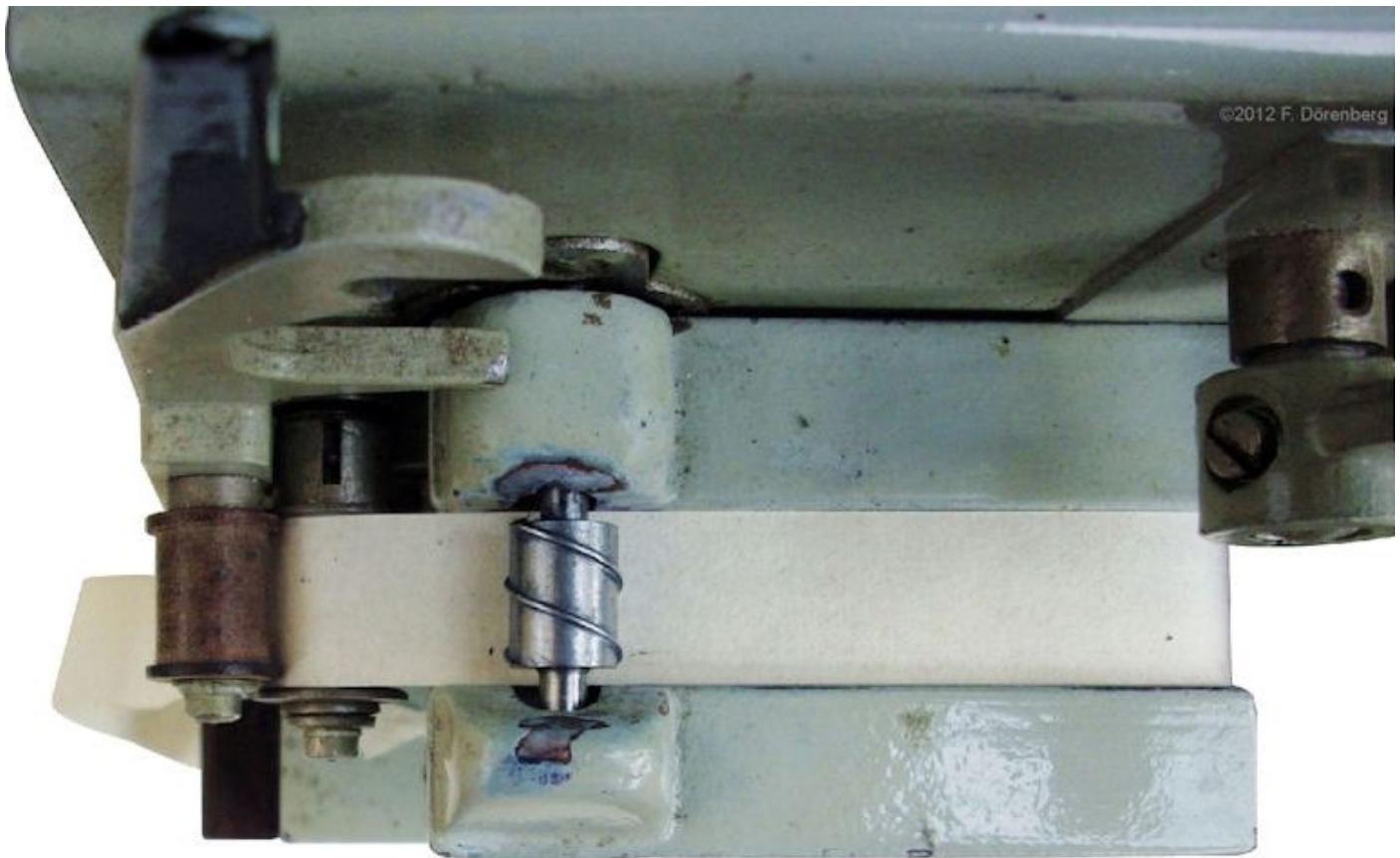


Fig. 26: Close-up of the standard Hell printer module of the HTG-1

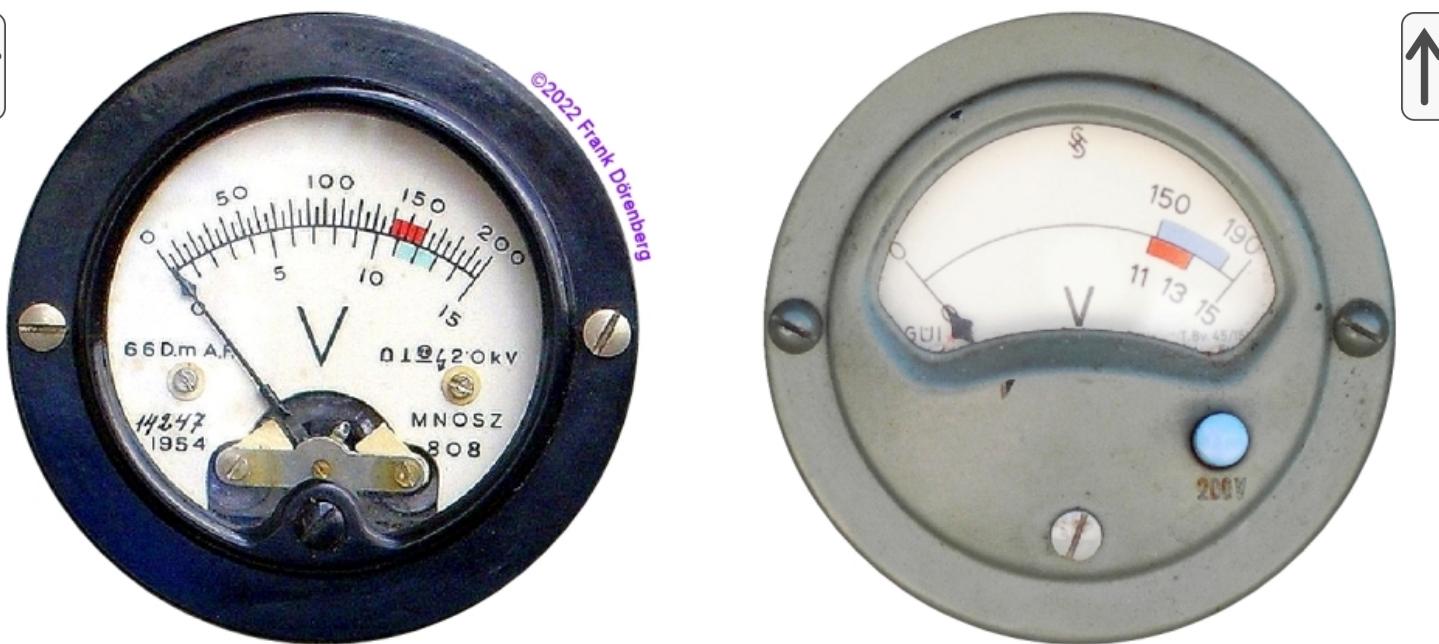


Fig. 27: Voltmeter of a 1954 HTG-1 (left) and of my 1938 standard German Feld-Hell machine (note the difference in the anode voltage range (140-160 vs. 150-185 Vdc) and the opposite red/blue color markings)



Fig. 28: carrying case of Hellschreiber model HTG-1

Like the standard German Feld-Hell machines, the HTG-1 has a 1-page instruction sheet on the inside of the lid of the carrying case. Unlike the German machines, it is printed on an aluminum sheet, instead of on paper:

Kezelési utasítás

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I. ÜZEMBEHELVEZÉS

A készülék csak 12 V-os egyenfeszültségű üzemre alkalmas!

1. A bal alsó sarokban lévő kart „NYITÁS” irányban meghúzzuk. Az alapzatot kissé előrehúzva a kart elengedjük. Ezután az alapzatot addig húzzuk előre, míg utkózik és a rögzítő becsappan.
2. A papírkészlet elhelyezése: A billentyűsor előtt középen lévő gombot lenyomva a fedél kinyilik. A keletkezett nyilás jobb oldalán lévő gombok egyikét behyonva a megfelelő papírtartó előreugrik. A papírszalagot az alapzat baloldalán lévő bemarásos egyikén áthúzva a festékhangerekart felelmezük, s a papírt az írásiga alatt átvezetve a papírvábboxt hengerei közé illesztjük.
3. **Bekapcsolás:** A 12 V-os akku, telep csatlakozó kábelét az erősítő előlapján lévő „+ 12 V-“ jelzésű csapokra dugaszoljuk. Az üzemkapesoló „KÉSZEN” állásában a műszer az akku feszültségét mutatja. Kb. 1 perc mulva a kapcsolót „ÜZEM” állásba kapcsoljuk. A műszer a gomb benyomásakor a generátor feszültségét mutatja. A műszer mutatójának minden esetben a pirossal, illetve zölddel jelölt sávon belül kell állnia. Távvezetéket, rádió vezetéket, távbeszélő készüléket a megfelelő szorítóba dugaszoljuk. Potenciómétereket max. állásba állítjuk. A motor tetején lévő beosztással ellátott szabályozó sapkát „5” állásba állítjuk. A piros billentyűt lenyomva, a beállító jelnek minden 4. hengerfordulatra meg kell jelennie a papírszalagon. Az ellenállomás közbezávarása esetén a beállítójel kettőzve jelentkezik.

Beállítás: Az ellenállomás jelei többe-kevésbé ferde sorokban jelentkeznek. A szabályozó sapka elforgatásával a sorok a papírszalag szélénél párhuzamosság tehetők. Ha a sorok balról-jobbra nézve felfelé futnak, a szabályozó sapkát alacsonyabb osztásra állítjuk, ha lefelé, akkor magasabbra. Közben a vevő potenciómétert oly értékre állítjuk be, ahol az írás a legtisztább.

II. ÜZEMMÓDOK

1. **Vezetékes üzem:** A vonalat a „VEZETÉK” felirású szorítóba kötjük. A kulcsot a „VEZETÉK” állásba állítjuk. A szabályozó potenciómétereket felcsavarjuk.
2. **„Modulált rádió” üzem:** A rádió vevőkészülék hallgató kapcsait a „M. R. VEVŐ” szorítóra, a rádió adókészülék mikrofon bemenetét pedig a „M. R. ADÓ” szorítóra kötjük. Az üzemmód-kapcsoló vételnél „M. R. VÉTEL” (felső) állásba, adásnál „M. R. AD” (középső) állásba kerül.
3. **„Kemény rádió” üzem:** Ha a rádió-vevő kimenő(hallgató) pontjain hangfrekvenciás jeleket kapunk, a kapcsolás: A rádióvevő hallgató hüvelyeit az „M. R. VEVŐ” szorítóra, a rádióadó billentyű pontjait a „K. R. ADÓ” szorítóra kötjük. Vételnél a kulcs „M. R. VÉTEL” állásban, adásnál „K. R. ADÁS” állásban van.
Ha a rádióvevő készülékből egyenáramú jeleket kapunk, akkor a „K. R. VEVŐ” szorítóra lépünk. A rádióadó billentyű pontjai maradnak a „K. R. ADÓ” szorítókon. Ebben az esetben a kulcs vételnél, adásnál egyaránt „K. R. ADÁS” (alsó) állásban van.

Fig. 29: 1-page operating instructions

(source: courtesy Istvan "Pista" Kovari (HA2EBA), used with permission)

See ref. 19 for the full-size sheet and an English translation.

RADIOS USED WITH THE HTG-1

The Hungarian State Railways (MÁV) used the HTG-1 with several receivers and transmitters. As shown in Fig. 3 above, one of those radios was the model model E44 "all band" receiver. It covers the frequency range of 100 kHz - 37.5 MHz, and was made by Autophon AG in Solothurn/Switzerland. Ref. 20A, 20B, 20C, 20D. The model was ordered by the Kriegstechnischen Abteilung (KTA) of the Swiss Army in 1944, designed that same year (hence Empfänger 1944 = E44) and produced from 1945 to 1951. Only 138 E44 were produced. It measures 40x32x31 cm (WxHxD). The unit comprises eleven tubes of type Philips "Miniwatt" D1F, a pentode known for its rather poor reliability. The associated power-supply is the E44Z, with built-in audio amplifier and loudspeaker. The receiver was used with a simple long-wire antenna, via transformer coupler AT44. The E44Z and AT44 are not shown in the photo.



Fig. 30: The Autophone receiver model E44

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The HTG-1 was used with at least the following Hungarian military radios:

- The R/7 transmitter ("adókészülék", "adó") and the R/7 receiver ("vevőkészülék", "vevő"). Ref. 1, 12. These radios date back to around 1939, and were manufactured by *Telefongyár Rt. (Terta)*, like the HTG-1. They covered the frequency range of 3750-8600 kHz, and operated on 4.5 and 132 volt (from a battery, or an R/7a pedal-powered generator).
- The Hungarian Air Force used the HTG-1 with the R-40 and R-50 transmitters, for communication between bases. Both were CW/AM transmitters and had a "hookup for Hellschreiber". Ref. 13.
 - The R-40 had an output power of 100 W (CW telegraphy or Hellschreiber) or 25 W (AM phone). It covered the frequency range of 2.5-20 MHz with three bands. The R-40 was built by *Telefongyár - Magyar Adócsógyár* [Hungarian Transmitter Tube Factory] during 1952-1955. This transmitter was also used in radio trucks.
 - The R-50 CW/AM transmitter had an output power of 1.5 kW (CW/Hell) or 250 W (AM tone/phone). It covered the frequency range of 2.75-15 MHz. The R-50 was built by *Magyar Philips Művek Rt.* (Hungarian Philips Works Co.) in Budapest during the early 1950s. This company was established by the 1939 merger of *Vatea Rádiotechnikai és Villamossági RT* (Vatea Radio Technology & Electrical Co.) and *Philips Rádió és a Villamossági Rt.* (Philips Radio and Electrical Co.). It was nationalized in 1949, and renamed *Magyar Adócsógyár*. In 1966, it was absorbed

into the *Egyesült Izzólámpa és Villamossági Rt.* (United Electric Incandescent Light Factory Co.), which became part of General Electric (GE) in 1989.

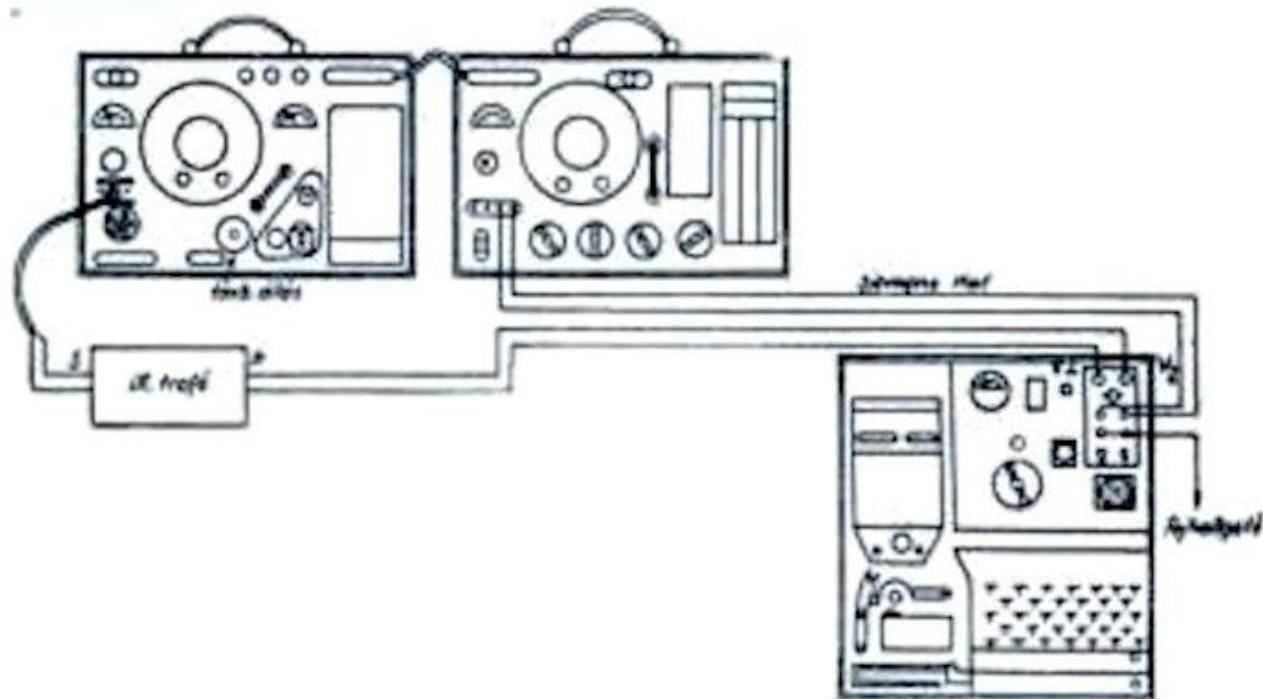


Fig. 31: HTG-1 with R/7 transmitter and R/7 receiver
(source: ref. 1)



www.radiomuseum.hu

Fig. 32: R/7 transmitter

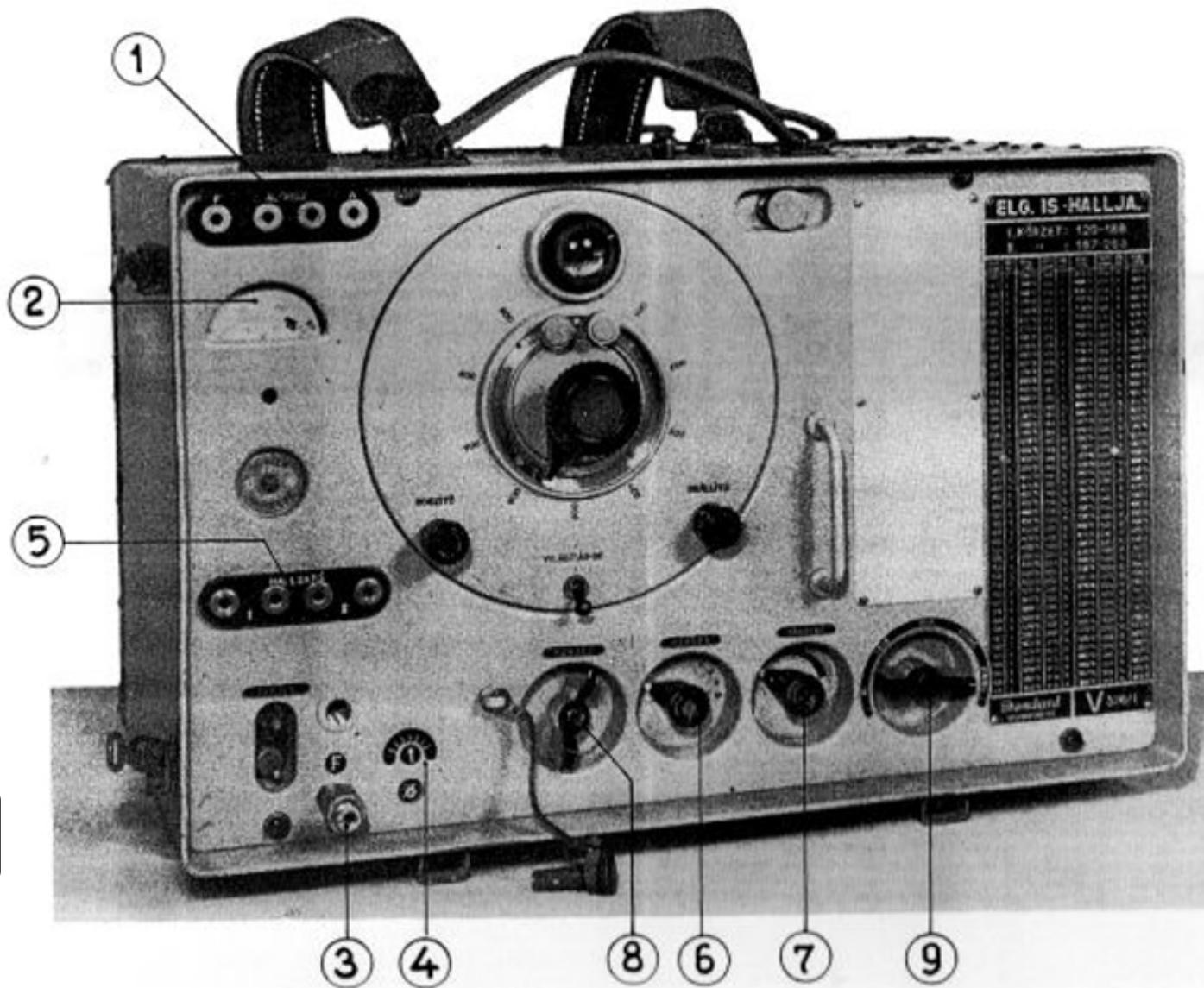
(source: [radiomuseum.hu](https://www.radiomuseum.hu/), accessed 25 March 2019)

Fig. 33: R/7 receiver

(source: ref. 12)



www.radiomuseum.hu

Fig. 34: The 25/50 W (AM/CW) transmitter model R-40
(source: radiomuseum.hu, accessed 25 March 2019)



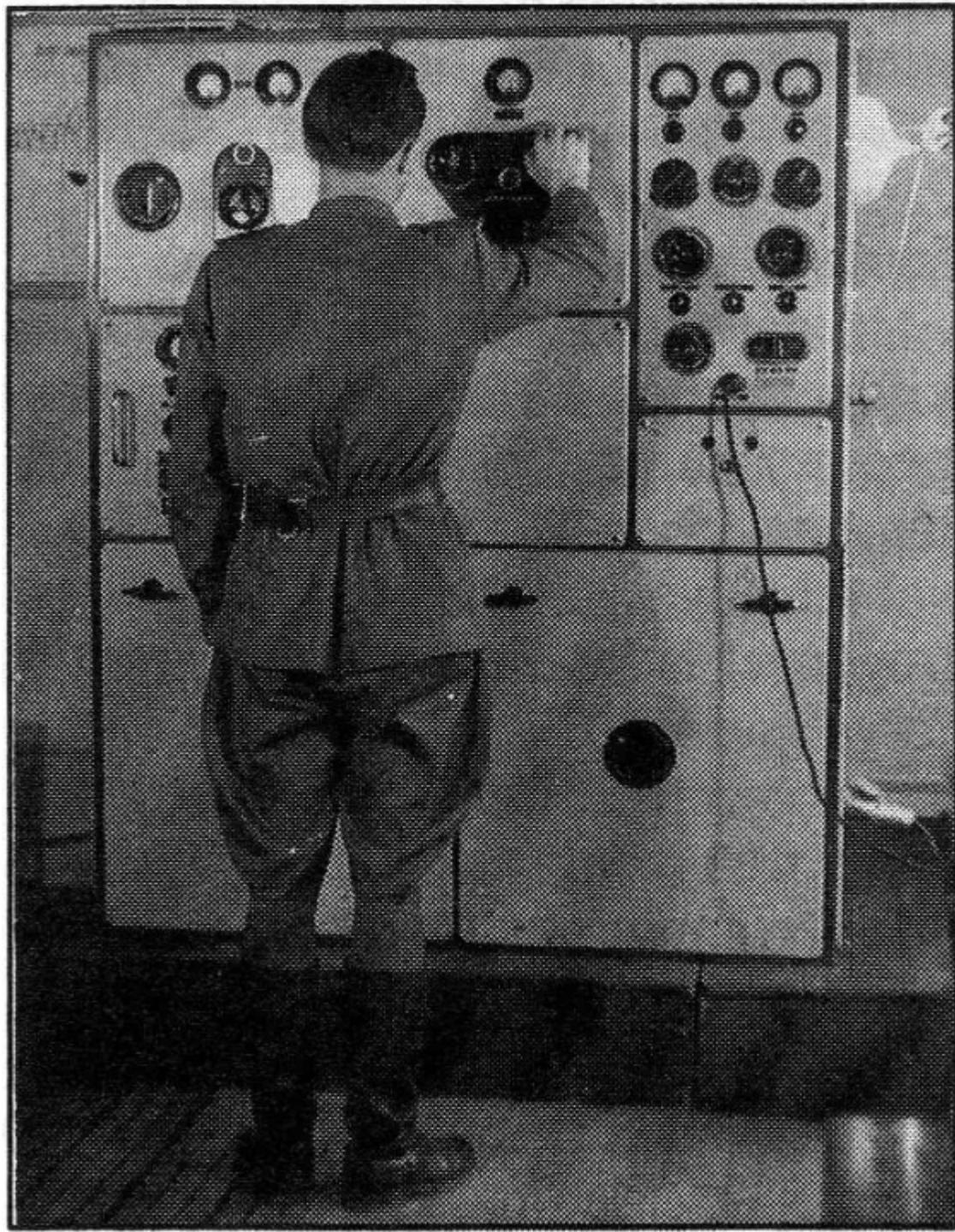


Fig. 35: The 250/1500 W (AM/CW) transmitter model R-50

(source: [Katonai rádiók magyarországon](#) - Military radio in Hungary, accessed 21 November 2021)

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