566 Sig

TB SIG E2

WAR DEPARTMENT TECHNICAL BULLETIN

GERMAN RADIO SET

Torn. Fu. d2.

WAR DEPARTMENT • 28 JANUARY 1944

RESTRICTED

WAR DEPARTMENT,
WASHINGTON 25, D. C., 28 January 1944.

TB SIG E2, German Radio Set Torn. Fu. d2., is published for the information and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

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The Adjutant General.

DISTRIBUTION:

D 2, 7(5); R 2, 5, 7, 19(3); IBn 2, 5, 7, 19(2); IC 2, 5, 7, 11(2).

(For explanation of symbols see FM 21–6.)

WARNING!

THE GERMANS ARE EXPERTS IN THE USE OF BOOBY TRAPS! TURNING A DIAL OR SWITCH MAY DETONATE THE EXPLOSIVE. DO NOT HANDLE OR EXAMINE THEIR EQUIPMENT UNTIL IT HAS BEEN CLEARED BY DESIGNATED PERSONNEL!

LOOK OUT!

DESTRUCTION NOTICE

DESTROY THIS SET COMPLETELY! THIS IS VITALLY IMPORTANT!

WHY — THIS IS THE ENEMY'S OWN EQUIPMENT! HE IS ALREADY FAMILIAR WITH ITS OPERATION. HE HAS ADEQUATE SUPPLIES OF REPLACEMENT PARTS. DON'T LET THIS SET FALL INTO HIS HANDS!

WHEN —When ordered to do so by your commander.

HOW — 1. Smash — Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools, etc.

2. Cut — Use axes, handaxes, machetes, etc.

3. Burn — Use gasoline, kerosene, oil, flame throwers, incendiary grenades, etc.

4. Explosives — Use firearms, grenades, TNT, etc.

5. Disposal — Bury in slit trenches, foxholes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT —1. Smash — Tubes, capacitors, coils, keys, headsets, microphones, panels, frames, antenna mast sections, and other electrical parts.

2. Cut — All cables, wiring, and cords.

3. Burn — Diagrams, charts, instruction books, wire.

4. Bury or scatter — Any or all of the above pieces after destroying them.

DESTROY EVERYTHING!

GERMAN RADIO SET
Torn. Fu. d2.

1. DESCRIPTION. The German radio set Tornister Funkgerät d2., abbreviated **Torn. Fu. d2.**, will hereafter be referred to as "the set" or the **Torn. Fu. d2.** The American military equivalent for **Torn. Fu. d2.** is "portable radio set d2." Whenever German words appear in this bulletin, the American military equivalent will follow in parenthesis. The set, a small, portable, high-frequency transmitter-receiver combination consisting of a three-stage transmitter and a six-tube superheterodyne receiver, is capable of operation on **Tg.**, Telegraphie (cw), or **Tn.**, Telephonie (voice), and can be used in nets with American amplitude-modulated radio sets within the frequency and distance range. The complete radio set is contained in two packs, the transmitter-receiver unit being in the apparatus case, and the power supply and frequency calibrator in the accessories case. The accessories and spare parts are distributed between both packs. Figure 1 shows the accessories carried in the apparatus case. The complete list of the components is as follows:

1 2-volt storage cell, German type 2B38.
2 90-volt plate batteries, German type DIN/VDE 1600.
2 Headsets.
1 Throat microphone.
1 Hand microphone.
1 Antenna mast.
1 Spare parts bag containing six tubes, German type RV2P800; two tubes, German type RL2T2; and two microphone buttons.
1 Telegraph key.
1 Counterpoise consisting of a terminal plug and four rubber-covered rays about six feet in length.
1 Cord with three hooks which is used to mount a pack-cover above the operating panel in such a way as to provide additional protection against rain.
6 Antenna sections which are carried in the place provided on the inside of the apparatus case cover.

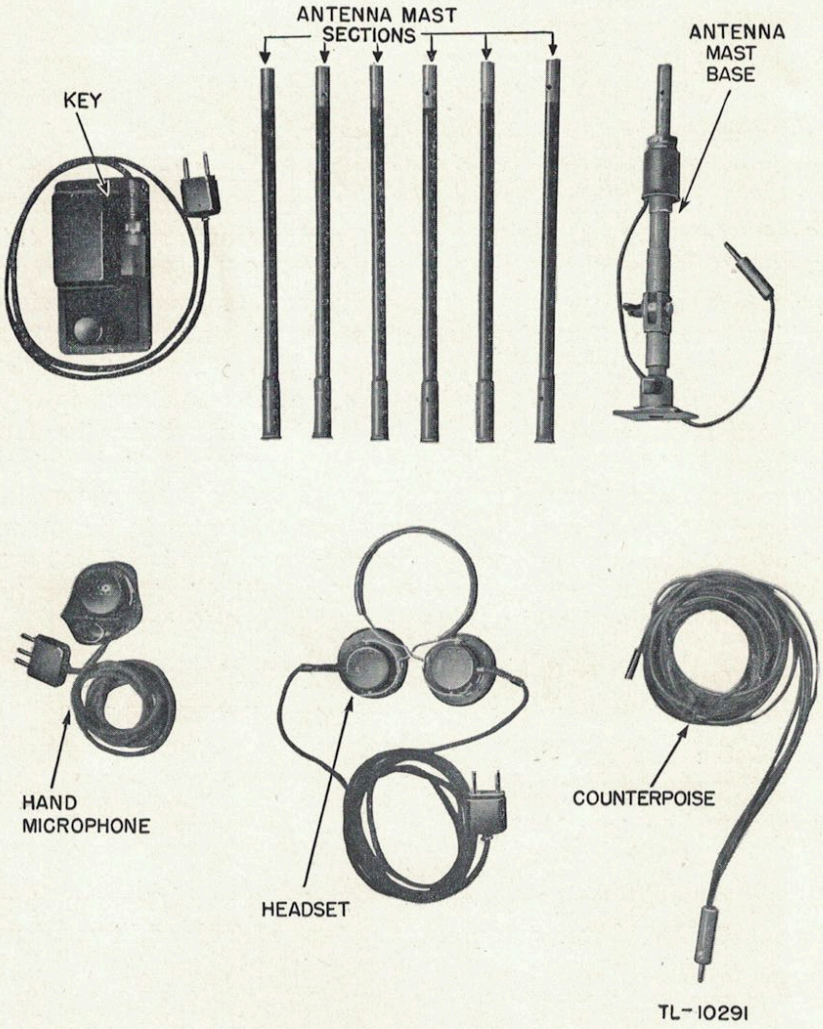
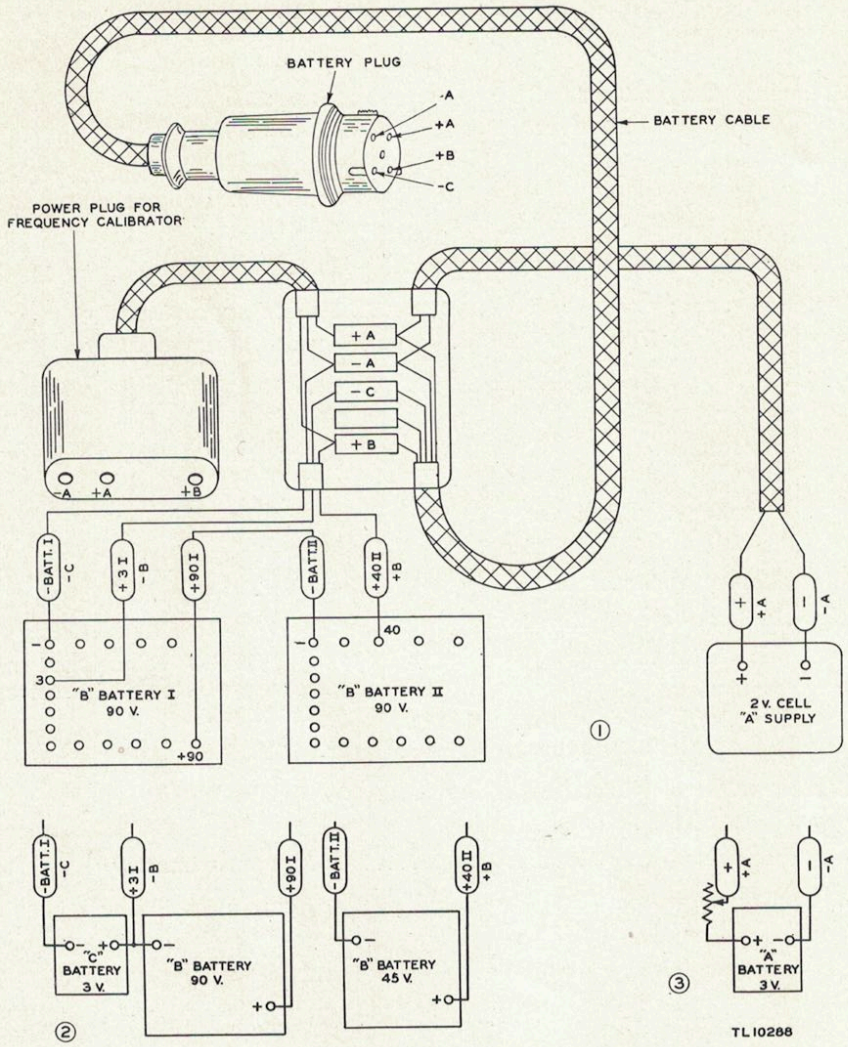


Figure 1. Accessories carried in apparatus case of German radio set, **Torn. Fu. d2.**

2. PERFORMANCE DATA. The table below lists the performance data of the set.

PERFORMANCE DATA

Frequency range: Transmitter	33.8 to 38.0 mc
Receiver	33.8 to 38.0 mc
Types of signals emitted	Telegraphie, Tg. (cw), Telephonie, Tn. (voice), amplitude-modulated
Types of signals which may be received	cw, tone, and voice
Distance range: Cw	10 miles approximately
Voice	2 miles approximately
Antenna type	vertical, approximately 6 ft in length
Type of transmitter	master oscillator-power amplifier (MOPA)
Number of tubes: Cw	3
Voice	4
Master oscillator tube	type RV2P800
Intermediate amplifier tube	type RV2P800
Modulator tube	type RV2P800 (also used as sidetone oscillator and receiver a-f amplifier)
Power amplifier tube	type RL2T2
Number of dial divisions	100
Frequency separation between dial divisions	42 kc approximately
Method of calibration	fixed crystal oscillator (7,000 kc)
Power output	1 watt
Type of receiver	superheterodyne
Number of tubes	6
1 r-f amplifier	type RV2P800
1 h-f oscillator	type RV2P800
1 mixer	type RV2P800
1 i-f amplifier	type RV2P800
1 2d detector	type RV2P800
1 a-f amplifier	type RV2P800
Intermediate frequency	2,100 kc approximately
H-f oscillator frequency	2,100 kc above incoming signal



① Battery connection using German-type batteries.

② American substitute batteries for plate and grid supply.

③ American substitute batteries for filament supply.

Figure 2. Power supply connections for German radio set **Torn. Fu. d2.**

Type of c-w oscillator	regenerative 2d detector
Sidetone in the set	yes—receiver a-f amplifier acts as audio oscillator to produce sidetone on cw
Zero beat transmitter to receiver	impossible
Power supply	batteries
Filament	2-volt storage cell
Plate	two 90-volt dry batteries
Grid bias for receiver	−3 volts
Transmitter current drain when used in 2-way communication:	
Filament	2.2 amps approximately, on cw 2.0 amps approximately, on voice
Plate	40 ma approximately, on cw 30 ma approximately, on voice
Receiver current drain:	
Filament	1.15 amps approximately
Plate	25 ma approximately

NOTE: When German batteries are used, the plate and grid use a 130-volt supply which is tapped at 3 volts.

3. BATTERY INSTALLATION.

a. General. If the proper German batteries are available, they should be connected in the accessories case as shown in figure 2 ①. The storage cell, German type 2B38, will fit into a compartment provided. Each of the two **Anode Batteries** (B batteries) also fits into a compartment of the case. Figure 3 shows compartments and placement of equipment in the accessories case.

b. Filament Supply Substitutes. When the German storage cell is unavailable, a 2-volt storage cell of any manufacture may be used. Dry cells of 3 volts may be used in place of the storage cell. However, a dropping resistor must be connected (fig. 2 ③), and provisions made for adjusting the resistance in this circuit when changing from the **Empf.** (receive) position to either of the two transmit positions marked **Tg.** (cw) or **Tn.** (voice).

NOTE: Adjust the value of the dropping resistor so that the filament voltmeter reading does not exceed 2.2 in any position of the control switch (fig. 4). The value of this resistor is approximately ½ ohm on **Tg.** and **Tn.** and approximately 1 ohm on **Empf.** This adjustment will lengthen the life of the tubes by preventing the application of excessive voltage to the filaments of the tubes.

c. Plate and Grid Supply Substitutes. When German **Anode Batteries** (B batteries) are not available, B batteries of American manufacture may be substituted as shown in figure 2 ②.

NOTE: A separate C battery must be connected for grid supply when American B batteries are used for plate supply.

d. Battery Life. The expected life of substitute American batteries is given in the table below. Other batteries which supply 2 volts for filament, 3 volts for the grid, and 135 volts for the plate may also be used. The batteries listed, however, will give reasonable life for a continuous filament drain of 2.2 amperes and a continuous plate drain of 40 milliamperes (continuous transmitting). Intermittent use or reduced drain such as in **Empf.** (receive) will, of course, greatly increase the life of the batteries. Since the drain on the C battery is very small, the expected life of these batteries is not given.

FILAMENT SUPPLY (A Battery)

Battery type	Number used	Connection	Delivered voltage	Life
BA–23	4	Series-parallel	3 volts	4 hours
	6	Series-parallel	3 volts	15 hours
BA–35	4	Series-parallel	3 volts	5 hours
	6	Series-parallel	3 volts	14 hours
BA–65	2	Series-parallel	3 volts	5 hours
	4	Series-parallel	3 volts	14 hours
BA–15A	8	Series-parallel	3 volts	5 hours
	12	Series-parallel	3 volts	14 hours

PLATE SUPPLY (B Battery)

Battery type	Number used	Connection	Delivered voltage	Life
BA–36	3	Series	135 volts	17 hours
BA–2	12	Series-parallel	135 volts	16 hours
BA–33	2	Parallel	135 volts	16 hours
BA–8	6	Series	135 volts	40 hours

GRID SUPPLY (C Battery)

Battery type	Number used	Connection	Delivered voltage
BA–27	1	Tapped at 3 volts	3 volts
BA–34	1	Tapped at 3 volts	3 volts

4. SET INSTALLATION.

a. Battery. (1) Connect the batteries as shown in figure 2 ①, or 2② and 2③ and described in paragraph 3.

(2) Connect the battery plug to the five-contact plug on the lower right of the set. Do not force this plug as it will only plug in one way. (Refer to fig. 4 for the location of jacks and controls.)

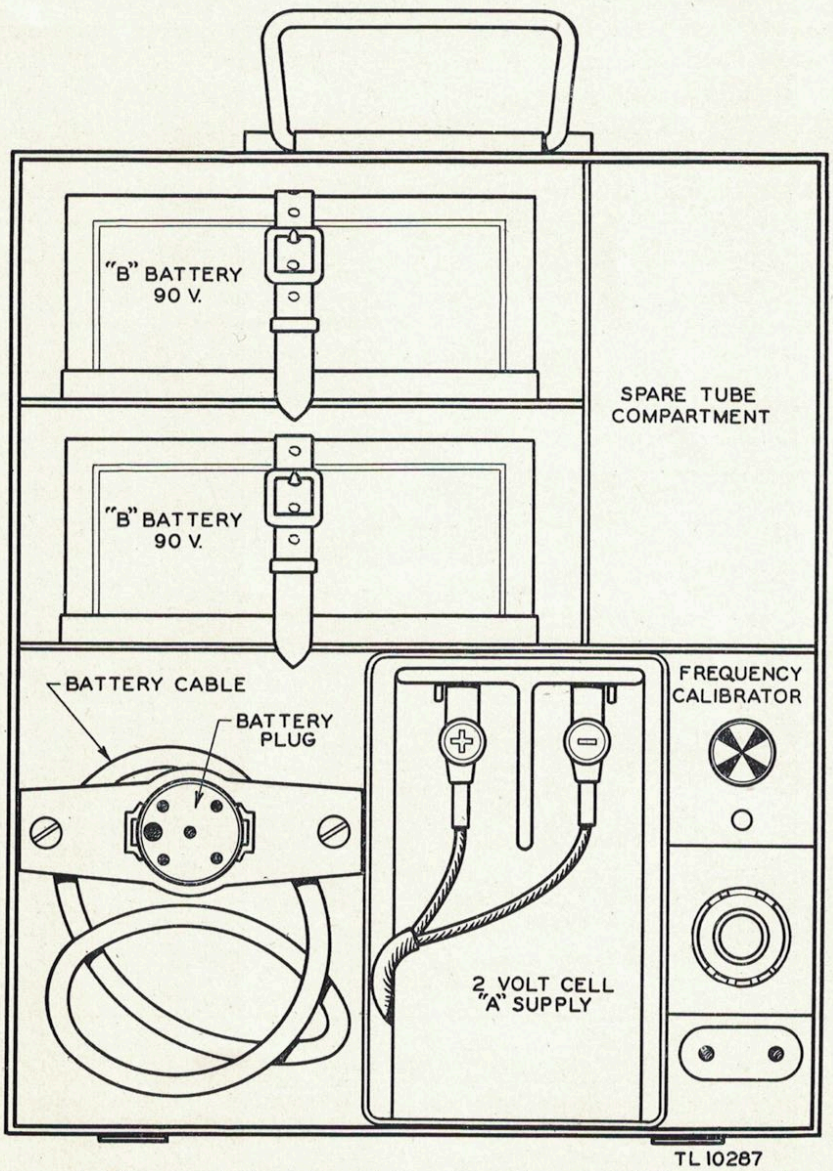


Figure 3. Placement of equipment in accessories case of German radio set Torn. Fu. d2.

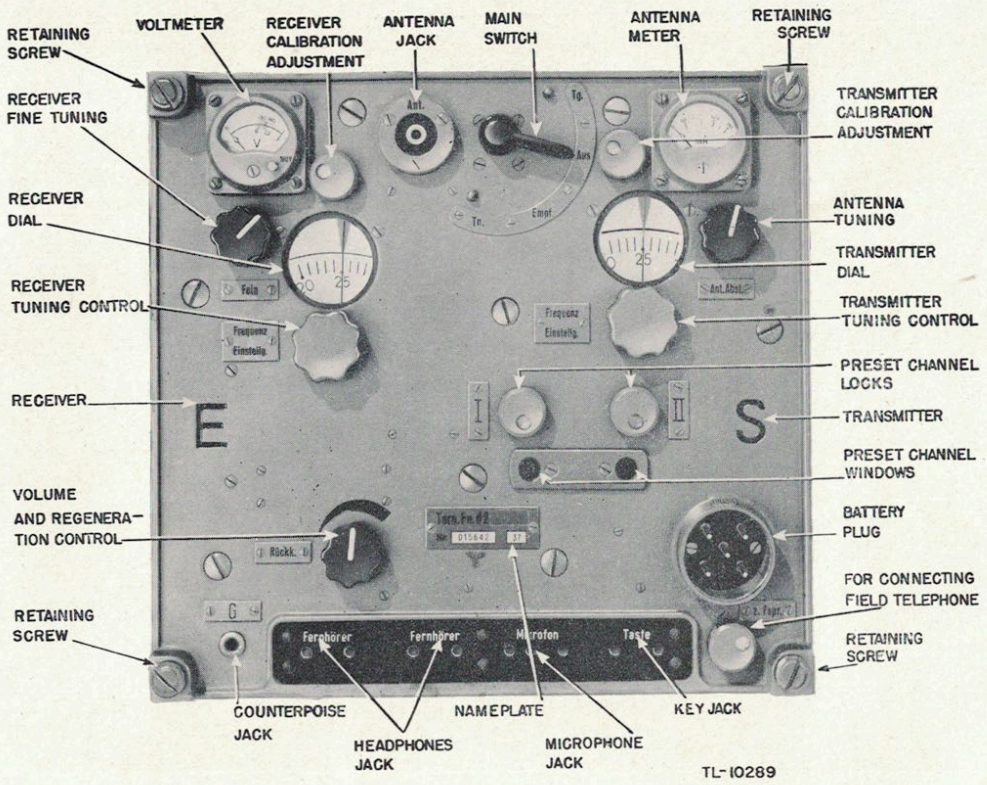


Figure 4. German radio set **Torn. Fu. d2.**, *removed from case, front view.*

b. Antenna. Either the regular antenna or the remote antenna may be used. The remote antenna affords operation with a distance of about 12 feet between the set and the antenna, which may be desirable when operating inside a tent, dugout, etc. The remote antenna equipment is carried in a separate waterproof bag. The regular antenna is easier to erect.

(1) REGULAR ANTENNA. (*a*) Remove the antenna base and lead from the accessory shelf, and mount on the antenna mast bracket on top of the set. Tighten the large wingnut.

(*b*) Assemble the antenna (sections are in the apparatus case cover), and mount upright on the base already installed.

(*c*) The antenna lead connects to the jack marked **Ant.** (antenna) on the front panel of the set.

(*d*) Spread out the counterpoise cables on the ground and connect to the jack marked **G** (counterpoise) on the left lower corner of the front panel.

(2) REMOTE ANTENNA. (*a*) Remove the various parts of the remote antenna from the waterproof bag.

(*b*) Mount the supporting mast in an upright position on a tent rod.

(*c*) Mount the antenna base to the supporting mast and tighten the wingnut.

(*d*) Assemble the antenna (sections are in the set cover lid), and mount on the antenna base already installed.

(*e*) Brace the antenna structure with four guy ropes.

(*f*) Connect the shielded cable to the antenna and to the **Ant.** (antenna) jack on the set. About 12 feet of shielded cable is provided.

c. Microphone. Plug the microphone, either the throat or hand type, into the jack marked **Mikrofon** (microphone). Any single button carbon microphone equipped to plug into the jack will work satisfactorily.

d. Telegraph Key. Plug the telegraph key into the jack marked **Taste** (key). Any telegraph key will work.

e. Headset. Plug the headset into either of the jacks marked **Fernhörer** (headphones). Any high impedance headset is satisfactory. The set is now installed and ready for operation.

5. OPERATION. After the set is installed (pars. 3 and 4) it is put in operation as follows:

a. Receiver Operation. (1) To receive, turn the main switch on the upper central part of the front panel to **Empf.** (receive).

(2) Read the battery voltages on the meter at the top left corner of the front panel. The filament voltage, shown as soon as the set is turned on, should be between 1.8 and 2.2 (indicated within the red section of the scale). Press the blue button marked 180V on the voltmeter to obtain the plate voltage. This should be between 130 and 140 (indicated within the blue section of the scale).

(3) To tune the receiver, turn the control marked **Frequenz Einstellg.** (tuning control) directly under the dial on the **E** (receiver) side of the panel until the desired dial reading appears. The dial is calibrated from 0 to 100. The control marked **Fein** (fine) provides a fine adjustment of the h-f oscillator frequency which permits following a drifting signal and also changing the tone in the headset.

(4) When receiving voice or tone-modulated signals, keep the control marked **Rückk.** (volume and regeneration) turned far enough to the left to prevent oscillation. When receiving c-w signals, this control may be turned to the right to produce the desired tone and volume in the headset.

b. Transmitter Operation. (1) To set the frequency of the transmitter, turn the control marked **Frequenz Einstellg.** (tuning control) directly under the dial on the **S** (transmitter) side of the panel until the dial is set at the desired reading. The dial is calibrated from 0 to 100. The frequency separation between dial divisions is approximately 42 kc.

(2) To preset channels proceed as follows:

(*a*) Turn the transmitter tuning control until the desired channel number, either **I** or **II** appears in its window below the tuning control (fig. 4). **I** appears in the preset channel window on the left and **II** in the one on the right.

(*b*) Turn the preset channel locks cover which is found directly above the window showing either **I** or **II**, to the left to provide access to the channel lock screw.

(*c*) Turn the channel lock screw to the left so that when the tuning control is turned, the channel number selected remains in its window.

(*d*) Turn the transmitter tuning control to the desired frequency.

(*e*) Tighten channel lock screw by turning to the right.

(*f*) Whenever the channel number preset appears in its window, the transmitter is within 1 kc of the frequency originally chosen.

(*g*) Set up the other preset channel in the same manner.

(*h*) The preset arrangement will also serve as a dial lock even though it is very easy to change frequency if desired.

(3) Turn the main switch to the **Tg.** (cw) position and check the battery voltages as instructed in paragraph **5a**(2). This is especially important when dry A batteries are used.

(4) Close the telegraph key and adjust the control marked **Ant. Abst.** (antenna tuning) for maximum reading on the antenna meter.

(5) To operate the transmitter on cw, use the telegraph key.

(6) To operate the transmitter on voice, place the main switch in the **Tn.** (voice) position and press the red knob on the microphone marked **Drücken** (press).

NOTE: When the main switch is in the **Tn.** (voice) position, the transmitter carrier is on.

(7) Due to the set design, it is impossible to zero-beat the transmitter to the receiver. The a-f amplifier tube of the receiver provides sidetone when operating on cw.

6. CALIBRATION. A crystal controlled frequency calibrator is located in the lower right side of the accessories case (fig. 3). A power cable and plug is provided for connection to the batteries. The calibrator is placed in operation by pressing the push-button switch marked **Drücken** (press). Plate current flow is indicated by the appearance of white sectors in the instrument directly above the switch.

a. Calibration of the Receiver. (1) Plug the headset into either of the jacks marked **Fernhörer** (headphones) on the front panel.

(2) Turn the main switch to **Empf.** (receive).

(3) Turn the control marked **Fein** (fine) until the stripe is vertical.

(4) Turn the control marked **Rückk.** (volume and regeneration) to the right until oscillation starts. Normally a tone will be heard when the detector is oscillating.

(5) The red line near 28.2 on the receiver dial, corresponds to the frequency on which calibration is to be made.

(6) Press and hold the push-button switch marked **Drücken** (press) on the calibrator and using the control marked **Frequenz Einstellg.** (tuning control), tune the receiver to zero-beat.

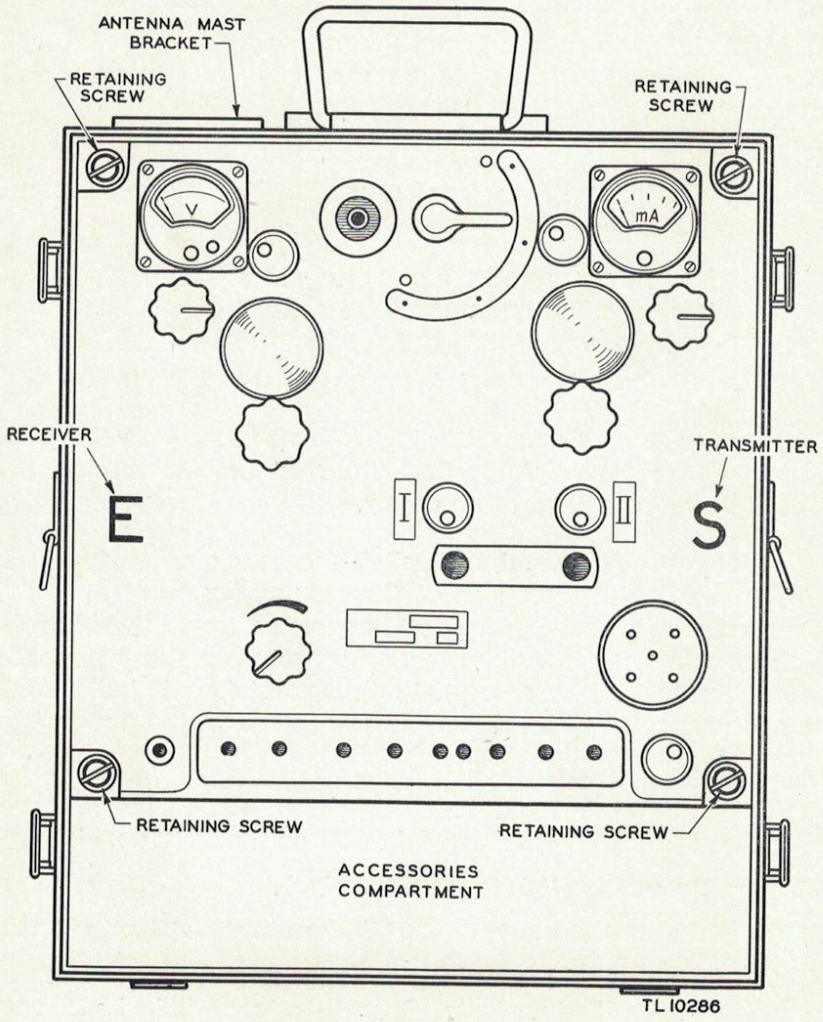


Figure 5. German radio set **Torn. Fu. d2.**, *front view.*

(7) If the red pointer does not point to the red line on the dial, make the correction as follows:

(*a*) Open the receiver calibration adjustment cover located immediately to the right of the voltmeter.

(*b*) With a screwdriver, adjust the position of the red pointer so that it corresponds with the red line on the dial.

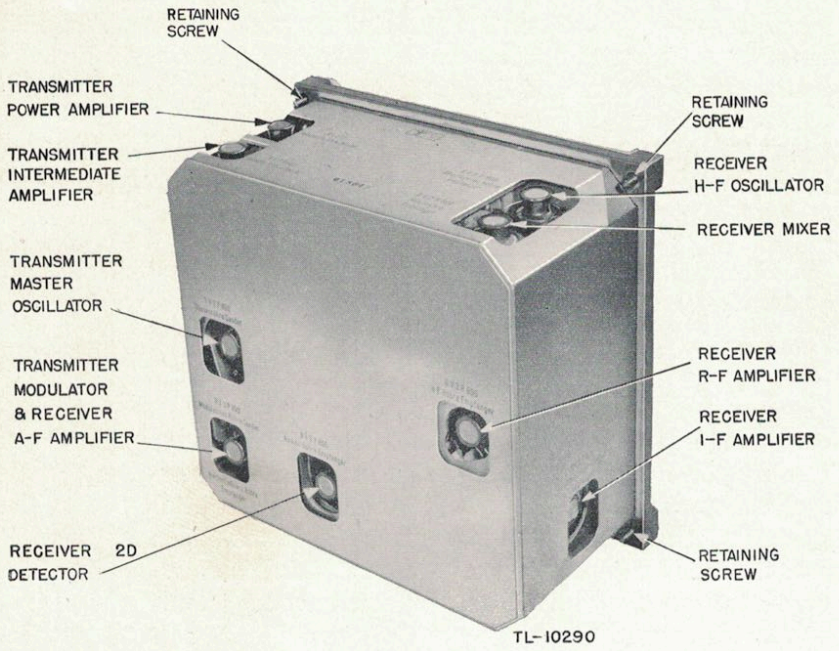


Figure 6. German radio set **Torn. Fu. d2.**, *removed from case, rear view.*

b. Calibration of the Transmitter. (1) Plug the headset into the jack marked **Fernhörer** (headphones) on the frequency calibrator.

(2) Turn the main switch to **Tn.** (voice).

(3) Press and hold the push-button switch marked **Drücken** (press) on the calibrator and using the control marked **Frequenz Einstellg.** (tuning control), tune the transmitter to zero-beat.

(4) If the red pointer does not point to the red line near 28.2 on the transmitter dial, make the following correction:

(*a*) Open the transmitter calibration adjustment cover located immediately to the left of the antenna meter.

(*b*) With a screwdriver, adjust the position of the red pointer so that it corresponds with the red line on the dial.

7. FIELD TELEPHONE OPERATION. It is also possible to modulate the transmitter over an ordinary field telephone line. Satisfactory operation may be obtained with about 1½ miles of field wire. Open the cover on the jack, **z. Fspr.** (for connecting field telephone). The field wire line is connected to a plug which will fit into this jack and a field telephone is connected across the line at the transmitter. It is possible to converse with the operator at the remote location over the field wire line. It is necessary for the transmitter operator to set the main switch in the **Tn.** (voice) position to prepare the transmitter for voice operation. The remote operator will hear the receiver when the main switch is in the **Empf.** (receive) position.

8. MAINTENANCE. Detailed maintenance instructions on this set are not given. Simple operating precautions should be observed. When the set fails to operate, proceed as follows:

a. Check the condition of the batteries with the voltmeter on the panel.

b. Check all cords, plugs, and connections. Much of the trouble will be in cording and connections.

c. Replace the tubes in order, starting with the antenna and progressing toward the master oscillator in the transmitter. In the receiver, start with the a-f amplifier and work to the r-f amplifier. To change the tubes, it is necessary to remove the set from its case. Do this by loosening the four retaining screws on the front panel of the set (fig. 5). Each retaining screw is surrounded by a red ring. Then pull the set from the case. Figure 6 is a rear view of the set with the case removed, showing the position and function of all the tubes.

> **NOTE:** The a-f amplifier of the receiver, the sidetone oscillator, and the modulator of the transmitter is the same tube; therefore, if the set is satisfactory in one of its functions, the trouble is probably not in this tube.

d. If the simple procedures outlined above do not make the set operate, send it back to a signal depot. The components may be used to repair other sets. WE CAN USE THE GERMAN PARTS TO REPAIR OUR OWN OR OTHER GERMAN SETS.

9. GLOSSARY OF TERMS. The German terms on the set and their American equivalent are as follows:

German	American
Ant. (Antenne)	antenna
Ant. Abst.	antenna tuning
Audion Röhre	2d detector tube
Aus	off
Drücken	press
E, Empf., Empfänger	receiver
Fein	fine
Frequenz Einstellg.	frequency control
Fernhörer	headset or headphones
Funkgerät, Fu.	radio set
G, Gegengewicht	counterpoise
Fspr., Feldfernsprecher	field telephone
H F Röhre, hochfrequenzröhre	r-f amplifier tube
Leistungsröhre	power amplifier tube
Mikrofon	microphone
Mischröhre	mixer tube
Modulations Röhre	modulator tube
Niederfrequenz Röhre	a-f amplifier tube
Röhre	tube
Rückk., Rückkopplung	regeneration
S, Sender	transmitter
Steuerröhre	control tube, master oscillator tube
Taste	key
Torn., Tornister	portable
Tg., Telegraphie	cw or telegraphy
Tn., Telephonie	voice or telephony
Uberlagerer Röhre	oscillator tube
z. Fspr., Zur Feldfernsprecher	for connecting field telephone
Zwischenfrequenz Röhre	i-f amplifier tube
Zwischenröhre	intermediate amplifier tube

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