

TB SIG E16

WAR DEPARTMENT TECHNICAL BULLETIN

GERMAN RADIO SET

Torn. Fu. g.

WAR DEPARTMENT

12 AUGUST 1944

RESTRICTED

WAR DEPARTMENT,
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(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 EXPLO-
SIVE. 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, fox holes, 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!

RESTRICTED

GERMAN RADIO SET

Torn. Fu. g.

1. DESCRIPTION.

a. **The Set.** The German radio set **Torn. Fu. g.** (portable radio set g)*, hereafter referred to as "the set," is a transmitter-receiver combination capable of **Tg.**, **Telegrafie** (cw), and **Tn.**, **Telefonie** (voice) operation. The nameplate which identifies the set is shown in figure 1. The set can be used in nets with American amplitude-modulated radio sets within the same frequency and distance range. The set is contained in a weatherproof metal case, on the top of which is a carrying handle and a socket for mounting the antenna. Three carrying-strap connectors and two ring-eyes are also provided for strapping the set to the operator's back. On the bottom of the case is a strap and clip for fastening the small accessories bag. Clips are provided to carry the whip antenna on the outside of the case.



Figure 1. Nameplate of German radio set **Torn. Fu. g.**

b. **Accessories.** (1) The accessories compartment contains the following items:

- 1 2.4-volt nickel-iron storage battery, German type **2.4NC28**.
- 1 Antenna base, German type **g**.
- 4 Antenna sections, German type **g**.
- 1 Antenna tuning coil, German type **g**.
- 1 Headset, German type **f**.
- 1 Telegraph key, German type **TKP**.

* Wherever German terms appear in this bulletin the American military equivalents will follow in parentheses.



Figure 2. German radio set Torn. Fu. g. in use.

(2) The accessories carried in the small bag (Fu)e are as follows:

- 1 Throat microphone, German type c.
- 1 Remote cable, German type c.
- 1 Counterpoise.
- 1 Headset, German type f.

2. PERFORMANCE DATA. The table below lists the general characteristics and performance data of the **Torn. Fu. g.** (portable radio set g).

PERFORMANCE DATA

Frequency range:

Transmitting2,500 kc to 3,500 kc

Receiving2,500 kc to 3,500 kc

Preset frequenciesnone

Types of signals emittedcw and voice

Types of signals which may be received ...cw, tone, and voice

Type of modulationamplitude

Method of modulationsuppressor grid

Distance range:

Cw16 miles approximately

Voice7 miles approximately

Antenna type:

Stationary operation4-section rod with tuning coil
and umbrella top

Portable operationwhip antenna with tuning coil
or rod with tuning coil

Dial graduationkilocycles

Number of dial divisions100

Kilocycles per division10

Type of transmittermaster oscillator-power
amplifier

Type of receiversuperheterodyne

PERFORMANCE DATA (contd)

Number of tubes 7

| Type of tube | Receiving function | Transmitting function |
|--------------|--------------------|---|
| RV2.4P700 | r-f amplifier | none |
| RV2.4P700 | converter | none |
| RV2.4P700 | i-f amplifier | none |
| RV2.4P700 | detector | sidetone amplifier for voice |
| RV2.4P700 | a-f amplifier | sidetone amplifier for voice and sidetone oscillator for cw |
| RL2.4P3 | none | master oscillator |
| RL2.4P3 | none | power amplifier |

Power output:

Cw 1 watt nominal
 Voice 0.5 watt nominal

Type of c-w oscillator regenerative detector

Zero beat transmitter with receiver impossible

Power supply 2.4-volt storage battery type
 2.4NC28 through synchronous vibrator

3. INSTALLATION.

a. Installation for Stationary Operation. (1) Remove the rear cover of the set and connect the leads, which are plainly marked (red +, blue -) to the **2.4NC28** battery. Place the battery in position (fig. 3) and strap it firmly in place.

(2) Determine the accessories required for the method of use from the paragraphs following and replace the cover.

(3) Assemble the antenna as shown in figure 4.

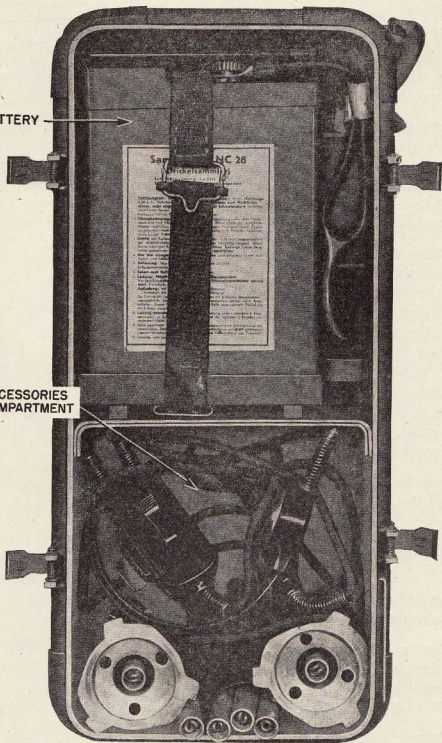
(4) Place the antenna base in the antenna socket on top of the set. Turn the antenna base to the right until it clicks into position. (When dismantling, press the spring lever on the antenna socket in the direction of the red arrow and turn the antenna base to the left.)

(5) Connect the counterpoise or a driven ground rod to the terminal marked **G** (counterpoise).

(6) Plug the telegraph key into the jack marked **Taste** (key).

BATTERY

ACCESSORIES
COMPARTMENT



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Figure 3. German radio set Torn. Fu. g., rear view, cover removed.

(7) Plug the microphone into the jack marked **Mikrofon** (microphone). Place the throat microphone **c** on the neck so that its leads hang downward and the microphone buttons lie flat against the throat.

(8) Plug the headset into one of the jacks marked **Fernhörer** (headset).

NOTE: Any telegraph key, single-button microphone (such as Signal Corps Microphone T-17-()) or high impedance headset (such as Signal Corps Headset HS-23-()) will work satisfactorily if equipped with suitable plugs.

(9) When the set is installed for stationary use (fig. 5), do not attempt operation with the front cover in place. A push-button switch at the left side of the front panel (fig. 8) automatically turns the set off when the cover is in place, regardless of the position of the main switch. This push-button switch has no effect when the remote control unit **c** is removed from the panel and connected through the remote cable **c**.

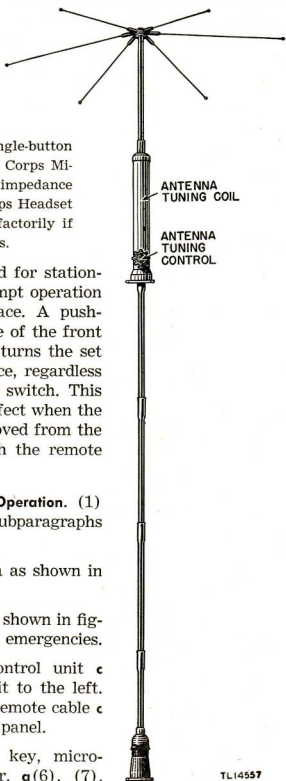
b. Installation for Portable Operation. (1) Follow the directions in subparagraphs **a**(1) and (2) above.

(2) Install the whip antenna as shown in figure 6.

(3) An antenna assembly as shown in figure 7 should be used only in emergencies.

(4) Remove the remote control unit **c** from the panel by pushing it to the left. Connect it by means of the remote cable **c** (fig. 8) to the socket on the panel.

(5) Connect the telegraph key, microphone, and headset (subpar. **a**(6), (7), and (8) above). Bring out the leads to the left behind the hook on the remote cable.



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Figure 4. Antenna set up for stationary operation.

4. OPERATION. After the set is installed (par. 3a), put it into operation as follows:

a. Tuning for Stationary Operation. (1) Set to the required frequency by means of the control marked **Frequenzeinstellung** (tuning control) (fig. 8).

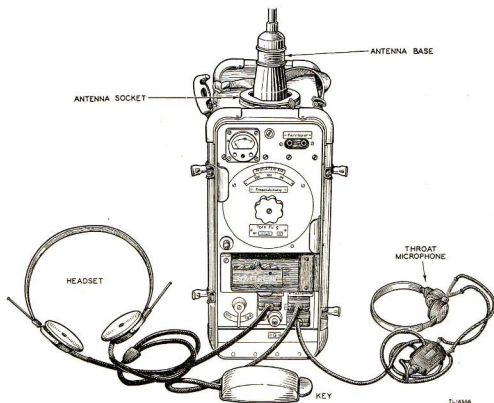


Figure 5. German radio set Torn. Fu. g., set up for stationary operation.

(2) Set the main switch to **Tg** (cw) position. Depress the telegraph key and check the filament and plate voltages as follows:

(a) Press the red button on the meter to check the filament voltage. The meter indication should be within the red section of the scale.

(b) Press the blue button on the meter to check the plate voltage. The meter indication should be within the blue section of the scale.

(3) With the main switch in the **Tg** (cw) position, depress the telegraph key and adjust the **Ant. Abst.** (antenna tuning) control on the antenna tuning coil (fig. 4) for maximum deflection on the meter.

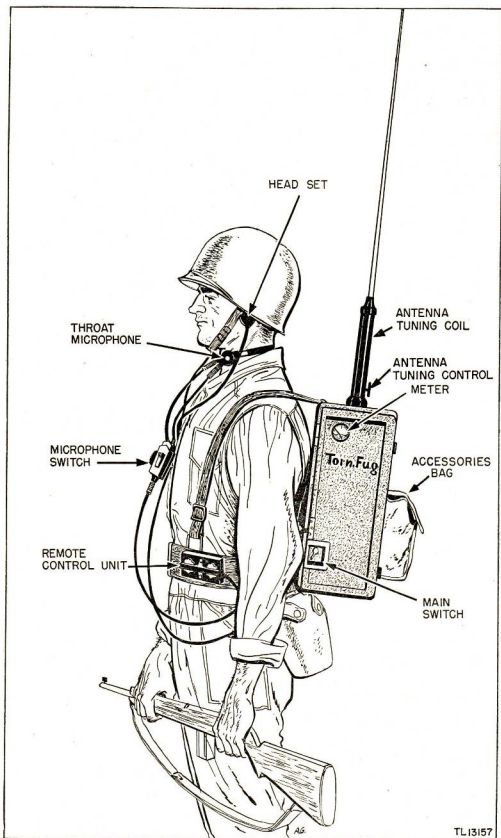


Figure 6. German radio set Torn. Fu. g., detail drawing of portable operation.



Figure 7. Antenna used for emergency portable operation.

(4) Turn the control marked **Lautstärke** (volume control) on the remote control unit **c** to the right as far as it will turn. For stationary operation, remote control **c** remains on the front panel.

b. Tuning for Portable Operation. (1) Perform the operations described in subparagraph **a**(1), (2), and (4) above.

(2) Put the covers on the set. Place and strap the set on the back. Attach the remote control unit **c** to the belt at a position conveniently accessible with the left hand. Put on the headset and microphone.

(3) Tune the antenna as described in subparagraph **a**(3) above.

CAUTION: The antenna must be tuned with the set strapped on the operator's back. If the set is removed for ground operation, the antenna must be returned.

c. C-w Operation. (1) Set the main switch to the **Tg** (cw) position.

(2) To transmit, use the telegraph key.

(3) To receive, make sure the telegraph key is open and proceed as follows:

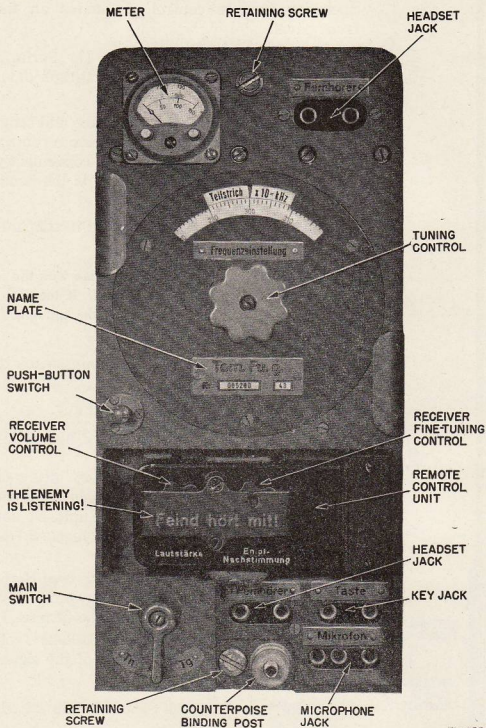
(a) Tune in the required signal by means of the control marked **Empf-Nachstimmung** (receiver fine-tuning) on the remote control unit. *Do not* change the setting of the control marked **Frequenzeinstellung** (tuning control).

(b) Adjust the control marked **Empf-Nachstimmung** (receiver fine-tuning) to produce a beat note of the desired pitch in the headset.

(c) Use the control marked **Lautstärke** (volume control) to vary the volume of the signal in the headset.

d. Voice Operation. (1) Set the main switch to the **Tn** (voice) position.

(2) To transmit, set the microphone switch (located in the microphone cord) to **S** (transmit) and speak.



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Figure 8. German radio set Torn. Fu. g., front panel.

(3) To receive, set the microphone switch to **E** (receive).

(a) Tune for maximum volume from the required signal by means of the control marked **Empf-Nachstimmung** (receiver fine-tuning) on the remote control unit **c**. *Do not* change the setting of the control marked **Frequenzeinstellung** (tuning control).

(b) Use the control marked **Lautstärke** (volume control) to adjust the volume of the signal in the headset.

(4) During conversation that is not to go out over the transmitter, set the microphone switch to the **E** (receive) position.

(5) When the set is not in use, turn the main switch to the **Aus** (off) position.

5. CALIBRATION.

a. Receiver. When the station cannot be tuned in by means of the **Empf-Nachstimmung** (receiver fine-tuning) control, it will be necessary to adjust the receiver calibration trimmer (fig. 9). Proceed as follows:

(1) Loosen the two red-ringed retaining screws and pull the set from the case.

(2) Extend the connections from the battery plug in the case to the power input socket (fig. 10) on the back of the set so that it will operate out of the case.

(3) Set the **Empf-Nachstimmung** (receiver fine-tuning) control to its midpoint.

(4) Calibration should be made at exactly 3,500 kilocycles as indicated by a blue mark on the dial. Frequency Meter Set SCR-211- ()* should be set to 500 kilocycles and used as the source of the calibrating signal.

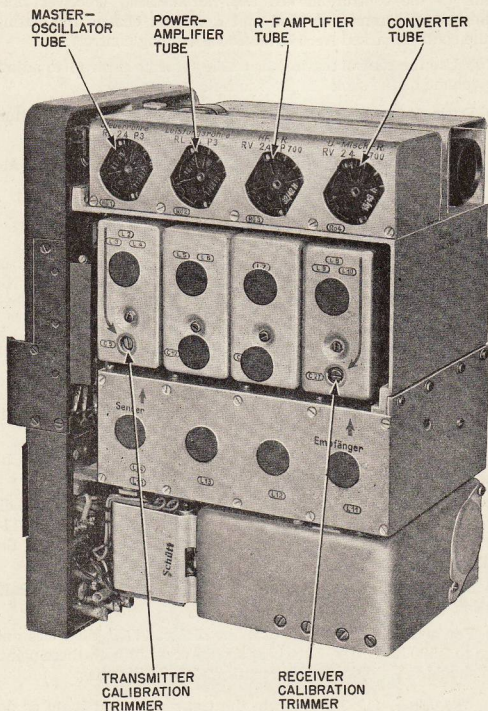
(5) Set the main switch to **Tg** (cw) and adjust the receiver calibration trimmer for zero beat.

(6) For an additional check turn the dial to 3,000 kilocycles and then to 2,500 kilocycles. Zero beat should occur at both these points and should fall within the blue mark at 2,500 kilocycles.

b. Transmitter. (1) To calibrate the transmitter, set it up as described in subparagraphs **a**(1), (2), and (4) above.

(2) Set the main switch to **Tg** (cw) and close the key.

* Refers to any model of Frequency Meter Set SCR-211.



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Figure 9. German radio set Torn. Fu. g., removed from case, right rear view.

(3) Adjust the transmitter calibration trimmer for zero beat (fig. 9).

(4) Check as in subparagraph a(6) above.

6. REGENERATION ADJUSTMENT. Whenever the detector tube is changed it may be necessary to adjust the regeneration control of the receiver. Aging of the tube may also make it necessary to adjust the regeneration.

a. Operate the set out of the case [par. 5a(1) and (2)] with the main switch on **T_n** (voice).

b. Carefully turn the regeneration control screw (fig. 10) to the right or left until regeneration starts.

7. BATTERY CHARGING. Charging requirements of nickel-iron-alkali storage batteries are different from the more common lead-acid type and the following instructions should be observed.

a. Remove the two metal filler plugs before charging and check the electrolyte level. If the plates are not covered, add enough distilled water to cover them.

b. Charge the battery 10 hours at a 4.2-ampere rate or 7 hours at a 6-ampere rate. The higher charging rate is preferable. The charge is complete when the voltage at the battery terminals measures 3.6 volts and remains at this value for 2 hours with the charger connected and delivering 6 amperes.

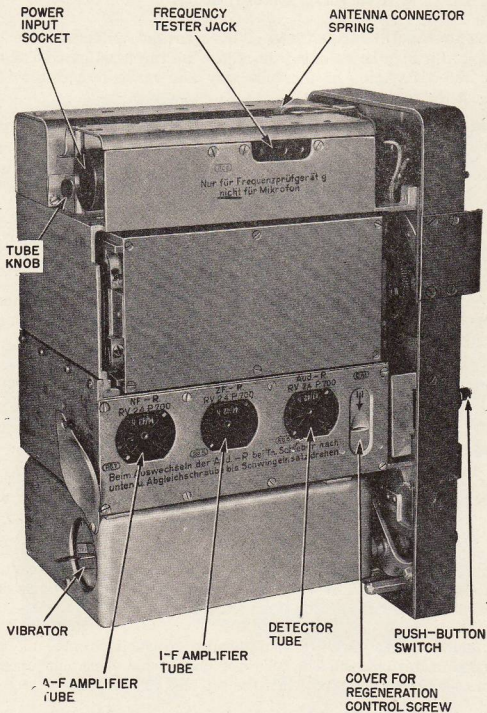
c. After the battery is charged, clean the filler plugs and replace them. Clean the top of the battery and the terminals. Then, go over the entire battery with a lintless oily cloth.

d. The battery will give better service if it is short-circuited and completely discharged just before charging. A hydrometer cannot be used to check the electrolyte since its specific gravity remains practically constant during charge and discharge.

8. MAINTENANCE. Detailed maintenance instructions are not included in this bulletin. The following checks and operating precautions should be observed when the set fails to operate.

a. Check all cords, plugs, and switches to make sure they are in good order.

b. If the filament voltage is too low, charge the battery or replace it with one fully charged.



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Figure 10. German radio set Torn. Fu. g., removed from case, left rear view.

c. If the plate voltage is too low when the filament voltage is normal, change the vibrator. Loosen the red-ringed retaining screws and remove the set from the case to reach the vibrator (fig. 10).

d. If sidetone is not present in the headset when transmitting on cw, replace the a-f amplifier tube (fig. 10). The receiver will also be inoperative if this tube is defective. A knob for removing the tubes is attached to the back of the set (fig. 10). Figure 11 shows a typical tube used in the set.

e. If sidetone is not present in the headset when transmitting on voice and with the antenna tuned, replace the detector and a-f amplifier tubes (fig. 10). Check the operation of the set after replacing each tube.

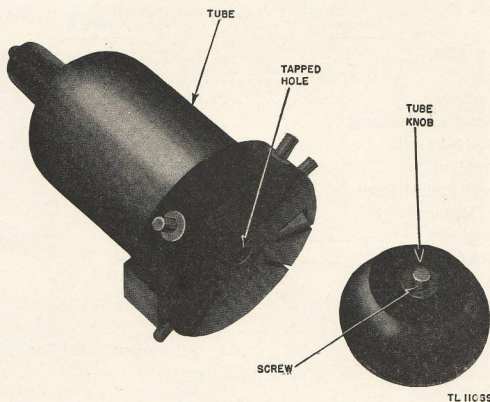


Figure 11. Typical tube used in German radio set Torn. Fu. g.

f. If no antenna current is indicated by the meter when either the microphone switch or key is closed, replace the master oscillator and the power amplifier tubes (fig. 9). Check the operation of the set after replacing each tube.

g. When the antenna has been tuned for transmission, the receiver background noise should increase when the **Lautstärke** (volume) control is turned to the right. If the noise does not increase, replace the r-f amplifier, converter, i-f amplifier, detector, and a-f amplifier tubes in that order.

NOTE: Always make a calibration check after the master oscillator and the converter tubes have been replaced.

h. If the procedure outlined above does not make the set operate, send it back to a signal depot. WE CAN USE THE PARTS TO REPAIR OUR OWN AS WELL AS GERMAN SETS.

9. GLOSSARY. The German terms on the set and their American military equivalents are as follows:

| <u>German</u> | <u>American</u> |
|---------------------------------|-------------------------------------|
| Ant. Abst. | antenna tuning |
| Aus. | off |
| Empfänger | receiver |
| Empf-Nachstimmung | receiver fine tuning |
| Feind hört mit! | The enemy is listening! |
| Fernhörer | headset |
| Frequenzeinstellung | tuning control |
| G., Gegengewicht | counterpoise |
| Lautstärke | volume |
| Mikrofon | microphone |
| Nr. | number |
| Sender | transmitter |
| Taste | key |
| Teilstrich $\times 10$ kHz | dial reading $\times 10$ kilocycles |
| Tg., Telegrafie | cw |
| Tn., Telefonie | voice |
| Aud.-R. | detector tube |
| HF.-R. | r-f amplifier tube |
| Leistungsröhre | power-amplifier tube |
| NF.-R. | a-f amplifier tube |
| Steuerröhre | master-oscillator tube |
| Ü.-Misch-R. | converter |
| ZF.-R. | i-f amplifier tube |

GLOSSARY OF TERMS (contd)

| <u>German</u> | <u>American</u> |
|---|---|
| Beim Auswechseln der Aud.-R bei Tn. Scheiber nach unten u. Abgleich- schraube bis Schwingeinsatz drehen . . . | When detector tube is changed switch to voice and adjust regeneration control |
| Nach Auswechseln dieser Röhren Frequenzprüfung vornehmen | After changing these tubes make a frequency check |
| Nur für Frequenzprüfgerät g <u>nicht</u> für Mikrofon | For frequency tester g <u>not</u> for microphone |
| Sochelknopf für Röhrenwechsel | Knob for removing tubes |