

## AIRBORNE RADAR

### FuG 25 AIRBORNE IFF TRANSMITTER-RECEIVER

The FuG 25 equipment is carried in an aircraft to notify short-range ground radar stations (Würzburgs) by coded pulses that the plane is friendly. Manufactured by Lorenz, the FuG 25 has a range of approximately 40 miles, within the range of Würzburgs.

It comprises two units: a transmitter-receiver unit (SE 25) and a tone generator, which includes a motor generator (no tone generator has yet been captured). The receiver-detector is tuned to the Würzburg frequency of 500 mc (approximately) and the transmitter to the 150- to 160-mc band covered by a special receiver in the Würzburg. Identification is by phone with an auxiliary signal strength meter which allows D/F on minimum signal.

The receiver uses a simple diode circuit followed by three amplifier tubes, the output controlling a three-tube transmitter (oscillator and two amplifiers). A signal input to the receiver of at least 2 millivolts at 30 percent modulation will cause the transmitter to operate at a fixed carrier frequency of 157 mc with a power output of 200 milliwatts. It is believed that the equipment is coded by keying both the carrier and the modulation frequency with a choice of two codes. Operation of a relay lights a neon lamp to inform the pilot that he is being interrogated.

It is believed that the FuG 25 equipment was designed originally for bombers. A captured document states, however, that it was to be used only in day and night fighters of the types Me 109, FW 190, Me 110 F-4, Ju 88 C-6, and Do 217 J/N and that other aircraft so fitted should have antennas and units removed, leaving mountings and permanent wiring untouched. It is believed that this policy has not been adhered to. Actually, FuG 25 fittings have been found only in two-engined fighters. It is

thought that this equipment is not in use at the present time.

The characteristics of the FuG 25 are as follows:

**RANGE (miles):** 40 (approximately).

**FREQUENCY RANGE (mc):** Interrogates 550 to 580; responds 150 to 160.

**PULSE RECURRENCE FREQUENCY (cps):** 5,000.

**PULSE LENGTH:** 2 microseconds.

**ANTENNA:** Vertical rod 14 inches long, directly connected with receiver feeder and matched to transmitter feeder. Antenna is mounted in vulnerable position; damage to it would open the high-voltage circuit and render the transmitter inoperative.

**POWER SOURCE:** "Tongeber" (tone generator) and dynamotor in single unit operating from a-c battery.

**SIMILAR SETS:** None. FuG 25A is a later development.

**POWER INPUT REQUIRED:** A signal input to the receiver of at least 2 millivolts at 30 percent modulation is required to cause the transmitter to operate at a fixed carrier frequency of 157 mc.

**POWER OUTPUT:** 200 milliwatts (peak).

**TYPE MODULATION:** CW transmission is modulated by tone generator and coded in Morse. The receiver is sensitive only to a modulation of 5,000 cps.

**TUBES (type and number):** Transmitter: one RV 12P 2000 MO, two RV P 2000 in push-pull frequency doubler stage. Receiver: one diode (LG 1) in r-f stage and three RV 12 P 2,000 in l-f stages.

#### PRINCIPAL COMPONENT

	DIMENSIONS			WEIGHT
	Height	Width	Depth	
T/R (SE 25) unit	8 in.	5½ in.	6 in.	7 lb. 11 oz.
Total weight				16½ lb.

## FuG 25A AIRBORNE IFF TRANSMITTER-RECEIVER

The identification equipment FuG 25A, a modified version of FuG 25, is designed to operate with medium- and long-range ground radar stations (Freyas). Consequently its range, 100 to 150 miles, is much greater than that of the FuG 25. While its primary use is for identification purposes, the FuG 25A is also employed as a bombing-release controller and as a navigational aid.

Manufactured by Gema, the equipment consists of one unit in three sections: transmitter-receiver, code keyer, and power supply. Two preset codes can be selected for the transmitter by inserting two keys in the code keyer. Turning the keys 90° lifts a number of the switches clear of the rotating cams, leaving the remaining switches to form the coding sequence, making and breaking the high-voltage circuit to the limiter tube and thus keying the transmitter. Only one of the switch banks, consisting of 10 parallel contacts, can be selected at a time. Over 1,000 codes in each bank are possible.

The receiver is an eight-tube superheterodyne. The i-f amplifier is tuned to a fixed frequency of 7 mc; the r-f oscillator thus operates 7 mc above the incoming signal frequency band and is swept through the 130- to 135-mc band by a split-stator capacitor connected across the tuned circuit of the oscillator at a speed of about 400 cps. This short-fast sweep of the receiver frequency insures a wide band with sensitive spot-frequency reception.

An h-f tube (type LD 1), capable of operating up to 6,000 mc, is used in the oscillator circuit. Resistors are placed across the i-f transformer windings to insure a bandwidth of 700 kc at 6 db down. When the second detector has a peak signal voltage of at least 2.6 volts at the plate, the trigger tube causes the transmitter to operate and to deliver a narrow pulse of high amplitude to the antenna. High output at low voltage makes the equip-

ment ideal for high altitudes.

The FuG 25A, though airborne, is preset on the ground before the take-off and the Morse recognition signal cannot be changed in the air. When used as a navigational aid, the aircraft is plotted from the ground by responses from the FuG 25A and is given course directions by voice radio, using FuG 16 or the transmitting radio-telephone attachment to FuG 10 which has a longer range than FuG 216. Latest use for the FuG 25A is for remote bombing control, using two Freya stations for a "fix."

Since FuG 25A functions with the German long-range Freya radars, it is to be expected that it would be fitted in all aircraft likely to be employed in attacks on Allied territory in order that they might be identified as friendly on their return journey. Crash examination, however, has shown that very few aircraft operating over Great Britain and the Mediterranean area have ever carried the equipment, although the mounting frame may be fitted. It could easily be installed in many types of aircraft should tactical requirements demand it. The German policy with regard to this equipment is not definitely known.

The characteristics of the FuG 25A are as follows:

RANGE (miles): 100 to 150.

FREQUENCY RANGE (mc): Interrogates 123 to 128; responds 152.2 to 161.0. Transmitter spot frequency 156.0. A received pulsed signal operates the transmitter on a preset frequency within the prescribed range.

PULSE RECURRENCE FREQUENCY (cps): 500 (minimum).

PULSE LENGTH: 0.5 microsecond.

ANTENNA: Vertical rod 14 inches long for both transmitting and receiving through the special antenna matching unit.

TYPE OF PRESENTATION: Visual.

POWER SOURCE: A self-contained rotary

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inverter supplies 18 to 20 volts ac at 130 cps to power transformer. It operates on an input of 25 to 28 volts at about 4 amp. The inverter also drives the coding switches through gearing.

**SIMILAR SETS:** The earlier model FuG 25 (with SE 25). Antenna stub is the same for both sets but antenna matching unit is different.

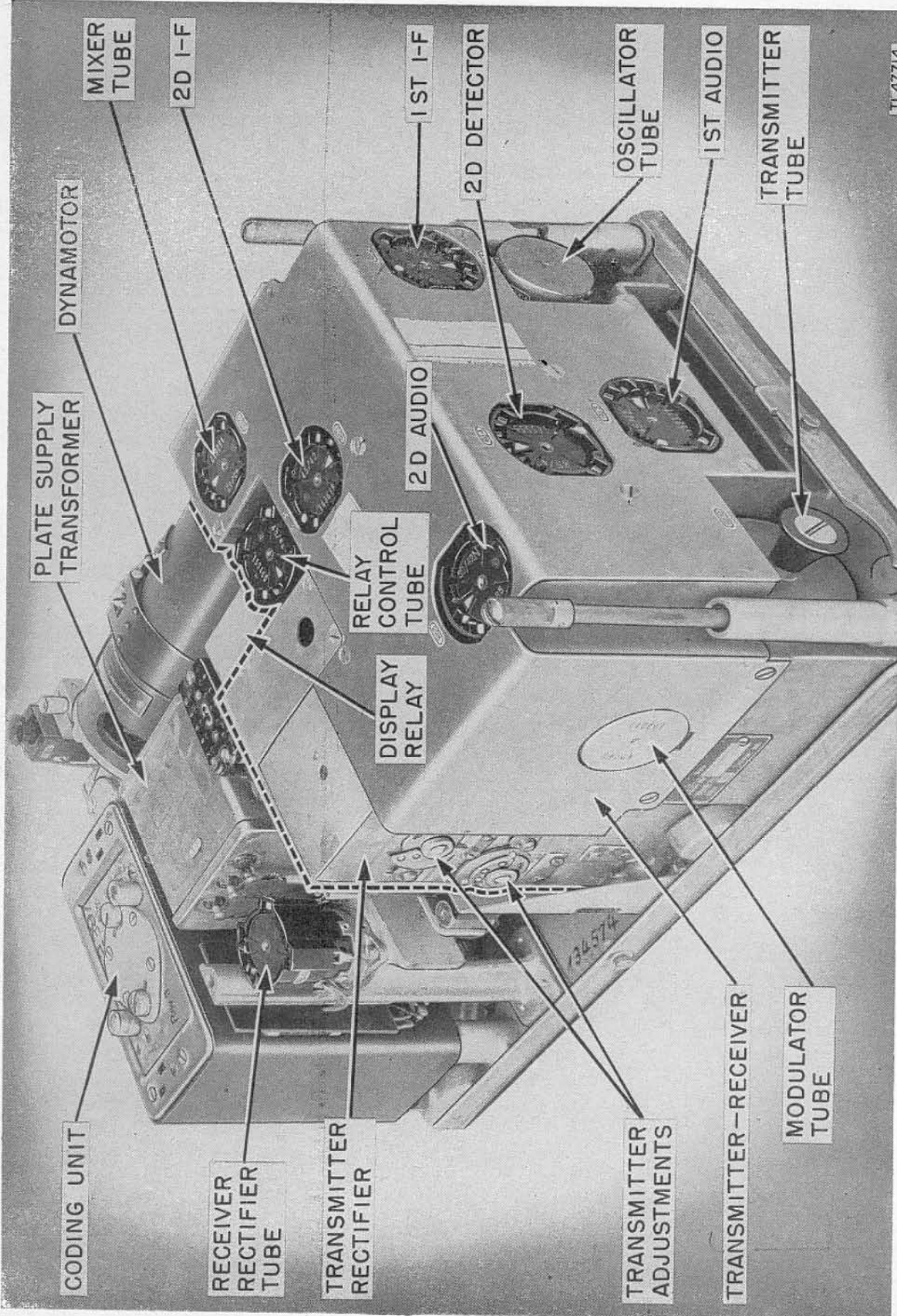
**POWER INPUT REQUIRED:** 25 to 28 volts at 4 amp.

**POWER OUTPUT (watts):** 400 (peaks).

**TUBES (type and number):** Transmitter: one LS 50 tuned by Lecher system. Receiver: six RV 12 P 2000 and two LD 1.

## PRINCIPAL COMPONENTS

	DIMENSIONS			WEIGHT
	<i>Height</i> (in.)	<i>Width</i> (in.)	<i>Depth</i> (in.)	(lb.)
SE 25A (transmitter-receiver) .....	13	8	5¼	20½
AR 25 (mounting frame) .....	14	8	2½	
WK 25 (resistance box) .....	3½	3	2¾	10
VD 25 (junction box) .....	3½	3½	1	
BG 25 (controller)....	3	2¾	2¾	1
Antenna matching unit .....	4	3½	2	1½
Total weight of components.....				33



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Figure 1. FuG 25A airborne IFF.

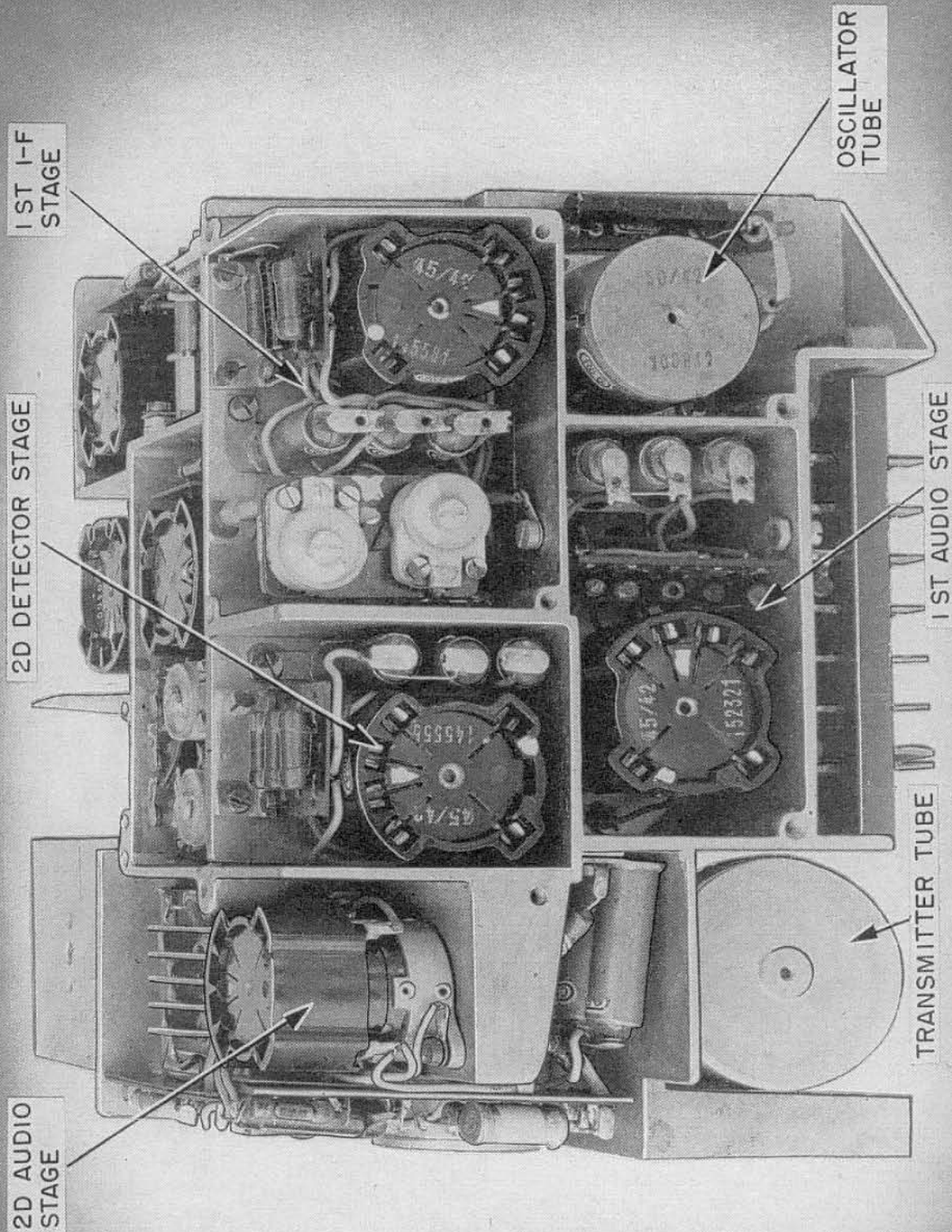
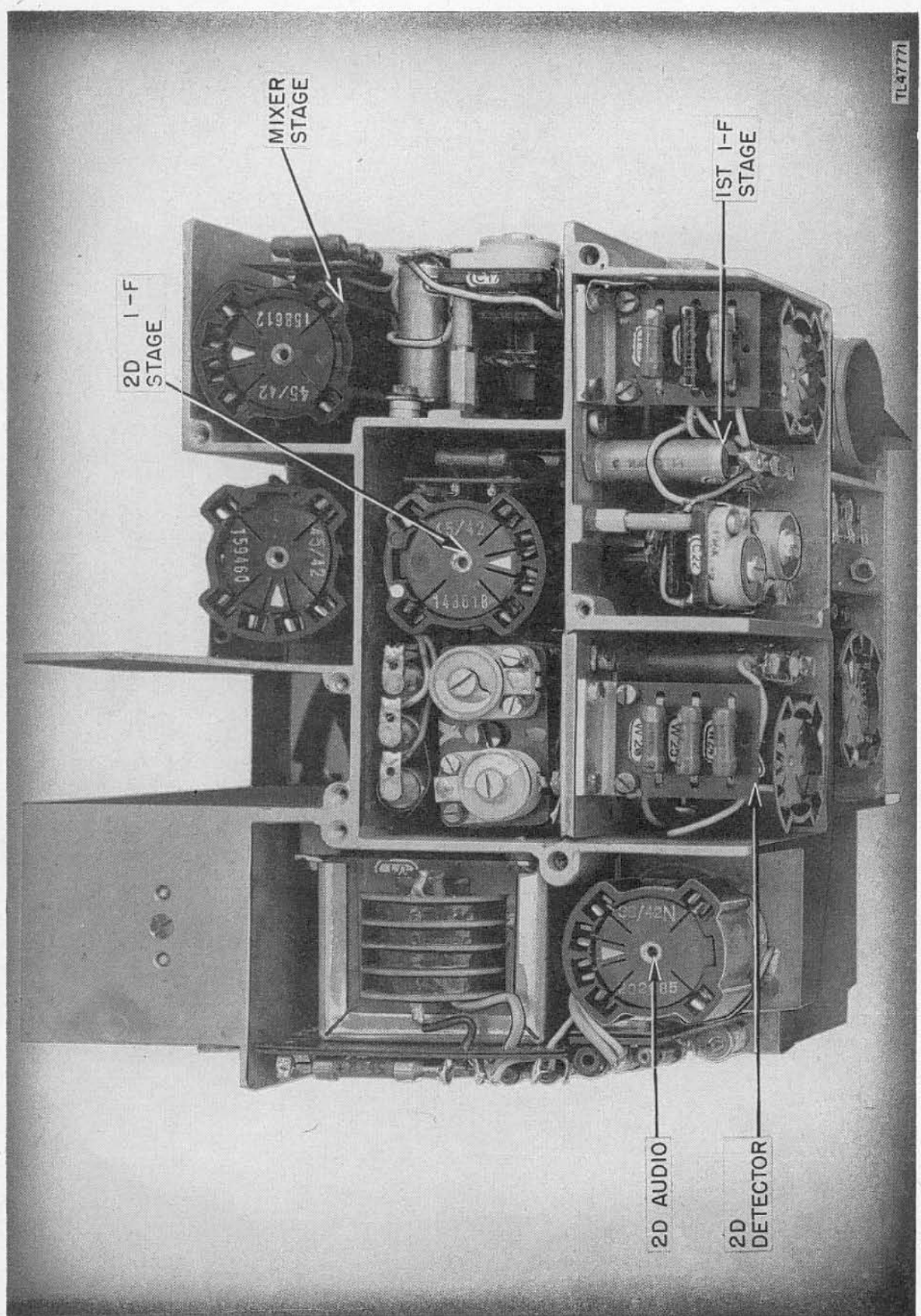


Figure 2. FuG 25A transmitter-receiver (end view).



2D I-F STAGE

MIXER STAGE

1ST I-F STAGE

2D AUDIO

2D DETECTOR

Figure 3. FuG 25A transmitter-receiver (top view).

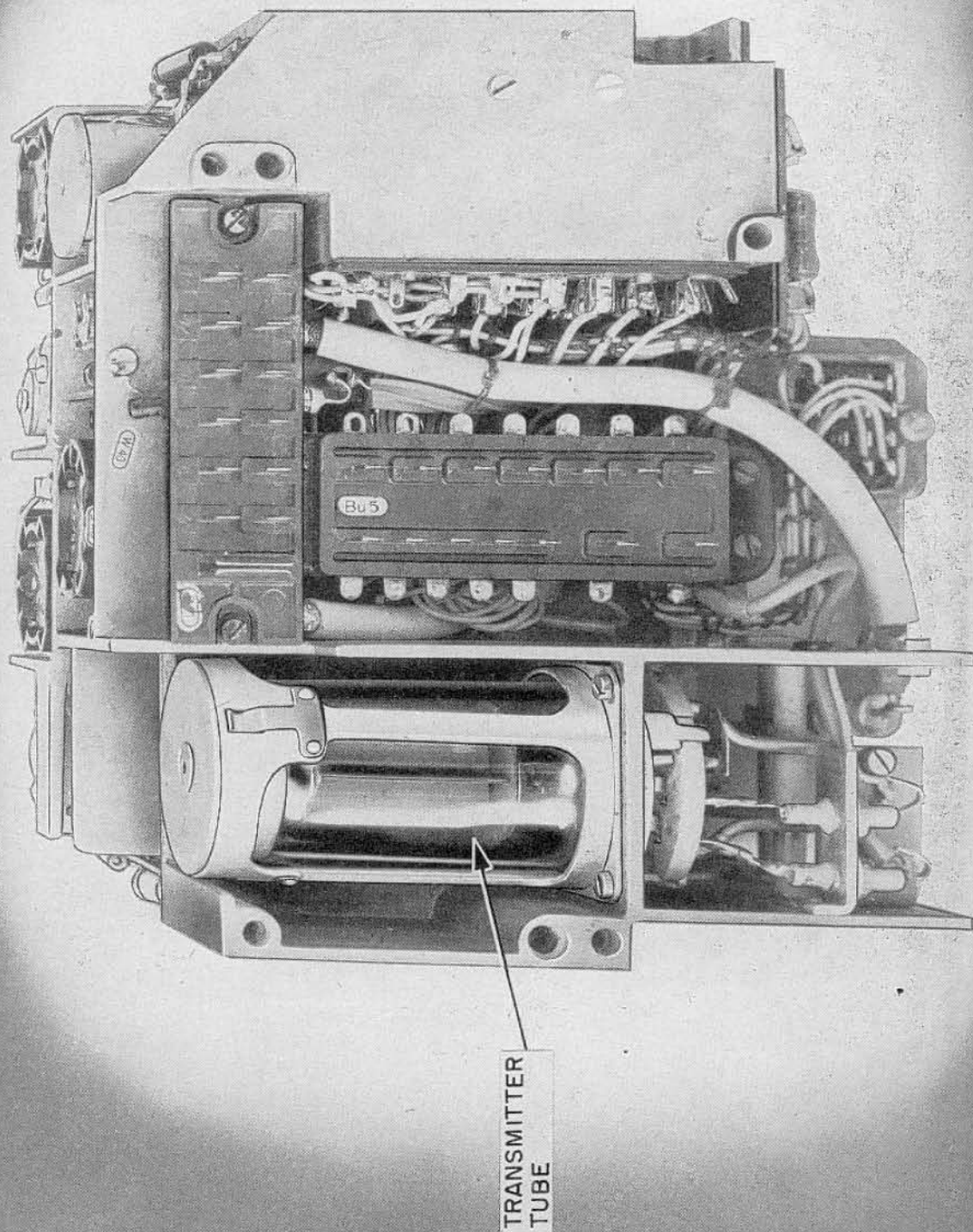
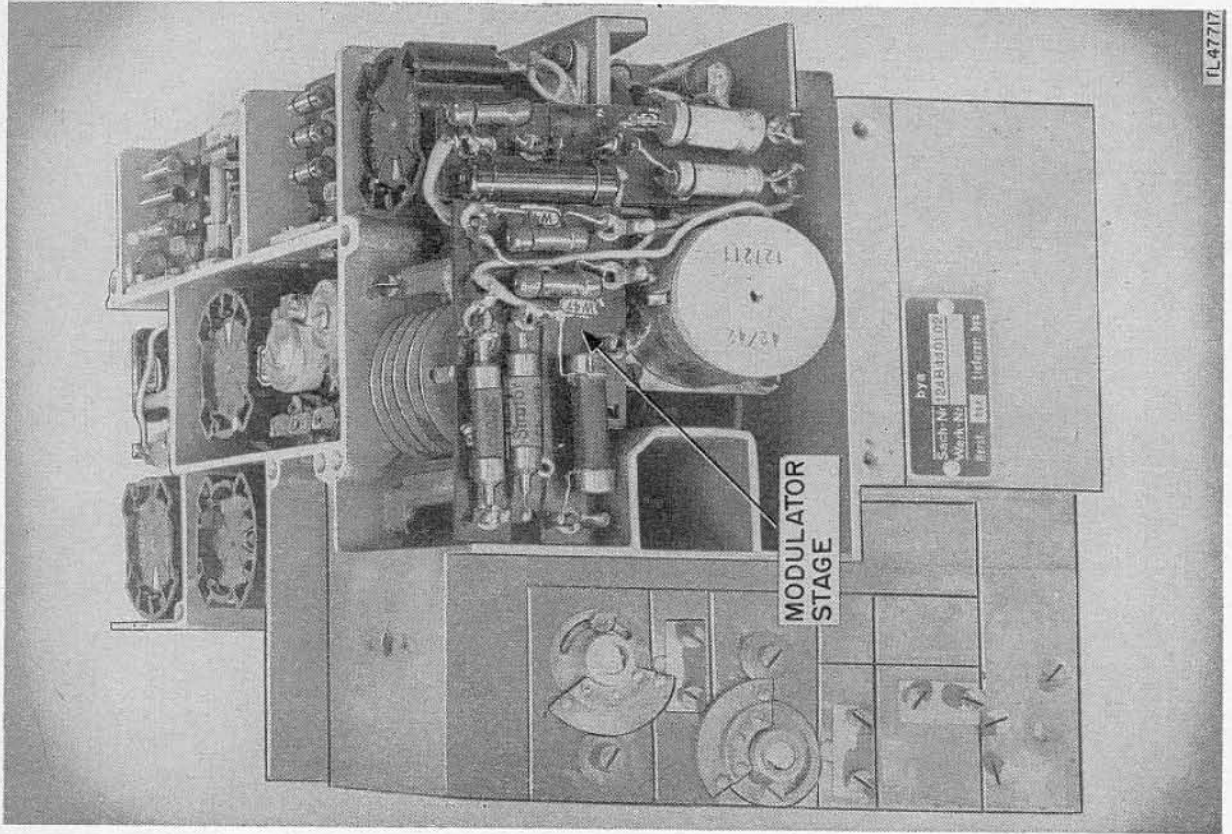
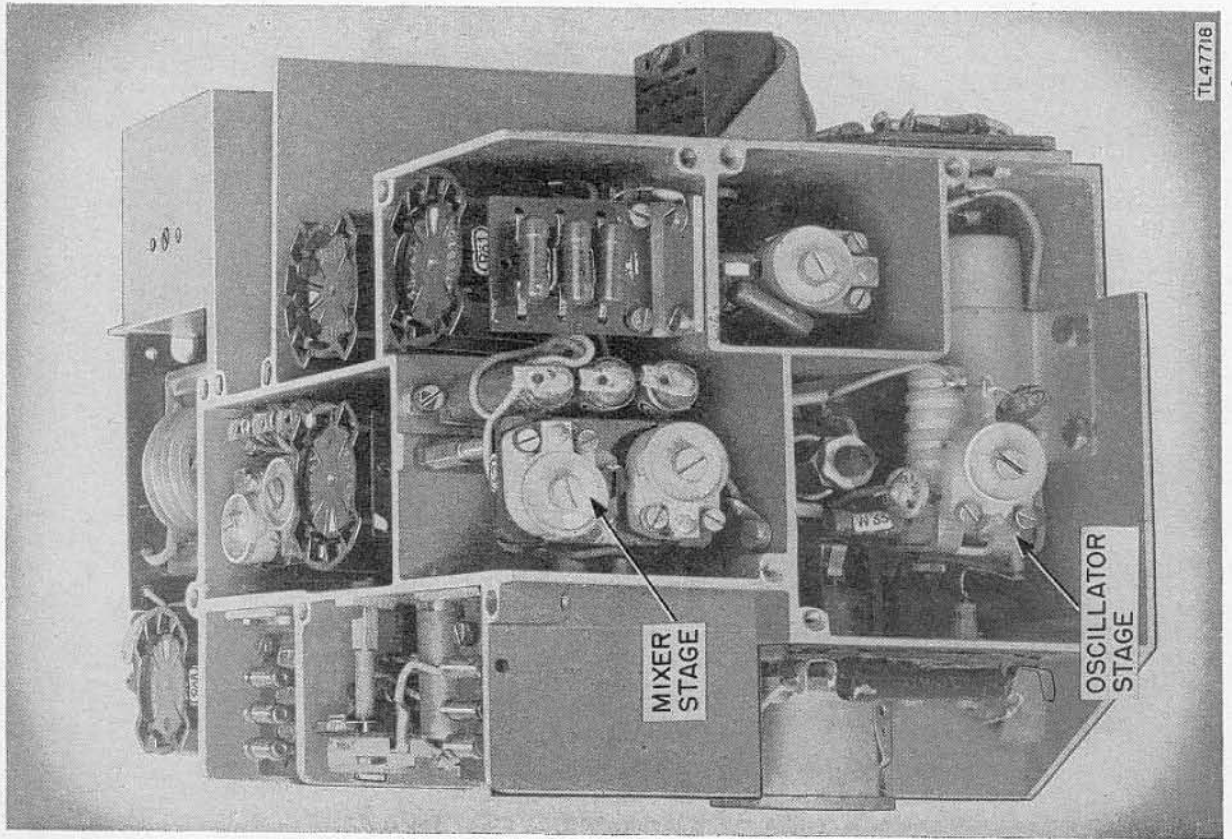


Figure 4. FuG 25A transmitter-receiver (bottom view).



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Figure 5. FuG 25A transmitter-receiver (side views).



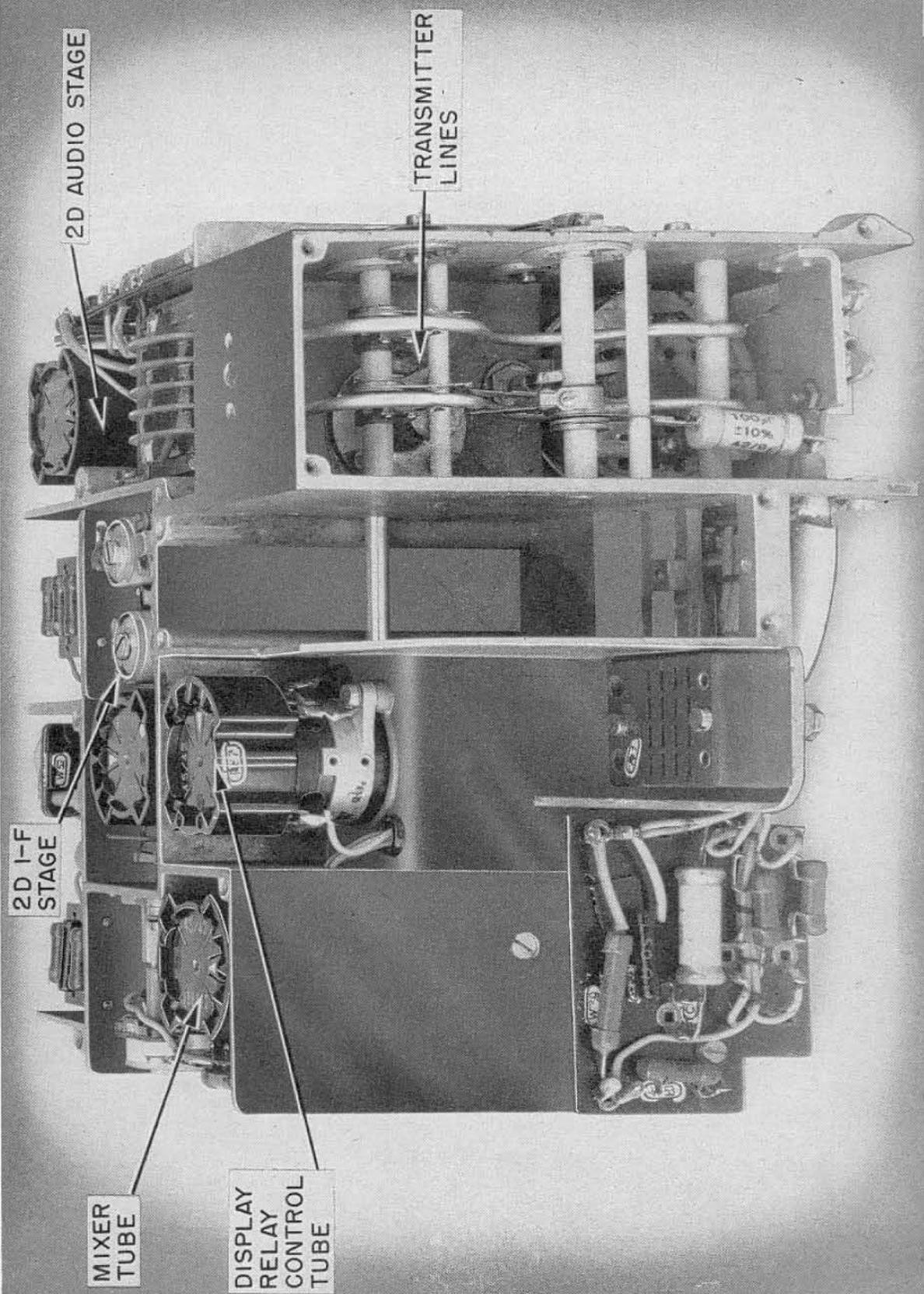


Figure 6. FuG 25A transmitter-receiver (end view).

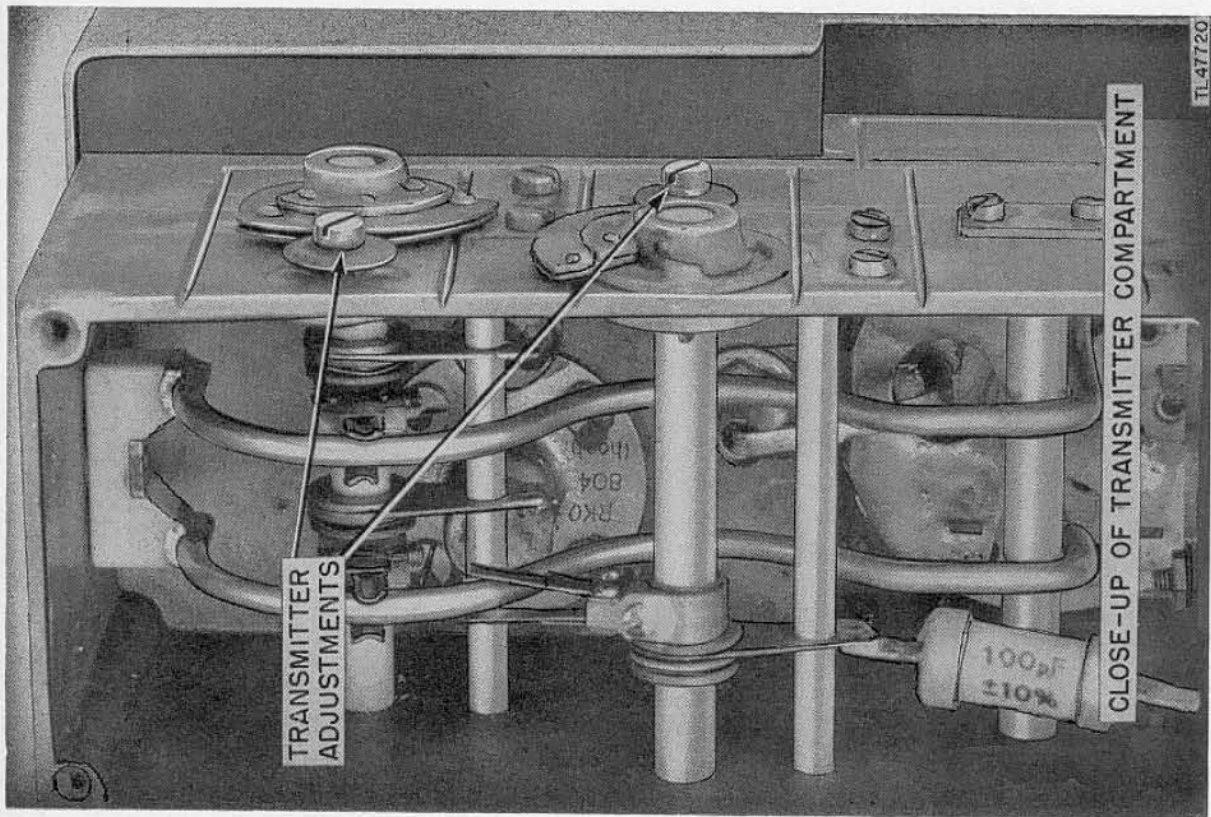


Figure 8. FuG 25A airborne IFF.

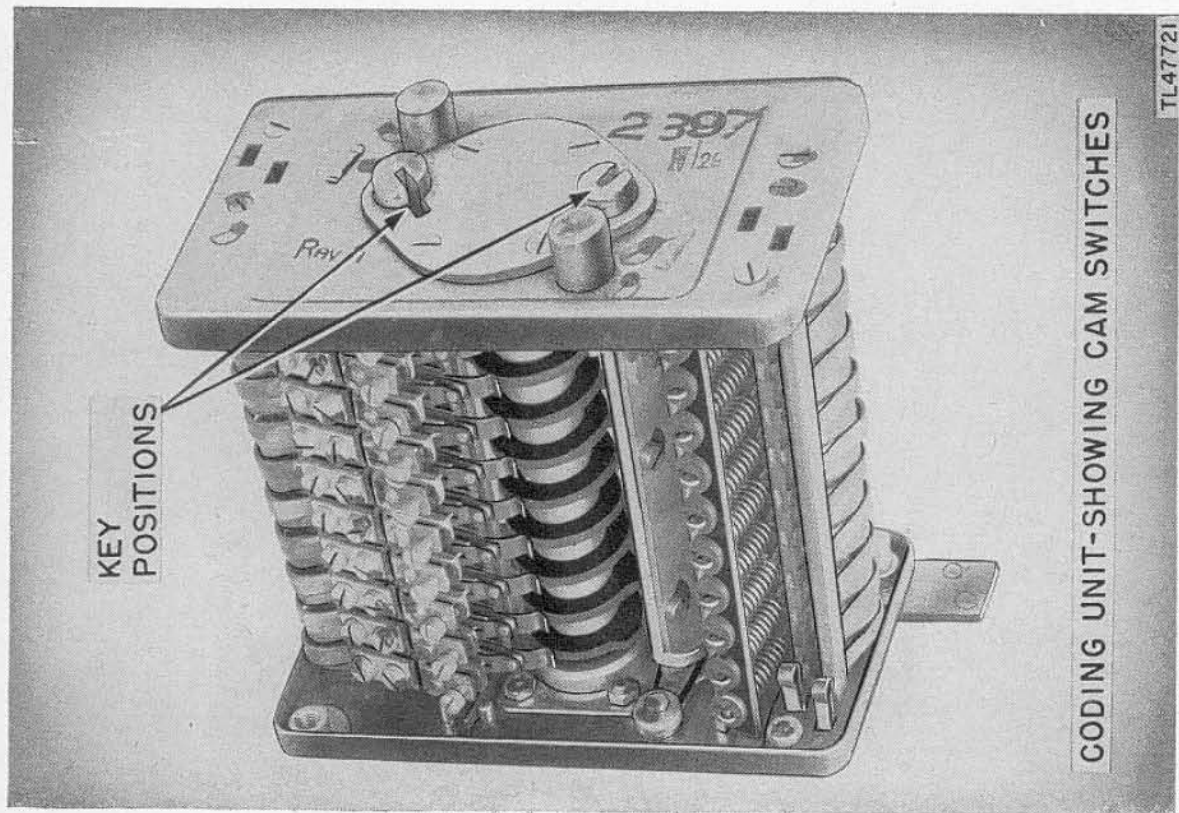


Figure 7. Coding unit, showing cam switches.