

German Field Line Communication equipment of WW 2



Funksammler Publications

FF 33 Field telephone

Development and description



Figure 2: Armeefernsprecher Alter Art

The development of field telephone equipment started in the late 19th century and by the time of the First World War the basic design features of field telephones were well established with the *Armeefernsprecher Alter Art* and the later *FF 16* and *17* models. “*FF*” stands for “*Feld Fernsprecher*” or field telephone. These telephones were locally powered by a battery (this mode of operation was called “*OB*” or “*Ortsbatterie Betrieb*”).

Locally powered networks were commonplace during the early years of the telephone but in the beginning of the 20th century, public networks increasingly used central powered systems (the power for the microphones is provided over the phone line from a central power supply). In Germany this was called a “*Zentralbatterie Betrieb*” (*ZB*) system. For field use however, locally powered telephones remained the norm of many years.



Figure 1: FF 16

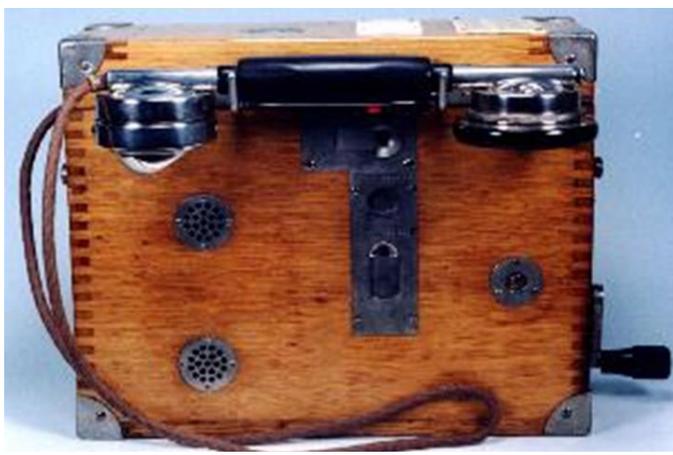


Figure 3: FF 26

As public telephone systems developed with a variety of operating principles, additional features were found to be necessary such as an automatic end-pulse when the handset was replaced, ability to connect a dialling disk etc. This resulted in the rather complex *FF 26* model.

When the Nazi's came to power, a rapid expansion of the armed forces was anticipated and so in 1933 the *Feldfernsprecher 33* was developed, essentially a "back to basics" model modernised to suit mass production. The earlier wood was replaced by a rugged moulded bakelite housing.



Figure 4: Early FF 33 phone. Note the plated metal parts

The components of the field telephone (bell, generator, microphone transformer and connections etc.) were placed on a metal frame which could be lifted out of the housing giving easier access for maintenance. Complicated components such as buzzers, end-pulse switches, external battery connections etc. were omitted to keep production and operation as simple as possible.

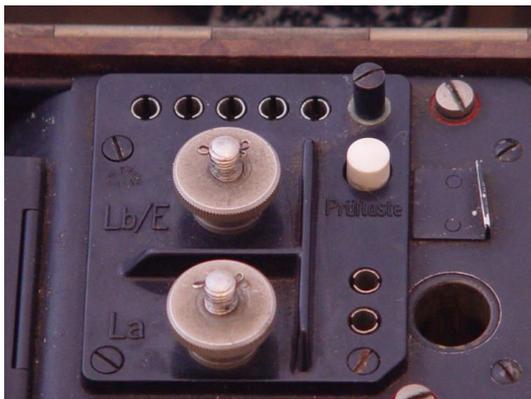


Figure 5: Connection panel

to be closed on the cables. Two rotating metal covers closed off holes in the side of the housing for the generator handle and the two connection sockets for the interconnection cord. A bracket on opposite sides of the housing allowed a carrying strap to be connected.

To avoid the battery of an OB system from discharging unnecessarily the battery is normally switched off and will only work when a microphone switch is depressed. To avoid the batteries from short circuiting when two or more OB phones are used in a single circuit, the microphone circuit is not directly connected to the phone line, but via a microphone transformer ("*Sprechspule*").

Connections for the handset, headset and the telephone cables were accessible on the top panel of the telephone, with the battery being accessed via a hinged lid connected to the top panel.

The bakelite housing cover could be closed over the top panel to protect the telephone from rain and dirt, a rubber seal on the edge of the lid allowed the lid



Figure 6: Battery

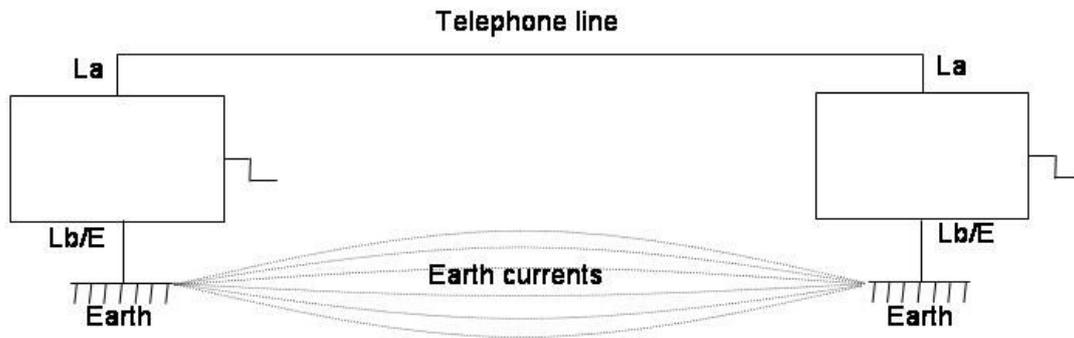


Figure 7: Current flow in a one line system

The FF 33 telephone has two line terminals marked “La” (“*Leitung a*” or line a) and “Lb/E” (“*Leitung b / Erde*” or line b / earth). The German army often used single wire connections with the other terminal connected to earth.

The upside is that a single cable connection only uses half the wire required for a double connection, making it cheaper and easier to build; the downside is that the return current flows through the earth, making it easier to intercept. For this reason telephone connections within 3 km of the front line had to be executed as double cable connections.



Sometimes during 1939 the type of microphone used in the *FF 33* handset was changed. The lower impedance microphone required a different microphone transformer. New *FF 33*'s can be recognised by a green stripe on the writing tab on top of the bakelite lid. The new microphones also have a green cross marking. Also around this time the finish of metal part was changed from a lacquered alloy to black painted steel.

Figure 8: New microphone and green

Most existing *FF 33*'s were modified to the new standard as very few examples with the old microphone coil and a non green striped writing tab survive.

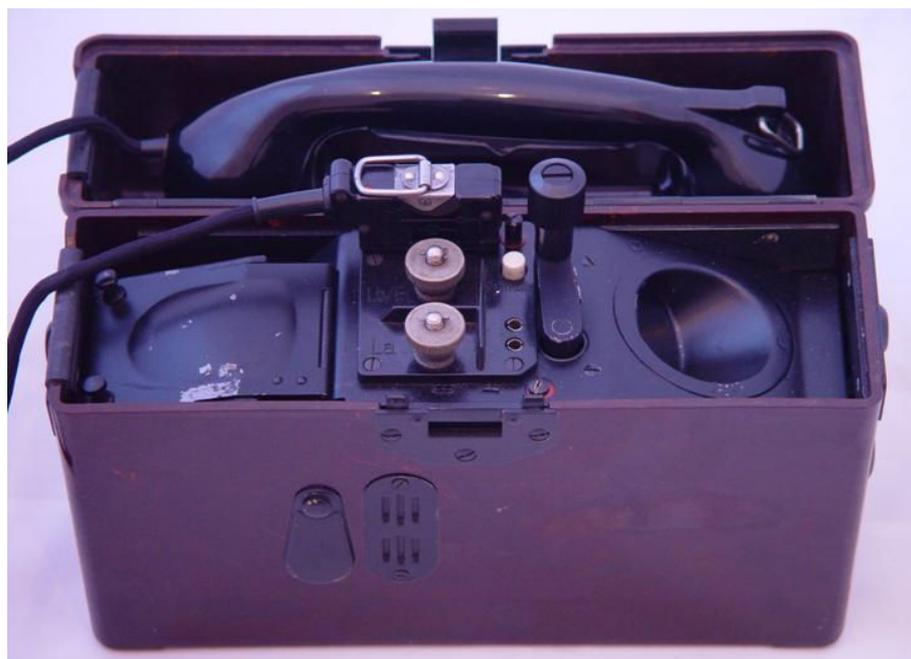


Figure 9: Model 1939 FF33. Note black painted metalwork



Figure 10: Late war 1943 model FF 33. Note changed line connections and the yellow painted metalwork

In 1943 the *FF 33* was slightly modified again to simplify production. The stamped metal frame was lightened by and spot welded rather than riveted. The bracket to hold the crank handle in place when stored was replaced by a simple stamped notch. The inside side covers were omitted. The

line terminal contacts were changed to a new type using less metal. Towards the end of the war, "*Dunkelgelb*" (dark yellow) paint was increasingly used to paint metal components.



Figure 11: Kriegsmarine version of the FF 33



Figure 12: Kriegsmarine headset adapter cable

The *Kriegsmarine* (the German Navy) had use for a special version of the *FF 33* equipped with the Navy four pin headset connection. The Navy headsets were designed for use in high noise environments and would keep the hands free. In these headsets, the Navy four pin socket was placed on the outside of the bakelite housing.

A short adapter cable connected this outside plug to the normal five pin socket inside.

A different microphone transformer was required for use with the navy headsets, to distinguish the navy modified *FF 33*'s they were marked with a yellow stripe on the writing tab.

Some of the *FF 33* Manufacturers are:

1		Ferdinand Schuchhardt, Berliner Fernsprech- und telegraphenwerk AG	Berlin
2	ber	Friedrich Reiner Telefonfabrik	Muenchen
3		Richard Bosse & Co	Berlin
4		Eumig, Electricitäts- und Metallwaren Industrie	Wien
5	bx/ea	Telefonbau & Normalzeit GmbH	Frankfurt/Main
6	bI	Radio A. Mende & Co	Dresden
7	dej	Siemens & Halske AG	Berlin
8	fsh/fsc	MK, Mikrofon Brueder Knotek	Prag
9		Mix & Genest	Berlin
10		Erka, Rudolf Krueger Telegraphen Bauanstalt	Berlin
11		Hagenuk	Kiel
12		Stöcker & Co.	Leipzig
13		Badische Telefonbau	Renchen
14		Kapsch	
15		Friedrich Merk Telefonbau	München
16		SABA	
17		Süddeutsche Apparate Fabrik GmbH	Nürnberg
18		Heliowatt Werke Electricitätswerke AG	Schweidnitz
19		Neufeld & Kuhnke GmbH	Kiel
20		STE Societe des Telephones Ericsson SA	Paris
21			
22			
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24			

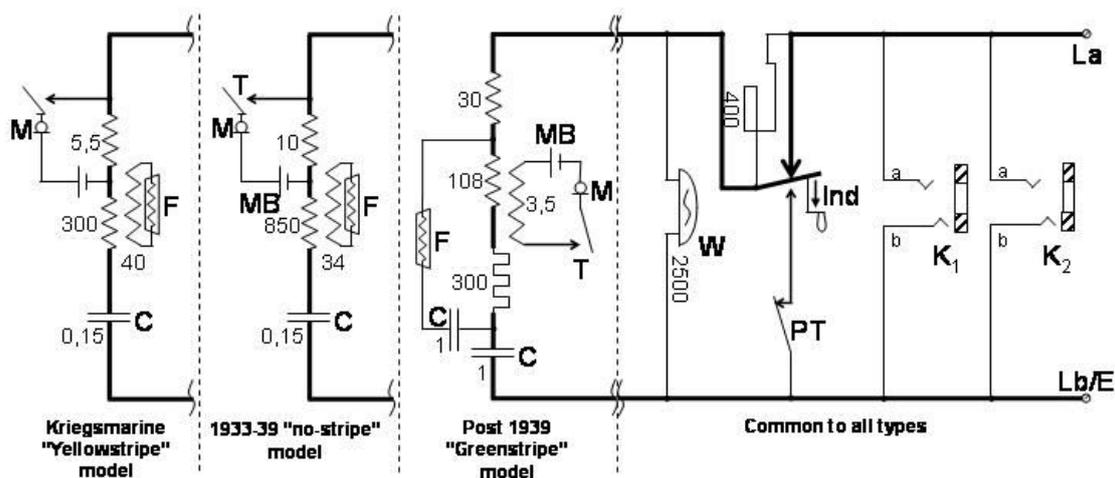
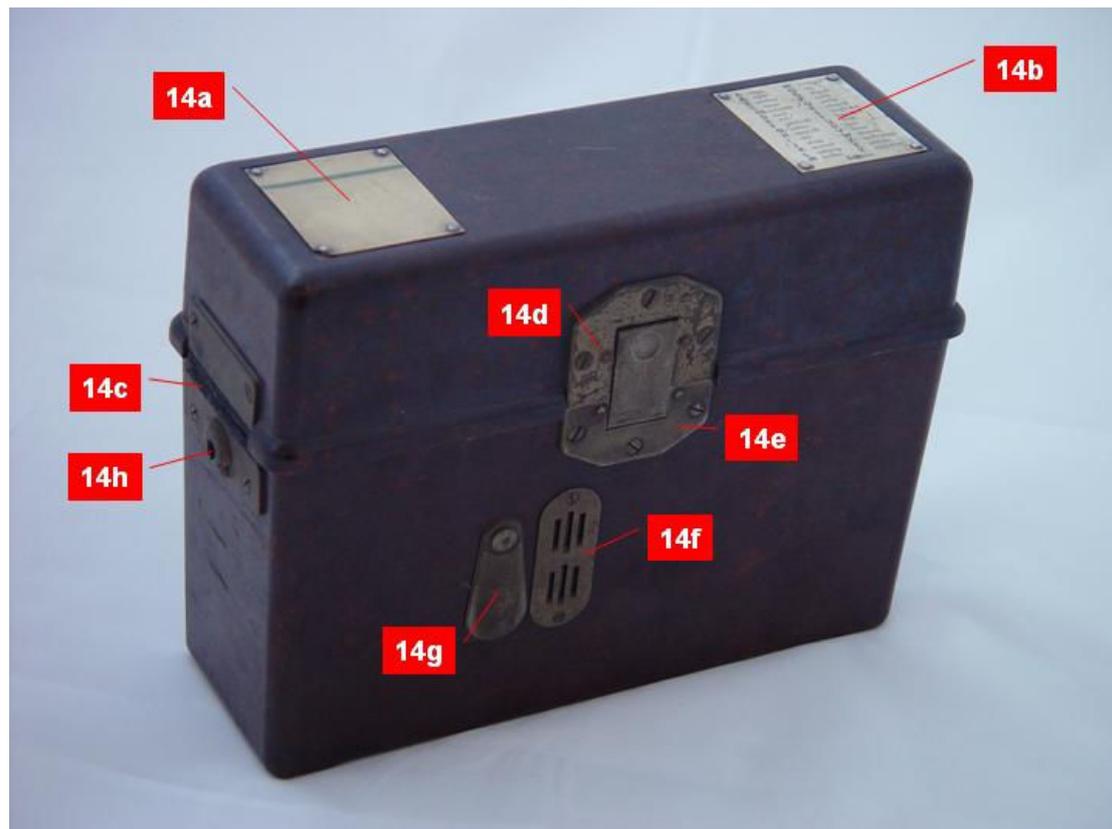


Figure 13: *FF 33* Schematics

The schematics show the different variations of the *FF 33*. The key difference is in the microphone transformer, whose resistance values are shown. Note how the microphone circuit has moved to the secondary side of the transformer on the “Greenstripe” model.

Construction

Figure 14: FF 33 front view



14a Writing tab (details like the station name or the station name on the other end of the line could be written on this tab with pencil)

14b Alphabet tag
 14c cable rubbers
 14d top lock
 14e bottom lock
 14f Bell sound passages

14g Interconnection socket cover
 14h Carrying strap brackets

Figure 15: FF 33 casing



15a Overview schematic
 15b Wiring diagram

15c Handset spring
 15d Mounting brackets

15e generator crack hole and cover

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Figure 16: FF 33 handset



- | | | |
|-------------------------|------------------------------|-----------------------|
| 16a 5-Pin plug | 16e Microphone cap | 16i Speaker cap |
| 16b Cable | 16f Microphone cap lock ring | 16j Microphone switch |
| 16c Microphone contacts | 16g Speaker contacts | |
| 16d Microphone | 16h Speaker | |

Figure 17: FF 33 telephone unit



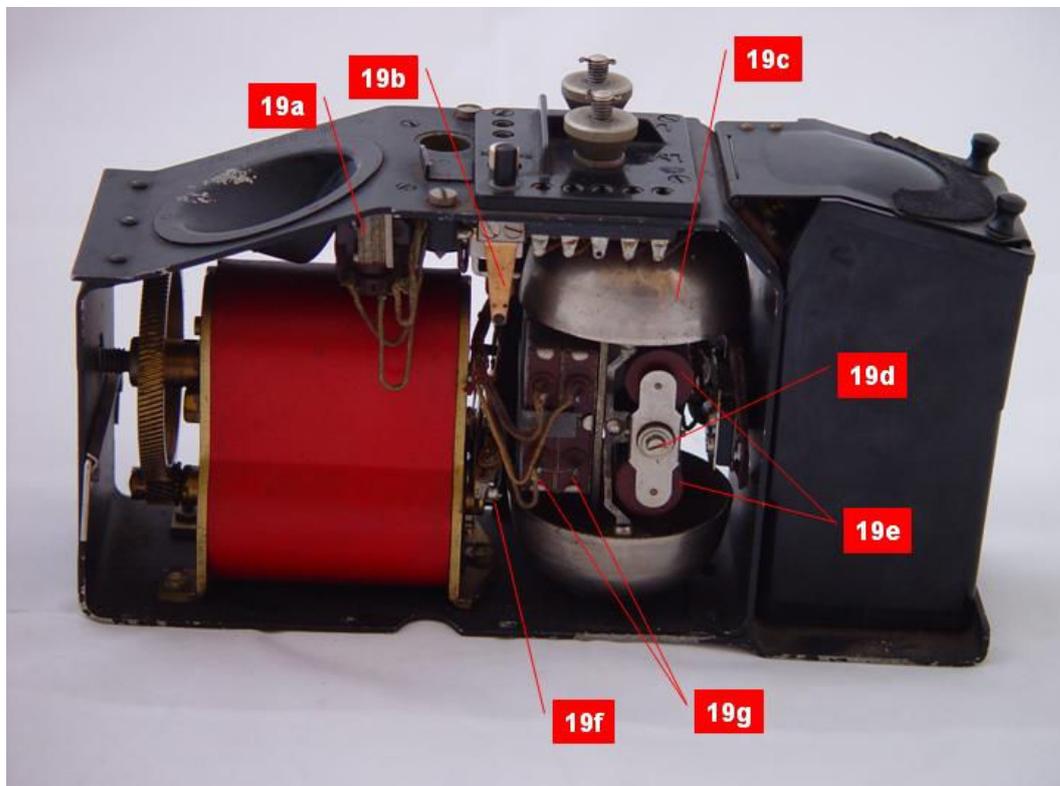
- | | | |
|----------------------------|---|-----------------------------------|
| 17a Battery lid | 17g Lb/E connection | 17l Battery box |
| 17b 5-Pin handset socket | 17h La connection | 17m Interconnection cable sockets |
| 17c Handset socket pin | 17i 2-Pin headset socket | 17n Bell sound passages |
| 17d Test button | 17j Generator crank storage | 17o Removable side panel |
| 17e Recess for handset | 17k Manufacturer, serial number and date area | 17p Side panel locking pin |
| 17f Housing locking screws | | |

Figure 18: FF 33 unit internal front view



- | | | |
|-----------------------|-----------------------------------|--------------------------------|
| 18a Battery box | 18d Microphone transformer | 18f Wiring loom |
| 18b Battery terminals | 18e Interconnection cable sockets | 18g Ringtone generator |
| 18c Battery spring | | 18h Generator crack connection |

Figure 19: FF 33 unit internal back view



- | | | |
|---|---|---|
| 19a Microphone transformer | 19d Bell yoke | frequency ringing current
flowing through the speaker
coil and the speaker) |
| 19b Test button contacts | 19e Bell coils | |
| 19c Bells (When the top screw is
slackened, the bells can be
rotated to adjust) | 19f Generator switch | |
| | 19g Capacitor blocks
(preventing the low | |

Figure 20: FF 33 accessories



20a Carrying strap
20b Connection lug
20c Hook for handset

20d Battery (Element d)
20e Earth pin
20f Earth pin carrying sheath

20g Interconnection cord

Operation

The minimal equipment needed to operate the field telephones are two *FF 33* (or compatible) phones, two wires and two 1.5 V batteries.

- Place the phone on a suitable surface, take the generator handle from its storage and connect it to the generator.

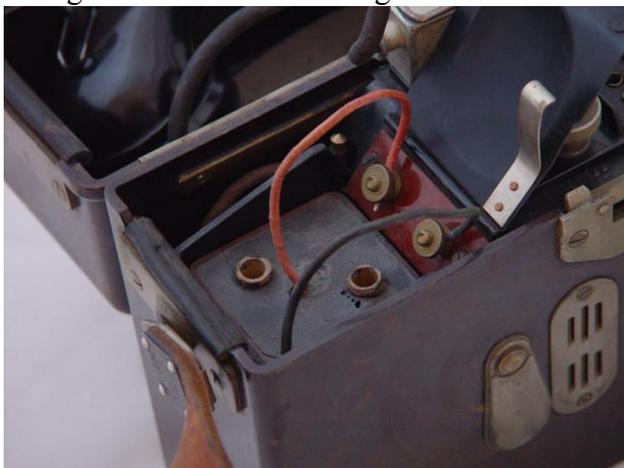


Figure 21: FF 33 Battery connection

- Connect the batteries the battery terminals (polarity is not critical).
- Connect one wire between the “La” connections of both phones and the other between the “Lb/E” connections. The normal mode of transmission by the German Forces was a single wire with return via earth; in

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this case the "Lb/E" terminal would be connected to an earth pick on each side.

- Uncoil the handset lead and place all the wires and leads on the rubber strips
- Close the lid and place the handset crosswise on top of the telephone.
Alternatively the phone can be hung from a nail or tree branch using the carrying strap. In this case the handset is hung from the hook on the carrying strap.



Figure 22: FF 33 connected and ready to use. Note the generator handle attached through the side and the connected carrying strap. The phone could be hung from the shoulder or a branch and the handset could be hung from the hook visible on the strap.

When the generator handle of one phone is cranked, the bell of the other phone should ring. The bell of the own telephone can be tested by depressing the white test button while turning the crank (a single telephone can also be tested in this way by shorting the La and Lb/E terminals).

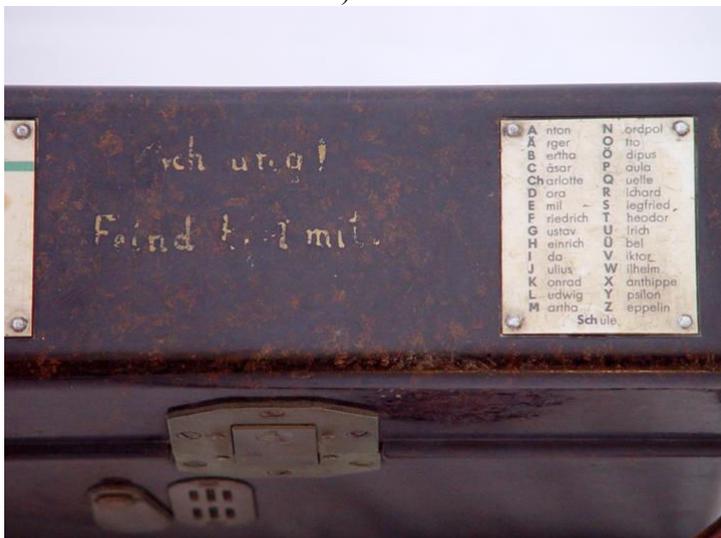


Figure 23: Alphabet table and painted warning "Feind hört mit!"

When speaking in the handset the microphone switch has to be depressed. The voice should be heard back in the own handset and should be heard through the handset on the other end of the line. Both parties can depress the microphone switch and speak and listen simultaneously as with normal telephones.

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When using field telephones it must be assumed that the message can be overheard by the enemy (“*Feind hört mit!*”), so messaging discipline is required by using appropriate codes for names and locations. For weak signals and noisy backgrounds the spelling alphabet printed on the top of the lid can be used to spell out messages.

On ending the telephone call the receiver shall be replaced and the generator should be cranked with three short movements. This “calling-off” procedure is particularly important when connected via telephone switchboards.

The signal will grow weaker as the line connection between telephones gets longer. The maximum range will depend on type of cable and how the connection is built. The following table gives an idea of the ranges achieved between two *FF 33* field telephones.

	Line lying on ground	Line suspended high	Double line
Light field cable	3 – 5 km	10 -20 km	-
Heavy field cable	10 - 12 km	50 - 60 km	30 -40 km
Long range cable without Pupin coils	-	-	40 - 48 km
Long range cable with Pupin coils	-	-	100 - 120 km



Figure 24: Two FF 33's connected by the interconnection cable

FF 33 field telephones can be interconnected via the interconnection sockets on the side to form a makeshift telephone switchboard. Each *FF 33* comes equipped with an interconnection cable that can be placed between two local phones. When so connected, the two separate field telephone lines can communicate. Several field telephones can be interconnected in this way.