Adapter for Drake Synthesizer FS-4

The FS-4 shall be connected directly to the R-4 or T-4 according to the manual /1/:

3-2. INJECTION CABLE.

The injection cable supplied is used to connect the FS-4 to an unused accessory crystal socket of the receiver or transmitter. Attach the ground lug to the chassis at the accessory crystal socket and insert the center pin into the selected accessory crystal socket. The receiver or transmitter will operate best when the center conductor is connected to the emitter of the crystal oscillator. This can be determined by noting the S meter reading or power output readout when the injection cable is plugged into each socket of the accessory crystal socket.

and 3 pages later:

The FS-4 should be unplugged from the receiver or transmitter if operation is desired from internal crystal control and not by use of the FS-4. The cable capacity of the FS-4 can cause oscillation of the receiver or transmitter that is not controlled by the selected crystal.

The direct connection of the FS-4 to the emitter of the oscillator in the R-4 or T-4 causes this problem. Furthermore i observed that the level of the FS-4 at higher bands – e.g. beyond 21MHz – is lower than the internal crystal oscillator.

The FS4-Adapter described here solves these two problems:
1. Isolates the FS-4 from the R-4 or T-4
2. Increases the outputlevel

The Circuit:

A simple broadbandtransformer (picture 1) is wound onto a small toroid with an outer diameter of 6.3 mm. The ratio is 3:6 turns to increase the output. It is NECESSARY to have the windings separated (picture 2 and 3) for low capacitive coupling between primary and secondary winding; don´t use a binocular core or bifilar windings on the toroid.

Note: One side of the secondary winding is connected permanently to the emitter of the internal oscillator in the R-4 or T-4, irrespective of the XTALS-switch setting.

The core´s material is N30; not the optimum for this frequency range - but the transformed „power" is nearly zero, therefore the losses are not relevant.
The nominal A_L is 1090nH, the three primary turns have (measured) 12,1µH which are 843Ω at the lowest operating frequency 11,1MHz. The primary´s impedance is high enough not to overload the FS-4.

FS-4

T1

Crystal socket R-6C

Ground
R-4
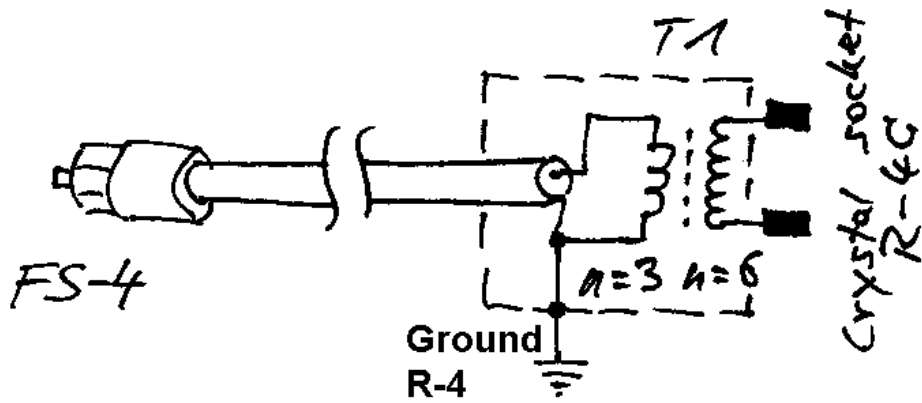
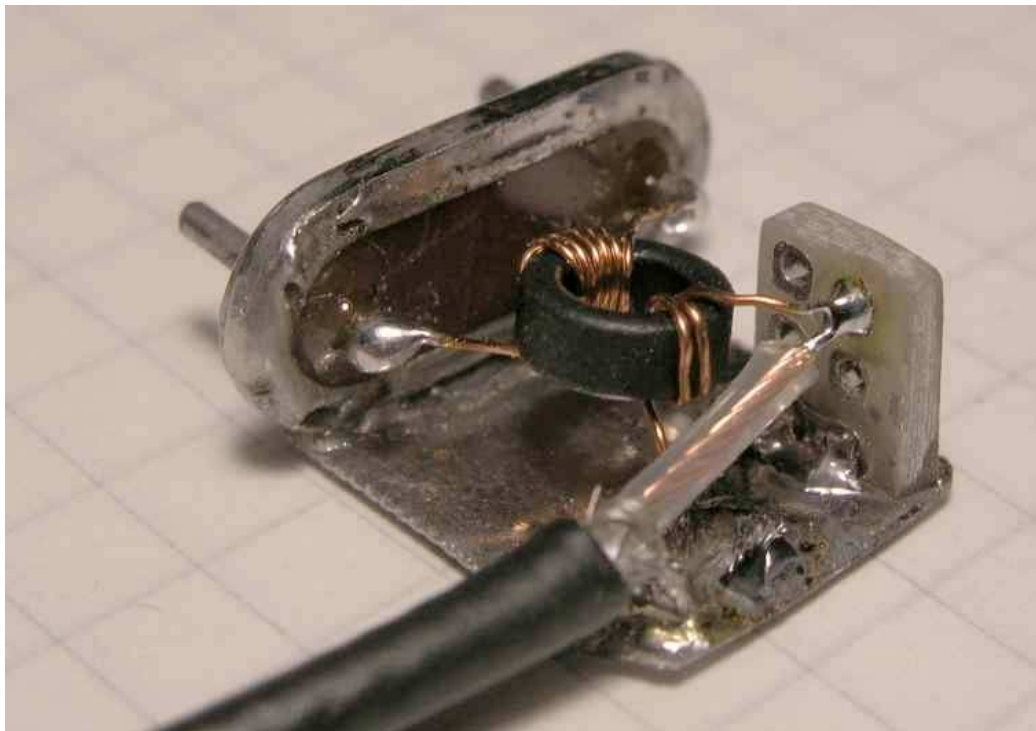T1: Material: N30

$A_L = 1090 nH$
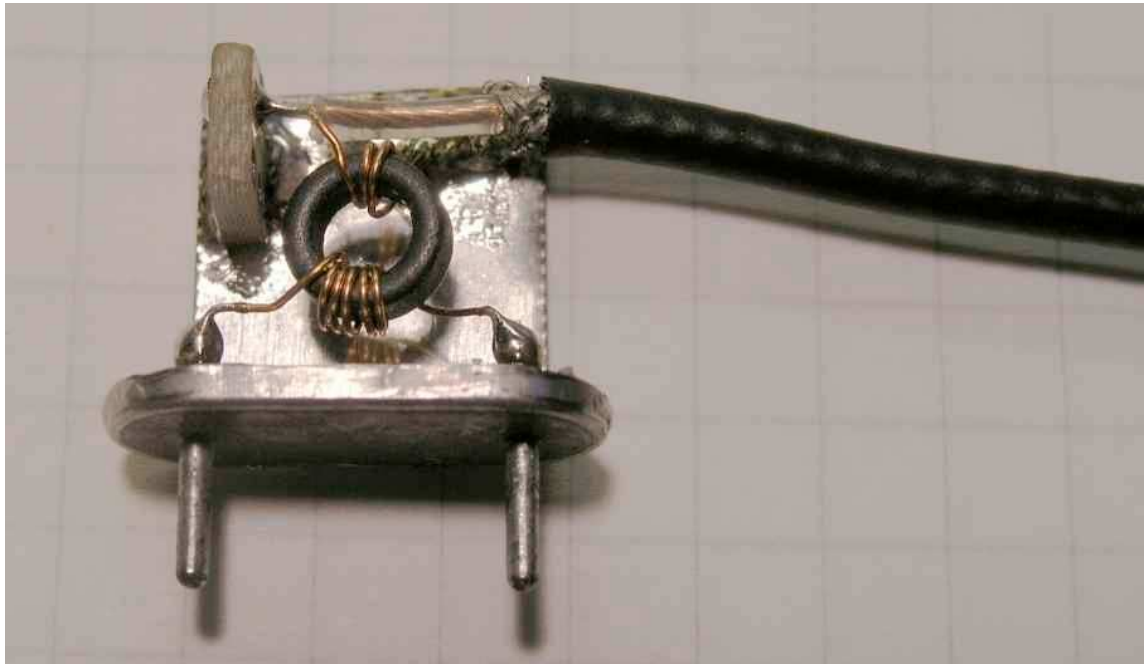
Type EPCOS, P37-X830

Diameter (outer): 6,3 mm

DL7MAJ 05/10

Picture 1: schematic

Picture 2

Picture 3

Picture 4

Mechanical Construction:

The case of an old crystal is used and a small piece of an experimantal board serves as mechanical support for the inner conductor of the coaxial cable (RG174), see picture 2.
I used position „15" of the XTALS switch for the adapter (picture 4) and cut a small hole into the XTAL´s cover (picture 5). A groundlug is added. The cable feedthroug (rubber) is cut and can easily be put over the cable after installation of the adapter and the connector.
And now: READY (picture 6).

Picture 5

Operation:

The adaptor may be left in place permanently – even when the FS-4 is not used.

IMPORTANT:
This adapter is not sufficient to isolate the FS-4 completely from the oscillators circuit in the R-4 or T-4. When the R-4 or T-4 is operated with the internal crystals, the FS-4 has to be switched OFF to avoid coupling of the FS-4 into the oscillator. If you forget to switch off the FS-4 you will hear a beat between the FS-4 and the internal crystal.
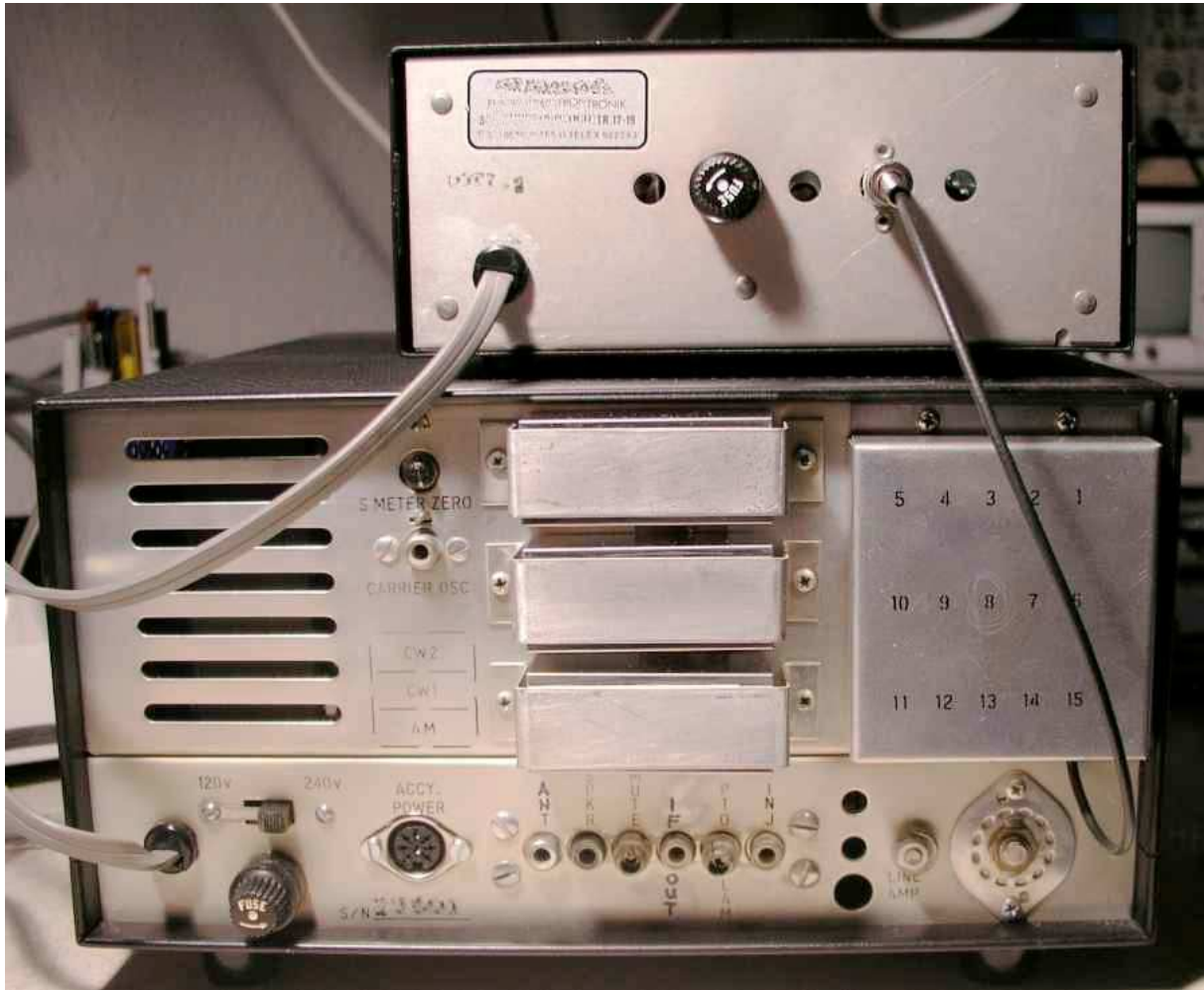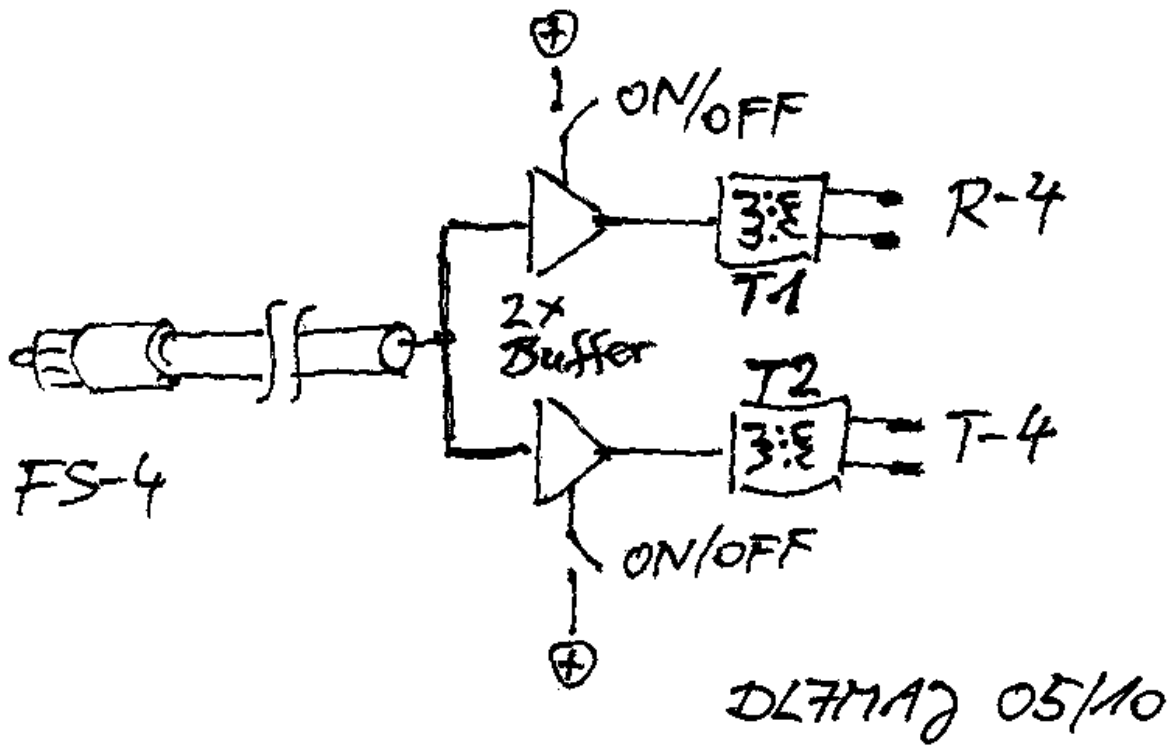
Picture 6

<u>Just an idea:</u>

When you want to operate your FS-4 with R-4 and T-4 simultaneously, it would be possible to use a circuit accordingly to picture 7: Two small bufferamplifiers separate both rigs from each other . The buffer of the rig in operation with the FS-4 is switched ON, otherwise it´s OFF. The FS-4 may be switched ON permanently, the buffers need a very good isolation between input and output when switched OFF to avoid unwanted spurii.
~~I didn´t realise this circuit – maybe „later".~~
<u>Now it´s realised; look at my FS-4 Wizard!</u>

Picture 7

/1/ Instruction Manual Drake Model FS-4

If you want to contact the author:
Stefan Steger, DL7MAJ, eMail: dl7maj@darc.de
Homepage: www.dl7maj.de