# SLNA 145sb installation instructions

Thankyou for buying muTek limited's SLNA 145sb transceiver-optimised preamplifier. Although it has been designed specifically for the Yaesu/Sommerkamp FT290 transceiver, it may find application in other transceivers for which no complete front-end modification is available. The installation notes below refer to the FT290: we regret that we have no detailed information available regarding installation of the unit in other transceivers.

There are usually two reasons for the less than adequate sensitivity of current transceivers. Firstly, the receiver designer's brief includes a dynamic range specification which leads him to balance large signal handling with sensitivity. With devices currently available at prices the transceiver manufacturer is prepared to pay, the balance comes out to around 4dB noise figure and 70dB intermodulation-free dynamic range in ssb bandwidths. The second point is that, also to save money, designers shy away from the use of electromechanical relays for antenna changeover switching and tend to use various forms of diode switch. These inevitably lead to greater insertion losses than suitable relays, often approaching 4dB! Thus it's not unusual for the overall receiver noise figure to reach 8dB or so!

At 144MHz, sky-noise limits the maximum usable sensitivity of a receiver used for terrestrial communications to about 2dB noise figure (this is about the same as 0.05uv pd for 10dB s+n/n ratio in ssb bandwidths). Lower noise figures are easily obtainable with modern devices, but they won't let you hear any more! However there is a distinct advantage in using a very low noise preamplifier to improve the sensitivity of a transceiver- if it has been properly designed.

Overall system noise figure depends not only on the noise figure of the preamplifier, but also on its gain and the noise figure of the subsequent stage (the transceiver in this case). By adjusting the gain of the preamplifier it is possible to set the system noise figure to any value greater than the intrinsic noise figure of the preamplifier. But, why bother to adjust the gain? It's an unfortunate fact that the more gain ahead of the receiver, the more susceptible it becomes to overload effects. By putting just enough low-noise gain ahead of the receiver to set the overall sensitivity to a level where external noise is the limiting factor an optimum (for the system) is reached. A very low-noise preamplifier such as the SLNA 145sb will minimise the amount of gain required, and hence the degradation of the dynamics.

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## Circuit Description

A low-loss relay provides the antenna changeover function. This is followed by a BF981 in an input noise-matched, output conjugately-matched configuration for a very low noise figure with optimum dynamic range. Following the output matching, a variable attenuator provides the gain control without compromising the dynamic performance, which would be the case if the usual amateur practice of providing gain control by varying the bias on G2 of the fet was followed.
After the attenuator, a properly designed bandpass filter provides very substantial rejection of out-of-band signals. The preamplifier is designed and tested to very high standards. A plated-through hole epoxy fibreglass pcb is employed, and bushed mountings are provided for mounting in the FT290.

## Installation

Before attempting installation of the SLNA 145sb it is very strongly recommended that the manual and circuit diagrams supplied by Yaesu/Sommerkamp are studied thoroughly. If you are at all unsure of your abilities muTek limited strongly recommends that you find a competent technician to perform the installation: we cannot accept responsibility for any damage however caused.
If any difficulties are encountered than please get in touch with muTek- we want to make sure that you are happy!

The preamplifier mounts on the lugs provided for mounting of the optional tone encode/tone squelch assembly. With the bottom of the unit removed, these may be found close to the 'Switch B' unit (see page 33 of the manual).

1. Remove both top and bottom covers of the transceiver.

2. Remove the battery compartment (4 screws).

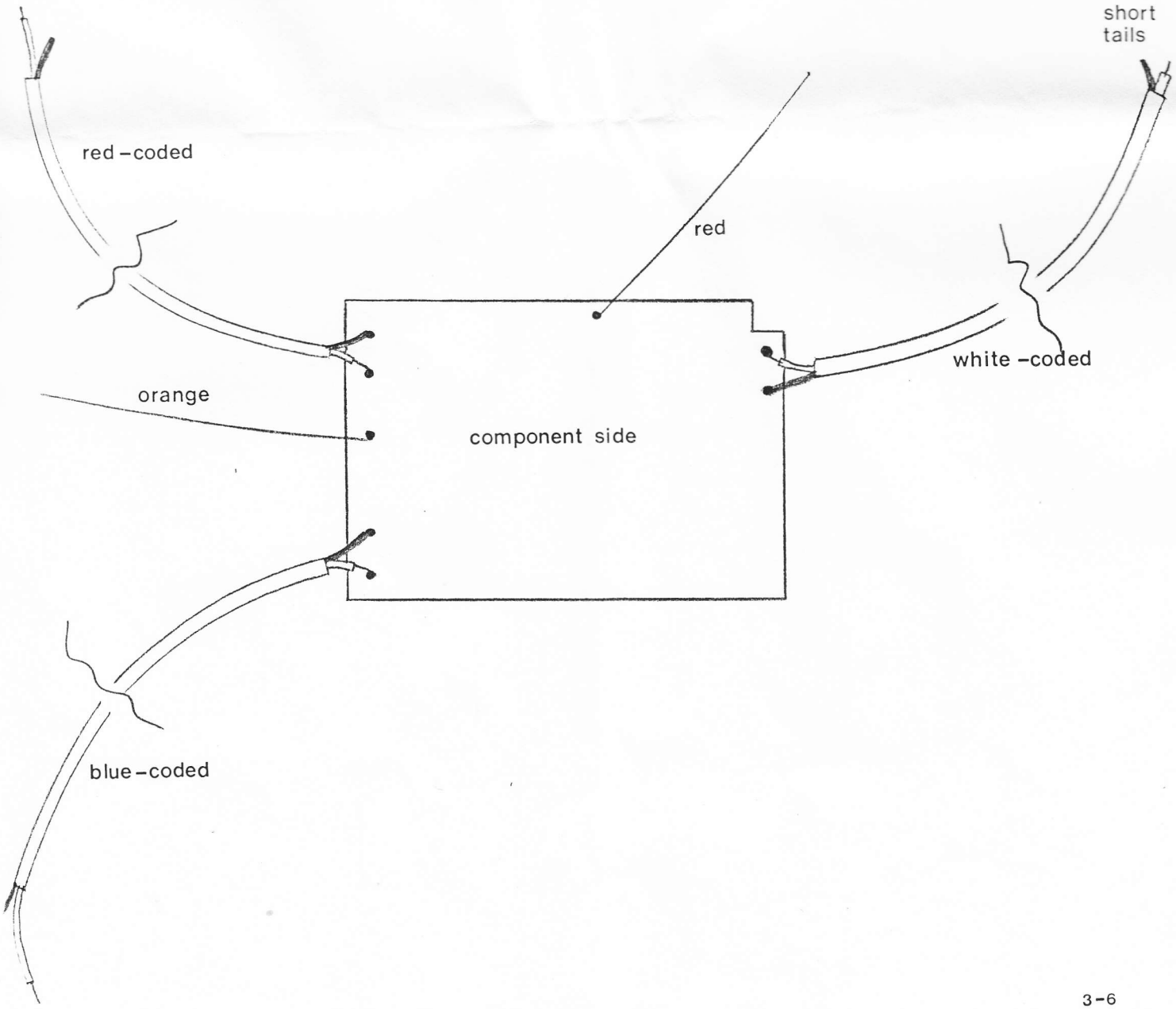
3. Locate and remove C101. This (normally 470pF or 1nF) capacitor is located on the main pcb near the PA compartment close to the back panel of the transceiver. This is probably best done by crushing the component with a pair of long-nosed pliers- and cutting clear the remaining debris- it may sound crude but it's better than wrecking the reverse side of the board- easily done!

4. Locate and remove L02- this is a usually yellow-sleeved toroidally wound inductor going between the stand-off in the PA compartment and the adjacent tag-strip. Keep this component- in the unlikely event of the SLNA 145sb having to be returned for service, the FT290 can fairly easily be returned to its unmodified state if the removed components are retained (almost any sub-min plate ceramic capacitor of around 1nF would be suitable for use as C101 in this eventuality).

5. Remove the telescopic antenna.

6. Remove the anodised aluminium strips from each side of transceiver case.

7. Unwrap the SLNA145sb and the kit of cables. Refer to the diagram below and solder the cables to the preamplifier as shown. BE VERY CAREFUL NOT to allow small whiskers of braid for example to short across pins.



8. Mount the preamplifier using the M3 screws provided.

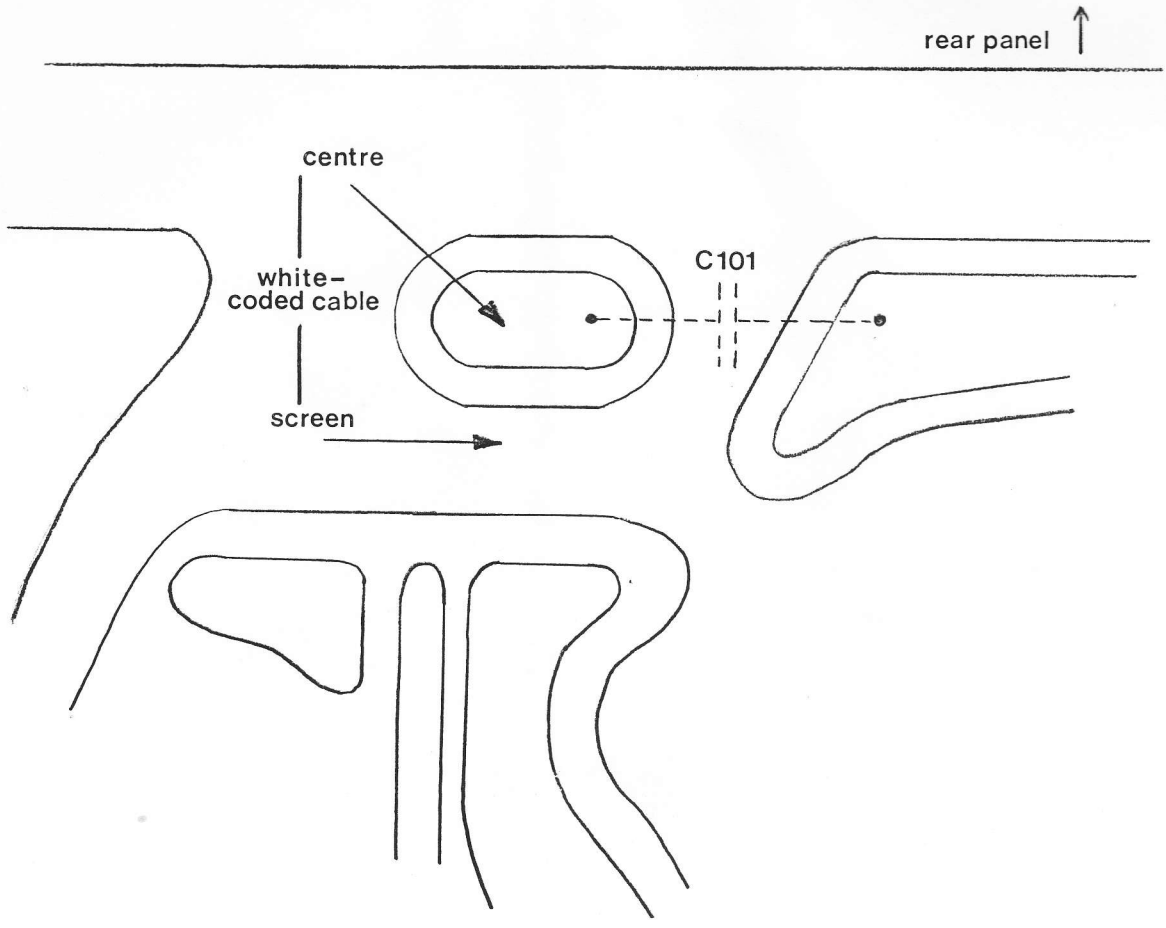
9. Solder the screens of the red and blue-coded cables to the earthed tag on the tag strip by the PA compartment.

10. Solder the long centre conductor of the blue-coded cable to the stand-off in the PA compartment from which L02 was removed.

11. Solder the centre of the red-coded cable to the centre tag of the same tag strip.

12. Now remove the four countersunk screws securing the back panel of the transceiver (two on each side) and very carefully ease it away from the area of the main pcb.

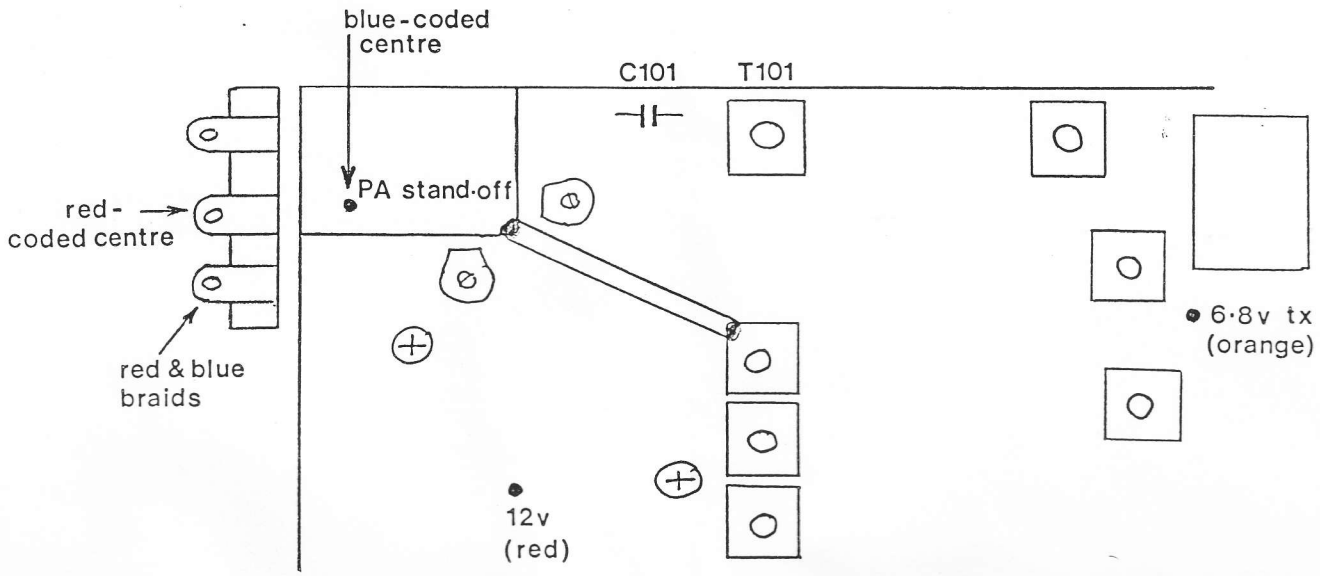
13. Now locate transformer T101 (T01 in some manuals). This is the shiny can next to C101, which you should already have removed. Now look at this area on the track side of the board- you should recognise the diagram below! Solder the white coded cable to the areas shown- the centre conductor to the pad at the input of T101, and the screen to the adjacent ground area. This is probably the most fiddly operation- do take great care not to allow whiskers from the braid short anything out!



14. After rechecking that operation 13 is all okay, replace the back plate of the transceiver with the four screws.

15. Solder the red wire to the 12v stand-off on the main pcb as shown below.

16. Solder the orange lead to the 6.8v transmit stand-off as shown below.




17. Lead the cables neatly around the SLNA 145sb ensuring that none of the cables or leads run across the board, and then replace the antenna screening tube in its previous position.

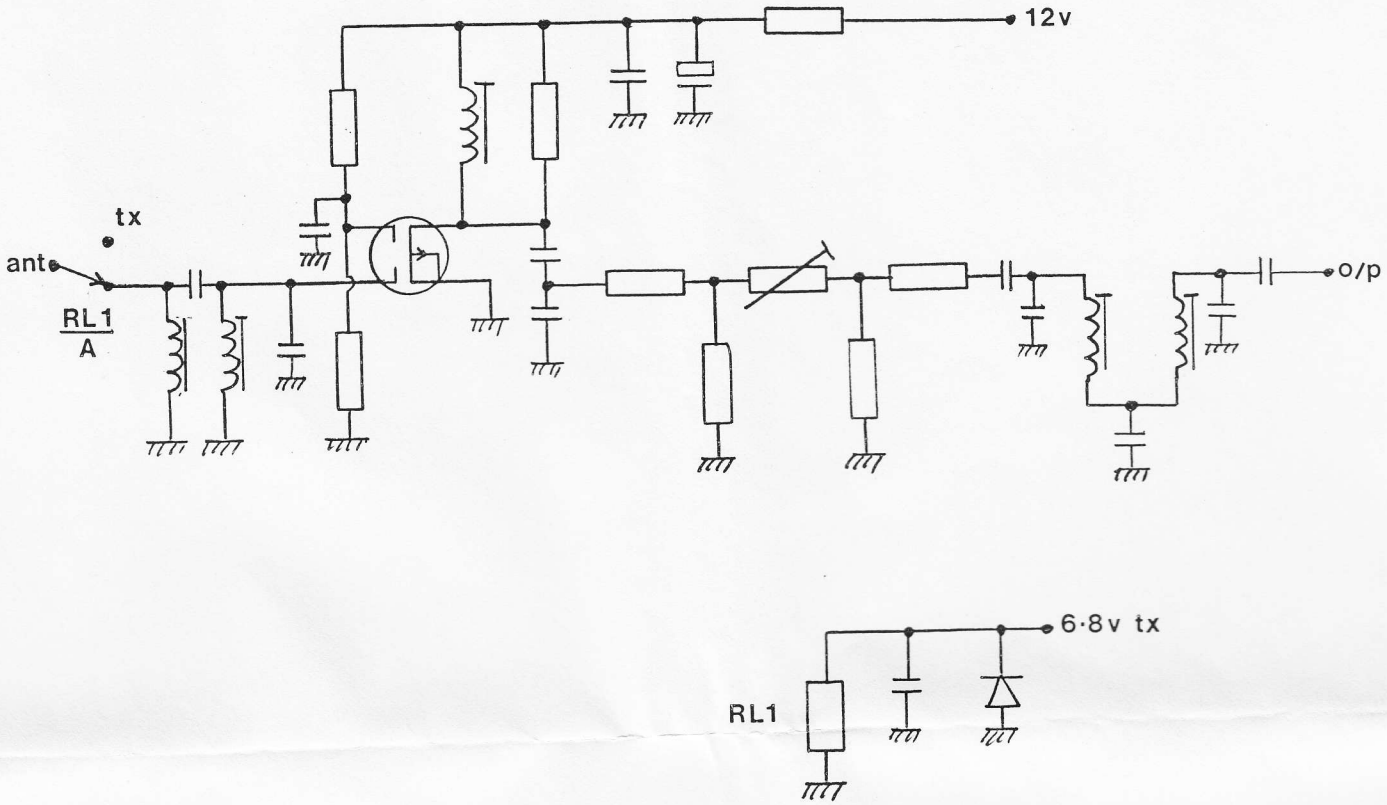
18. Replace the anodised aluminium trims on each side of the transceiver.

19. Replace the battery compartment, taking great care not trap the red lead to the preamplifier. NiCad batteries when shorted do a pretty passable impression of a nuclear fission reactor during 'melt-down'- not adviseable! Seriously though, do be careful.

20. Turn the transceiver on and find a weak fm signal. Now adjust the attenuator on the SLNA 145sb with the trimming tool provided until the slightest degradation in signal to noise ratio is noticed, then back off this adjustment very slightly. It is quite normal for the correct position of the attenuator once this had been done to be perhaps only 15 or 20 degrees from full anti clockwise travel.
This adjustment carefully done will result in the maximum dynamic range for the system.

21. Replace both top and bottom covers.

22. Installation is complete.




SLNA 145sb Schematic