

## Specification For The MSB Design Transmission Bridge TB-1

### Introduction

When testing apparatus designed for connection to the telephone system, provision must be made to supply power to that equipment. This power supply not only has to be at a certain voltage, and be capable of supplying the necessary current, but it also must be noise-free and of a relatively high impedance to ac, to prevent loading, and therefore attenuation, of the applied ac signals during test procedures. An example of a suitable feeding bridge is given in British Standard BS6305, Figs. 7 and 12.

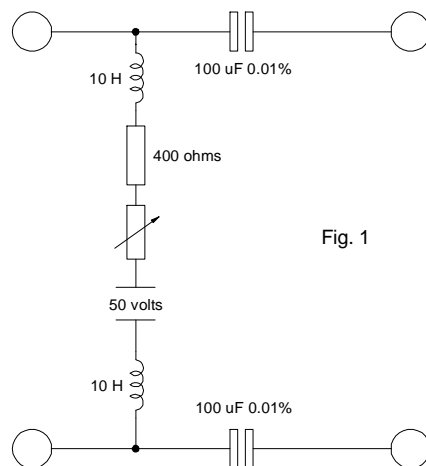


Fig. 1

Referring to BS6305, it will be seen that the two diagrams are essentially the same except that in Figure 12 there are added two resistors of value 300ohms and a generator. In addition the text refers to the substitution of another 300ohm resistor for the generator.

The Transmission Bridge TB-1 can satisfy all the needs for the relevant diagrams, the various options being easily selected via front panel switches, enabling comprehensive testing with the minimum of additional apparatus.

### Features

Referring to the diagrams you will see that the bridge is normally constructed from two large chokes of 10H and a 50v voltage source combined with a resistor to give a current source. In the last amendment to the specification it was allowed that the chokes and battery could be replaced by a constant current source if this source was of sufficiently high impedance. This is possible because the purpose of the bridge is mainly to supply the apparatus with a chosen dc current superimposed on any ac signal applied at the terminals on the other side of the circuit. The capacitors prevent the dc from being shunted by the applied signal and the chokes prevent the power supply from shunting the ac signals.

If a constant current source is used instead it is effectively seen by the circuit as a high impedance so that prevents the ac from being attenuated, and acts in the same way as the chokes. This is most desirable because those chokes would be very large and heavy and the unit would be much bigger.

The TB-1 has a variable constant current source adjustable to 120mA to suit the requirements of the tests that stipulate a selection of current steps. The maximum current to be applied to the apparatus under test is defined as that which will flow when a 50v source is applied to it via a 400 ohm resistor, and in order to determine that current limit, the TB-1 has a 50v source in series with a 400 ohm resistor which can be switched in when required.

Referring to the front panel, you will note a row of toggle switches at the top of the unit, and several sets of 4mm screw terminals at the bottom. These function as follows :-

At bottom left there are 3 terminals; the green one is the earth connection, although it acts as the apparatus earth connection and is not directly connected to ground. The red and black are the A and B wires to the apparatus under test, and are connected in parallel with the line jack above them.

The rotary control sets the constant current, and this current can be monitored via the first set of white terminals. Note that if no instrument is connected to these terminals they must be linked to enable continuity in the current path.

The next four sets of terminals are arranged in pairs, with like colours connected in parallel, to enable both connection to apparatus and monitoring of the signal conditions at those terminals. The black are the A leg out, the red are the B leg out, the green are the apparatus ground out and the white are for connection to the external signal generator. Note that the green terminals are merely connected together, and to R3, and are not connected to mains or chassis earth.

Going back to the toggle switches, the first allows for the reversal of the line at the apparatus under test. This applies signal and current in the reverse direction, a situation that the apparatus under test must cope with as there is no specification for the polarity of apparatus connected to the PSTN.

The next switch provides for either the set current or to test for the maximum current to be applied. In the test position 50v is applied via a 400 ohm resistor to the apparatus under test and the resulting current can be measured at the current sense terminals. Note that the 50v source and 400 ohm resistor are built in to the TB-1 and need not be supplied from an external power source. In the set position the current is controlled via the rotary knob.

The next switch selects either the close-matched 100uF capacitors as shown in Fig.12 or the 400 uF capacitors needed for Fig.7.

The next switch allows the insertion of the two 300 ohm resistors as shown in Fig.12.

The last switch replaces the generator with another 300 ohm resistor. Note that the generator must be disconnected when the resistor is selected or it will shunt the measured signal.

Note also that, due to the large capacitances used to achieve the low noise performance, it will be seen that the power LED remains illuminated for some time after switch-off. This does serve the additional purpose of indicating that there is still a voltage present at the terminals until the LED is extinguished.

When using the unit for low noise figure tests it is sometimes found advantageous to connect the chassis of the measuring instrument to the case of the TB-1, and so a green chassis socket has been added to the rear panel for this purpose. This socket **IS** connected to mains earth.

## Uses

The uses that the unit is put to will depend on the requirements of the user, but there follow a few suggestions :-

- a) BS6305 test A.4 Determination of return loss
- b) BS6305 test A.5 Impedance balance about earth
- c) BS6305 test A.6 Power level determination
- d) BS6305 test A.7 Signal balance about earth

etc.

## Specification

Capacitors	100 uF matched to 0.01% 470 uF matched to 10%
Resistors	300 ohm matched to 0.01% the resistors and capacitors can be switched in or out to implement the different tests specified in the standards.
Power supply	50v constant voltage source and 400 ohm resistor built in.
Current source	constant current source fully adjustable to 120mA.
Tolerances	voltage +/- 5% current +/- 5% resistance +/- 0.01% capacitance +/- 0.01% for 100uF +/- 10% for 400uF

The unit is housed in a steel / aluminium enclosure, with all switches and connectors on the front and rear panels. It is mains powered, via an IEC connector on the rear panel. Enclosure dimensions are 220mm x 220mm x 70mm.

## General Arrangement

The diagram below shows the relationship between the front panel functions and the circuit elements :-

