



## Specifications for the MSB Design Feeding Bridge FB-2

### Introduction

The **Feeding Bridge FB-2** is a comprehensive source of the feeds and ancillary components required to carry out the tests described in TBR21 and TBR38.

These standards define the setups needed to carry out the tests described. In all cases a voltage source of one kind or another is called for, and in many of the cases this voltage source has to be such that it causes the minimum attenuation of the signals present at the equipment under test ( EUT ) terminals.

In addition to this there are several feed resistances specified, various switching arrangements to give an open-circuit or short at the terminals, provision for connection of a ringing source, plus a requirement for dial tone to be present. All of these are catered for in the **FB-2**, plus much more.

The unit is mains powered, 240v ac @ 50Hz, and it is completely self-contained. Just add your measurement equipment, such as voltmeters and oscilloscopes etc. plus a ringing generator, and plug in your equipment to be tested.

Full connection details are available in pdf format from the applications page of our web site - [www.msbdesign.co.uk](http://www.msbdesign.co.uk).

Let's look in more detail at the unit :-

### Voltage Feeds

Looking through the TBR documents you will find that most of the tests are carried out with some voltage applied to the EUT.

The presentation of this voltage is done in one of two ways. In the first a dc voltage is applied directly to the EUT via a resistance, either to the normal connection terminals or maybe to the apparatus earth terminal. In these cases there is nothing special required of the feed and a plain dc voltage is provided for these purposes. The actual voltage value is selectable via the front panel control, and the choices are

25v dc  
50v dc  
60v dc  
100v dc

The second voltage presentation is via a feeding bridge arrangement. This means that the voltage is applied to the apparatus terminals in such a way that the voltage source does not shunt any signals seen at the terminals. This is traditionally catered for by the use of large high value inductors that act as blocks to any ac signals but pass the dc voltage. It is easy enough to replace these inductors with a constant current source to achieve a saving in size and weight, plus we can lose the inherent problems that come with inductors and switching voltages. This is the approach taken with our sister product the **Transmission Bridge TB-1**. However, in the TBR cases the situation is complicated by the requirement of various feed resistances. Now the constant current circuitry works well if we know the current required, but for the TBRs this must vary with the load and the series resistance that has to be inserted for the test. We need to more closely emulate the inductor situation.

That is exactly what we have done in the **FB-2** - the current automatically adjusts to suit the required feed, and acts as if the voltage was connected to the EUT via the fixed resistors, yet the ac signal is not attenuated.

This feeding bridge arrangement is powered by a 50v dc source as required in the TBR documents.

The best way to describe the units capabilities is by way of the front panel controls, and then expand into greater detail about the respective functions.

## Voltage Selector

The voltage feeds are selected via the front panel six-position rotary switch. There are two separate voltage sources within the unit, one variable and one a fixed 50v. It is the latter that is used for the feeding bridge arrangement.

The first four positions of the switch select the required dc voltage, which is presented to the EUT via a switch selectable resistance. The fifth position, labeled "100E+" presents 100v dc directly between the Earth terminal and one of the line terminals. Which one depends upon the position of the reverse switch. The sixth position, labeled "100E-" reverses the polarity of this 100v dc source, such that the -ve is connected to the line terminal and the +ve is connected to the Earth terminal. Using these last two positions in conjunction with the reverse switch allows all of the combinations required in the TBR tests.

Below the voltage selector switch you will find a two position toggle switch, labeled "feeding bridge / off". When in the feeding bridge position the voltage source is switched from that used above to the 50v source complete with the active feeding bridge circuitry. In this position only the two 100E selections on the voltage selector switch are active. Note that in the pdf documents that we have provided on our web site, when it comes to the tests that require the feeding bridge to be switched in we have specified setting the voltage selector to 50v. This is not strictly necessary as we are not using this particular 50v in the bridge, but in the feeding bridge position, as the 100E voltage selections are active, what we are trying to say is " do not select either of the 100E positions ". It was a lot easier to just say " select 50v ". I hope that is clear enough !\*?

## Resistance Selector

When the first four voltage selector positions, or the feeding bride, are selected, the current is supplied via a resistance, selectable via the twelve position rotary switch. In addition, the twelfth position selects a two way toggle switch that selects one of two extra resistances. The reason for the toggle switch is simply that the rotary switches used have twelve positions and we need thirteen to include all the resistances defined in both TBR21 and TBR38.

The resistors used are selected to be able to handle the power levels expected when the selected voltages are applied to the EUT.

Note that these resistances are also used when the external ringing generator terminals are selected, and therefore when carrying out the ringing tests the required resistance should be selected via the rotary switch.

In addition to the selected resistances, there are, on the rear panel, a pair of terminals labeled "sense resistor", and a rocker switch labeled "100R" & "1k". These resistances are contained within the feed resistor chain and can be used to monitor the feed current if required. If 100R is selected then for all feed resistances the sense terminals will monitor across that 100R resistor. If 1k is selected then for all feed resistances up to 1k the sense terminals will monitor across those values of feed resistance. Above feed resistances of 1k the terminals will monitor across the 1k resistor.

## Reference Selector

Provision is made to select a reference impedance with which to terminate the non-EUT side of the feeding bridge. There are three different complex impedances defined in the TBRs plus a simple 600R resistance, and all are selectable via the rotary switch. In addition the impedance can be switched out of circuit altogether.

## Dial Tone Generator

Some of the tests require the provision of dial tone, if this is needed to activate the EUT. The **FB-2** has a built in dial tone generator, and this can be switched into circuit via the toggle switch labeled "dial / 300Rs". This is a three position switch, and in the *dial* position the dial tone is presented at the non-EUT side of the feeding bridge. Associated with this is the adjacent three position switch labeled "cadence / cont". This controls the cadence of the dial tone, and switches it from the preset cadence to a continuous tone. Note that this is also a three position switch and in the middle position the tone is disabled completely. You may think that this is accomplished by the other positions of the first switch, but in sensitive apparatus there is a small breakthrough of the generator heard and so disabling it completely solves the problem.

## 300R Resistors

The TBRs require a test to be performed where the non-EUT side of the bridge is terminated by two 300R resistors, and associated with that there are other requirements. These are catered for by the 300R position of the first switch plus the third toggle switch labeled "*R to E / osc i/p*". When the first switch is in the 300R position then two 300R resistors are placed across the non-EUT side terminals. Then, using the third switch, signals can be injected, via the input terminals, between the resistors' mid point and Earth, or a further resistor can be inserted between the same points instead.

## Normal / Reverse

The polarity of the EUT terminals is reversed using the switch labeled "*normal / reverse*". This switch operates close to the terminals so everything after that is reversed.

## Feed / Ring

The switch labeled "*feed / ring*" selects whether the EUT is connected to the voltage sources or the external ringing generator terminals.

## Feed / Open / Short

This switch has three positions. In the first the EUT is connected as normal to the voltage sources. In the middle position the EUT is disconnected completely. In the third a short is placed across the EUT. These positions cater for the respective tests in the TBRs.

## Input Connectors

The EUT can be connected to the unit either via the two 4mm terminals marked "*A*" and "*B*", or plugged into the line jack socket. The terminal marked *A* is connected to the socket pin 5 and *B* to pin 2. The two white terminals marked "*ring*" are used to connect an external ringing generator. Note that this generator should contain the necessary dc backing as the internal voltage sources are not designed to provide this function.

## Non-EUT Side Connectors

The green Earth connector is not connected to any real mains earth at all, but to the switches and circuitry associated with the tests that require it. It is purely a connection point for the Earth connection on the EUT.

The two 4mm terminals labeled "*A*" & "*B*" are the line connections at the non-EUT side of the feeding bridge. The remaining two 4mm terminals are for connection of an external oscillator.

## Specifications

<b>Feed Voltages</b>	25 volts
	50 volts
	60 volts
	100 volts
	100 volts to one leg
	50 volt feeding bridge
<b>Feed Resistances</b>	200 ohms
	230 ohms
	500 ohms
	850 ohms
	1k ohms
	2050 ohms
	2300 ohms
	2800 ohms
	3200 ohms
	8k ohms
	24k ohms
	36k ohms
150k ohms	

<b>Reference Impedances</b>	ref 1	270R + ( 750R // 150nF )
	ref 2	82R + ( 600R // 68nF )
	ref 3	220R + ( 1k8 // 150nF )
	600R	
	off	
<b>Dial Tone</b>	350Hz + 440Hz	
	Cadence	0.2,0.2,0.6,1.0 or continuous
<b>Coupling Capacitors</b>	470uF	
<b>Feeding Bridge Return Loss</b>	38.2 dB @ 300Hz	
	47.7 dB @ 1k Hz	
	53.8 dB @ 3k Hz	
<b>Feeding Bridge Insertion Loss</b>	0.05 dB @ 1kHz	
<b>Output Connectors</b>	2 off 4mm screw terminals	
	1 off line socket	
<b>Input Connectors</b>	2 off 4mm screw terminals	
<b>Additional Inputs</b>	4mm screw terminals for external ring generator	
	4mm screw terminals for external oscillator	
	4mm screw terminal, local earth	
<b>Dimensions</b>	220mm x 220mm x 70mm	
<b>Power</b>	240v ac @ 50Hz	

## Service

The unit has no customer serviceable parts, and should give trouble-free operation for many years.

However, in the event of any problems arising the unit should be returned to :-

**MSB Design  
26 The Rookery  
Balsham  
Cambs.  
CB1 6EU**

**Tel: 01223 893073**

If the unit is less than one year old and the fault is not caused by misuse of any kind, then all service work will be carried out free of charge.

If the unit is over one year old, or the fault has been caused by misuse of any kind, then service work will be charged at cost.

# FB-2 Switching Diagram

