

**TB8100** base station

## Using a TB8100 with an External Modem



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## Associated Documentation

TB8100 Installation and Operation Manual (MBA-00005-xx).

TB8100 Specifications Manual (MBA-00001-xx).

TB8100 Service Kit User's Manual (MBA-00010-xx) and online Help.

Your modem User's Guide.

# 1 Overview

This Application Note provides information on how to configure a TB8100 base station to use an external modem by means of the extended bypass audio functionality. The extended bypass functionality provides an analogue signal path with a higher than standard frequency response, but only via the unbalanced line. This allows the connection of external modems that have information content above 3kHz. Included in this Application Note are instructions on how to configure the TB8100, and some performance indications for various types of modem.

This Application Note is intended for use by system integrators.

# 2 Applicability

The extended bypass audio functionality is only available on reciters with hardware version 0.04 or later. The performance has been tested using only the unbalanced line interface on an isolated system interface board (TBA10B0).



**Note** The TB8100 does **not** check the extended bypass functionality against the hardware version number. It is up to the user to ensure that the correct hardware version is used.

# 3 Disclaimer

Tait Electronics Limited has not applied for, and will not apply for, regulatory compliance when using the bypass or extended bypass path. This is because Tait does not want to specify any particular external modem to be used. The choice of external modem is therefore up to the user.

The bypass and extended bypass path has been provided to facilitate **only a data path** through the TB8100. Note that normal voice-type compliances cannot be achieved when this has been selected in the channel profile. This is primarily due to the lack of a limiter in the transmit modulation path.

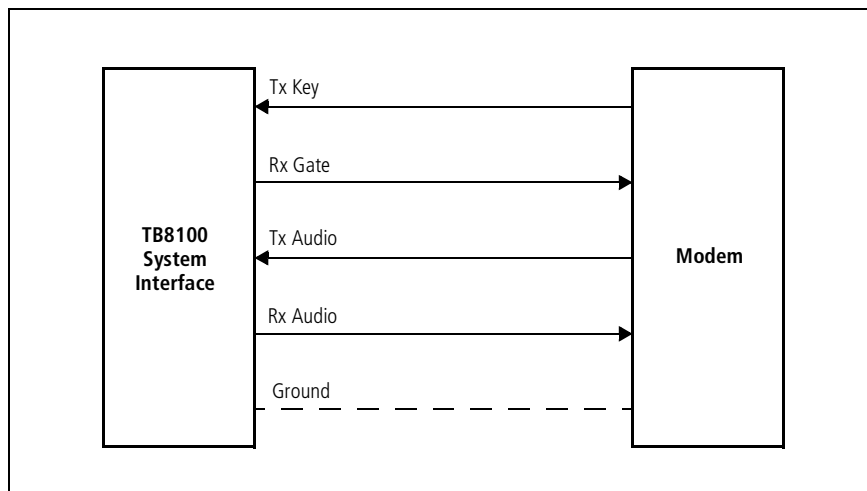
It is therefore the responsibility of the user to apply to their local regulatory authorities for the appropriate data compliances.

## 4 Functional Description

- Exciter Bypass**            The bypass path connects the audio sampled at 25kHz from the analogue unbalanced line input directly into the frequency control loop (FCL), which then modulates the RF hardware. The only digital filtering in the bypass path is an optional AC filter, which has a cut-off frequency of 0.8Hz. Note that there is no limiter present in this path.
- Receiver Bypass**            On the receive audio bypass path, received audio from the FM demodulator is decimated from 50kHz to 25kHz. It is then directly converted to the analogue unbalanced line output with no further filtering.
- Extended Bypass**            There is anti-alias analogue filtering performed on the unbalanced lines, and also on the FCL outputs. This filtering on the bypass path causes a roll-off in amplitude as the audio frequency is increased. When extended bypass is enabled, the analogue filtering on the unbalanced lines is disabled by hardware, and a digital finite impulse response filter with a constant group delay is used in both the transmit and receive bypass paths to extend the frequency response.

## 5 Connecting the TB8100 to an External Modem

Figure 1 Typical connection



### Connection

Connect the TB8100 to the external modem using the unbalanced line input (Tx audio) and output (Rx audio) on the system interface connector. If required, you can also use the Rx Gate and Tx Key lines, as described below.

Details of the pin allocations for the different types of system interface connector are provided in the “Connection” chapter in the TB8100 Installation and Operation Manual, and also in the TB8100 Service Kit (Configure > Base Station > System Interface).

### AC Coupled Unbalanced Audio Input

The modem selected may have a DC offset present for both the transmitter and the receiver. On the standard system interface board, the transmit path is DC coupled (with a bias of 2.5V), and the receive path is AC coupled.

We recommend that you enable the high pass filter in the Signal Path tab of the channel profile dialogue box in the Service Kit (refer to “[Configuring the Base Station](#)” on page 7). This will ensure that the transmitted signal is exactly on the configured carrier frequency. If you do not enable the high pass filter, ensure that you set the transmit carrier frequency exactly to the required frequency by adjusting the DC bias of the external modem.



**Note** The CODECs used to sample the unbalanced line input are DC capable. However, because of component variations, the DC offset incorrectly reported by the CODEC can lead to a small offset in the transmit carrier frequency, which is removed by selecting the high pass filter.

### Receiver Gating

If the receiver is not gated, the received audio will be continuously presented to the external modem. This may lead to the occasional false packet detection, due to noise falsing the decoder. One option to prevent this is to gate the received audio and/or use the Rx Gate signal to indicate to the modem when a valid RF signal is present.



**Note** In this case, you will probably have to configure the external modem to cope with the timing sequence of audio presented from the unbalanced line. Refer to the TB8100 Specifications Manual for gating response times.

### Tx Key

If you do not require continuous transmission, you can use the Tx Key input on the system interface board to key up the TB8100, and to key it down when transmission is not required.



**Note** In this case, you will probably have to configure the external modem to cope with the timing sequence of audio presented to the unbalanced line for transmission. We also recommend that you refer to the Tx Timers tab of the signalling profile dialogue box in the Service Kit, and select suitable values or disable timers as appropriate for your system.

## 6 Configuring the Base Station

Extended bypass is configured in the channel profile assigned to the operating channel. If a different operating channel is selected, the signal path configured for that channel will take effect.



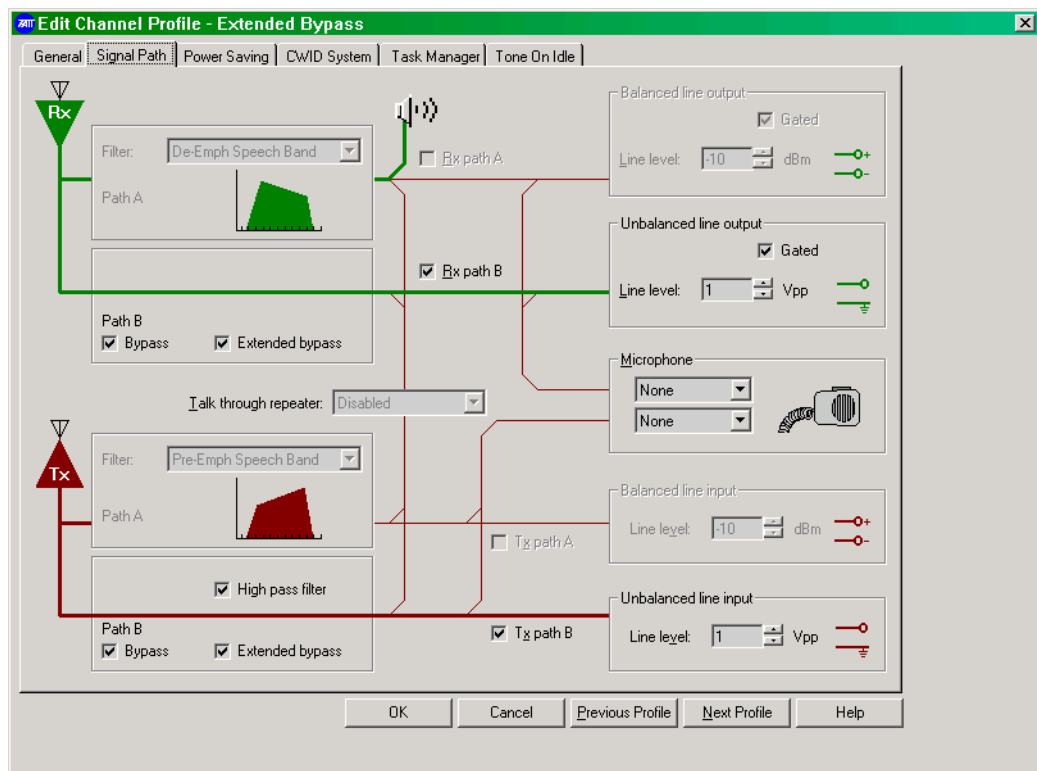
### **Important**

Selecting this function bypasses the limiter. This may allow overdeviation and cause the equipment to become non-compliant. It should be selected only when the TB8100 is connected to approved level-controlled devices (modems, trunking controllers, etc.).



### **Important**

With extended bypass you cannot use the balanced line or internal talk-through repeater connections from receiver to transmitter.



To configure the signal path for extended bypass.

1. Run the Service Kit and open the Add or Edit Channel Profile dialog box for the appropriate profile.
2. Select the Signal Path tab.
3. Select the **Bypass** check boxes for Path B (both transmit and receive). **Extended bypass** check boxes appear alongside the **Bypass** check boxes.

4. Select one of the **Extended bypass** check boxes. This selects the other **Extended bypass** check box as well. (You cannot configure extended bypass separately for the transmit and receive paths.)

## 7 Performance Specifications

Extended bypass has been tested with external modems as follows:

narrow bandwidth C4FM	9600bps external modem based on a CML FX919 chipset
narrow bandwidth GMSK	BT=0.5, 4800bps external modem based on a CML FX489 chipset
wide bandwidth GMSK	BT=0.5, 9600bps external modem based on a CML FX489 chipset

The performance figures given in these specifications are typical, and are supplied only as a guide to the expected performance. The actual performance achieved by your system will depend on the specific external modem used, and the interface levels into the TB8100.

	<b>NB C4FM</b>	<b>NB GMSK</b>	<b>WB GMSK</b>
Minimum Receiver RF Level for a Robust Link	— <sup>a</sup>	-109dBm (0.79μV)	-109dBm (0.79μV)
Strong Signal Packet Error Rate (PER)*	<10 <sup>-4</sup>	<10 <sup>-4</sup>	<10 <sup>-4</sup>
*for RF levels of 0dBm			
Signal Displacement Bandwidth	>1kHz	>1kHz	>2kHz
Selectivity	— <sup>a</sup>	71dB	79dB
Modulation Fidelity*	3.5%	6%	6%
*measured as Error Vector Magnitude, through combined receive and transmit paths			

a. Unavailable at time of publication.



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