



# Technical Support

TECHNICAL NOTE

Technical Note TN-919-AN

## Configuring the TM8100 for Data Operation

30<sup>th</sup> September 2004

### Applicability

This application Note applies to anyone wanting to configure their TM8100 for either Low Speed Data or Tait High Speed Data (THSD) using the internal software Modems of the Radio.

The latter requires the THSD feature to be enabled in the radio using the Software Feature Enabler (SFE). This Technical Note assumes that the user already has this feature enabled in the radio - Refer to Technical Note 822 for more information on enabling this feature.

Radio Firmware Version 2.02 and TM8100 PC Application Version 2.68 or greater is recommended for Data operation.

## 1. Overview

The TM8100 is able to send and receive Serial Data to and from Data Terminal Equipment (DTE) or Data Communication Equipment DCE (DCE) using an RS-232 connection. Figure 1 is an example of a typical configuration.

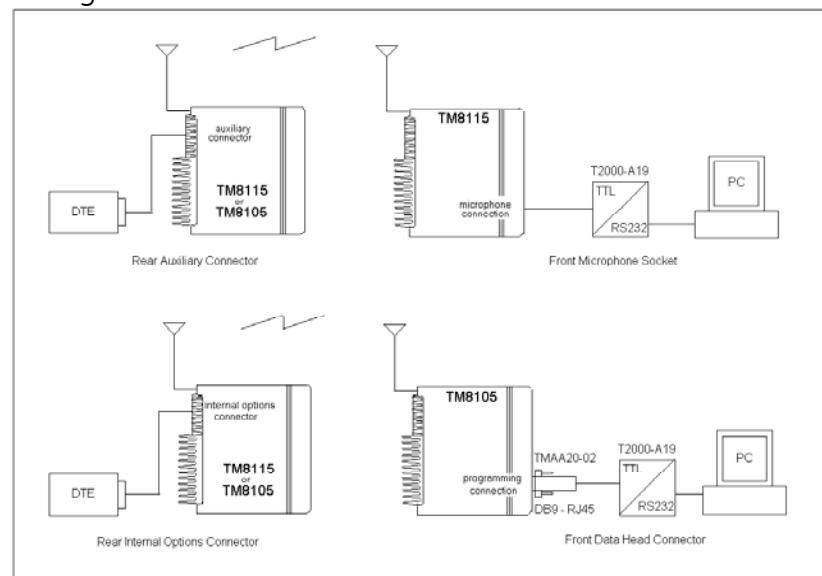


Figure 1

As a standard feature, the TM8110 and TM8115 mobiles come with an internal DSP (Digital Signal Processor) 1200-baud Modem.

As an option, the radio can be upgraded using the SFE to provide a high-speed 12000bps or 19200bps Modem. This high-speed option is known as THSD.

The 19200bps (19k2bps) option can only be used on wideband channels (25kHz) and is not available in some countries due to type approval restrictions. The 12000bps (12Kbps) option is designed for both narrow and wideband band systems.

The 1200-baud standard option uses the rugged FFSK (Fast Frequency Shift Keying) modulation scheme. This works well at low signal levels and through most repeaters.

The THSD option uses a 4 level frequency shift keying modulation scheme, which occupies most of the available audio bandwidth and requires synchronisation.

The TM8000 range supports three high-speed serial ports. One at the front of the radio (In either DB-9 or RJ-45 formats), one at the internal options connector and one at the rear of the radio (Auxiliary).

Only one of these serial ports can be assigned at any time for the purpose of data communications. These serial ports are at 3v3 CMOS levels.

The front serial port is the microphone socket on the TM8110 and TM8115. This can be converted to RS232 levels by using the T2000-A19 programming lead and the TMAA20-04 RJ12 to RJ45 adaptor.

The TM8105 blank control head radio front serial connection is a 9-way D-range. This option is also available as a separate part (TMAC10-0T). The Rx and Tx data levels are 3v3 CMOS.

The internal options connector also provides a serial port at 3v3 CMOS levels; this is available as an 18-way micro-match connector. This is typically used to connect to internally mounted options boards such as the 'Internal options Extender' (TMA01-05).

The third serial port is available at the rear of the radio; this is a low-density 15-way connector. Levels are also 3v3 CMOS levels.

An RS232 compliant asynchronous serial port is also available through the use of the Internal options extender board (TMAA01-05).

The choice of Modem for the user ultimately comes down to the amount of data to be transferred and the RF path between the radios.

These Modems have a number of configurable parameters, which are configured using the TM8000 radio programming software. This Technical Note will cover how to configure a radio for Data operation and also the options available within the Programming Software to suit your Data application.

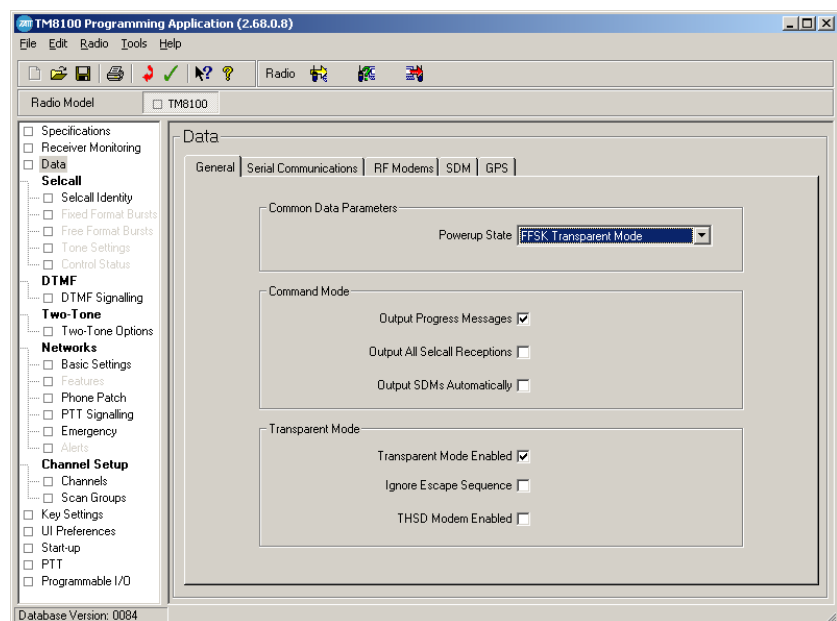
## 2. Programming the TM8100 for Data Operation

### Details

The following are instructions on how to configure the Radio for data operation on the TM8100. It assumes that the appropriate RS232 to TTL converter, for the port in use, is being used between the DTE and the DCE.

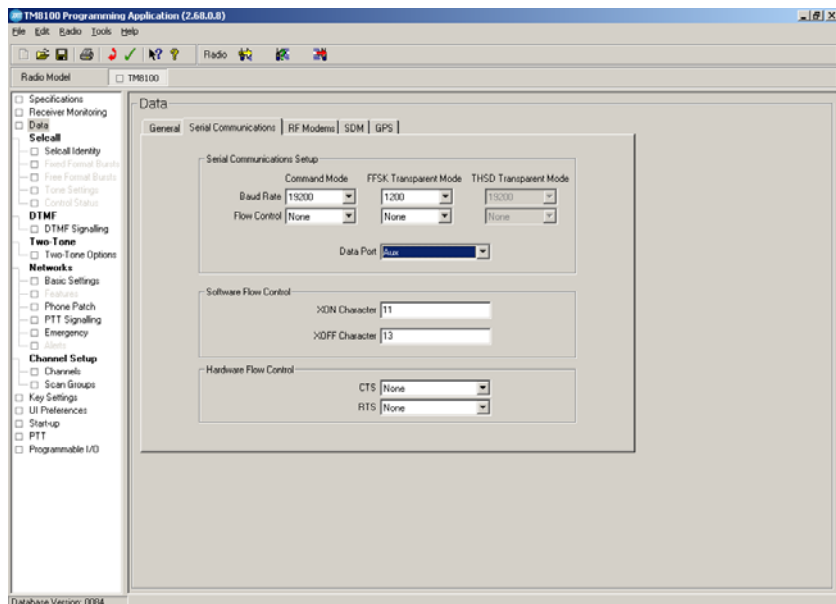
**NOTE:** Included with this Technical Note are two sample data files for 1200 and 19200 BAUD operation (Titled 1k2 and 19k2). These files can be used as a template for your own data file.

### • 1200 BAUD operation



- In the programming application under **Data** select the **General** Tab
- For Transparent operation select **Transparent Mode Enabled** and set the **Power up** state to **FFSK Transparent mode** so that when the radio is switched on it starts up in Transparent Data Mode.

**NOTE:** In Transparent Mode the radio will automatically transmit data over the air once data is presented at the pre-programmed port of the radio approximately 3 seconds after power up. During this brief period of time the radio is in 'Command Mode'. This delay is designed so that there is a brief window that will enable the user to Read/Program the radio.

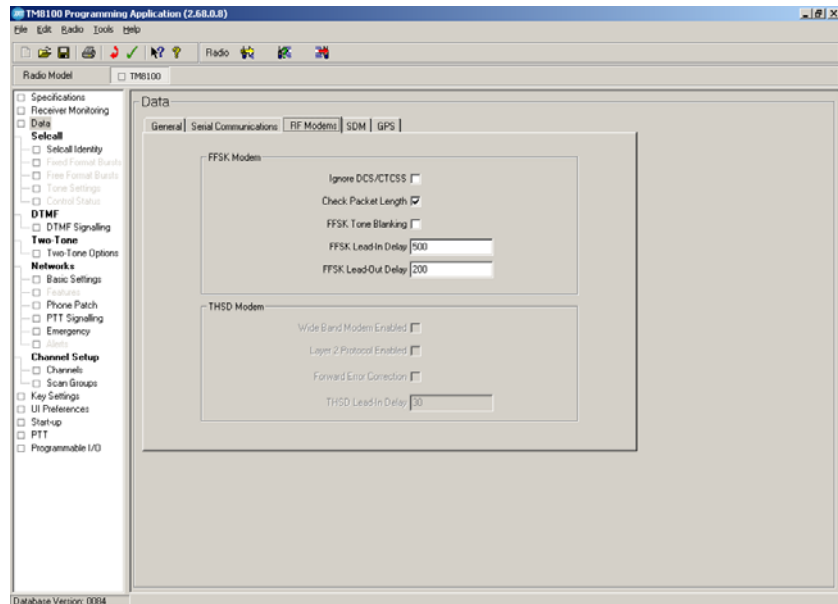


- Select the **Serial Communications** Tab. In this window you set the DTE BAUD rate and Flow control requirements
- Set the **FFSK Transparent Mode** BAUD rate to 1200
- Select Flow **Control** if required. When using the Mic Port with Hardware flow control only one GPIO is available so only RTS or CTS can be chosen. For software flow control Xon/Xoff can be used.
- Select the **Data Port** you wish to use. In this instance we are using the **Mic** port.

**NOTE:** If the BAUD rate of the DTE is higher than 1200 BAUD then some form of Flow Control may be required.

- Select the **RF MODEMS** tab. In this window you define the operational characteristics of the FFSK Modem.

**NOTE:** The 1200-baud FFSK modem does not provide any form of error checking or correction.



- **Ignore DCS/CTCSS** Determines whether the radio requires valid subaudible signalling before processing received data
- **Check Packet Length** enabling this will check packet lengths as data is received causing a small-received data delay. Packets that contain errors will not be sent out the data port.

When this option is not selected the data throughput is slightly quicker, but erroneous data may be sent to the DTE.

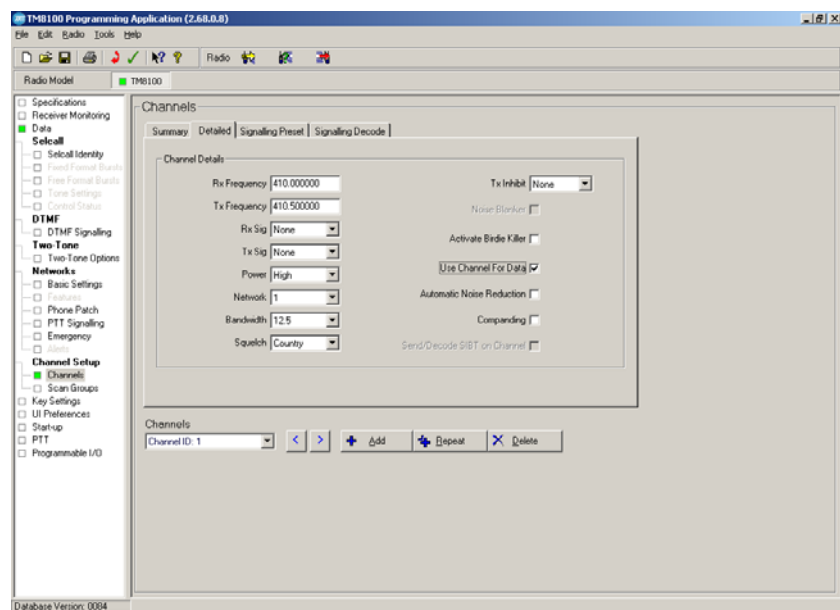
**NOTE:** From testing we have verified that the **Check Packet length** field needs to be **Disabled** when the TM8100 is used with the Kingfisher© Remote Terminal Units.

- **FFSK Tone Blanking** enable this to disable the speaker when receiving data.
- **FFSK Lead in delay** sets a delay after the transmitter has keyed up, before any message block is sent. This may be required if operating through a repeater.

- **FFSK Lead out delay** operates like a Tail Timer and will keep the transmitter keyed up after the Transmission of data is complete.

**NOTE:** The default setting for FFSK Lead-In delay is 500ms and for FFSK Lead-out delay is 200ms. These figures may need to be reviewed if data errors are experienced. A recommended value for Radio-to-Radio communications is 100ms for both the lead-in and lead-out delay.

- Select the Channel **Detailed** Tab under Channel Setup>Channels>Detailed for the channel to be used for data transmission



- Select the **Use Channel for Data** option.

**NOTE:** This option sets whether the channel is optimised for data transmission and reception. When selected certain stages in the radio's audio path will be bypassed. This includes the high-pass audio filter, Automatic Noise Reduction, Companding, de-emphasis, and pre-emphasis.

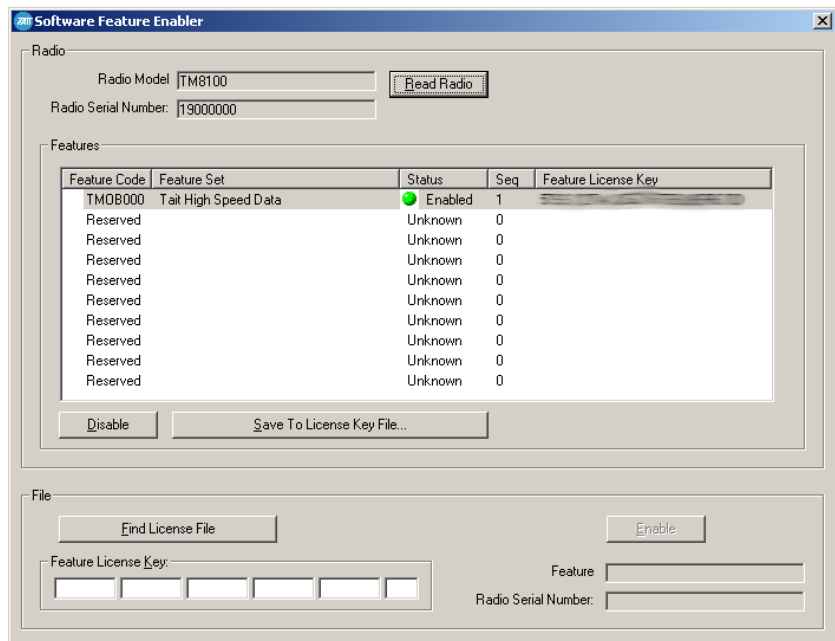
- Complete the programming of the radio for channel information etc. The radio is now ready for operation for 1200 BAUD data Transfer through the Mic port using the T2000-A19 programming lead and the TMAA20-04 RJ12 to RJ45 adaptor.

- **THSD operation**

The configuration of the TM8100 for THSD operation is very similar to 1200 BAUD FFSK operation.

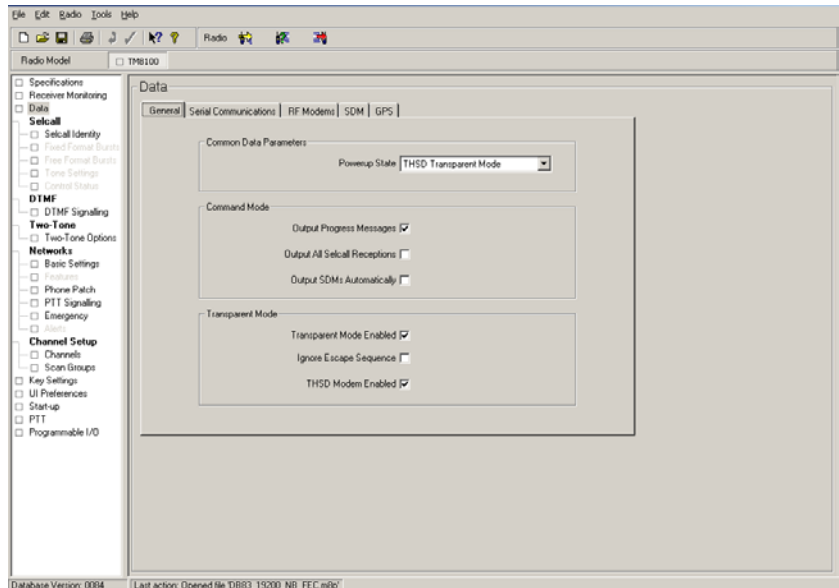
In this instruction, the Radio is going to be configured for Transparent mode operation with a BAUD rate of 19200bps, over a Wide Band channel, with Forward Error correction. The **MIC Port** will be assigned the port used for Data Transfer.

- Ensure your radio is enabled for THSD operation. You can check this under Tools>Optional Features.

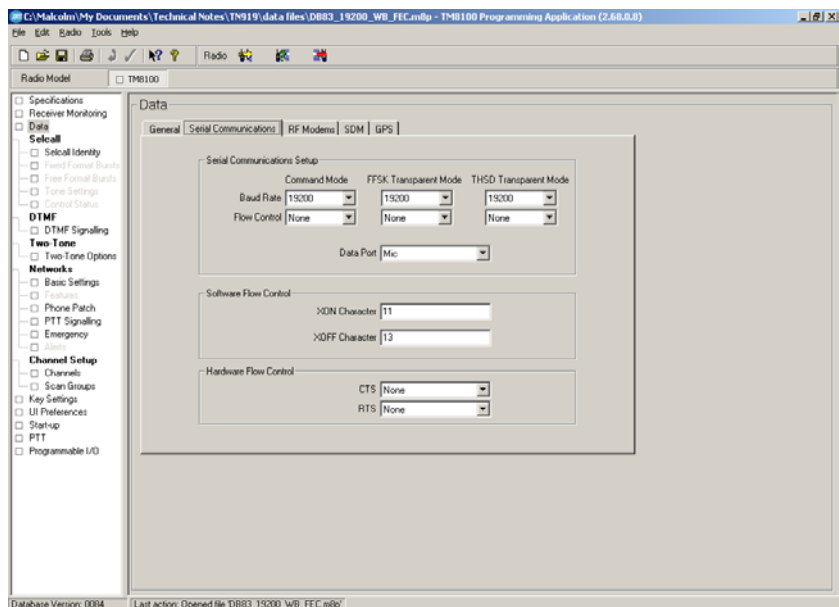


- Select **Read Radio**
- If the SFE option is enabled then you will receive an **Enabled** response as shown above (For security purposes the **Feature License Key** for this example has been blurred out).
- If it is not enabled, then a **Disabled** response will be reported back (Please refer to TN 822 for information on how to enable this feature)





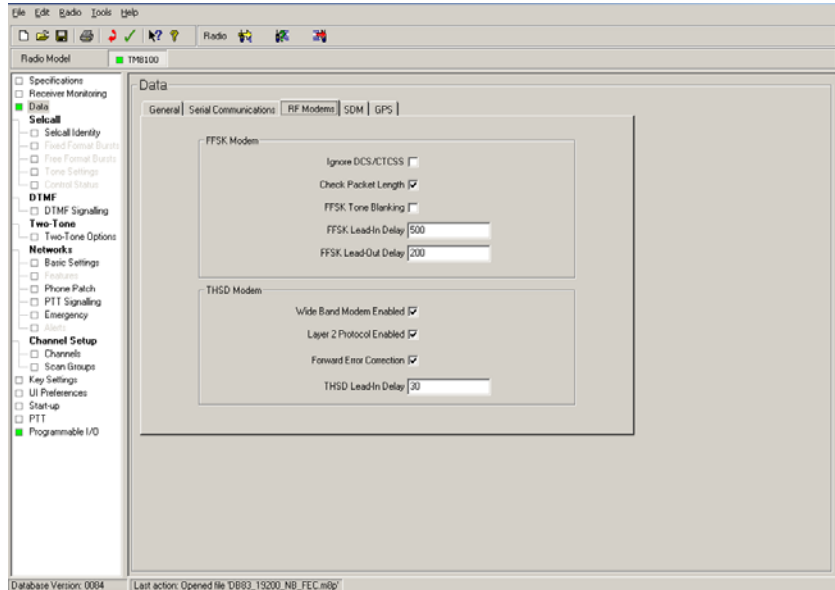
- Once the THSD option is enabled, select the **General** tab under the **Data** field
- To enable the operation of the THSD Modem tick the **THSD MODEM enabled** tick box.
- For Transparent operation tick **Transparent Mode Enabled** and set the **Power up** state to **THSD Transparent Mode**
- Select the **Serial Communications** Tab



- Set the **THSD Transparent Mode BAUD Rate** to the desired BAUD Rate. In this example 19k2bps is being used.

**NOTE:** Over-the-air data is always transmitted at 1200bps for the FFSK modem, and at 12kbps or 19k2bps for the THSD modem (Dependent on Channel Bandwidth). If the baud rate is programmed higher than the over-the-air rate, then flow control may be required to prevent buffer over-run.

- Set the **Flow Control** to **None**
- Set the **Data Port** to **Mic**



- Select the **RF MODEMS** tab. In this window you define the operational characteristics of the THSD Modem.
- When the **Wide Band MODEM Enabled** is selected, data will be sent over-the-air at up to 19200bps for wide-band channels. The maximum rate will drop to approximately 12000bps for medium or narrow-band channels.

**NOTE:** Tait high-speed data fully conforms to the relevant European performance specifications only when operated with this check box cleared. Do not select this check box unless local regulations in the country of operation allow.

- **Layer 2 protocol Enabled** is a simplified layer two protocol that is available as a programmable option. If layer two is not enabled, then the THSD modem will send data in 147- byte 588 symbol blocks.

If there is not enough user data to fill 147 bytes, then the remaining bytes will be padded with a “\”.

Enabling layer two provides a simple Start-Of-Text/End-Of-Text type protocol. With layer two enabled, baud rates to the DCE can be lower than the over air data rate.

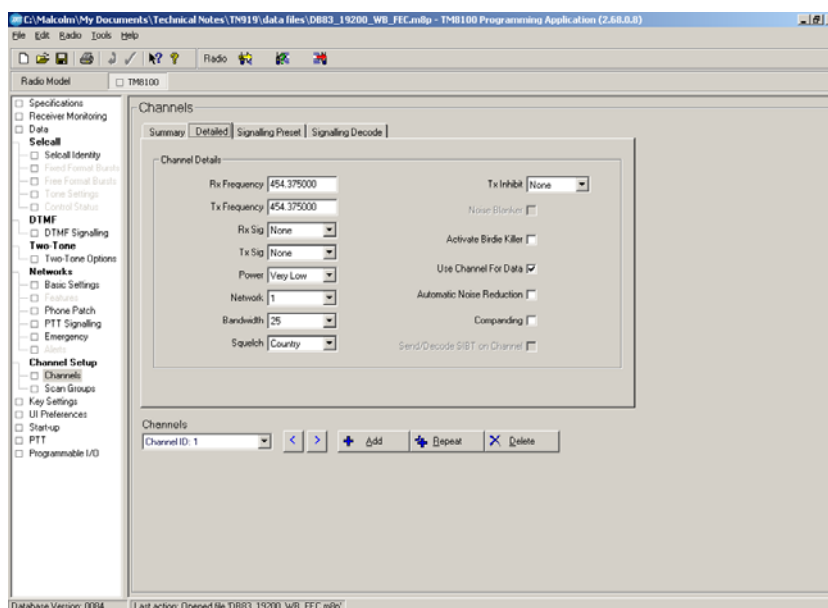
Layer two is useful in situations where the controlling equipment is expecting the original data sent from the transmitting equipment, and no extra characters.

- **Forward Error Correction** This enables the FEC (Forward Error Correction) option within the THSD modem. This uses a Reed-Solomon algorithm and enables the modem to work at lower signal levels.

<p><b>NOTE:</b> The effective throughput of the modem will drop when FEC is enabled. This is due to the extra information added to the data packet to detect and correct errors.</p>
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- **THSD Lead in Delay (mS)** sets the amount of lead in delay before the transmission of data commences. The Functionality of this feature is similar to that of the lead in delay in the FFSK modem. This value is dependent on your system configuration, but a minimum value of 30ms is recommended.

- Select the Channel **Detailed** Tab under Channel setup>Channels>Detailed for the channel to be used for data transmission
- Select the **Use Channel for Data** option.



- Complete the programming of the radio for channel information. The radio is now ready for operation for 19k2 BAUD data Transfer through the Mic port using no Flow Control.

## Related Documentation

- TN822 - How to Use the Software Feature Enabler Application
- TN855-AN – TM8000 Internal Modem

## Compliance Issues

Tait high-speed data fully conforms to the relevant European performance specifications only when the 'Wide Band' Modem is disabled. Do not select this feature unless local regulations in the country of operation allow.

## CSO Instruction

Distribute to those involved with the Configuration of the TM8100 for Data applications.

## 3. Issuing Authority

### Name and Position of Issuing Officer

Malcolm Brown  
Senior Technical Support Engineer

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**Distribution Level**

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**Document History**

Original Release

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