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## TECHNICAL NOTE TN-1038b-SR

### TM8100 Firmware v2.09 and Programming Application v2.92

25 July 2005

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#### Applicability

This Software Release Note applies to the TM8100 Mobile Radios.

## 1. Firmware Changes

#### Resolved Issues

- It was found the Audio DSP did not reset the Audio Tap Out line to zero volts when the audio line goes idle. This caused a DC offset which impacts some third-party equipment. The firmware was changed so the signal processing forces a zero to the DAC when the signal processing is idle. Raised as Focus 20304.
- An issue raised by a TEU customer using the TMAA10-01 Desktop Microphone was that occasionally the radios would not transmit. The problem was traced to a very large bouncing 'spike' that was so long the radio was not interpreting any change of state between the PTT switch being keyed and the PTT input being read. This was solved by re-enabling of the I/O line interrupt to happen before reading the current status of the line. This change doesn't impact normal PTT. Raised as Focus 20844.
- It was noted during extensive testing of TM8100 and TM8200 Vote Group testing that the field Validate Signalling While Voting is enabled by default. The 'channel' outcome at the end of a "Vote Pass" is the same regardless of whether this setting is enabled or not, except it can take 250ms per channel longer with this tickbox enabled even on non-signalling groups. As requested this tickbox is disabled by default now but can be enabled for Groups that do use signalling. Raised as Focus 19865.
- Resolved an issue where the Programmable I/O option Mute Audio Output Path would become disabled if the personality was either written to the radio or saved to disk. Raised as Focus 20792.
- Emergency ANI has been corrected. When in Emergency mode the Emergency ANI sends the correct ID together with the Emergency status. However once acknowledged, and the TM8100 goes into Cycling, the ANI appended has a non-emergency status. Raised as Focus 20091.
- Resolved an issue that occurred when you selected a Scan Group if the radio also had THSD enabled. This caused an 'E1' error to display. This was caused by a missing validation. Raised as Focus 21144.
- Fixed an issue with Repeater Talk Around (Function Key option) where it was not de-activated when a group was selected by another function key, but was for a group that was accessed by scroll keys. Raised as TMS 43980.
- Corrected an error where 'R10' (set as the Rx Tap\_In on the Programmable I/O Audio page) and the radio had a Powerup State set as THSD Transparent Mode would cause the radio to reset. Raised in TMS 44634.

## 2. Prog App Changes

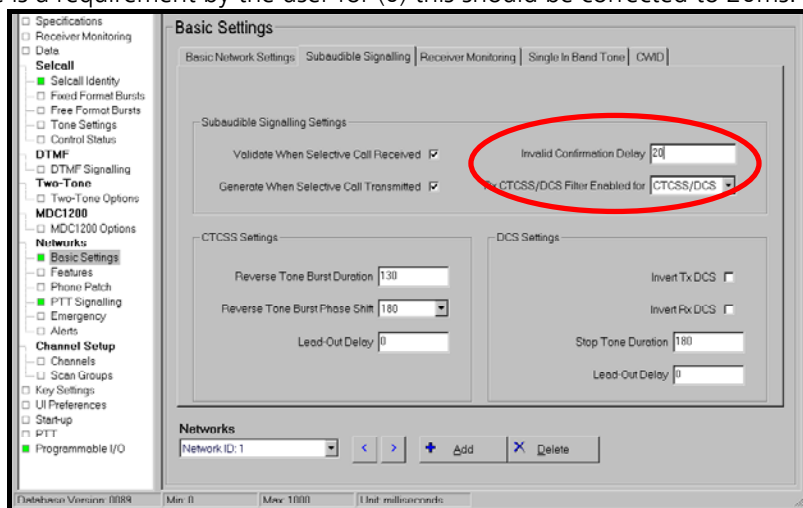
### Power-up Changes

- The Programmable I/O option Toggle Standby Mode has been renamed Power ON (Stand-by).
- The Programmable I/O option Power Sense (Ignition) can only be assigned to AUX\_GPI3 and can only be active HIGH. Although the Programming App allowed it, the Hardware was not designed to work with this line as active Low.
- When Action Enter Emergency Mode is selected for AUX\_GPI2, then the line can only be active LOW. This option can only be assigned to either AUX\_GPI2 or IOP\_GPIO7.
- A new Programmable I/O option has been created called Power Sense (Internal); this Input action can only be assigned to IOP\_GPIO7 and can only be set as active HIGH.

### Invalid Confirmation Delay values

Invalid Confirmation Delay found in **Networks > Basic Settings > Subaudible Signalling** can now be adjusted between the values of 0 and 1000ms. The default is 20ms. This value defines how long the signalling (CTCSS or DCS) on the carrier has disappeared before the receiver closes the mute. This was changed as a result of requests from some users.

Some very early production radios had this value set at (0) in error and this would cause a pop-up error when read into a newer application. Unless there is a requirement by the user for (0) this should be corrected to 20ms.

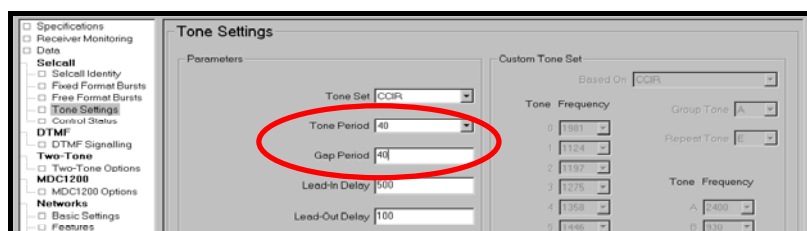


### Selcall's that don't work?

There have been issues raised by some users who couldn't understand why their defined Selcall system didn't decode.

The **Selcall > Tone Settings** page allows the Selcall system user to define the Tone Period and also the Gap Period. The values of these fields are both defaulted to 20ms, but can be variable from the drop-down box on the Tone Period and between 10 and 150 ms in the Gap Period.

The most common reason for a radio that won't decode a Selcall is the Gap Period has been set to a lower value in comparison to the Tone Period. The solution is to set the Gap Period **exactly** the same as the Tone Period, even if the defined sequences do not use Gaps. The Selcall decoder will identify the space between individual Tones as valid Gaps and interpret the incoming format as such. Technically the Gap should be at least 66% duration of the defined Tone Period.



**First Serial Number**

From radio serial number **(TBA)** all TM8100 radios built have Firmware v2.09 installed.

**Upgrading existing radios**

For upgrade firmware procedures please follow the instructions in **TN-969**.

### 3. Enhancements

**TMAA02-08  
Keypad  
Microphone**

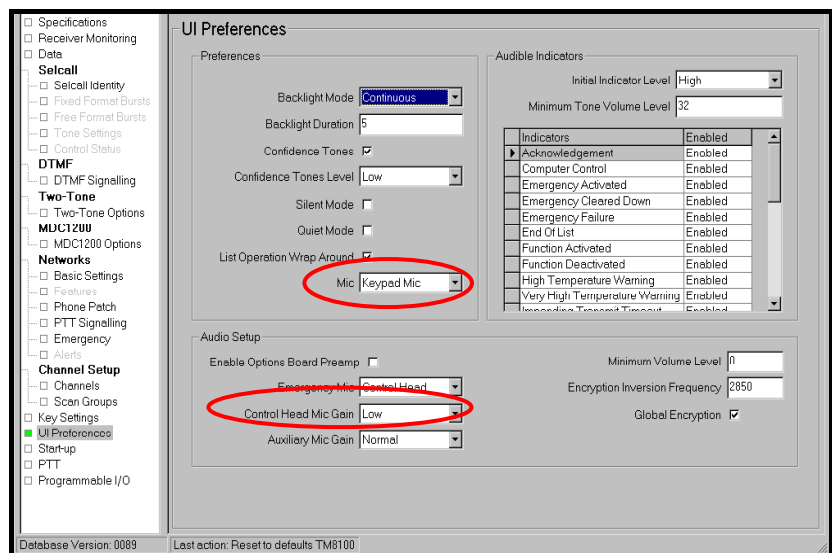
Versions 2.09 or later firmware can now support the TMAA02-08 Keypad Microphone allowing quick/direct channel access.

As shown in the screenshot below, the new field Mic on the UI Preferences page allows the option of Keypad Mic. When this is enabled the radio will expect there to be a TMAA02-08 Keypad Mic to be connected and allow direct entry to any 2-digit channel/group ID.

The keypad Microphone's backlighting mode will follow the TM8100's programmed setting.

**Points to Note:**

- The audio gain of the TMAA02-08 is slightly higher than the TMAA02-01 standard microphone and if this causes issues for customer's it is suggested the Control Head Mic Gain be set to Low.
- The Control head port cannot be enabled for keypad Mic if the Data Port or the GPS Port is already set to Mic.
- Once the radio is programmed for the TMAA02-08 it will need to be powered-off and on when reading and writing in the same fashion as transparent data as the port is only expecting data from the Mic.
- When entering channel ID's two digits are always required i.e.: Channel 8 is entered as '08'. The user has 3 seconds after the first digit to enter the second digit. If this time expires OR the requested ID does not exist the radio will revert to the previous channel ID.
- The up/down scroll keys function in the same way as the front panel buttons, but the two 'function' keys to each side of scroll have no function.
- The TMAA02-01 standard microphone can still be used if required.



**High VSWR Alarm**

The TM8100 will now emit from the speaker a single two-tone warble on PTT when a Standing Wave Ratio greater than 5:1 is measured. The radio will automatically change to Very Low RF power (1W) on the 25W radios and 10W on High Power models for the duration of each high VSWR transmitted carrier.

## Transmitter Lead-Out Delay

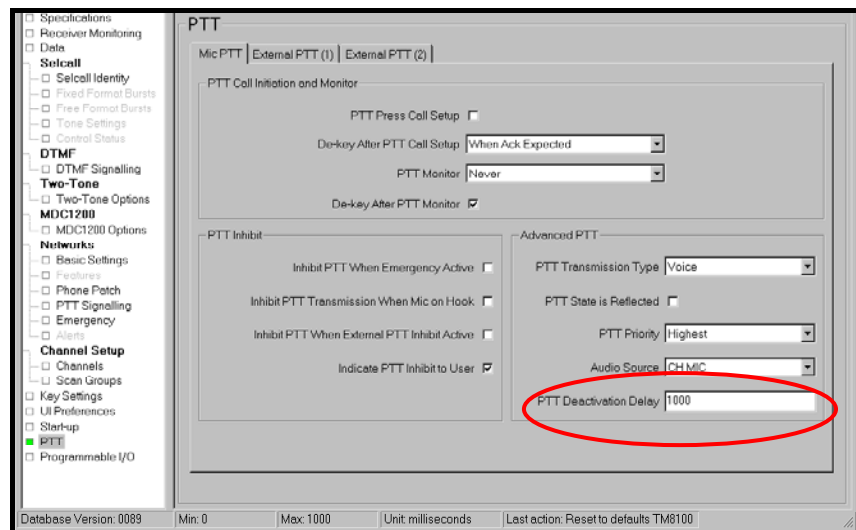
A new field has been introduced in the Programming Application providing a transmit 'hold' timer. The PTT Deactivation Delay can be set differently on each PTT tab from 0ms to 1000ms. Default is 0ms.

This duration will hold the radio in its previous transmitting state, complete with any signalling such as CTCSS, active. When the timer has elapsed the radio will process the normal PTT release functions such as Reverse Tone Burst, Trailing ANI etc if enabled.

This helps solve two requirements:

- (1) An issue noted for a TCL customer where the radio was chopping off the last part of external input audio data due to the time required processing the data through the radio to air. In this case only a few milliseconds is required. Raised as Focus 18719.
- (2) Users who were coupling two TM8100's together as a repeater requested a way of encoding a transmitter 'repeater tail'. This could be achieved previously by paralleling two EPTT inputs and using different debounce settings for fast-attack and slow-release. But the maximum duration available was only 200ms.

This field will also be ported into the next release of the TB7100.



## New CCDI Commands

New Computer Controlled Data Interface query command features added based on CCTM commands 318 and 319 are:

- Request Transmit RF Forward power reading -- **q0453185A**
- Request Transmit RF Reverse power reading -- **q04531959**
- Request current RSSI reading -- **q0450645C**

The responses for these commands are:

**j06318634F7** - Response to a forward power reading, in this case the forward power reading is "634". The response is an ADC value with a range from 0 – 3000.

**j06319191F8** - Response to a reverse power reading, in this case the reverse power reading is "191". The response is an ADC value with a range from 0 – 3000.

**j07064-896c1** - Response to an instantaneous RSSI value, in this case the reading is "-896" or -89.6dBm. The response is a value in 0.1dBm steps in the approximate range from -1400 (-140.0dBm) to -240 (-24.0dBm). Originally implemented as a TCI job a2482.

## TaitAx Scanning

TaitAx (also known as MultiAx) is a Scan group type that operates the same as a Standard scan type until the PTT is pressed or 'flashed', then the radio starts looking for the **next free** channel that it can transmit on.

If this is the first action after entering Scan the channel chosen will be the first in the Scan member list.

If the scan group has become idle OR the Group Hold Timer has expired and a user PTT's, the radio will select the **next** channel in the scan list and transmit on that.

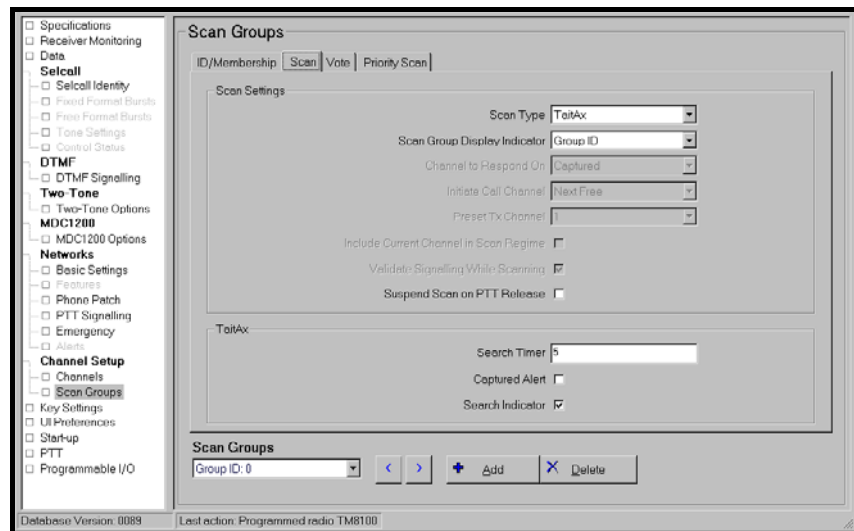
The radio will always transmit on any currently captured channel (until the Group Hold Timer expires) as per Standard Scan operation.

If no channel is free and the Search Timer duration (variable between 1 and 10 seconds) has elapsed, the Tx inhibit tone [a single low-tone beep] sounds, and scanning resumes.

Captured Alert, when selected will give the Channel Freed tone [a triple-beep sequence] when a valid free channel is available.

Search Indicator, when selected will give the Search tone [a bop-bop sequence] when it is looking for a free channel.

NOTE: this is a quieter level in comparison with the alert tones.



The objective of TaitAx as a Scan type is to utilise all channels (repeaters) in the area equally by ensuring users are accessing the next repeater.

**Note:** TaitAx is an optional feature, and can only be enabled in the radio after obtaining and entering a (SFE) license key. TMA5014.

## MDC1200 Signalling

MDC1200 (encode only) Signalling is now supported within TM8100 firmware. Up to 4 different MDC1200 profiles can be defined.

The network can have a MDC1200 profile in the same way as a DTMF or Selcall profile.

The Radio ID uniquely identifies the radio when transmitting MDC1200 ANI or emergency sequences on channels associated with this channel profile. The ID is in 4-digit hexadecimal format (0 to 9 and A to F).

The ANI Sequence and Emergency Sequence can all be defined with different ID's if desired.

**Note:** MDC1200 is an optional feature, and can only be enabled in the radio after obtaining and entering a (SFE) license key. TMA5012.

## CCDI 'Big SDM'

A number of sales prospects required more than the normal 32 character Short Data Messages. The CCDI3 command has following format called "adaptable SDM", will allow a string of up to 128 characters:

**a [Length] [Lead-in-delay] 204BigSdmString [Radio-ID] [Checksum]**

Length => 2 character (hexadecimal)  
 Lead-in-delay => 2 character (hexadecimal)  
 204 => GFI = 2 (type is ASCII), SFI = 04 (Code is "Big SDM")  
 Radio ID => 8 characters  
 Checksum => 2 characters

The example below will send a 128 character SDM to unit 00002233:

a8D192040000223301abcdefgh02abcdefgh03abcdefgh...13abcdef7D

The SDM text data is split into several FFSK frames and put back together at the receiving radio. The backwards compatibility is maintained, since the GFI/SFI is not "0", so earlier firmware or other radio models will simply ignore the received 'Big SDM'.

## Using CCDI to control a CCR

CCR is "Computer Controlled Radio". This is the ability to set a TM8100's current channel personality in real-time, usually from a PC or similar device.

This enhancement to the TM8100 provides for the ability to convert received Short Data Messages into CCR commands. This provides the ability to remote control a TM8100 radio.

The following needs to be enabled as a minimum:

- SDM is enabled and the radio unit has a SDM identity.
- SDM Format is CCDI3 (only currently available in the TM8100).

Where the CCDI String is built with:

**a [Length] [Lead-in-delay] [203] [Radio-ID] [The CCR command] [Checksum]**

Length => 2 character (hexadecimal)  
 Lead-in-delay => 2 character (hexadecimal)  
 203 => 2 (type is ASCII), SFI = 03 (Code is SDM)  
 Radio ID => 8 characters  
 The CCR Command – R09159200000084  
 Checksum => 2 characters

Example:

A despatch TM8100 radio in CCDI mode can send this string to a remote TM8100 (ID 00002233) that's already in CCR mode.

String: a1B1120300002233R0915920000084C3

The remote TM8100 will process the "set receive frequency" command and change the Rx frequency to 159.200000 MHz.

To exit CCR Mode the string **E005B** sent will initiate a software reset in the same way as the "^" character and exit to normal channel mode.

## CCR Squelch

An addition to the CCR command set is Set Squelch.

This command configures the TM8100 radio's operating busy detection criteria. Where the CCR String is built with:

**K [ss] [p] [x] [CC]**

K denotes the set squelch threshold command

ss is the number of x characters. Always "02"

p is the busy detect method:

"R" determines busy by RSSI.

"N" determines busy by Noise level (SINAD)

x is the Squelch threshold levels:

'1' – Country

'2' – City

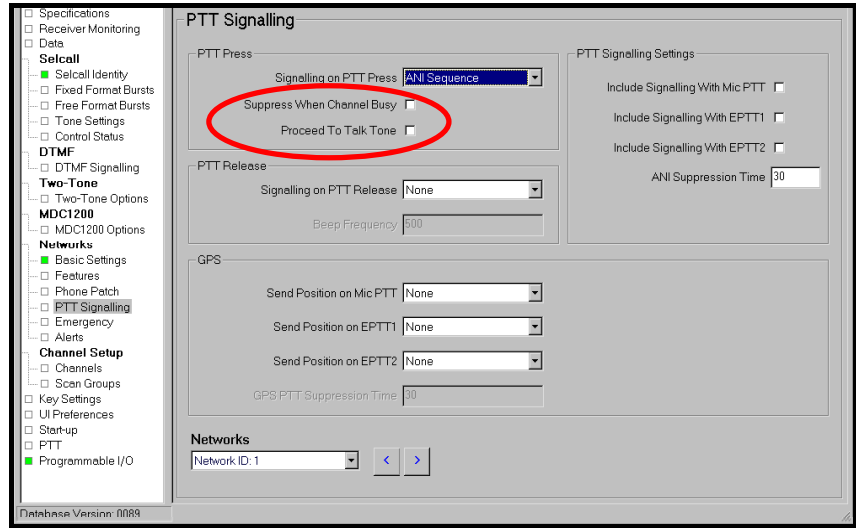
'3' – Hard

CC is the checksum

This string: **K02N3D2** will set the receiver to Hard squelch in a SINAD (Noise Level) Network.

### Proceed to Talk Tone

This is an audible tone heard from the speaker at the end of a PTT Leading-Edge ANI to inform the user they are now free to speak. The tickbox on **Networks > PTT Signalling > PTT Press** un-greys if the current network is Selcall and the Signalling on PTT Press is ANI Sequence.



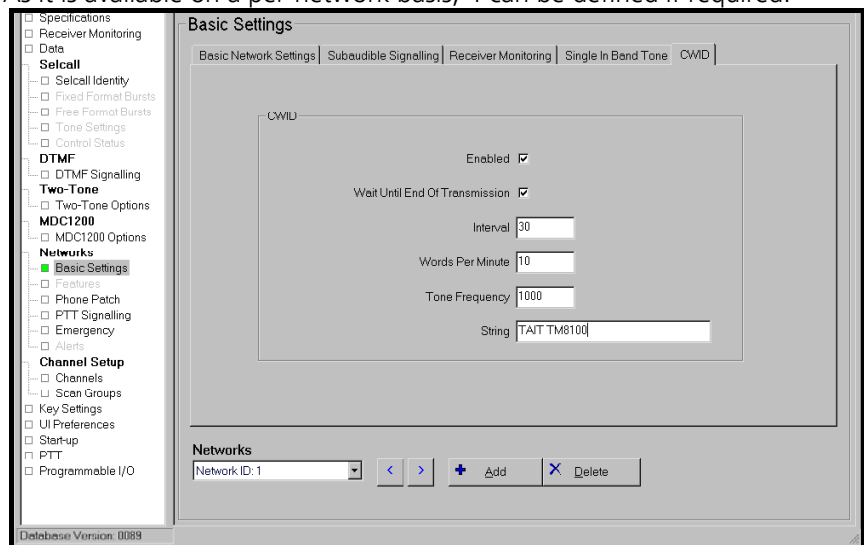
### CWID

A new tab has been added to **Networks > Basic Settings** called CWID. CWID is Carrier Wave Identity. On FM systems tones are used to duplicate the effect of Carrier Wave being received. The Tone Frequency can be varied from 400 to 2000 Hz.

The Interval is the time between Strings being sent to air in 1-minute steps from 1 to 240. The message string is not sent over any active transmission if Wait Until End Of Transmission is enabled.

The String can consist of up to 30 elements from the list of: 0123456789ABCDEFGHIJKLMNQRSTUUVWXYZ.,:?'-/()". This includes spaces. The default text is "MESSAGE". The message is sent over the air at a Words Per Minute rate between 5 and 30 in 5wpm steps.

As it is available on a per-network basis, 4 can be defined if required.

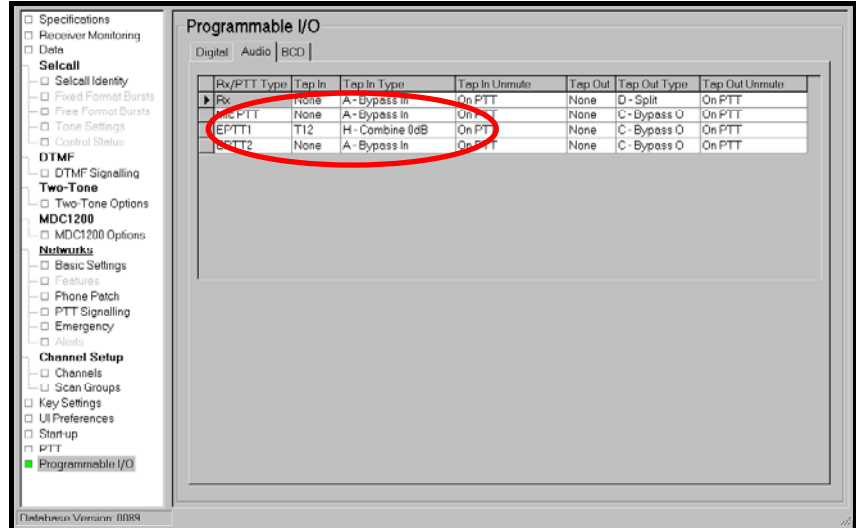


### Combine and Combine (0dB)

Originally developed for the TB7100 Base station, a new Tap\_In type called H-Combine 0dB has been added to Programmable I/O > Audio tab in the Programming Application.

The TB7100 uses T12 Tap-In for MPT1327 trunking applications where FFSK from the CCM and normal speech audio are both required to be processed by the transmitter.

Speech audio is applied via Aux\_Mic\_Aud but it is not desirable to have this audio scaled by -6dB, using just B-Combine, as this will result in only half the required deviation and increasing the audio drive level to compensate, would cause the limiter to prevent this increase being passed on to tap T12.



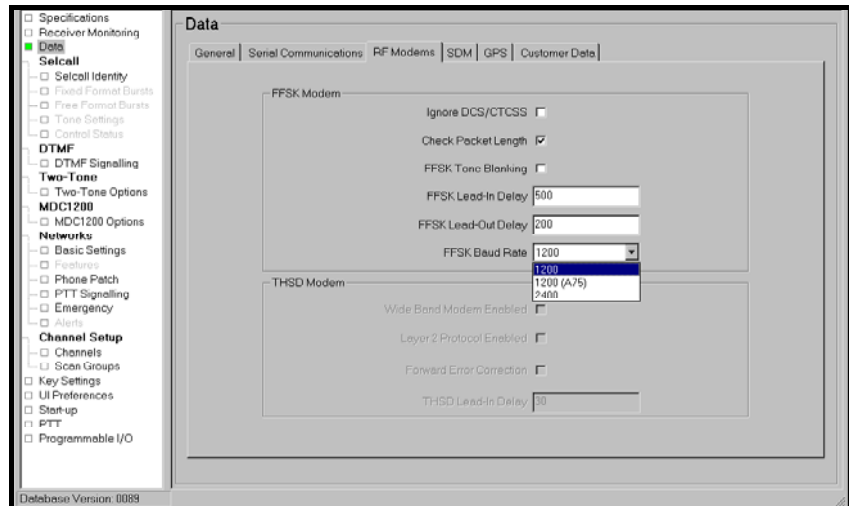
### 1200 Baud FFSK in T2000-A75 systems

FFSK 1200 baud on the T2000-A75 (data interface board) runs approx 8bps slower than on the TM8100. Some customer's experienced problems putting new TM8100's into those existing networks.

The standard TM8100 implementation has a shorter first frame of 16 bytes to help get onto the channel quicker. For normal operation this has no effect on overall modem performance, however transmitted data with long strings of 'zeros' or 'ones' results in the first symbol transition following the long same-symbol string being lost altogether or replicated depending on the direction of data between the TM8100 and the T2000-A75.

The implemented solution in the TM8100 checks for long strings of 'zeros' or 'ones' and when the string length reaches 20, the symbol interval for the next transmitted symbol is increased by one sample.

Found in **Data > RF Modems**, the drop-down box for FFSK Baud Rate has the options of 1200 for normal TM8100 operation, 1200 (A75) for use with existing systems with T2000-A75's and 2400. This last option is to be included in later enhancement work on the TM8100.





## Correction to Prog App

The first version of Programming Application in this release was v2.90. However an error was found where the Transmit Frequency band of operation for D1 (216 to 266 MHz) was incorrectly limited as (216 to 226 MHz).

This error was quickly resolved and a new Programming Application has been released, v2.92. This is the only change over v2.90, so if v2.90 is installed and the D1 band is not used in your market there is no requirement to replace your Programming Application.

All CD-ROM's with TM8100 Programming Applications included, TMAA20-00 and TMAA20-01, will now include v2.92 as release version.

## Compliance Issues

None.

## CSO Instruction

Inform all sales and service staff of the released versions.

# 4. Issuing Authority

## Name and Position of Issuing Officer

Graham Brenchley  
Technical Support Engineer

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## Distribution Level

Associate.

## Document History

Original Release	25 July 2005	GCB
Prog App correction and version update	5 Aug 2005	GCB