Technical Support
TECHNICAL NOTE

TECHNICAL NOTE TN-842-AN

Direct Connect GPS operation with the TM8100

2nd August 2005

Applicability

This Technical Note provides details on how to configure TM81xx radios for AVL (Automatic Vehicle Location) operation.

1. Introduction

One of the advanced features of the TM81xx is its ability to support a vehicular location service.

The TM8100 is able to process data received from a GPS receiver (GPRMC NMEA 0183 format only). The radio can then be polled using a 3rd party application, and provide its current position and velocity.

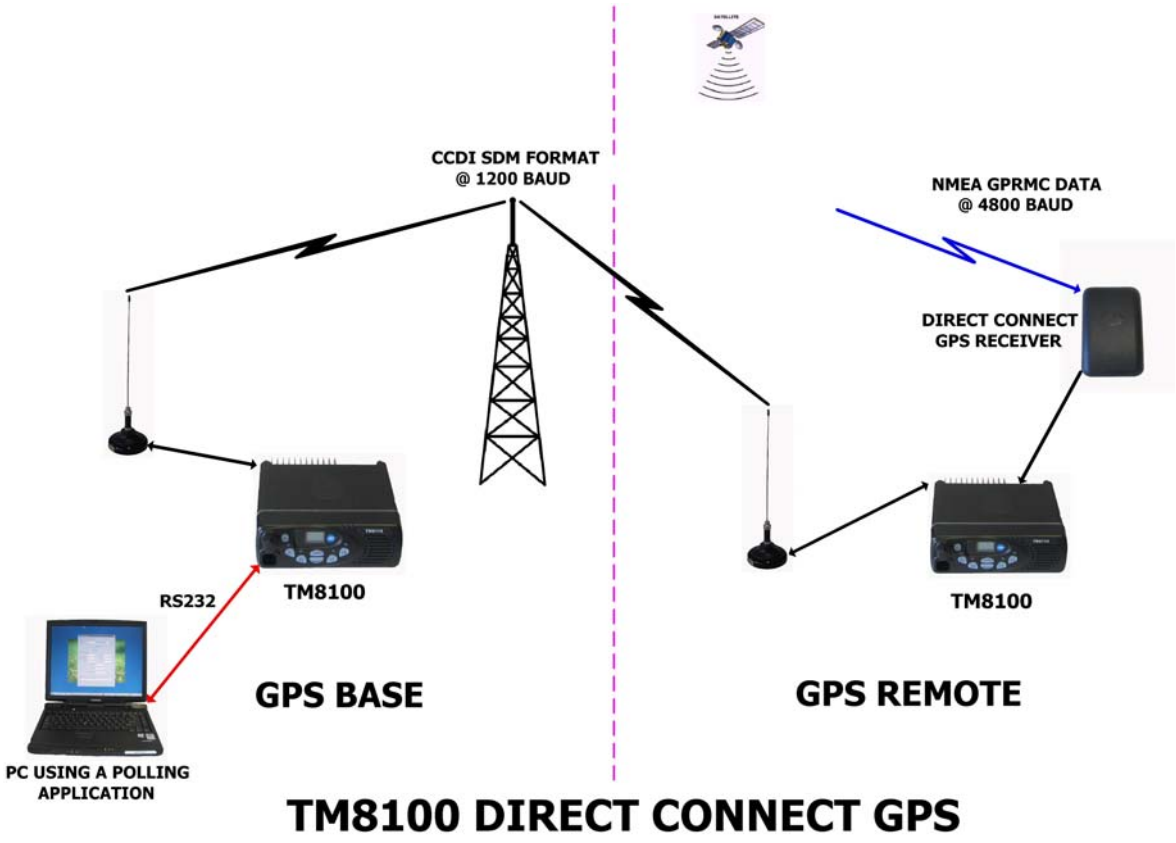
There are many applications that could make use of this feature, examples include:

- **AVL (Automatic vehicle location)**

  Any situation where there is a requirement to provide real time tracking of vehicles and/or keep track of members of a fleet. This could be either "manual" or "automatic" requests for a vehicles location. (The sample supplied with this application note is using manual polling)

  - Taxis / couriers.
  - Locating vehicles in emergency situations.
  - Environmental tracking for application of chemical fertilisers, crop spraying and pest control.

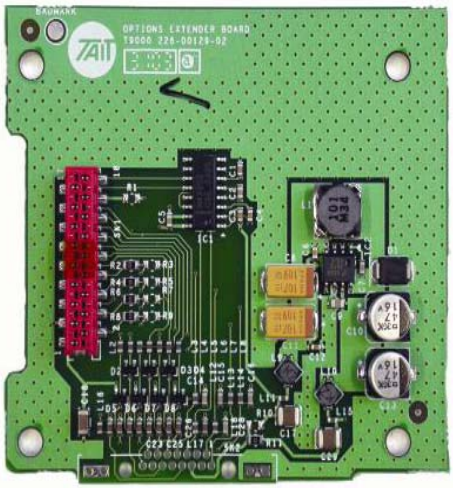
- **Asset tracking**
  - Traceability: locating where expensive equipment is currently being used.
  - Security: Locating stolen assets.
  - Real time user charging (Road tolling).



TM8100 DIRECT CONNECT GPS

2. Details

NB: 13.8v is available from all 3 connectors to power the GPS unit – if the GPS unit requires another voltage an external regulator would be necessary. For units that require 5V, an options extender PCB (TMAA01-05) may be fitted that will provide this voltage



Operational Description

In the 'TM8100 Direct Connect GPS' example, on the previous page, the GPS base radio is controlled via a PC polling application. It polls the GPS remote radio using 1200 Baud CCDI SDM's.

The Remote radio processes incoming GPS data from the GPS receiver, packages it into an SDM and sends it over the air back to the base, again as a 1200 baud CCDI SDM.

The data from the GPS unit to the radio is at 4800 baud and is in the NMEA GPRMC format.

To reduce the "on-air" time, the data is compressed and not all portions of the RMC sentence are transmitted.

The base radio unpacks the data and sends it, via the serial port, to the PC to be displayed within the polling application.

GPS Rx Connection details

There are 3 points of connection required to the radio:

1. Power for GPS Rx
2. Ground
3. Data input to the radio

The unit can be connected to any of the 3 serial ports on the radio. NOTE: Correct power supply requirements for the GPS RX may not be supplied on the selected ports.

1. Control Head (Microphone RJ45 or blank head DB9 connector)
2. Auxiliary DB15
3. Internal options.

Options Extender PCB

Table 1 below shows the connection points to the 3 available serial connectors on the radio. In this example a **GARMIN** -16HVS GPS receiver was used. Other GPS receivers may require different configurations.

GPS Receiver (GARMIN) Connection	8115 (RJ45)	8105 (DB9)	AUX (DB15)	Internal Options 18way micromatch	Control Head (18 Way SMD Header)
+13.8Volts PIN 6 (RED)	2	6	8	1	2
GND PIN 7 (BLACK)	6	8	15	3	6
RXD (on the Radio) PIN 3 (WHITE)	7	4	3	17	7

Table 1: TM8100 - Direct Connect GPS Receiver Connection details

Radio Programming Details

Two data files (**Base.m8p & Remote.m8p**) have been created and are included with this Application Note. The following programming details highlight the fields that have been configured within these two files. They are intended as a useful starting point.

The **BASE** and **REMOTE** TM8100's need to be configured so that they have unique data identities, can send and receive SDM's and that the supported GPS SDM format is selected.

Base radio Configuration

(Refer to FIG1)

1. Under **DATA>GENERAL** select the **POWERUP STATE** as **COMMAND MODE**
2. In this same field select **OUTPUT SDMS AUTOMATICALLY**

(Refer to FIG 2)

3. Under **DATA>SERIAL COMMUNICATIONS** select the required **BAUD RATE** (This example has 9600 selected)
4. In this same field select the **DATA PORT** to be used to connect the radio to your P.C.

(Refer to FIG 3)

5. Under the **DATA >SDM** tab, select **SDM ENABLED**
6. Choose a unique **UNIT DATA IDENTITY**
7. From the dropdown box for **SDM FORMAT** select "**CCDI2 GPS"**

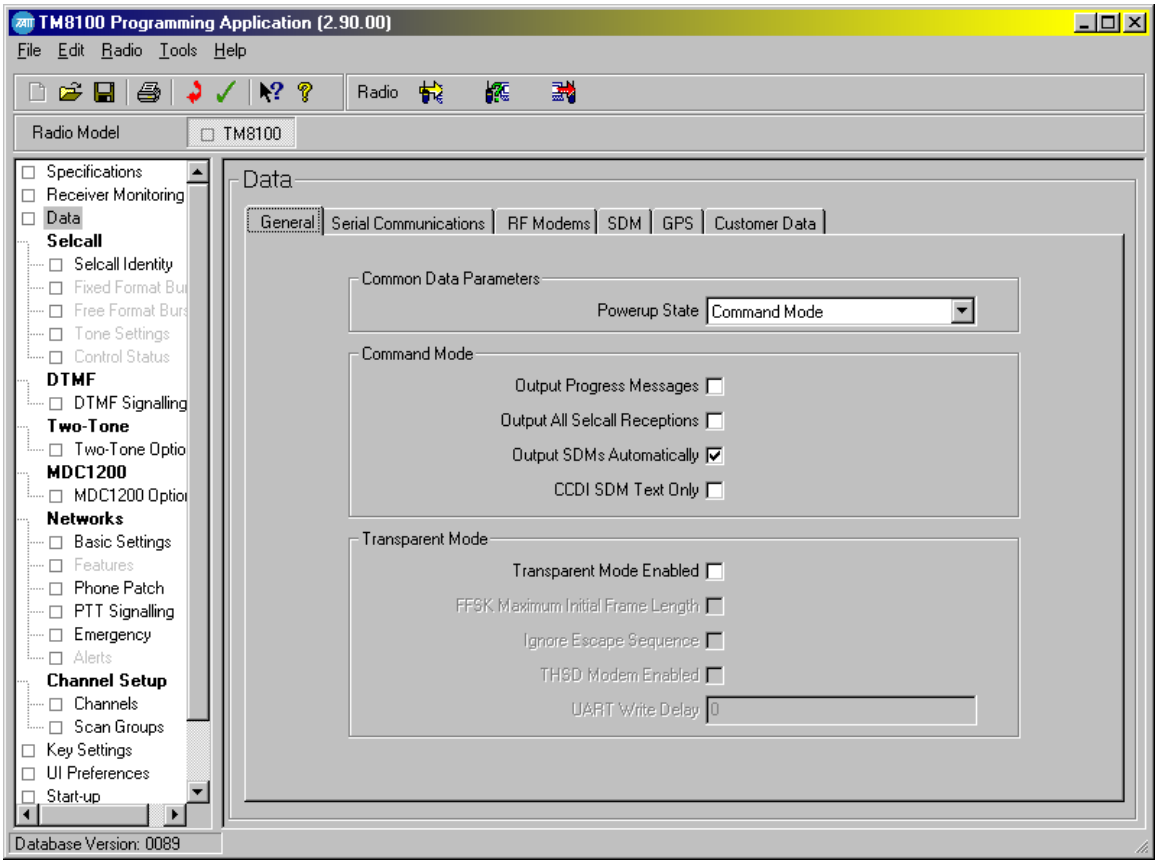


Fig 1: Base Radio Configuration

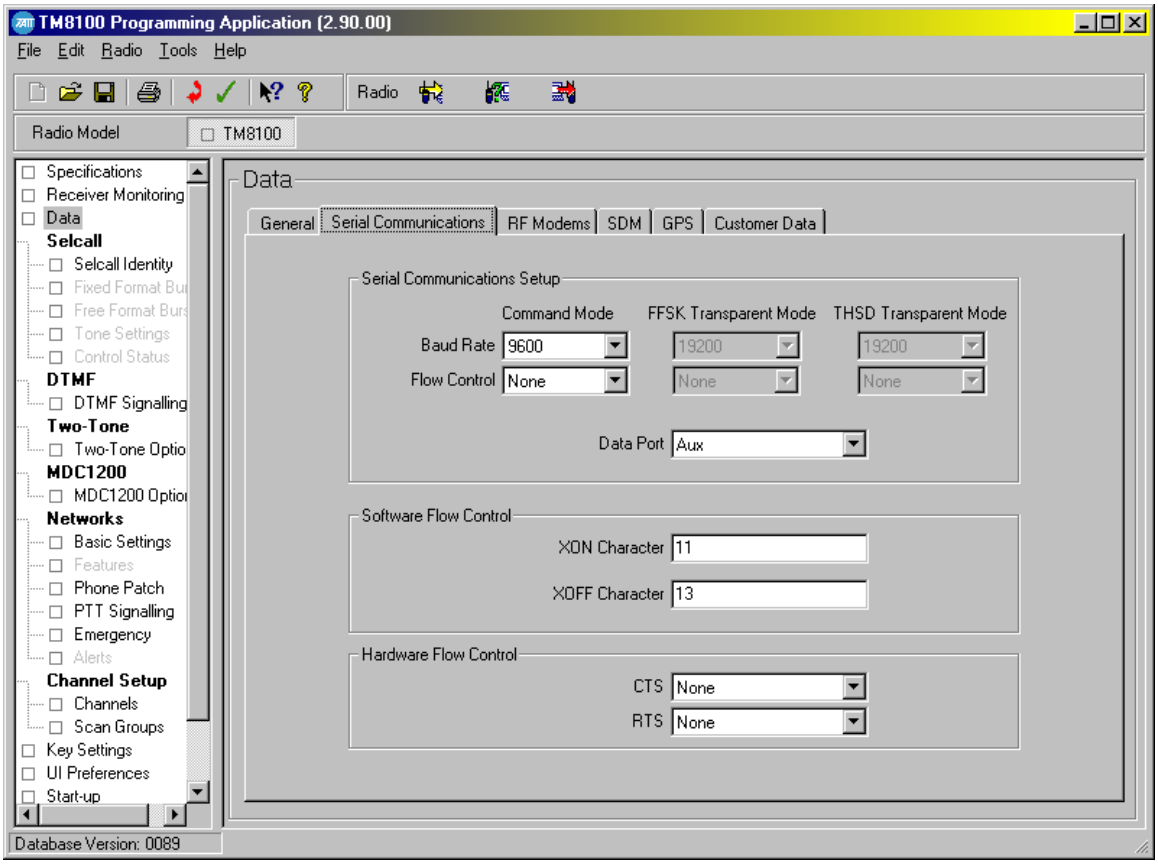


Fig 2: Base Radio Configuration

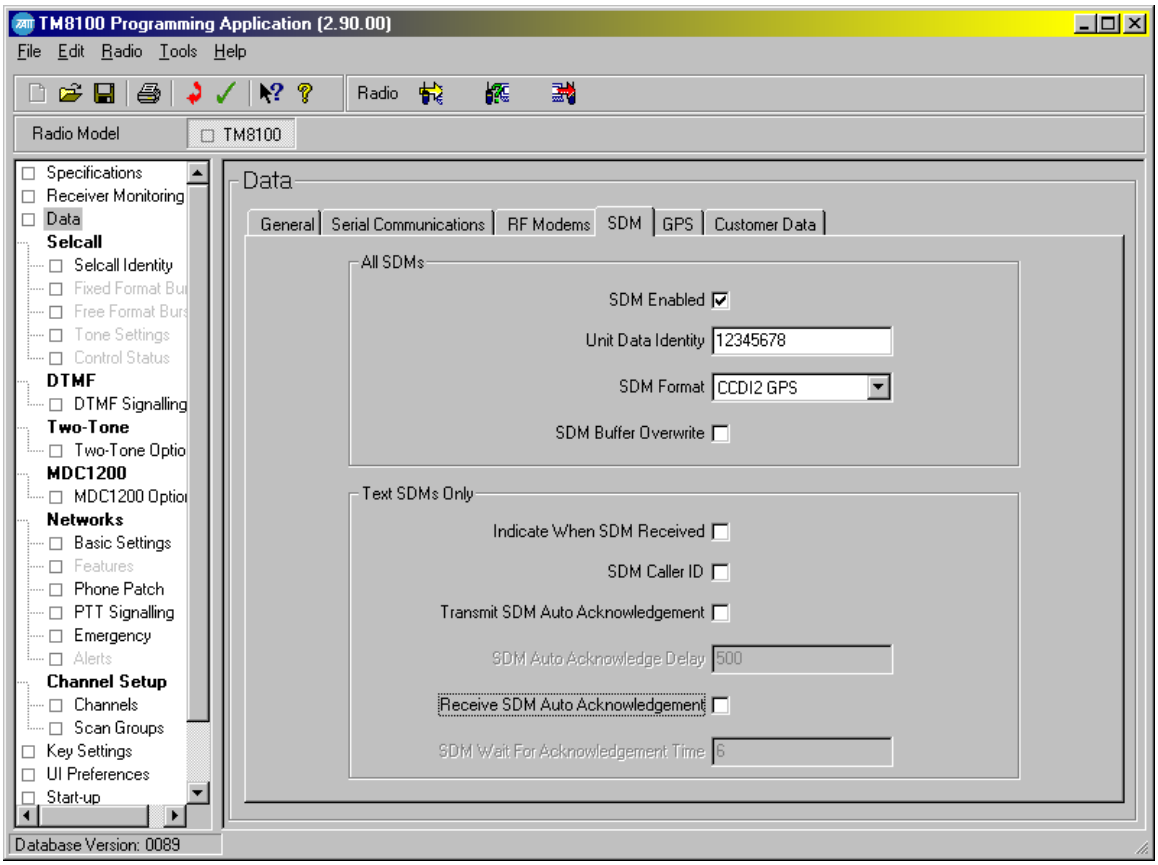


Fig 3: Base radio Configuration

Remote Radio Configuration

(Refer to Fig.1)

1. Under **DATA>GENERAL** select the **POWERUP STATE** as **COMMAND MODE**

(Refer to Fig. 3)

2. Under the **DATA >SDM** tab, select **SDM ENABLED**
3. Choose a unique **UNIT DATA IDENTITY** for this radio i.e. different to the base radio and any other radio in your fleet. (87654321 was used for this example)
4. For the **GPS SDM** format select "**CCDI2 GPS"**

(Refer to Fig. 4)

5. Under the **DATA>GPS** tab select **GPS POSITION REPORTING ENABLED**
6. Enter in a **CONNECTION TIME OUT** value. This is the time the radio allows before sending back the response 'GPS not operational' if there is no data being received from the GPS RX.
7. Insert the data identity of the base radio in the **DISPATCHER ADDRESS** field.
8. Select the serial port of the radio that will be used to connect to the GPS receiver (It must be different to the Data Port)
9. Select the required baud rate of the GPS RX (Usually 4800 for most GPS receivers).
10. Enter in a **POLL RESPONSE DELAY TIME** if required
11. The **GPS LEAD-IN DELAY** field is used to set a 'Lead in Delay', to overcome delays encountered when operating through a Repeater, before the SDM response is transmitted.

12. Select whether you want the poll response from this radio to go out on the current or another dedicated channel in the **CHANNEL SETUP** field.
13. The operating parameters of the **ALARM** (When Activated via a GPIO on the AUX connector) are set within the **ALARM FIELD.** These are how often a GPS Position report is sent out and at what interval (For more a more detailed description refer to the **ALARM MODE** field at the end of this document).

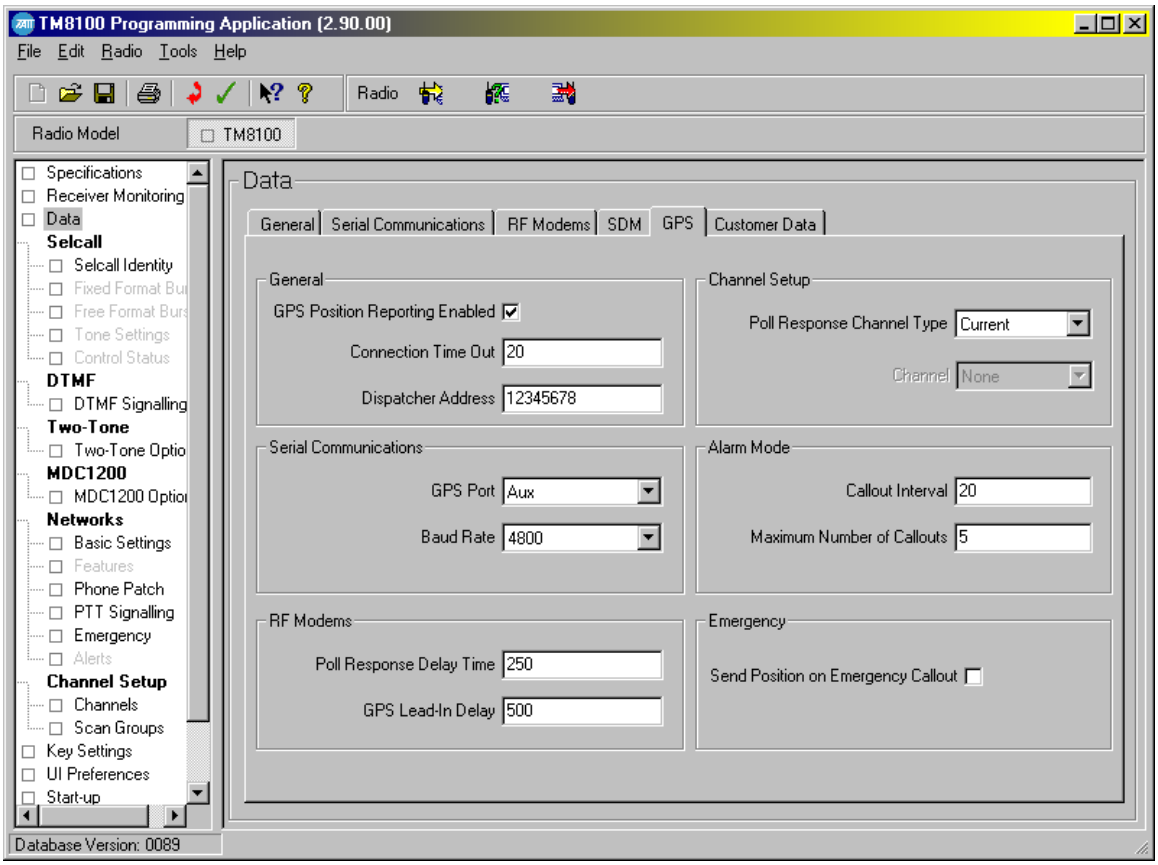


Fig 4: Remote radio Configuration

Radio Polling

A simple windows based polling application (**Called "Tm8000_v1.1.exe"**) is also provided with this application note. Load this application on to the PC that will be used with the **BASE** radio.

Before use, set up the Com port that will be used to connect to the radio as well as the baud rate of this port. (Refer to Fig 5)

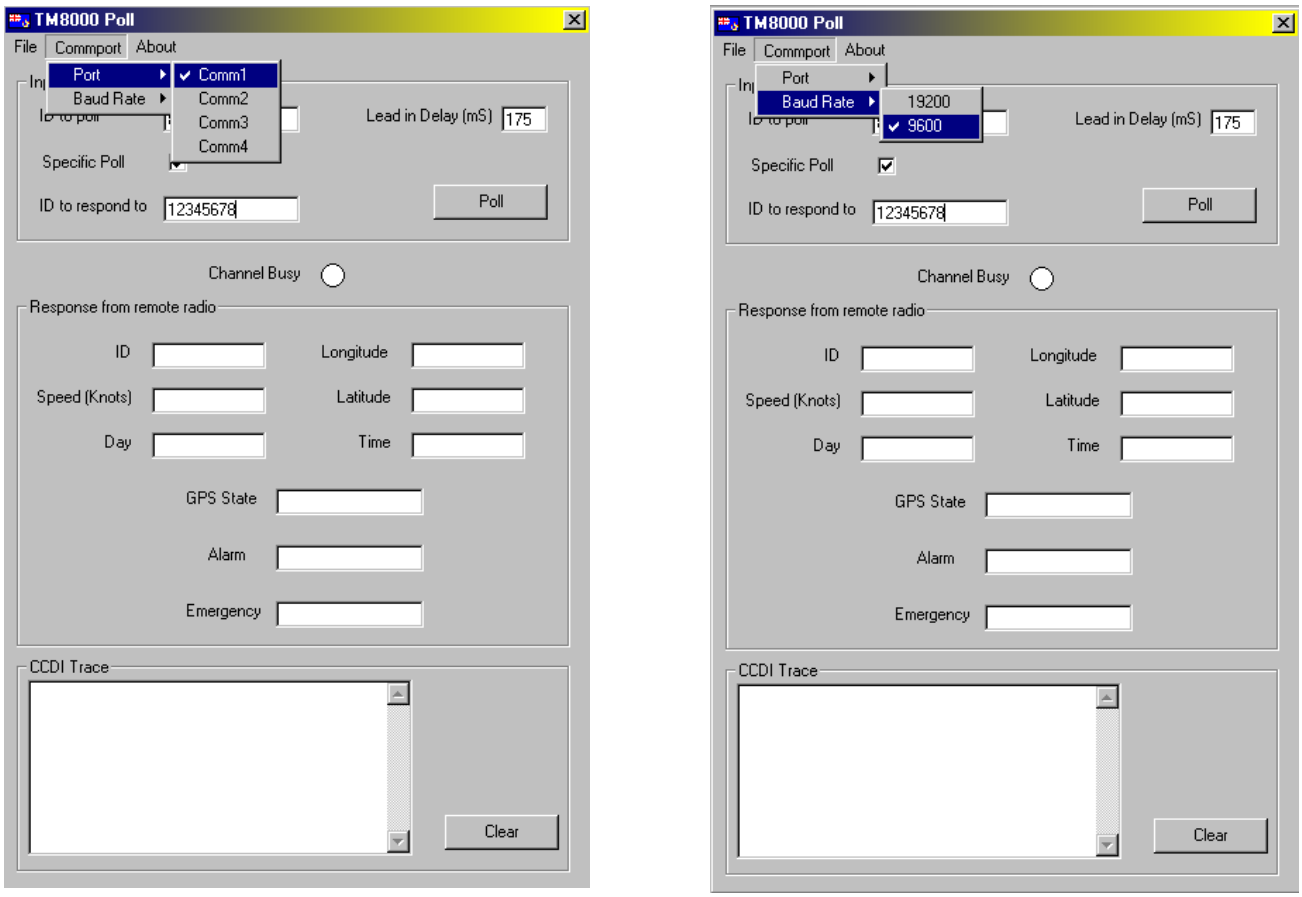


Fig 5: Configuring Comport and BAUD rate for Polling Application

(Refer to Fig. 6)

1. To poll the remote radio, enter the remote radios Data identity into the **ID TO POLL** field.
2. Click the **POLL** button.

Results

(Refer to fig. 7)

1. If a successful poll occurs GPS data will appear in the boxes under **RESPONSE FROM REMOTE RADIO** and the **GPS STATE** field will read '**SUCCESSFUL POLL'**
2. In addition the actual sent SDM and the received GPS data in the SDM packetized form will be shown in the **CCDI TRACE** window

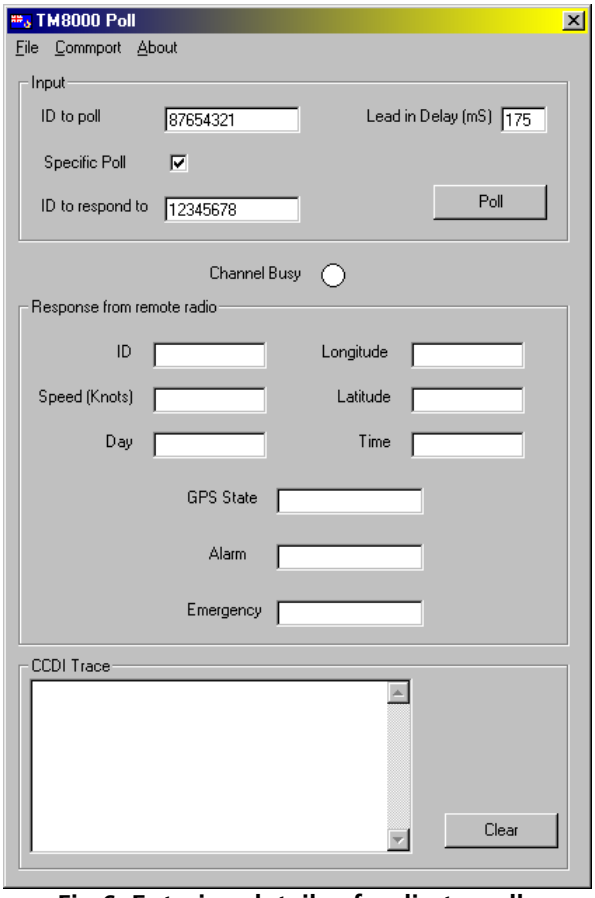


Fig 6: Entering details of radio to poll

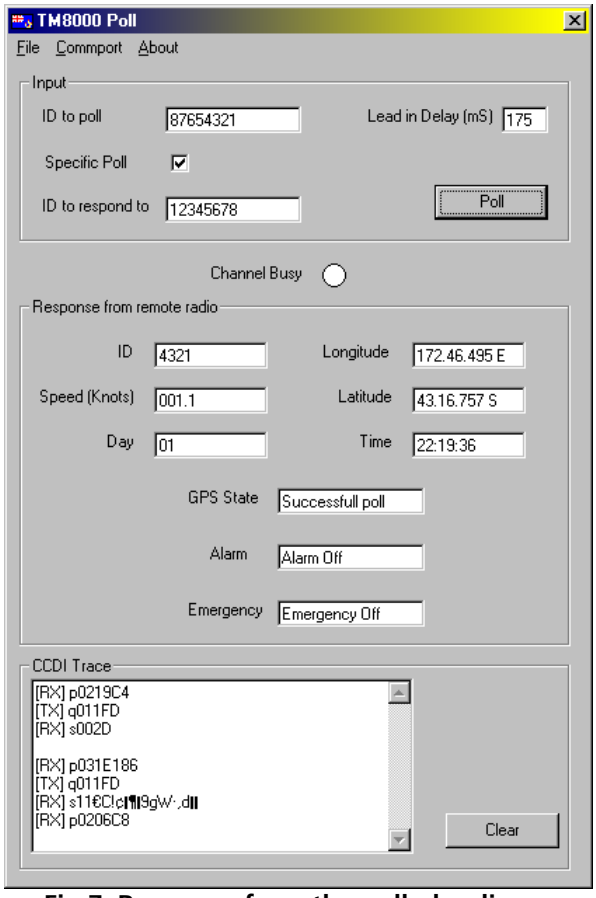


Fig 7: Response from the polled radio

3. If the GPS receiver is disconnected from the remote radio then a response of **'GPS not operational'** will be returned and displayed in the **GPS STATE** field.
4. If the remote radio is switched off or an incorrect ID is entered in the **ID TO POLL** field then the fields in the **RESPONSE FROM REMOTE RADIO** will remain blank.

Additional Features

Alarm Mode

1. A radio with a direct connect GPS RX can be programmed to go into an alarm state, which is initiated via one of the programmable GPIO lines (Called "**TOGGLE ALARM MODE**").

(Refer to fig.4)

2. Once activated the radio will begin sending the current GPS location at a rate set by the **CALLOUT INTERVAL**.
3. The **MAXIMUM NUMBER OF CALLOUTS** field sets the number of times that the radio will send out an alarm state. The number of callouts can be set between 0 and 250. If 0 is entered, then no callouts are sent at all, but a GPS poll response will have the Alarm Bit set, if the radio is currently in alarm mode.
   (The channel that is used is designated as either the current one, or another specific channel that is set in the **CHANNEL SETUP** field.
4. If the **SEND POSITION ON EMERGENCY CALLOUT** box is ticked: GPS location information will be sent immediately following the emergency callout sequence. Part of the location data sent will indicate that the radio is in emergency

GPS/ANI

1. GPS location information can also be sent as a leading or trailing ANI on any one of the 3 PTT's. (See Fig 8)

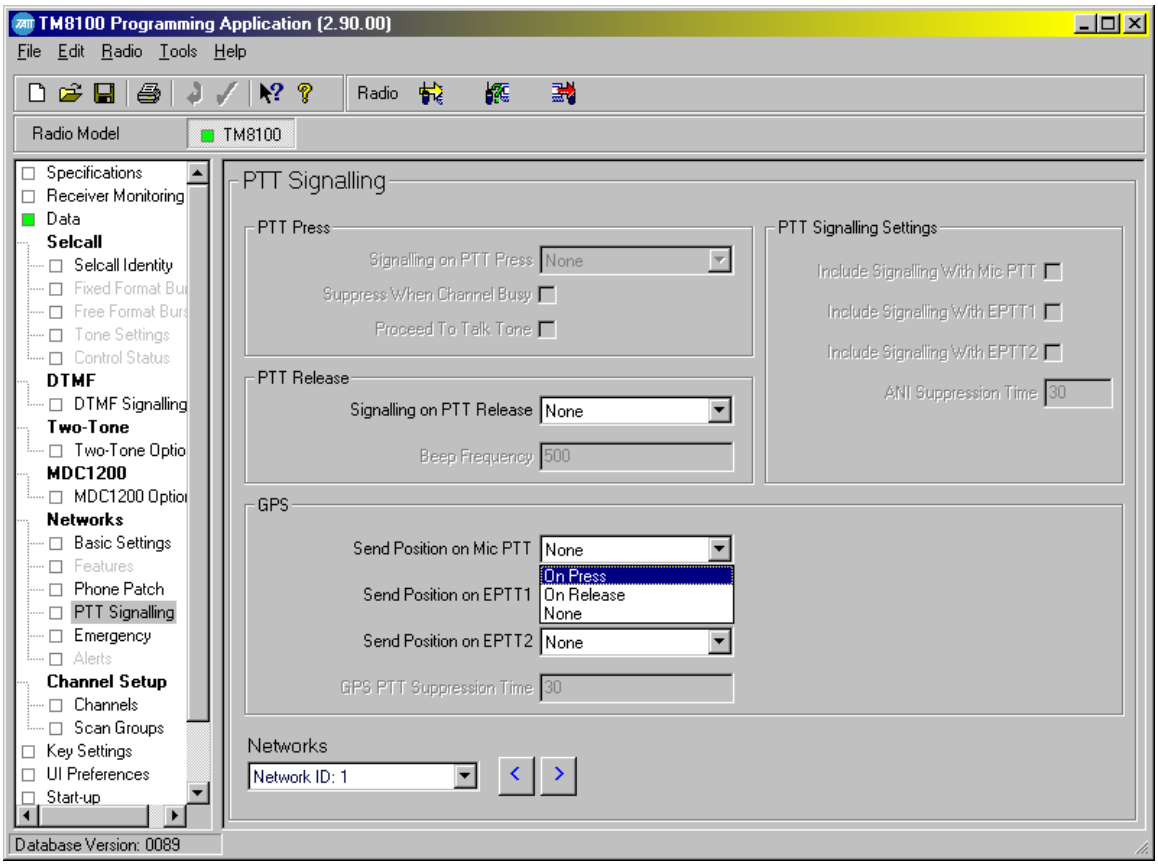


Fig 8: Configuring PTT GPS requirements

3. Head

Compliance Issues None

CSO Instruction Please inform all Sales and Technical staff who wish to demonstrate/test the abilities of the TM81xx for AVL applications.

4. Issuing Authority

Name and Position of Issuing Officer Malcolm brown
Senior Customer Support Engineer - Data

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Document History

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