

TDFM-136(A)

VHF FM DIGITAL AIRBORNE TRANSCEIVER



TRANSCEIVER UPGRADE PROCEDURE

For
Firmware Release 3.x.x

AUG 2014

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CONTACT INFORMATION

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! WARNING !

Power failures during firmware upgrades can cause the equipment to become locked without any means of restoration. To avoid time consuming and costly factory repair, please ensure that you have appropriate an UPS as part of your equipment for upgrading radio firmware.

If you do not have the appropriate equipment, or if you are unsure, please return the unit to an approved maintenance facility for firmware upgrade.

SECTION 1

INTRODUCTION

This guide provides information for upgrading the Main and Boot-loader (Boot) firmware components of the TiL TDFM-136 or TDFM-136A transceiver, hereafter referred to as TDFM-136(A).

These are generic instructions, not specific to a particular firmware version. Contact TiL for current released versions of both the Main firmware and the Boot firmware.

1.1 Scope

It is the intent of this document to instruct the user in methods to manipulate and operate the TDFM-136(A) for purposes of re-programming it's firmware components. It is beyond the scope of this document to instruct on how to use test equipment, or to instruct on the basic operation of the transceiver itself. Thus:

- When referring to system commands this guide assumes that the user is familiar with and has a copy of the appropriate Command Reference guide.
- When referring to operation of equipment required to perform these operations, this guide assumes that the operator has adequate knowledge of the systems in use, and access to the necessary instruction guides.

1.2 Equipment Required

In order to perform the procedures contained herein the user will need a workstation equipped with the following:

- PC with serial port available
- Windows NT 4.0, WIN2000, WIN XP, or Windows7. (Other versions of windows may work, they have not been tested).
- Software Terminal Emulation Program (Hyper Terminal, TeraTerm etc)
- Current TDP-136 if you are planning to backup your channel memory data.
- UPS capable of greater than 30 min operation *supplying PC and Target system*.
- Correct connecting cables.

1.3 Firmware Components Required

The processes described cover updating either or both the Main and the Boot firmware components. If only the Boot-loader is being updated, you will still need a copy of the current Main code as it will be erased as part of the process.

1. TiL TDFM-136 or TDFM-136A Main Firmware:
For TDFM-136: 00S052_TDFM-136_3xx.s19
For TDFM-136A: 09S142_TDFM-136_3xx.s19
2. Til boot-loader Updater firmware: 04S100_TDFM-136_BootUpdate_3xx.sx

Note: Do not begin an upgrade if you do not have all of the necessary components available.

1.4 Set Up for Firmware Upgrade

Both the Main and the Boot firmware components are loaded into the transceiver unit under test (UUT) using the currently installed Boot-loader. The Boot-loader is accessible in two different ways: from command level 5 (L5-8), or by holding a special key sequence at power on time. If accessing from command level 5 then the transceiver must be configured to allow access to the Level 4 & Level 5 (L4, L5) command levels, see 1.4.1 below.

In either case the unit should be configured to allow useful communication messages to be output on the rear connector.

1.4.1 Set Access Jumpers

There are two (2) jumpers that have to be set to allow you to re-program the system software as desired: the Boot Block write jumper and the L5 access jumper. If you are going to update the TiL Main software then you must place shunts on both jumper pins.

To access programming Levels 4 and 5: Place a shunt on the *middle* set of jumper pins, on the front most jumper field.

To allow re-programming of the TiL transceiver software: Place a shunt on the rear most jumper field – there is only one position.

Note: for units with firmware 3.x.x and higher this jumper position may (and should) be permanently closed. Typically the jumper has been pinched and soldered, though it may have been removed entirely and closed on the PCB.

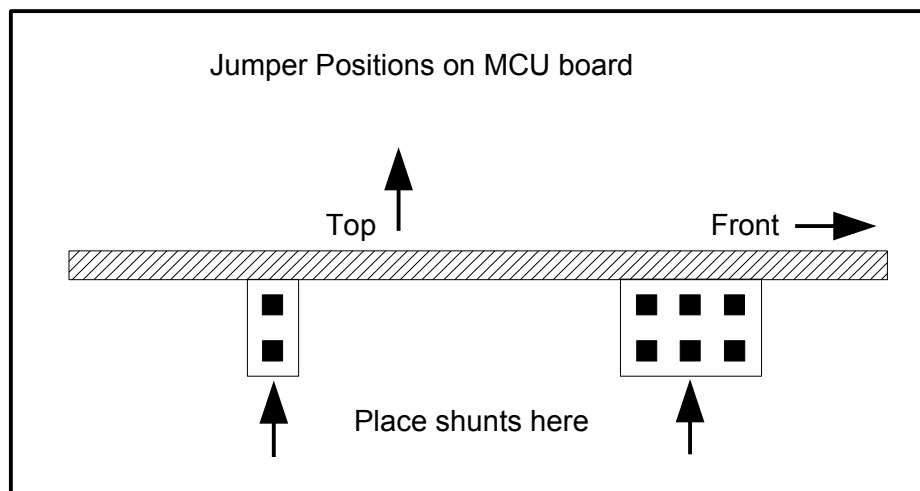


Figure 1. Jumper positions on the MCU board.

1.4.2 Password Access

If the unit has the appropriate MOD applied then L4 and L5 command levels may be accessed via password. Default passwords are printed in the transceiver Operating Instructions.

For TDFM-136: MOD7

For TDFM-136A: MOD6

If you do not have the appropriate MOD applied then set the Access Jumpers as shown in 1.4.1 above.

Note: The MOD *only* indicates that the hardware requirements for password access have been implemented. The unit may have been configured for hardware only access, if this is the case you will not be able to access the upper command levels using passwords.

1.4.3 Boot Time Key Press Access

Units with Boot-loader 3.x.x and higher can be accessed at boot time by pressing and holding 4 keys, turning the power on and then releasing the keys.

The keys to be held are: 7,2,3 and 0.

The front panel of the unit will indicate that the unit is running the bootloader as will any correctly connected terminal program.

1.4.4 Connections

The minimum requirement to upgrade the software is a connecting cable that supplies power (+28VDC) to the unit and provides a serial connection to a PC. See appendix B for wiring guidelines.

SECTION 2

UPDATING THE RADIO

This section contains a description of how to upgrade the various firmware components necessary to complete a transceiver firmware upgrade.

There are several different 'pieces' of firmware within the transceiver, in the case of updating the radio several firmware components may need to be updated at the same time. When updating follow this sequence:

1. Save your channel memory data using appropriate TDP-136 version.
2. Update TiL boot-loader code – if necessary.
3. Update TiL Main code – if necessary.

2.1 Save your Channel Memory Data

The upgrade procedure will destroy any channel data in the radio, if you do not have this data already backed up, then it must be backed up before proceeding or it will be lost.

Connect the transceiver to a PC, use the appropriate TDP-136 program to transfer the data from the radio to the PC and save the file.

Note: “Multi-TDP” program does **not** work with the TDFM-136.

- Power on the UUT.
- Start the TDP-136
- Set the UUT to PC Communications mode (L3-8)
- Use the controls to upload current data from the UUT.
- Save your data file.
- Terminate the TDP program.

If you are updating your main code only, jump to section 2.3

2.2 Updating the boot-loader

In order to program the TDFM-136, the unit uses a small piece of code known as a boot-loader. The boot-loader is programmed into the target and then run, once running, the boot-loader allows the TDFM-136 to program itself. If the boot-loader needs to be upgraded, then you must use the methods described below.

2.2.1 Connect the Unit to a PC running a Terminal Program

Connect the target system to a PC running a terminal program. Set up the terminal program serial port parameters as (9600, 8, N, 1) see appendix B for details.

2.2.2 Determine if boot-loader needs to be Updated

Start the Boot_loader using one of the methods described in 1.4.2, 1.4.2, or 1.4.3 you will

see a display like the one shown in figure 2 below.

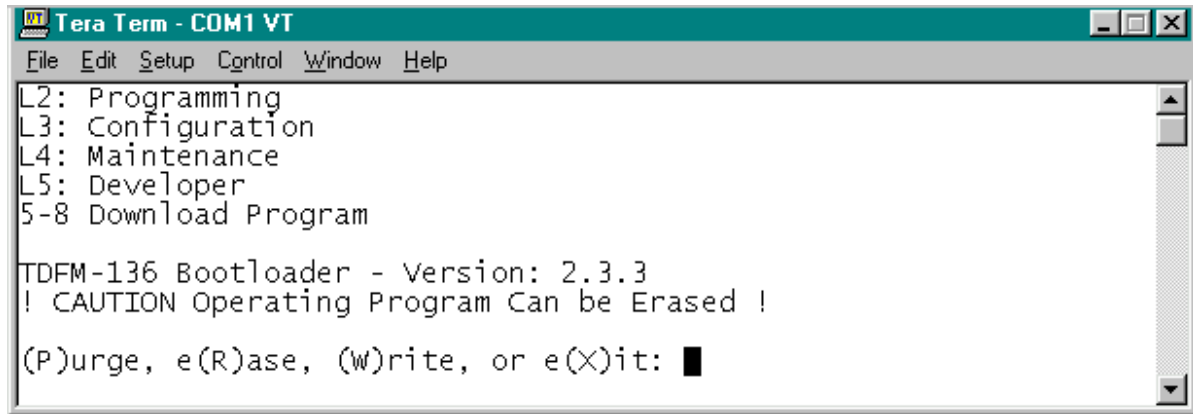


Figure 2. The TDFM-136 boot-loader Screen

Check the boot-loader screen to determine the current version of boot-loader installed if it is not current, or does not show a version, then it needs to be updated.

Note that the options shown are accessed by pressing the letter shown in round brackets “()”. Note that the letter does NOT need to be capitalized.

2.2.3 Erase the Existing Main Code

Use the e(R)ase command to erase both Main Block 0 and the Boot Block as follows:

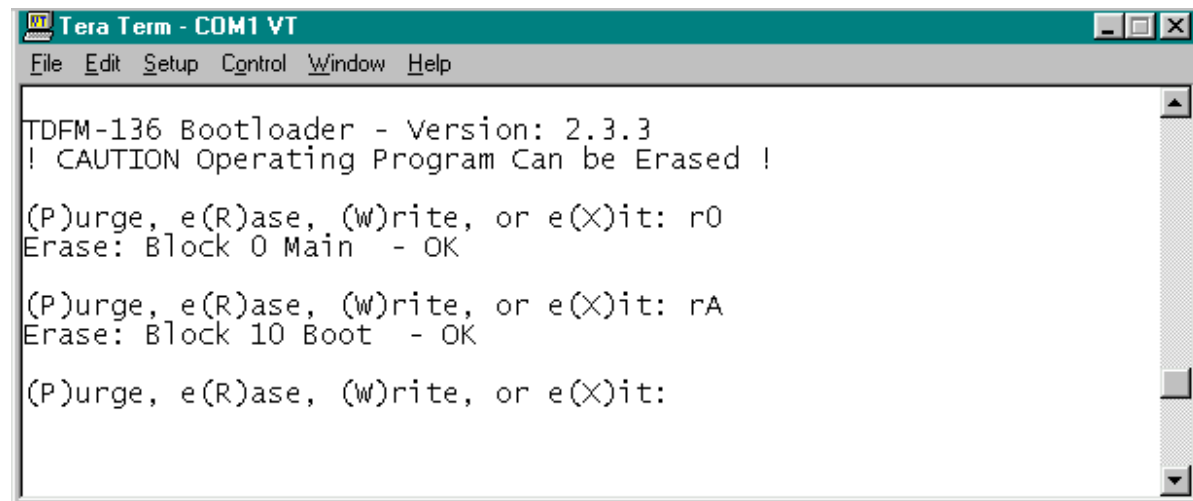


Figure 3. Erasing Main Block 0 and the Boot Block

Note that versions of the boot-loader that don't display the version number have (E)rase in place of the e(R)ase command.

If the process locks while erasing then you will need to use the hardware POD to update the boot-loader, or you will have to return the unit for repair.

2.2.4 Load the boot-loader Update Utility Program

Now select the write (W) command, the unit will display the prompt “Writing FLASH”, it is now waiting for you to send the file, as shown in figure 2-10 below.

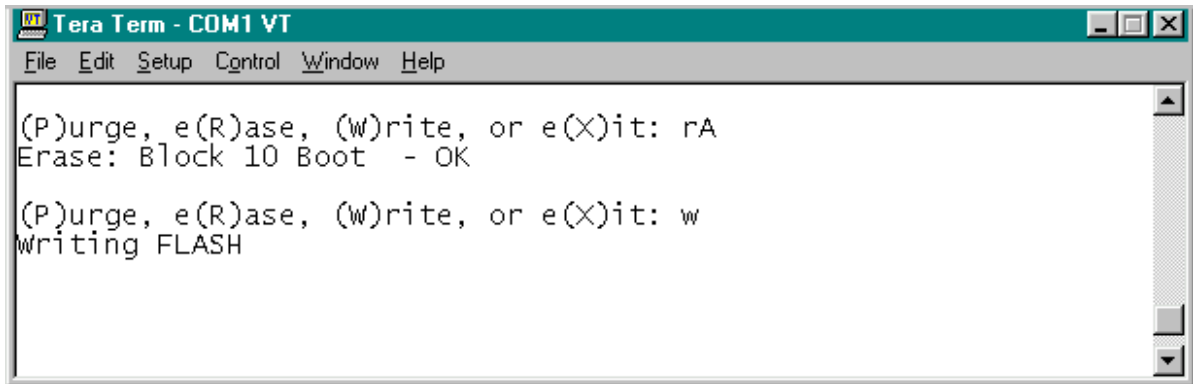


Figure 4. Waiting for the User to Send the Program File

In your terminal program, select the file transfer option, and select the file to transfer. Note, if your terminal program gives you a choice between text and binary file transfer, choose **text**.

Select the boot update file: "04S100D_TDFM-136_BootUpdate_302.SX", the selected file will be written into the UUT's FLASH memory as shown in figure 2-11.

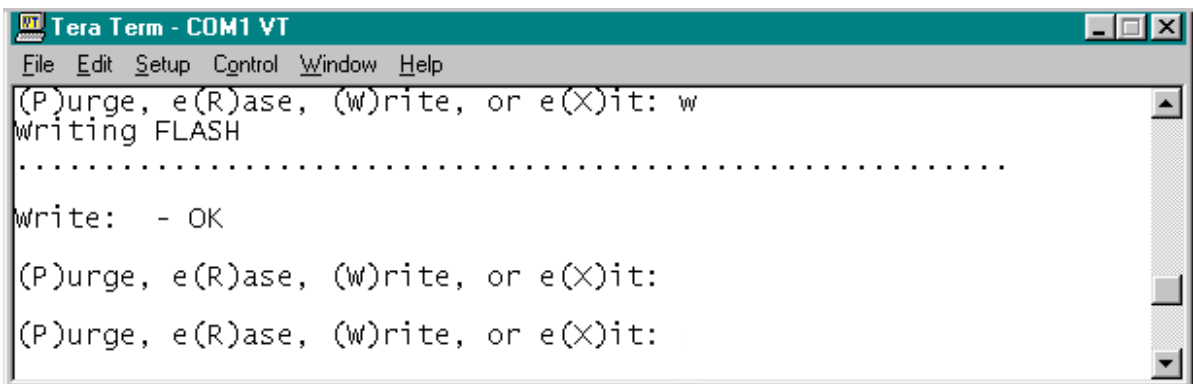


Figure 5. Writing the Boot-loader Program File

2.2.5 Run the Boot-loader Update Utility Program

After the download is complete, exit from the boot-loader by selecting 'x'. The boot-loader Update Utility will automatically start, you have two choices: Upgrade or exit.

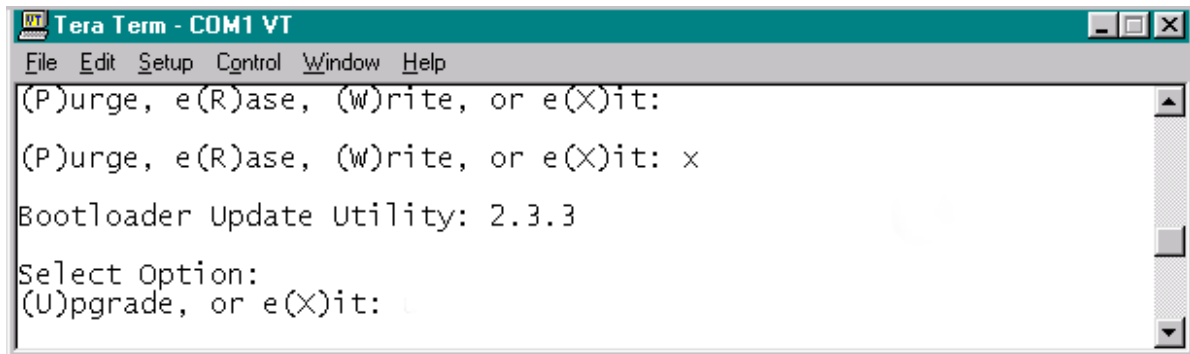


Figure 6. Running the boot-loader Update Utility.

Select "u" to upgrade the boot-loader to the new version. The boot-loader Update Utility will erase the old boot-loader and install and run the new boot-loader as follows:

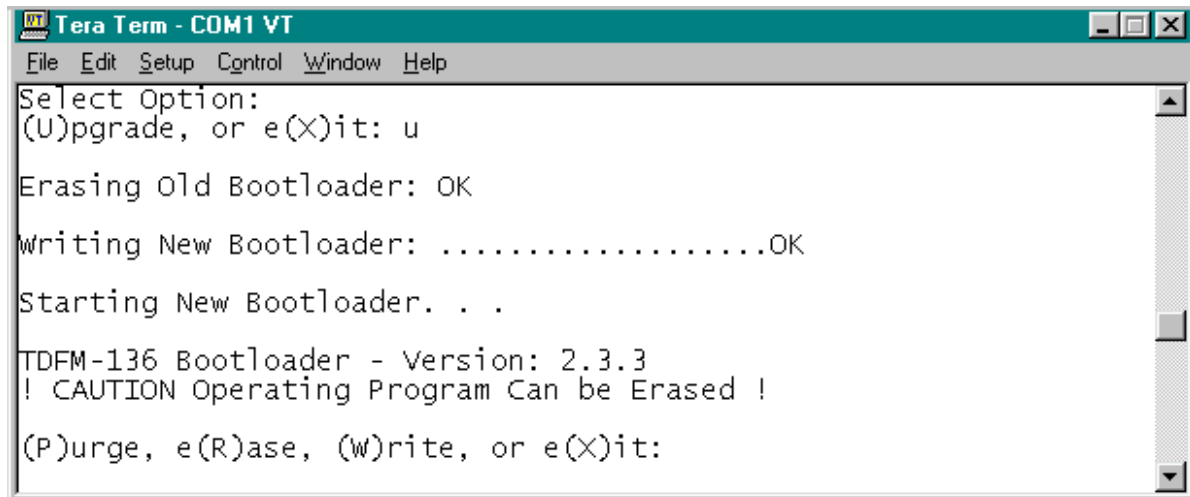


Figure 7. Erasing the Old boot-loader, and Writing the New, then running it.

Note: there is a long pause between erasing and writing, do not worry, wait until the process has been completed as shown.

Note: the version displayed will reflect the correct version, it may not be as shown.

! DO NOT turn off the power to the UUT !

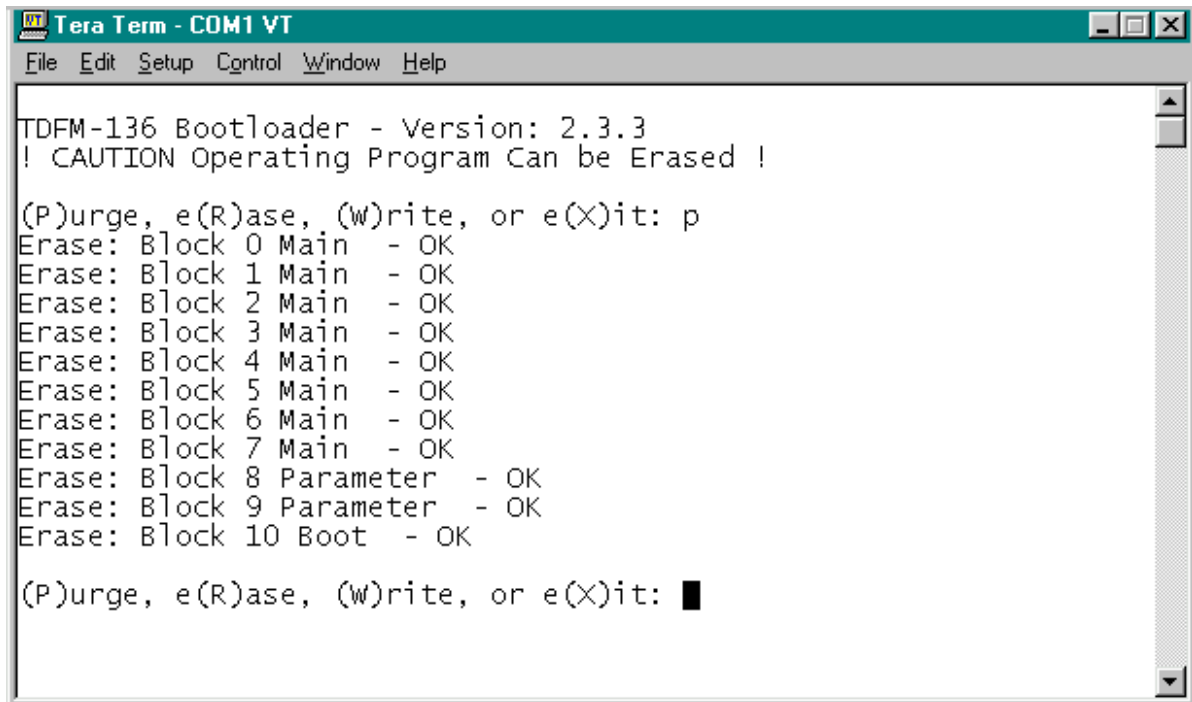
2.3 Updating the Main Radio Firmware

Once you have the correct boot-loader version installed, you can proceed to upgrade the Main Radio Firmware. This section describes how to do this.

The boot-loader should now be running, either because it did not need to be updated, or because it was updated with the 'Update Utility'. In any case you should be looking at the boot-loader screen.

Follow these steps:

- a. Select the (P)urge command to erase the entire memory, see figure 2-7.



```
Tera Term - COM1 VT
File Edit Setup Control Window Help

TDFM-136 Bootloader - Version: 2.3.3
! CAUTION Operating Program Can be Erased !

(P)urge, e(R)ase, (w)rite, or e(X)it: p
Erase: Block 0 Main - OK
Erase: Block 1 Main - OK
Erase: Block 2 Main - OK
Erase: Block 3 Main - OK
Erase: Block 4 Main - OK
Erase: Block 5 Main - OK
Erase: Block 6 Main - OK
Erase: Block 7 Main - OK
Erase: Block 8 Parameter - OK
Erase: Block 9 Parameter - OK
Erase: Block 10 Boot - OK

(P)urge, e(R)ase, (w)rite, or e(X)it: █
```

Figure 8. Erasing the entire system memory using the Purge command.

- b. Program the New Release Firmware into the radio using the 'Write' command and then selecting the Main firmware file (00S052 TDFM-136 Main 3xx.s19). The boot-loader will download and program the new file into FLASH memory as shown in figure 2-8.

Note: Once you press 'w', then the boot-loader is waiting for you to start to transfer the program (*.s19) file. To do this consult the instructions for the terminal program that you are using. (Be sure to send as a 'text' file not as 'binary').

When the code is being transferred to the radio, you will see a row of dots being printed to the screen to indicate transfer activity. Once the program has been completely transferred, the boot-loader prompt line will again be displayed.

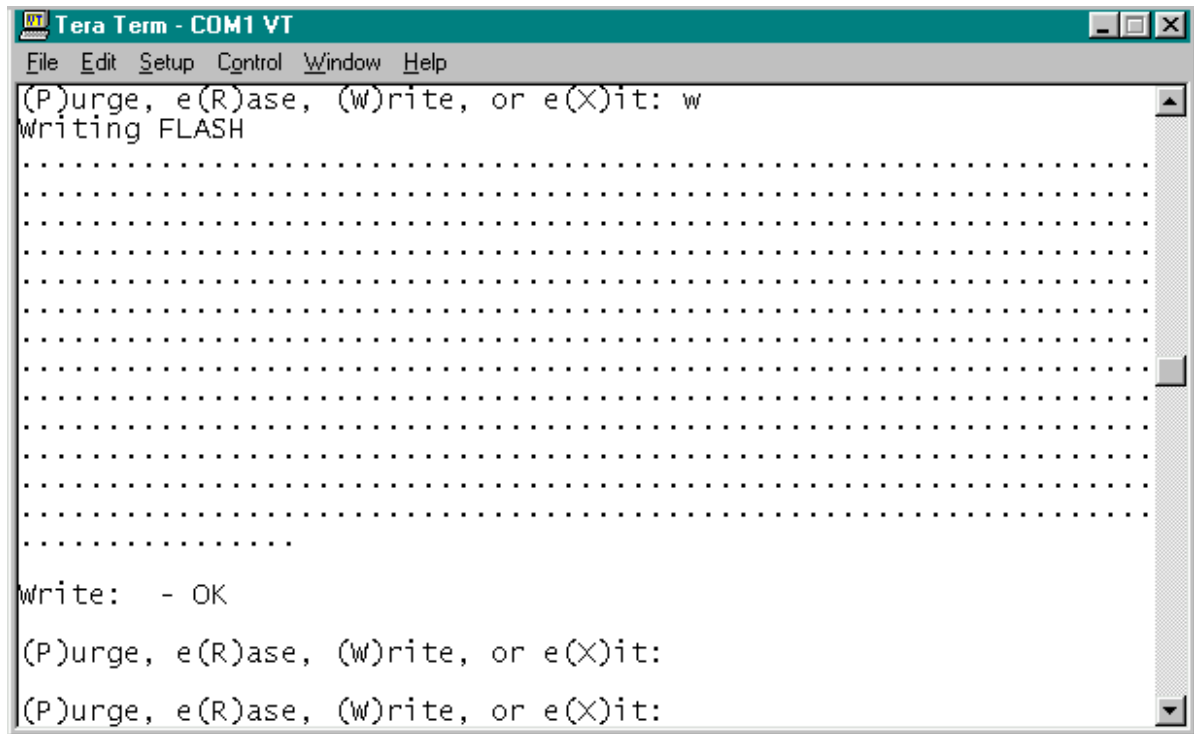


Figure 9. Writing the New Main Program Code into memory.

After the download has been completed, select "X" to exit the boot-loader and run the new Main code. The system will re-boot, and begin to go through it's virgin initialization process, this takes longer than a normal boot as the RF modules are being initialized.

After the radio has booted you are finished the firmware update process. Now use the TDP to restore the radio's channel data if required.

Note: that if you are updating from a 1.x.x version the TDP will ask if you wish to convert the file, be sure to answer yes, and then remember to save this new format file after you open it.

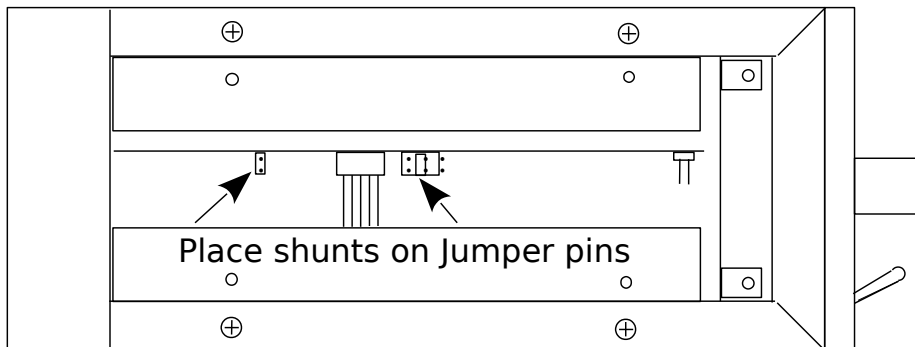
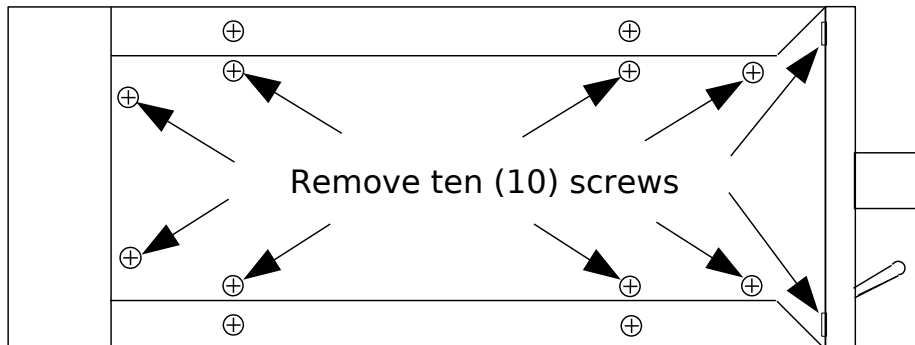
SECTION 3

APPENDICIES

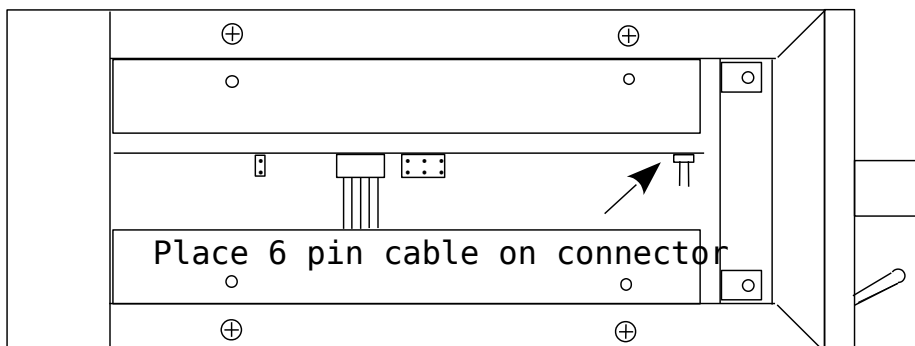
3.1 Appendix A - Connections for Radio Maintenance

The transceiver can be put into modes that allow the user to maintain and support the radio. The required configurations are shown in the diagrams below.

1. To access Command Levels 4 & 5



2. To use the programming POD



Use a pair of tweezers to put the cable on the connector – align back pins and tilt on.

3.2 Appendix B – Terminal Program Configuration

Various aspects of the firmware upgrade require that you communicate with the radio via a PC based terminal program. Set up your terminal program according to the table below.

PC Terminal Configuration Parameters	
Parameter	Value
Baud Rate	9600
# of Data Bits	8
Parity	No
# Stop Bits	1
Flow Control	None
Character Delay	0mS
Line Delay	0mS

Note

- Be sure you know how to send a file with the terminal program that you choose to use.
- The Technisonic firmware files are saved in the hex record format which is text not binary, so transfer the files as text rather than as binary files.

3.3 Appendix D – Connecting Cable Wiring

The wiring for the TDFM-136 is as follows:

Radio Cable Connections		
DB-15 PIN #	SIGNAL	CONNECT TO
7 & 14	28 VDC In	Power Supply +ve
8 & 15	Power Ground	Power Supply gnd
10	Signal Ground	DB-9 F, pin 5
1	Headset (Rx) Audio Out (600 ohm)	Headset
2	RS-232 Data Out	DB-9 F, pin2
3	Lamp Voltage In (28v/5v)	Power supply
4	Memory Up In (active low)	Pushbutton
5	Memory Down In (active low)	Pushbutton
6	Mic (Tx) Audio In	Microphone audio
9	Speaker (Rx) Audio Out (8 ohm)	Speaker
11	RS-232 Data In	DB-9 F, pin 3
12	reserved	
13	PTT In (active low)	Pushbutton

Note

- The headset, mic, speaker, and all control pushbuttons require a ground connection.
- The DB-9 to the PC requires ground on pin 5.

If you want a ready made solution, Technisonic manufactures a “Radio Test Jig” that supports these requirements (TiL # 04T139).

3.4 Appendix E - Using the boot-loader

To use the boot-loader you must have a terminal program running on a PC connected to the radio.

Set up the serial port parameters as follows:
(9600, 8, N, 1, no flow control).

Be sure that you set the serial port delay settings to:
Character Delay: 0mS
Line Delay: 0mS line

The boot-loader should now be running, either because it did not need to be updated, because it was updated with the 'Update Utility' or because it was updated via the hardware POD and started. In any of these cases you should see the following screen:

```
TDFM-136 boot-loader - Version: 2.3.2  
! CAUTION Operating Program Can be Erased !
```

```
(P)urge, e(R)ase, (W)rite, or e(X)it:
```

The **purge** command '**P**' will erase all of the memory blocks in the TDFM-136. This command has no arguments and will start as soon as the key is pressed, it will erase all the blocks of FLASH memory in the radio. This *will erase all data in the radio*, not just the Main Program.

The **erase** command '**R**' allows the user to selectively erase memory blocks. This command expects a block to be specified by the user before executing, for example:

```
r 0
```

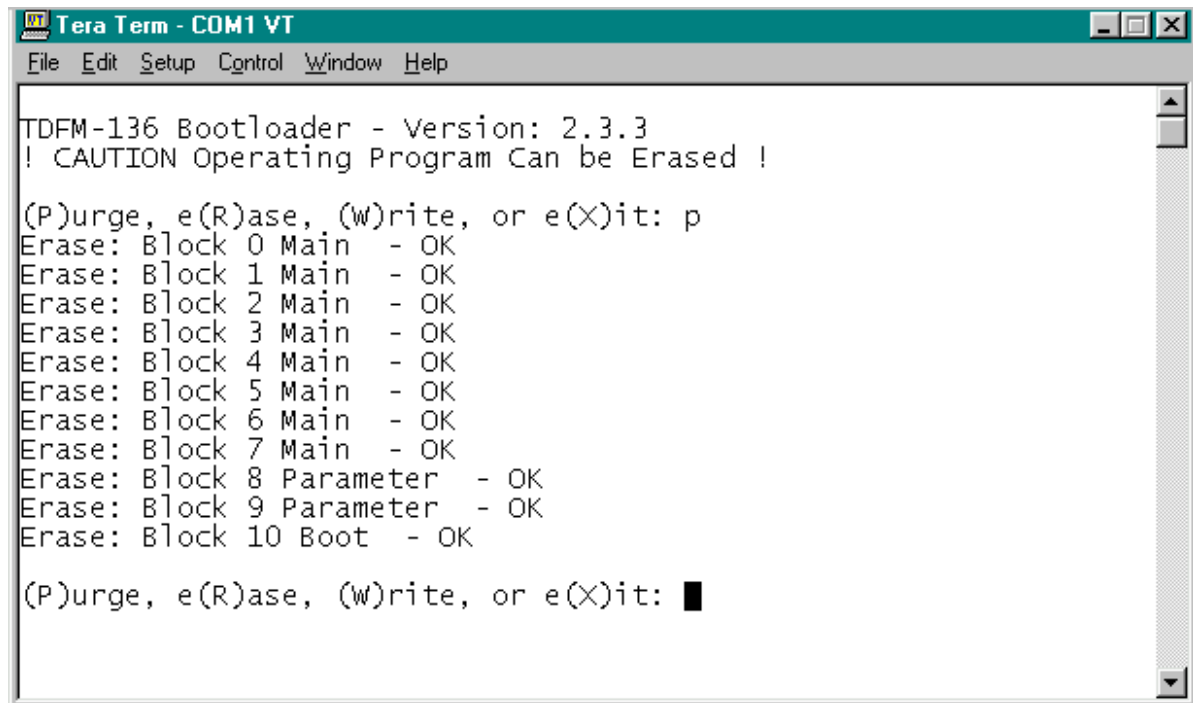
Upon pressing the 'R' the unit waits until you specify the block to erase, upon pressing the '0' the boot-loader will immediately try to erase block 0.

The **write** command '**W**' allows the user to upload new software to the TDFM-136. This command has no arguments, but upon pressing the command the unit is waiting for the user to start the transfer of the program file. The file must be transferred as a 'text' file NOT as a binary file. Once the file transfer has started, the boot-loader will return periods (.) to the terminal as an indication that the data transfer is in progress, the menu line will be displayed once the transfer is complete.

The **exit** command '**X**' allows the user to exit the boot-loader and run the TDFM-136 Main program. If the main program has not been loaded, the boot-loader print a warning message and will not exit. (so you can correctly load the main program).

Notes:

- Once you have erased or purged the program from the memory DO NOT turn off power to the radio until you have successfully written in a new program using the write command!
- Be sure to back up your memory files using the TDP before running the boot-loader to avoid any data loss.
- Once started, the Purge command cannot be stopped, it will erase everything, as follows:



The screenshot shows a terminal window titled "Tera Term - COM1 VT". The menu text displayed is as follows:

```
TDFM-136 Bootloader - Version: 2.3.3
! CAUTION Operating Program Can be Erased !

(P)urge, e(R)ase, (W)rite, or e(X)it: p
Erase: Block 0 Main - OK
Erase: Block 1 Main - OK
Erase: Block 2 Main - OK
Erase: Block 3 Main - OK
Erase: Block 4 Main - OK
Erase: Block 5 Main - OK
Erase: Block 6 Main - OK
Erase: Block 7 Main - OK
Erase: Block 8 Parameter - OK
Erase: Block 9 Parameter - OK
Erase: Block 10 Boot - OK

(P)urge, e(R)ase, (W)rite, or e(X)it: █
```

- Once you press 'w', then start to transfer the Main Program file to the radio *according to the instructions for the terminal program that you are using*. (Remember to send as a 'text' file not as 'binary').

3.5 Appendix F - boot-loader Flash Block Erase Maps

The boot-loader allows you to erase and re-program the system's FLASH memory, flash is divided into blocks and can only be erased a block at a time. When the boot-loader runs you are given the choice to erase blocks, the table below shows which blocks hold what data, and the erase parameter to be used by the boot-loader to erase that block.

FLASH Memory Map			
Block	Block Type	Data Type	boot-loader Erase Parameter
0	Main Block 0	Main Program	0
1	Main Block 1	Channel Memory Parameters	1
2	Main Block 2	Channel Memory Parameters	2
3	Main Block 3	reserved	3
4	Main Block 4	reserved	4
5	Main Block 5	reserved	5
6	Main Block 6	reserved	6
7	Main Block 7	reserved	7
8	Parameter Block	reserved	8
9	Parameter Block	reserved	9
10	Boot Block *	Main Program	A

* Note that the Boot Block is hardware locked by a jumper on the MCU board, you must have a shunt on this jumper or any erase attempt will fail. See appendix A.

If you are updating the transceiver Main Firmware only, then use 'r0', 'ra', at the boot-loader prompt to only erase the operating program while leaving your data intact. NOTE you cannot do this if you are upgrading across Release numbers as the user parameter data structures are not guaranteed to be compatible. In this case you must purge the entire memory, so back up your data using the appropriate TDP-136 PC programmer first.

3.6 Appendix G – Firmware Revision Nomenclature

The firmware for the TDFM-136 adheres to the following revision nomenclature:

SoftwareNumber_ProjectName_ProgType_Opt_Release.Extension

Where:	SoftwareNumber	is the TiL assigned software number: YYSnnn
	ProjectName	is the TiL assigned project name: TDFM-136
	ProgType	is the code function: Boot, Main
	Release	is the Release.Version.Revision information (see below)
	Extension	is the object code extension type: sx

Example:

00S052_TDFM-136_Main_223.SX

Release.Version.Revision information

Where:	R - indicates the appropriate software Release
	V - indicates the Version
	r – indicates the revision

Example: 223 = 2.2.3 (Release2, Version2, revision3)

Release numbers refer to major features or system architecture, different release numbers are NOT likely to work together, though it is possible.

Version numbers refer to feature changes or additions, the system operation will change according to the feature added or changed.

revision numbers refer to bug fixes (ie make the radio perform as documented).

Note: the Release number can have a suffix of letters (a, b etc), *but these are for beta test and evaluation versions only*, they should be short lived and are NOT for release. These are used for testing and debugging of a specific feature only, they are disseminated only for the purpose of checking and verifying by Beta Testers. Once the version has been tested and approved then the correct release number is appended and the code can be released.