connected freedom

Telran TDK Kit User Guide

Telran TDK TZ2070-IFU_v2.02
Sep 2011

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Document Revision History

Issue	Description	Author	Date
1.00	First Version for Telran TDK	AM	20-Jan-2011
2.00	Updated for Version 2 TDKs	AM	06-Jul-2011
2.01	Updated for Version 2 TDKs	AM	10-Aug-2011
2.02	Safety Information Updated	AM	22-Sep-2011

Contents

Figures

1. Introduction

The Telran TDK kit serves as a development and evaluation tool for the Telran TZ1053 RF device. The boards contained in this kit have sufficient features and expandability to allow the user to explore all of the features of the Telran TZ1053.

This document is applicable to the Telran TDK Version 2

This section of the User Guide contains general information that will be useful to know before using the Telran TDK Kit contents. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Toumaz Web Site
- Customer Support
- Document Revision History

1.1 Document Layout

This document describes how to evaluate and use the Telran TZ1053 device by using the hardware within Telran TDK kit. The User guide layout is as follows:

Section: 1 Introduction
This section of the User Guide contains general information that will be useful to know.

Section: 2. Regulatory Approval
This section indicates the current Regulatory Approval Status.

Section: 3 Telran TDK Kit Contents
This section describes features of the hardware in the Telran TDK Kit.

Section: 4. Getting Started
This section goes through the basic step-by-step process for getting the Telran TDK Kit working

Section: 5. Accelerometer Demo Program
This section describes the installation and operation of the Accelerometer Demo for the Telran TDK Kit.

Section: 6. Customisation
This section details the processes required to customise the Telran TDK Demonstration program. his section also guides the User through the steps required to produce Script based program.

Section 7. Reference Design Schematic Diagrams
This section presents the schematic diagrams of each of boards that go to make up the Telran TDK kit.

1.2 Screen Displays

The screen displays in this document are representative of what will be seen by the User when running the various programs described in this document. Actual screens may differ as program versions change or are updated.

1.3 Conventions Used in this Guide

Section to be completed.

Description	Represents	Examples
Italic character	References	• *TZ1053 Telran datasheet V1_06 draft.doc.*
	Emphasised text	**Section to be completed.**
Text in angle brackets <>	A key on the keyboard	Press <Enter>
Underlined text in blue	Hyper link to a website	Toumaz

1.4 Recommended Reading

- *TZ1053 Telran datasheet*
- *TZ1053 Software User Guide*

- *UMI (Universal Metering Interface) Overview document: eSmart-M-004* v2.1.doc *from* Cambridge Consultants Ltd.

For more information regarding the Telran TZ1053 device please refer to the Toumaz web site.

1.5 The Toumaz Web Site

Toumaz provides online support for registered customers / users through the 'extranet' at www.toumaz.com. This web site is used as a means to make files and information easily available to customers.

The Toumaz web site is accessible by using an Internet browser and clicking on the 'extranet' menu item. The User can the either log on or register with the Toumaz website.

The web site contains the following information:

Product Support – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software.

General Technical Support – Frequently Asked Questions (FAQs), technical support requests.

1.6 Abbreviations

The following abbreviations are used within this document.

CE	Conformité Européenne – conformance marking
CRC	Cyclic Redundancy Check
FAE	Field Application Engineer
FCC	Federal Communications Commission - US
GPIO	General Purpose Input Output
ISM	Industrial Scientific and Medical
ISP	In System Programming
ITU	International Telecommunications Union
ITU-T	ITU – Telecommunications
MAC	Media Access Controller
NSP	Network Service Protocol
NSP	Nanopower Sense Protocol
OTA	Over The Air
PCB	Printed Circuit Board
RF	Radio Frequency
RFM	Radio Frequency Module
RX	Receiver
SDB	Sensor Development Board
SPI	System Packet Interface
TDK	Telran development Kit
TX	Transmitter
UMI	Universal Metering Interface
USART	Universal Synchronous Asynchronous Receiver Transmitter
USB	Universal Serial Bus

1.7 Customer Support

Users of Toumaz products can receive support through a number ways:

Distributor or Representative
Local Sales Office
Field Application Engineer (FAE)
Technical Support

2. Regulatory Approval

The Telran TDK RF module, TZ207010 and Telran TDK USB module, TZ20720 have undergone testing for regulatory approvals in Europe, the United States and other countries.

FCC modular approval will allow the end user to place the Telran TDK RF module, TZ207010 inside a finished product and not require regulatory testing for an intentional radiator (RF transmitter), provided no changes or modifications are made to the module circuitry. Changes or modifications could void the user's authority to operate the equipment. The end user must comply with all of the instructions provided by the Grantee, which indicate installation and/or operating conditions necessary for compliance.

The integrator may still be responsible for testing the end product for any additional compliance requirements required with this module installed (for example: digital device emission, PC peripheral requirements, etc.) in the specific country that the end device will be marketed.

2.1 USA

The Telran TDK RF module, TZ207011 has received Federal Communications Commission (FCC) CFR47 Telecommunications, Part 15 Subpart C "Intentional Radiators" 15.247 and modular approval in accordance with FCC Public Notice DA 00-1407 Released: June 26, 2000, Part 15 Unlicensed Modular Transmitter Approval. The Telran TDK RF module, TZ207011 module can be integrated into a finished product without obtaining subsequent and separate FCC approvals for intentional radiation.

The Telran TDK RF module, TZ207011 module has been labelled with its own FCC ID number, and if the FCC ID is not visible when the module is installed inside another device, then the outside of the finished product into which the module is installed must also display a label referring to the enclosed module. The following examples present terminology that could be used: A user's manual for the product should include the following statement:
Contains Transmitter Module FCC ID: ZT9-TZ207011V2.
or
Contains FCC ID: ZT9-TZ207011V2. This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

2.2 Canada

2.2.1 Radio Frequency Module

Canada IC: 9809A-TZ207011V2

This Class B digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareillage numérique de la classe [B] répond à toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif peut ne pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.

2.2.2 USB Dongle

Canada IC: 9809A-TZ207021V2

This Class B digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareillage numérique de la classe [B] répond à toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif peut ne pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.

2.2.3 Sensor Development Board

Canada IC: 9809A-TZ207030V2

This is Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

2.3 Europe

The Telran TDK RF module, TZ207010 module has been certified for use in European countries. The following is Toumaz's R&TTE Declaration of Conformity:

R&TTE Declaration of Conformity

Toumaz UK Ltd, Building 3, 115, Milton Park, Abingdon, Oxon OX14 4RZ, UK declares that the following product:

TELRAN 868MHz TDK Kit TZ207000 (TZ1053TDK868), comprising of the following modules:

- 868MHz TDK RF Module TZ207010
- 868MHz TDK USB dongle TZ207020
- 868MHz TDK Sensor Dev. PCB TZ207030

is in conformity with the essential requirements and other relevant requirements of the R&TTE Directive 95/5/EC.

The product has been assessed under annex IV by notified body TUV SUD Ltd (CE0168) and is in conformity with the following standards:

RTTE article	Relevant Standard
Article 3.1 (Safety)	IEC 60950-1:2006/A1:2010
Article 3.1.b (EMC)	EN 301489-1 v2.3.1 referencing EN 301489-3 v1.4.1
Article 3.2 (Spectrum)	EN 300220-1 v2.3.1 referencing EN 300220-2

Signed on behalf of Toumaz UK Ltd

Chief Technology Officer **Regulatory and QA**

Date: 06 Sep 2011 Date: 06 Sep 2011

ETSI does not provide a modular approval similar to the USA (FCC) and Canada (IC). However, the declaration of conformity above can be used as part of the customer's application for certification. The test report data can be included in their test plan and can significantly the lower customer's certification burden.

A helpful document that can be used as a starting point in understanding the use of Short Range Devices (SRD) in Europe is the European Radio Communications Committee (ERC) Recommendation "70-03 E", downloadable from the European Radio Communications Office (ERO): http://www.ero.dk/

The end user is responsible for ensuring compliance with harmonized frequencies and labelling requirements for each country in which the end device is marketed and sold.

2.3.1 Helpful Web Sites:

Federal Communications Commission (FCC): http://www.fcc.gov

Radio and Telecommunications Terminal Equipment (R&TTE):
ttp://ec.europa.eu/enterprise/rtte/index_en.htm

European Conference of Postal and Telecommunications Administrations (CEPT):
http://www.cept.org/

European Telecommunications Standards Institute (ETSI): http://www.etsi.org/

European Radio Communications Office (ERO): http://www.ero.dk/

3. Telran TDK Kit Contents

3.1 Deliverables

The Telran TDK kit contains the following items:

Telran TDK RF Module, TZ20701x.
Telran TDK USB Dongle, TZ20702x.
Telran TDK Senor Development Board, TZ207030.
The Telran TDK Kit DVD, containing User Guide, Software application notes and the Windows Based Telran Wireless Tool.

The x above in the board number refers to the base frequency of operation of the unit. Thus:

Where x = 0, i.e. TZ207010 and TZ207020 the base frequency will be 868 MHz, (ITU Region 1),
Where x = 1, i.e. TZ207011 and TZ207021 the base frequency will be 915 MHz, (ITU Region 2),
Where x = 2, i.e. TZ207012 and TZ207022 the base frequency will be 950 MHz.
Where x = 3, i.e. TZ207013 and TZ207023 the base frequency will be 779 MHz.

This document will refer to TZ207010 and TZ207030 throughout. It should be understood that where a kit is supplied at a different frequency for example 915 MHz comments made about TZ207010 and TZ207020 apply equally to TZ207011 and TZ207021, respectively. This applies equally for other frequency Telran TDK kits.

Note: Telran TDK Sensor Development Board, TZ207030, does not contain any radio frequency dependant parts and thus will be the same in each kit.

3.2 Electrostatic Warning

The Telran TDK kit components are supplied in a protective anti-static package. The boards comprising the TDK Kit must not be subjected to high electrostatic potentials. A grounding strap or similar anti-static protective device should be worn when handling these items. Avoid touching the components on the TDK boards.

Static sensitive components are used on the Patch PCBA and therefore handling of this unit shall be in accordance with ESD Handling Procedures.

ESD Symbol

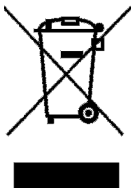
3.3 Safety Notice

The Telran TDK kit contains a USB Dongle this is supplied with power via the USB connector. The USB Dongle can be connected directly to a desktop or laptop PC, or via an USB extension cable of not more than 1 m in length. The USB Dongle can also be connected via a self-powered or powered USB Hub to a desktop or laptop PC.

To avoid the risk of electric shock or fire hazard ensure that any external power source used with the USB Dongle or the Sensor Development Board and RF Module Combination must meet the requirements of IEC 60950-1 clause 2.1.1.5, Limited Energy and source must also meet the requirements of IEC 60950-1 clause 2.5, Limited Power Sources. The PSU used with the USB should be voltage and current limited to 5V@50mA. The PSU used with the Sensor Development Board and RF Module Combination should be voltage and current limited to 3V@50mA

3.4 Waste Electrical and Electronic Equipment (WEEE)

Important:



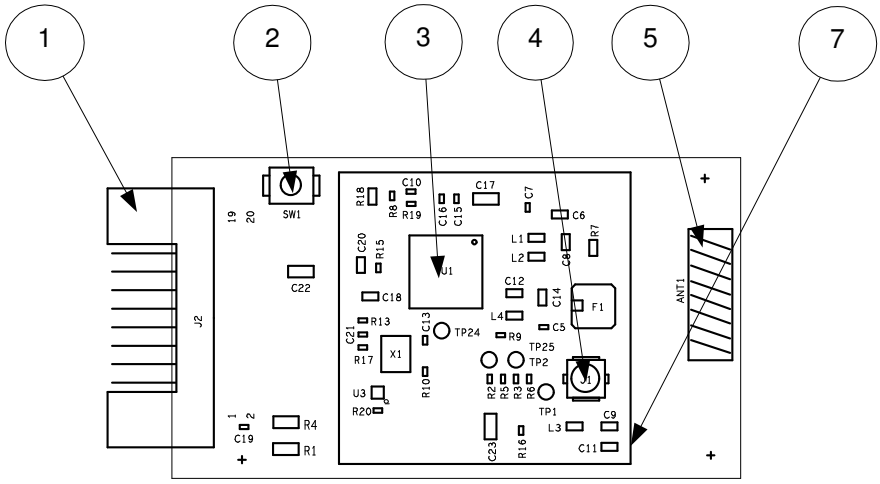
This symbol is placed on the product to remind users to dispose of Waste Electrical and Electronic Equipment (WEEE) appropriately, per Directive 2002-96-EC. In most areas, this product can be recycled, reclaimed and reused when properly discarded. Do not discard labelled units with general waste. For information about proper disposal, contact your Toumaz Distributor or representative, or visit www.toumaz.com.

3.5 Telran TDK Hardware Features

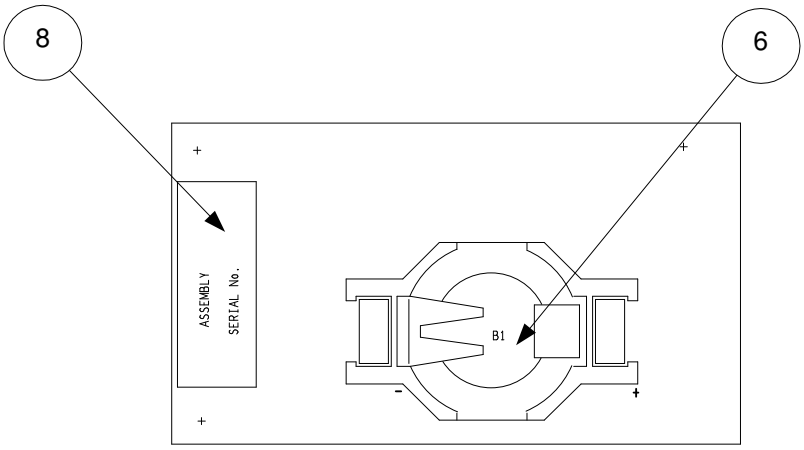
The layouts of each board in the Telran TDK Kit are shown in the following sections, with a list of the main features. More complex features are discussed later.

3.5.1 Telran TDK RF Module (RFM).

3.5.1.1 RFM Assembly Details



View on Top of PCB



View on Underside of PCB

Figure 1. Telran TDK RF Assembly Views.

1. J2 Connector to Telran TDK Sensor Board.
2. Telran Reset.
3. Telran TZ1053.
4. J1 U FL RF Connector.
5. Antenna.
6. LR44 Battery Retainer (Not normally fitted).
7. Outline of RF Can (Fitted to 915MHz RF Modules)
8. Assembly Labels

3.5.1.2 RFM Block Diagram

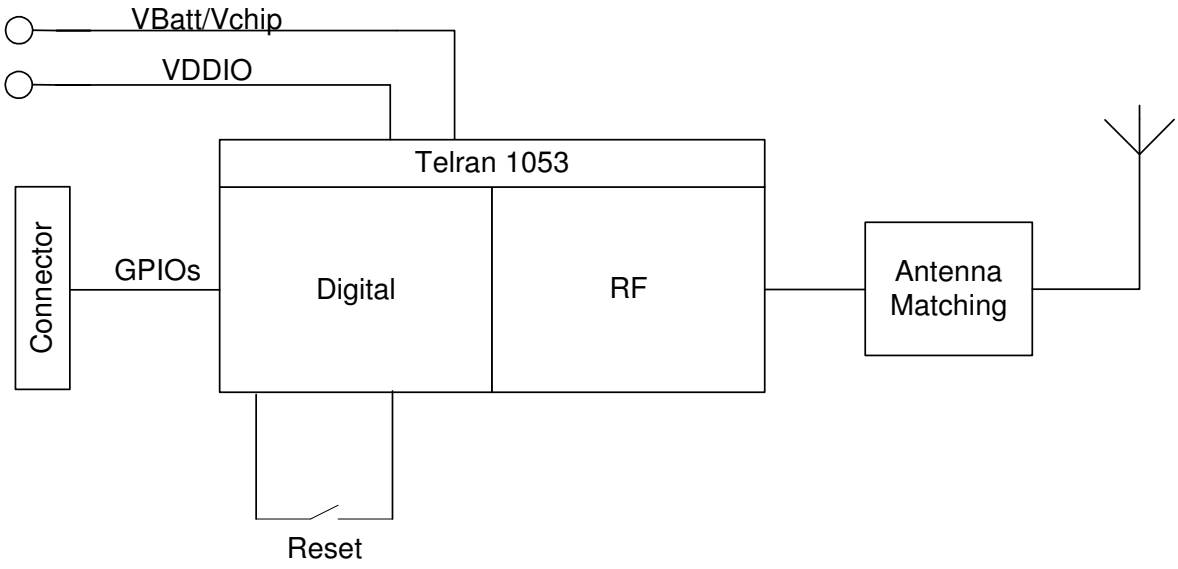


Figure 2. Telran TDK RFM Block Diagram

3.5.1.3 RFM Board Dimensions

4 layer PCB 22 mm x 39 mm x 1.0 mm. Length overall, including connector 43.74 mm.

3.5.1.4 RFM Board Weights

EU Version, TZ207010: Weight: 2.8 gms without battery or Battery Holder
Weight: 3.7 gms with Battery Holder and no battery
Weight: 5.1 gms with Battery Holder and battery

US Version, TZ207011: Weight: 5.9 gms with RF Can, Battery Holder and no battery fitted
Weight: 7.8 gms with RF Can and Battery Holder with battery fitted.

3.5.1.5 J1 U_FL Co-axial Antenna Connector

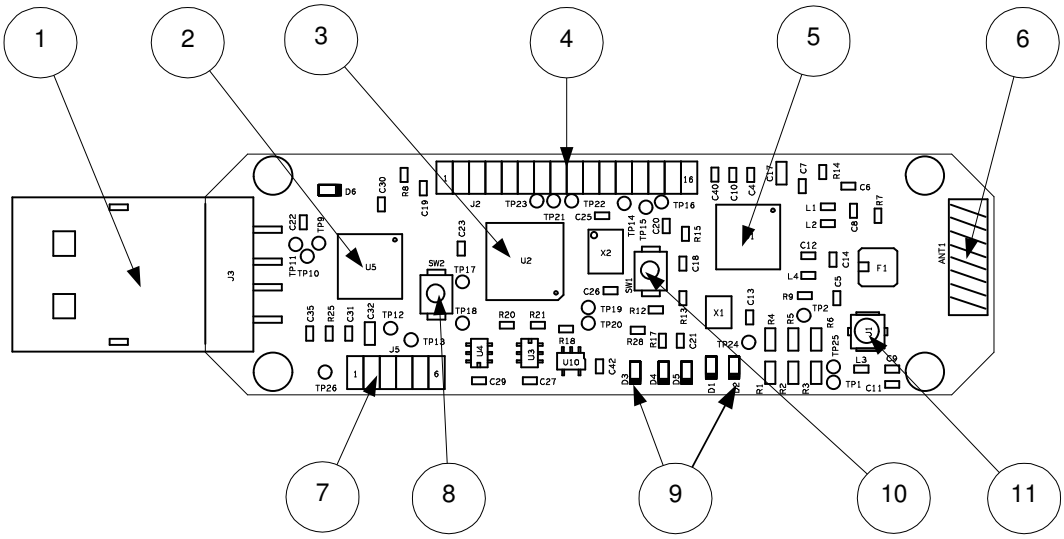
A 'Unique' connector for connecting to external antennas. Note for full power to be delivered to an antenna attached to this connector C9 must be removed from the PCB.

3.5.1.6 J2 Telran TDK External Connector

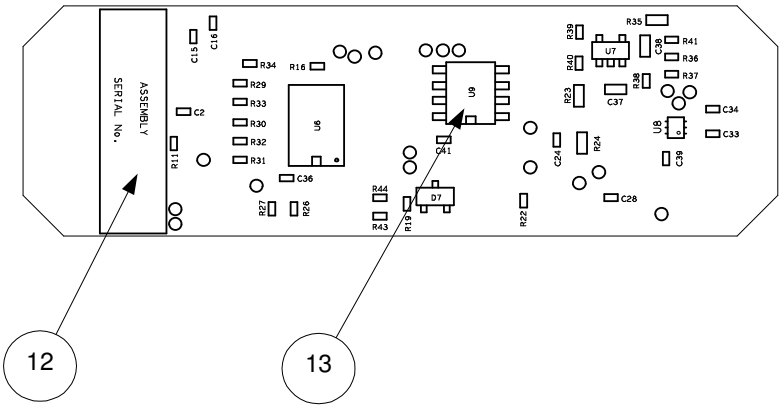
Pin No.	Function	Pin No.	Function
1	VDDIO	2	MISO_TEL
3	F0	4	MOSI_TEL
5	GND	6	SPI_CLK
7	GND	8	SPI_CS_N
9	TEL_GPIO4	10	TEL_RESET
11	SLPTMR	12	TEL_GPIO0
13	TEL_GPIO1	14	TEL_GPIO2
15	TEL_GPIO3	16	Vchip
17	Reserved	18	Reserved
19	Reserved	20	Reserved

3.5.2 Telran TDK USB Dongle

3.5.2.1 USB Assembly Details



View on Top of PCB



View on Underside of PCB

Figure 3. Telran TDK USB Board Assembly Details

1.	J3 USB Connector.	8.	PIC Reset pushbutton.
2.	FTDI USB Interface Chip.	9.	LEDs
3.	PIC18LF25K22.	10.	Telran Reset pushbutton
4.	J2 Telran TDK External Connector.	11.	J1 U_FL co-axial antenna connector
5.	Telran TZ1053.	12.	Assembly Labels
6.	Antenna.	13.	SPI Memory (23K256)
7.	J5 PIC ISP.		

3.5.2.2 USB Board Dimensions

4 layer PCB 18.68 mm x 61.47 mm x 1.0 mm.

3.5.2.3 USB Board Weights

USB Dongle (TZ207020 and TZ207021) Weight: 10.3 gms

3.5.2.4 USB Block Diagram.

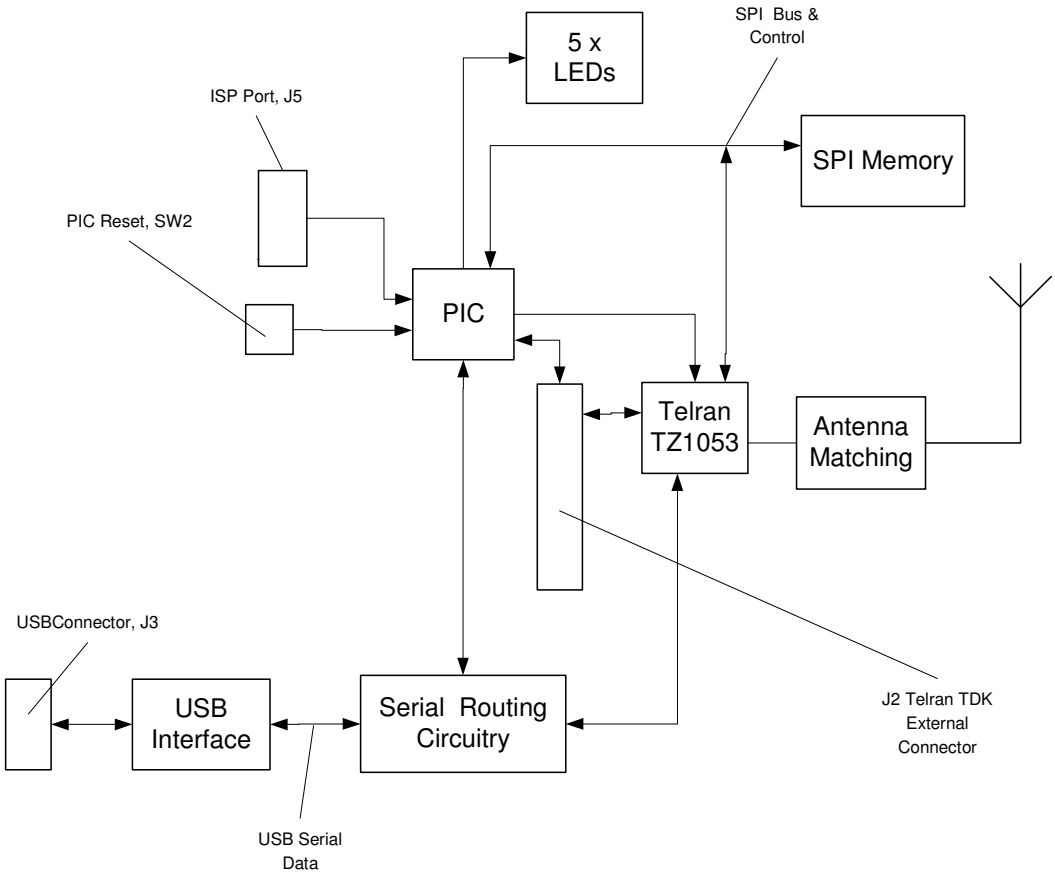


Figure 4. Telran TDK USB Board Block Diagram

3.5.2.5 J1 U_FL Co-axial Antenna Connector

A 'Unique' connector for connecting to external antennas. Note for full power to be delivered to an antenna attached to this connector C9 must be removed from the PCB.

3.5.2.6 J2 Telran TDK External Connector

Pin No.	Function	Pin No.	Function
1	VDDIO	2	MISO_TEL
3	F0	4	MOSI_TEL
5	GND	6	SPI_CLK
7	GND	8	SPI_CS_N
9	TEL_GPIO4	10	TEL_RESET
11	SLPTMR	12	TEL_GPIO0
13	TEL_GPIO1	14	TEL_GPIO2
15	TEL_GPIO3	16	Vchip

Connector J2 is not normally fitted.

3.5.2.7 J5 PIC ISP Connector

Pin No.	Function
1	VPP
2	VDDPIC
3	GND
4	PGD
5	PGC
6	Unconnected

J5 is used to program the PIC on the Telran TDK USB Board.

3.5.2.8 LEDs

The location and function of LEDs on the Telran TDK USB board is shown in Figure 5.

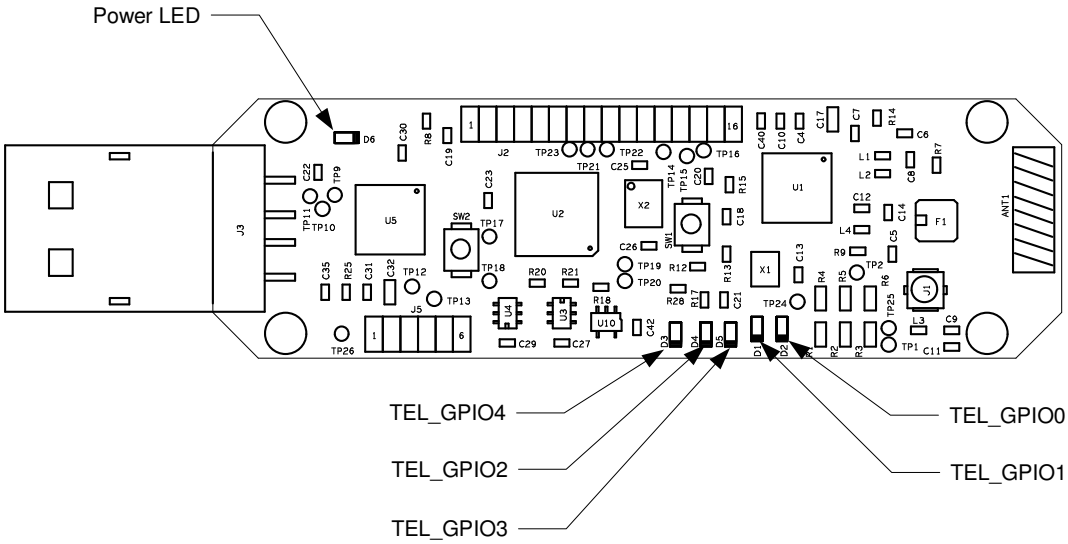


Figure 5. Location of LEDs on Telran TDK USB Board

The LED Functionality is shown in the following table:

LED	Telran Pin No.	As Telran Function pin(s)	As Telran Status Pin
D3	TEL_GPIO4	GPIO/1 wire protocol	Radio Busy
D2	TEL_GPIO0	GPIO/UART TX	-
D1	TEL_GPIO1	GPIO/UART RX	-
D5	TEL_GPIO2	GPIO/(I2C) SDA	Needs Attention
D4	TEL_GPIO3	GPIO/(I2C) SCL	CPU Busy

See *TZ1053 Telran datasheet* and *TZ1053 Software User Guide* for further details.

3.5.2.9 TDK USB Dongle & Connections to a PC

The TDK USB Dongle may be plugged directly into a USB port of a Desktop PC or Laptop. An extension cable of not more than 1m in length may be also used to connect the TDK USB Dongle to a Desktop PC or Laptop.

The TDK USB Dongle may also be plugged into a USB hub that is subsequently connected to a Desktop PC or Laptop.

3.5.2.10 USB UART Routing

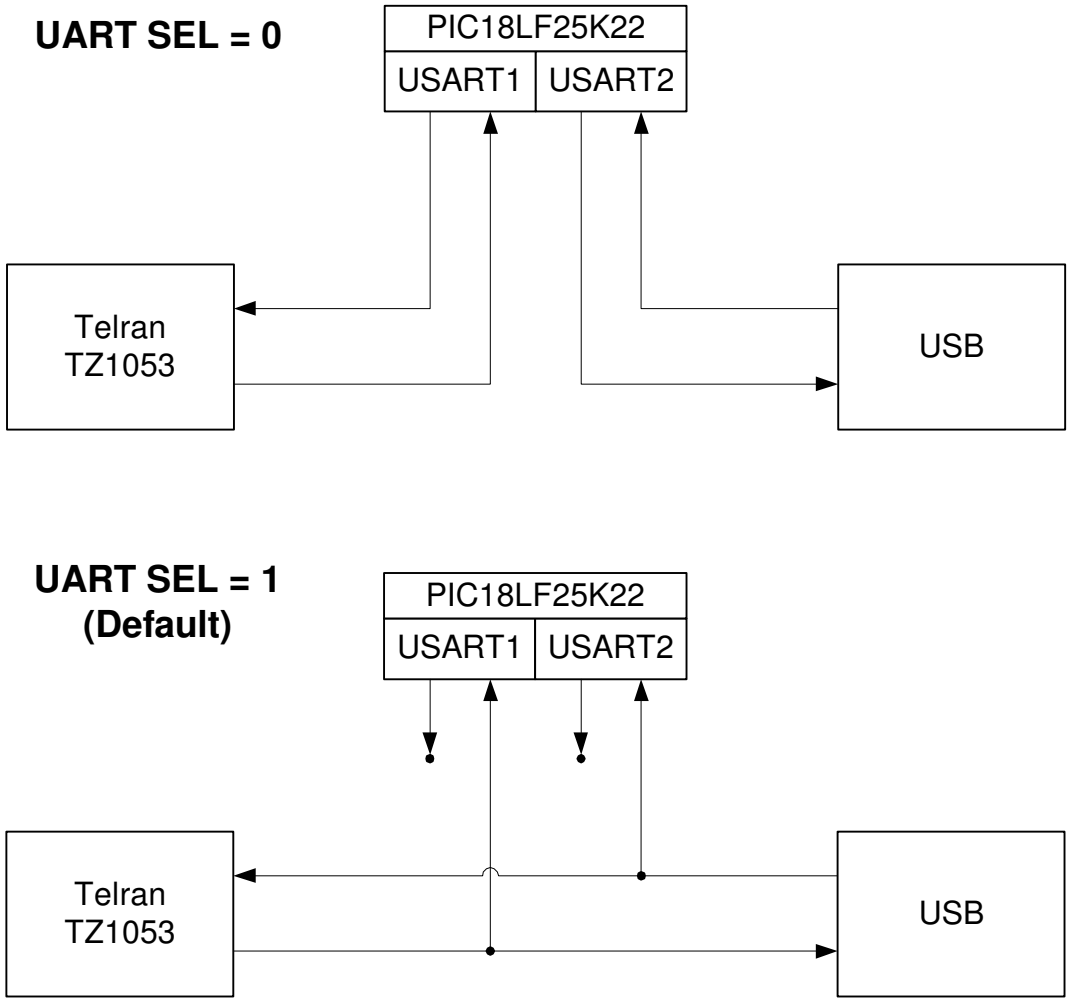
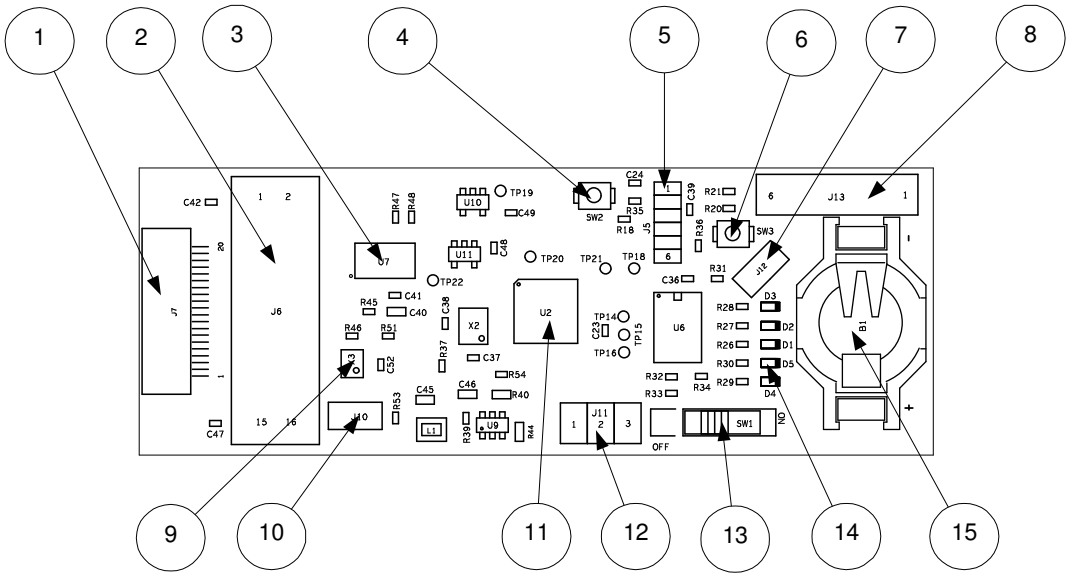


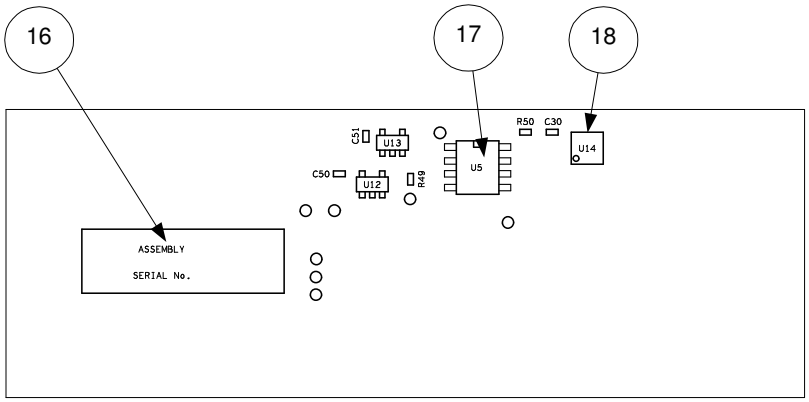
Figure 6. UART Routing as Controlled by PIC_UART_SEl.

3.5.3 Telran TDK Sensor Development Board (SDB)

3.5.3.1 SDB Assembly Details



View on Top of PCB



View on Underside of PCB

Figure 7. Telran TDK Sensor Development Board

1.	J7 Connector to Telran TDK RF Board.	10.	Jumper J10.
2.	J6 UMI+ Connector (see for pin out).	11.	PIC18LF25K22.
3.	Accelerometer 3 axis LIS35DE +/-2g, +/-8g	12.	Jumper J11.
4.	PIC Reset.	13.	Battery On/Off Switch SW1.
5.	J5 PIC ISP Connector.	14.	LEDs.
6.	User Push button.	15.	LR44 Battery Retainer.
7.	Jumper J12.	16.	Assembly Labels.
8.	J13 USART2 Connector.	17.	SPI Memory (Not Fitted).
9.	32k678Hz Oscillator.	18.	Alternative 3 axis accelerometer – LI35DH (Not Fitted).

3.5.3.2 SDB Board Dimensions

4 layer PCB 27.0 mm x 75.0 mm x 1.0 mm.

3.5.3.3 SDB Board Weights

Weight: 7.7 gms without battery fitted.
Weight: 9.6 gms with battery fitted

3.5.3.4 SDB Block Diagram

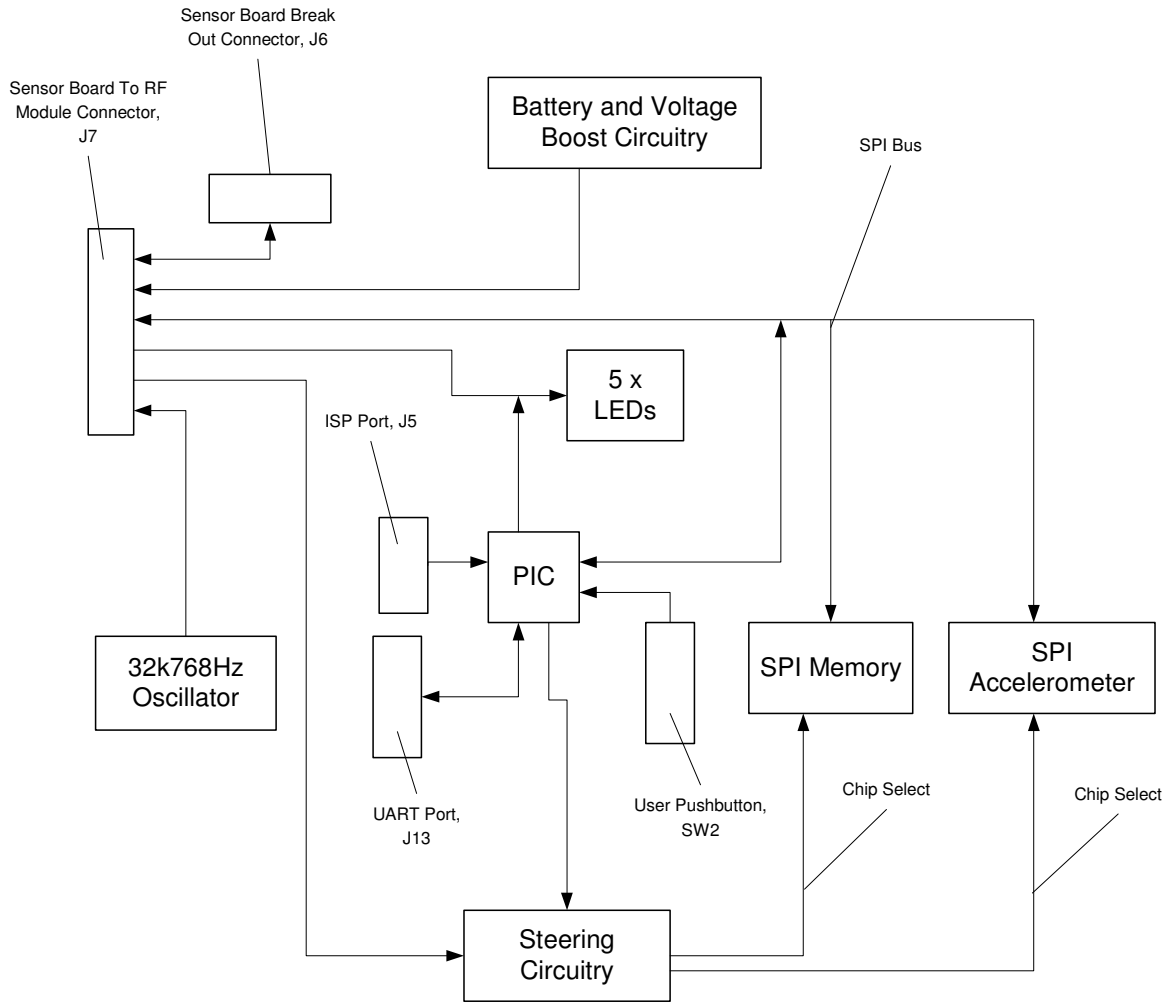


Figure 8. Telran TDK SDB Block Diagram

3.5.3.5 J5 PIC ISP Connector

Pin No.	Function
1	VPP
2	VDDPIC
3	GND
4	PGD
5	PGC
6	Unconnected

J5 is used to program the PIC on the Telran TDK Sensor Board.

3.5.3.6 J6 UMI+ Connector

The UMI+ Connector is a connector that is configured to provide connections to the Universal Metering Interface.

Pin No.	Function	Pin No.	Function
1	VDDIO	2	MISO_TEL
3	F0[1]	4	MOSI_TEL
5	GND	6	SPI_CLK
7	GND	8	SPI_CS_N
9	TEL_GPIO4	10	TEL_RESET
11	SLPTMR	12	TEL_GPIO0
13	TEL_GPIO1	14	TEL_GPIO2
15	TEL_GPIO3	16	Vchip

Note:
Pin 3 - F0 is not a UMI pin as this is used by High power UMI devices.
Pins 1 to 10 are configured as UMI connections, whilst the remaining pins can be used to connect to other functions on the Telran TDK RF and Telran TDK Sensor Boards.

3.5.3.7 J7 Telran TDK RF Board Connector

Pin No.	Function	Pin No.	Function
1	VDDIO	2	MISO_TEL
3	F0	4	MOSI_TEL
5	GND	6	SPI_CLK
7	GND	8	SPI_CS_N
9	TEL_GPIO4	10	TEL_RESET
11	SLPTMR	12	TEL_GPIO0
13	TEL_GPIO1	14	TEL_GPIO2
15	TEL_GPIO3	16	Vchip
17	Reserved	18	Reserved
19	Reserved	20	Reserved

This table shows the correct pinout of J7. The pin numbering indicated on the TZ207020 PCB is incorrect, with 1 and 20 swapped.

3.5.3.8 J10 1.25V Jumper

J10 is linked to supply the Vchip of an attached Telran TDK RF Board with 1.25V when a battery or external power supply is used to power the Telran TDK Sensor Board.

A current meter placed across J10, when it is unlinked, can be used to monitor the current used by an attached Telran TDK RF Board.

Note:
Jumper J10 should not be linked when supplying Vchip from Connector J11.

3.5.3.9 J11 External Power Supply / Monitor Connector

Pin No.	Function
1	VDDIO – 3V
2	Vchip – 1.25V
3	GND

J11 can be used to monitor the VDDIO and Vchip voltages used on the Telran TDK Sensor board. Alternatively this connector permits an external 3V power supply to be used to power the Telran TDK Sensor Board via J11 pin 3.

A separate 1.25V supply can be connected to J11 pin 2 to power an attached Telran TDK RF Board. In this case Jumper J10 should not be linked.

3.5.3.10 J12 LED Enable/Disable Jumper

Placing a jumper link on J12 will enable the operation of the LEDs D1 to D5. Leaving the link off the LEDs will be non-operational.

WARNING: Running the Sensor Board on battery, with the LEDs enabled will reduce the life / running time of the battery.

3.5.3.11 J13 USART2 Connector

J13 is used to connect the PIC's number 2 USART to a serial host connector.

Pin No.	Function
1	GND
2	Unconnected
3	Unconnected
4	USART2_TX
5	USART2_rRX
6	Unconnected

3.5.3.12 LEDs

The location and function of LEDs on the Telran TDK Sensor board is shown in Figure 9.

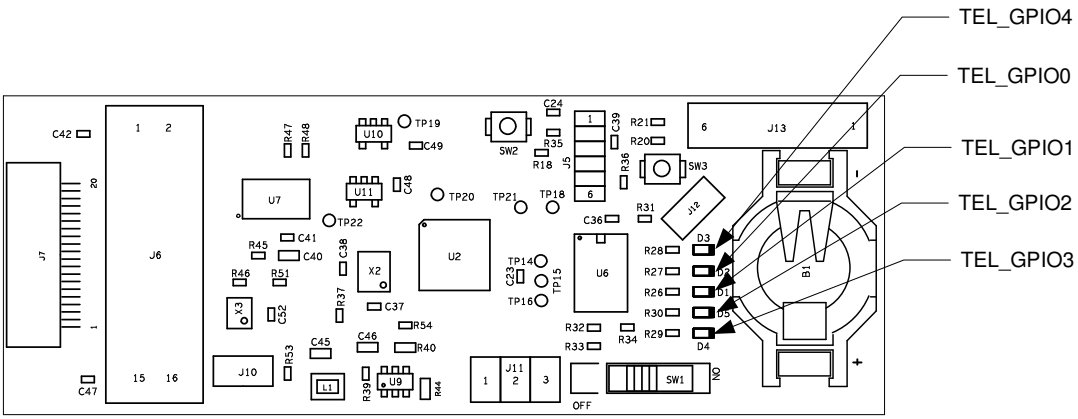


Figure 9. Location of LEDs on Telran TDK Sensor Board.

The LED Functionality is shown in the following table:

LED	Telran Pin No.	As Telran Function pin(s)	As Telran Status Pin
D3	TEL_GPIO4	GPIO/1 wire protocol	Radio Busy
D2	TEL_GPIO0	GPIO/UART TX	-
D1	TEL_GPIO1	GPIO/UART RX	-
D5	TEL_GPIO2	GPIO/(I2C) SDA	Needs Attention
D4	TEL_GPIO3	GPIO/(I2C) SCL	CPU Busy

See *TZ1053 Telran datasheet* and *TZ1053 Software User Guide* for further details.

3.5.4 RFM with SDB.

Figure 10 shows the RFM plugged into the SDB.

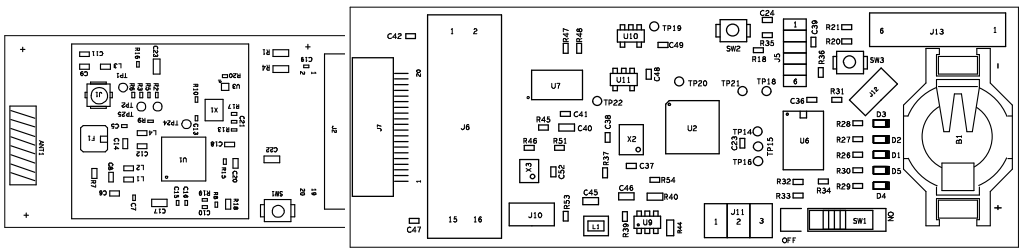


Figure 10. RFM Plugged into SDB.

4. Getting Started

4.1 What's On The CD

The TZ2070-CD contains:

- Splash screen, File to start-up CD and display contents of CD.
- Readme.txt, Readme.html - Files to allow the user to determine what on the CD.
- TZ1053 data sheet: TZ1053-TDS V1_07.doc, TZ1053 data sheet describes the features of the Telran Chip.
- Telran TDK Errata.doc, Errata for the Telran Development Kit.
- TZ1053-AN02 RF Reference PCB Layout.doc.
- Telran User Guide: Telran TDK TZ1053-IFU ver 2.00.pdf. A guide showing what's on each board and how to use the kit, Demo Accelerometer Application and associated software.
- Bootstrap Loader: PIC Bootlader.HEX and AN1310ui.exe. Bootstrap Loader code for the PIC and Bootstrap loader program for a PC to permit UART down load of user code.
- Accelerometer Demo Program.
- Telran Plug Code In User Guide: TZ1053 Plugin Code Userguide_V1_1.pdf. How to use and compile Plug-In code.
- Software User Guide:
- Telran Scripter Guide: How to use and compile Script codes for the Telran.
- Telran TDK GUI
- Any redistributable code that is required to make any of the above work on an End Users PC or to give the End User the ability to reconfigure the TDKs.

4.2 Software Tools

In order to be able to evaluate the Telran TZ1053 a set of software tools are required. These are:

Included on the DVD with the Telran Development Kit is a utility that permits the User to communicate with the Telran TZ1053. This utility, the 'TELRAN Wireless Application Tools' can also be used to send plug-in code to the Telran TZ1053 on the USB Board and to remote Telran TZ1053 by using an Over The Air (OTA) command. . The latest version of this tool can be downloaded from the Toumaz web site.

Template files. The latest version of the Template files can be downloaded from the Toumaz web site.

If the PIC code on the Telran TDK Sensor or USB boards is to be modified then Microchip's MPLAB IDE and the HI-TECH C Compiler for PIC18 MCUs will be required. Both of these tools can be downloaded from Microchip's website. The HI-TECH C Compiler can be installed as a 'Lite' version – a restricted version of the fully released compiler.

4.3 Toumaz Wireless Tool

The Toumaz Wireless Tool included with the Telran TDK Kit is a tool that enables the User to debug and control applications running on the Telran TZ1053.

The current tool included with the kit will be replaced by a new Graphical User Interface in the very near future. Users should refer to the Toumaz web site www.toumaz.com for the latest updates.

This Guide shows briefly how to use and setup the Toumaz Wireless Tool in Appendices A2 and A3. These Appendices show how the TZ207020 USB Dongle is tested.

This section of the Telran User Guide will be expanded at a later date to reflect the new tools once they are available.

5. Accelerometer Demo Program

The Telran TDK Kit is supplied with a 3-axis accelerometer demonstration program that is intended to show the capabilities of the Telran TZ1053.

The Application Screen has a number of areas of information as shown by Figure 11.

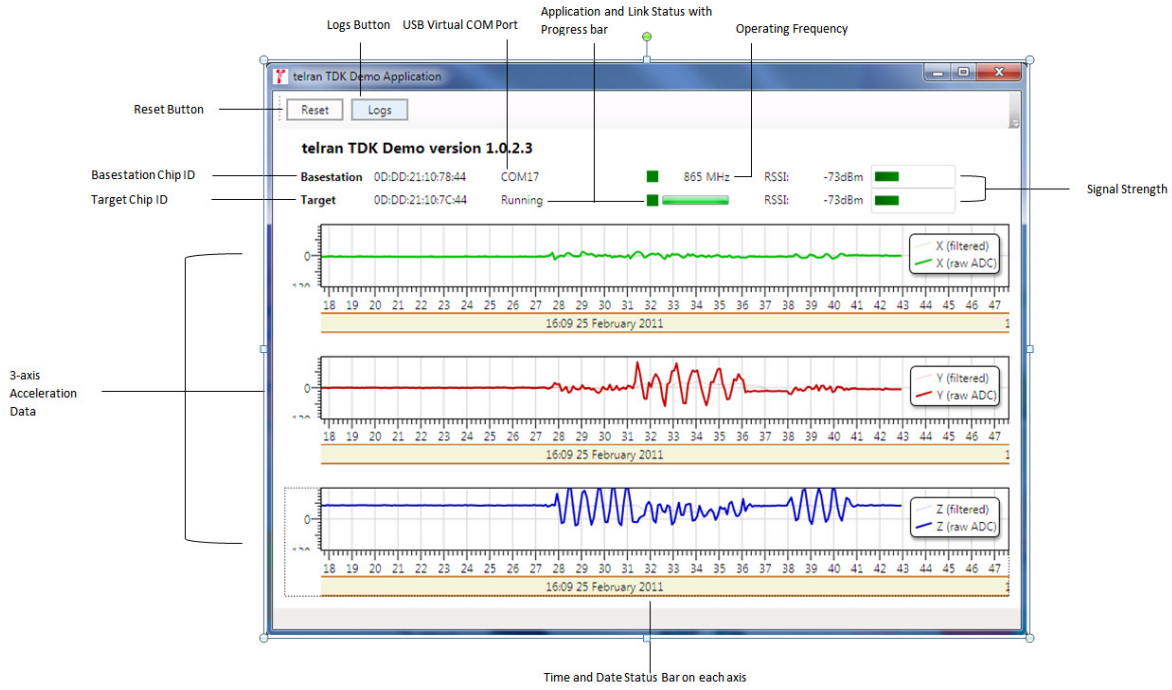


Figure 11. Application in operation.

The information areas are:

- Basestation: Chip ID of the Telran used in the Telran TDK USB Dongle.
- Target: Chip ID of the Telran used in the Telran TDK RF Board.
- Com Port: Virtual Com Port used by the Telran TDK USB Dongle.
- Link Status: This Box changes colour according to of the link:
-

  Target available
  Linking to target
  Linked to target station.

- Operating Frequency: The current frequency used by the application.
- Operating Signal Strength: The signal strengths observed by both the Telran TDK USB Dongle and the Telran TDK RF Board.
- Application Status: Indicates the actions that the Demonstration program is performing.
- Progress Bar: Indicates the progress of linking.
- 3-axis Acceleration Data: A display of Raw and Filtered Data received from the Target.
- Time and Date Status Bar: The time and date at which sample data is received.
- Reset Button: Button to Reset the Base station
- Logs Button: Button to display Logs

5.1 Installation of the Accelerometer Demonstration Program.

Installation of the Accelerometer Demonstration program requires that the PIC application code to be installed in the TZ207020 USB Dongle. This is done using the Bootstrap Loader (see Section 6.2) to write the appropriate regional file to the USB Dongle:

TZ2070 Dongle Application_xx.hex

Where xx = CN, for Chinese operating frequency band – 779 MHz,
EU, for European operating frequency band – 868 MHz,
JP, for Japanese operating frequency band – 950 MHz,
US, for United States operating frequency band – 915 MHz,

Installation also requires that the PC code for the application is installed on the user's PC in a directory called TelranTdkDemoApplications-1.0.2.3, see Figure 12

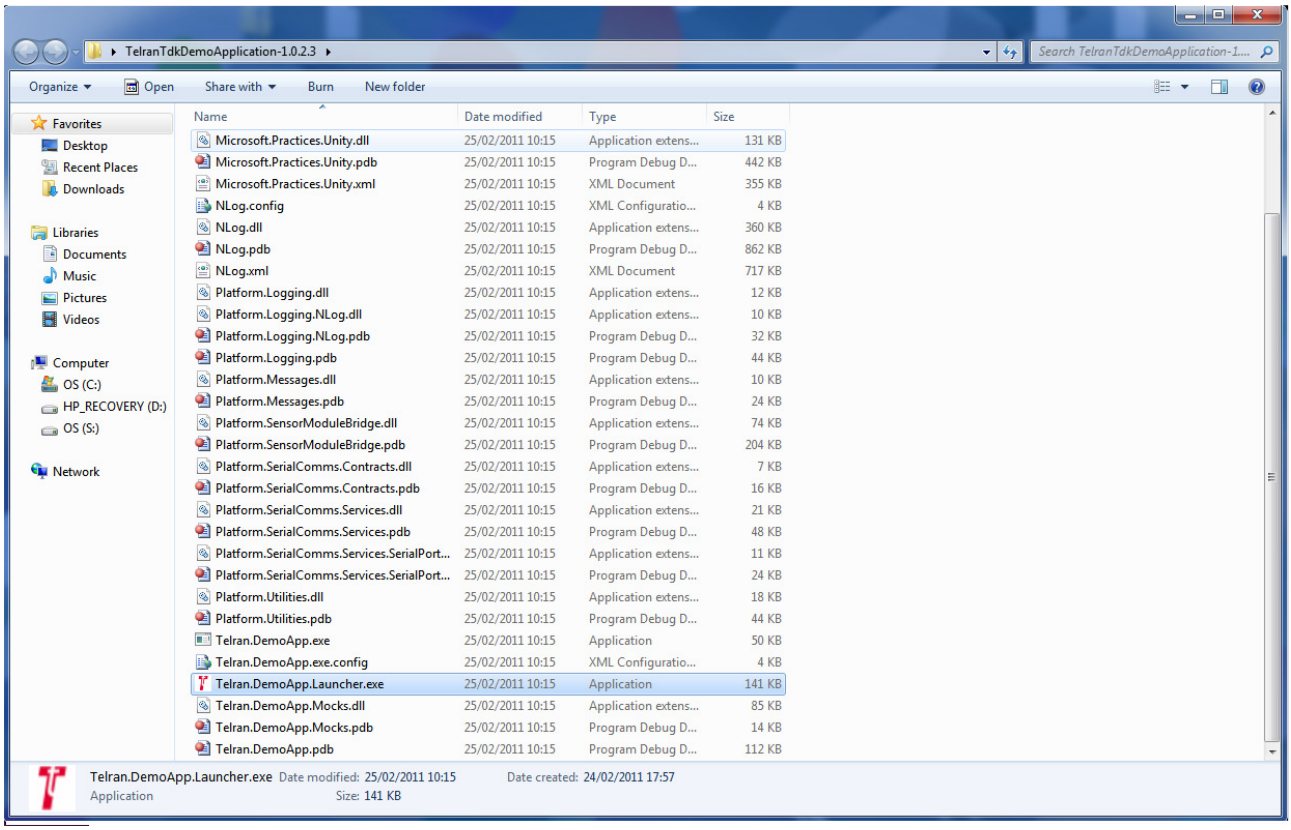


Figure 12. File structure for Accelerometer Demonstration.

5.2 Operation of the Accelerometer Demonstration Program.

To operate the Accelerometer Demonstration program take the following steps:

1. Connect the USB dongle to the PC and press the Reset button as shown in item 9 figure 2.
2. Navigate to the directory TelranTdkDemoApplications-1.0.2.3, see Figure 12.

3. Click on *Telran.DemoApp.Launcher.exe*. This starts the application and shows the splash screen (this might take a few seconds), and then Figure 13 is displayed.

Figure 13. Application Screen opening and looking for target.

4. To view the logs click on the logs button. This opens up Baretail and to view the basestation logs click on the packet-processors.txt tab Figure 14.

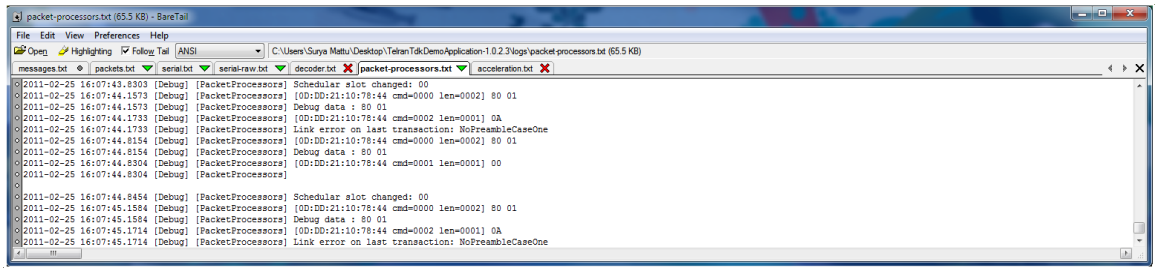


Figure 14 Logs showing Base station looking for target

5. Connect the target RF board to the sensor board as shown below.

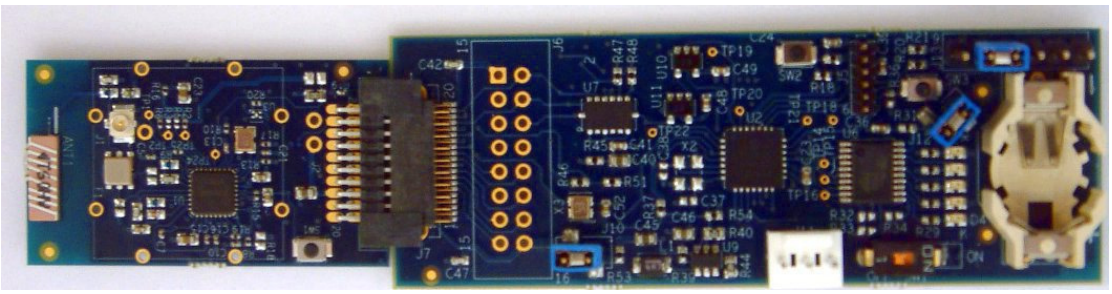


Figure 15 TELRAN RF Module and Sensor Development Board

6. Put the battery into the sensor board with the positive side on top. The LED's will turn on, on inserting the battery
7. Once a Target Station has been found the Application will link with that target and start running, Figure 16.

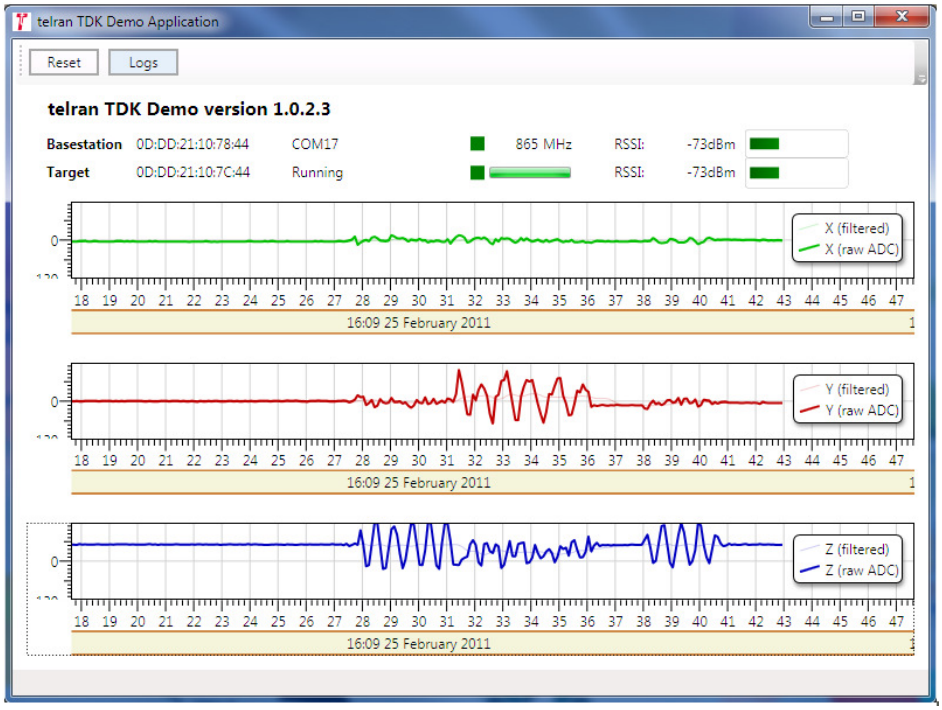


Figure 16. Application running with linked target.

6. Customisation
6.1 The Scripter

The TELRAN Scripter provides a simple and efficient means for the control of attached sensors, local data processing, and the exchange of data to and from TELRAN devices.

6.1.1 What is a Script?

A Script file is an ASCII text file comprised of a set of syntactically correct TELRAN Script Statements. Script files can be created manually in any text editor or edited within the TELRAN Script Compiler. These files are compiled by the TELRAN Script Compiler, producing a byte code file. This byte code is then loaded into a TELRAN (either via UART/SPI or over the Radio Link), and executed by the TELRAN internal Script Interpreter. For a detailed description of how to use scripts and the TELRAN Script Compiler the user is referred to the TZ1053 Scripter User Guide.

6.1.2 The Telran Demo

The Demo provided with the TELRAN TDK's was implemented using a Script. Figure 17 shows a screenshot of the Demo application script in the TELRAN Script Compiler. This code is written in the scripting language and is compiled to produce byte code that is loaded into TELRAN.

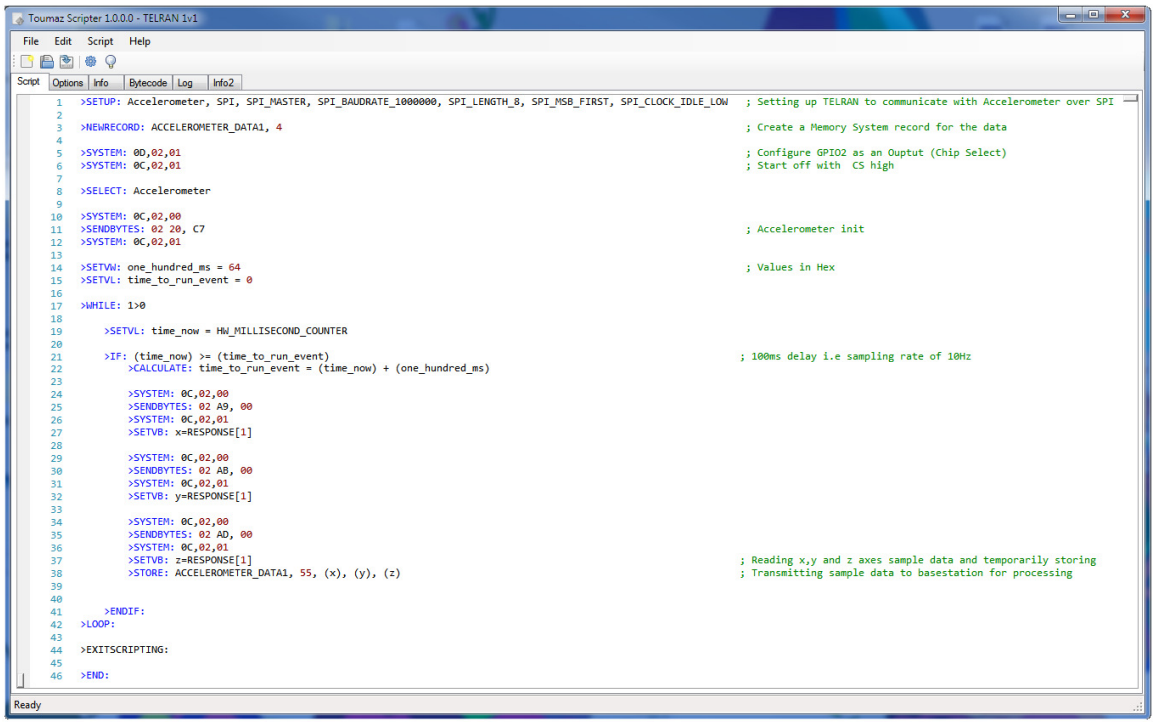


Figure 17 Accelerometer demo application script loaded in TELRAN script compiler

The script communicates with the accelerometer via SPI and reads sample data at a rate of 10Hz and transfers this data to the base station OTA (Over the Air) where it is processed and displayed on a real-time graph. Figure 18below shows the byte code that's generated by the Script Compiler. The byte code is outputted in different formats depending on how it is to be used. For further information on the scripter and its functions the user is referred to the TZ1053 Scripter user guide.

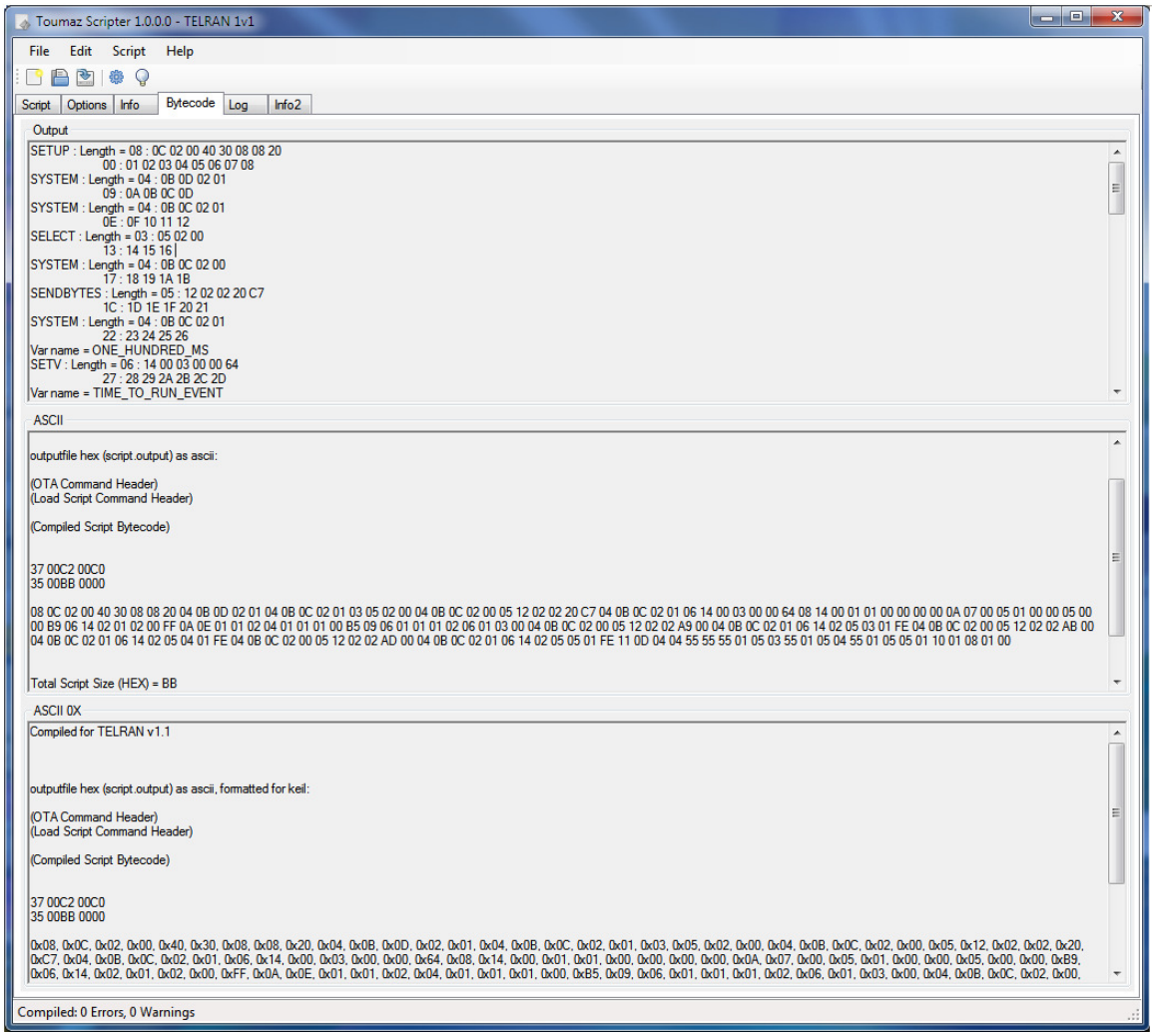


Figure 18 Byte Code for Accelerometer demo application

6.2 Using the Bootstrap Loader.

The Bootstrap Loader is used to download user code into the PIC on the TDK USB Dongle, TZ207020 or the PIC on the TDK Sensor Board, TZ207030.

1. To use the Bootstrap loader the TDK USB Dongle PCB must be removed from its enclosure so that the PIC Reset button can be accessed. Then carryout the following steps:

2. Locate the place where the program AN1310ui.exe exists or click on the program's desktop icon if one is available:

3. The screen shown in Figure 19 is now displayed.

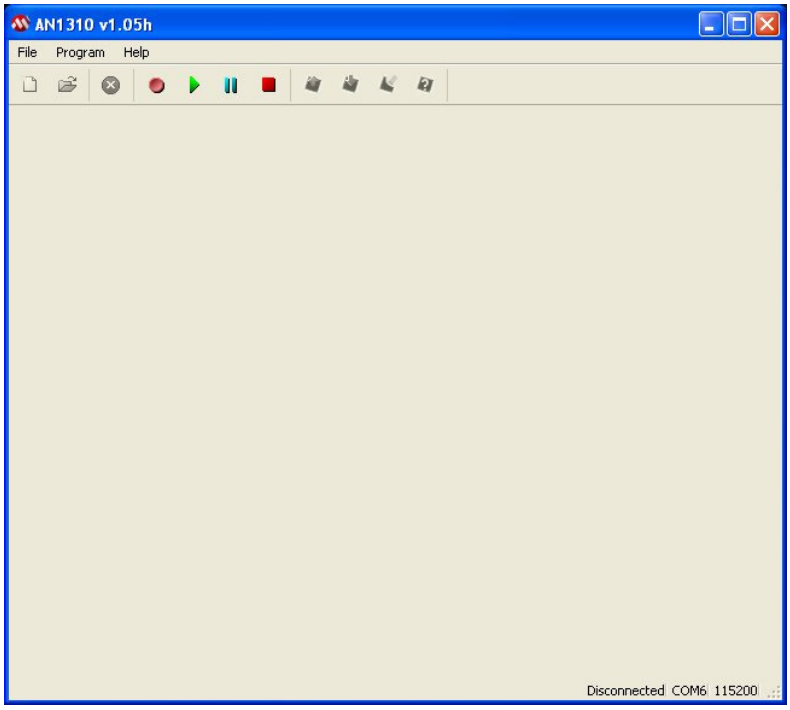


Figure 19. Bootstrap Loader Opening Screen.

4. To ensure the Bootloader is set up correctly Click on the 'Program' item on the Menu Bar. This will produce a dropdown menu as shown in Figure 20.

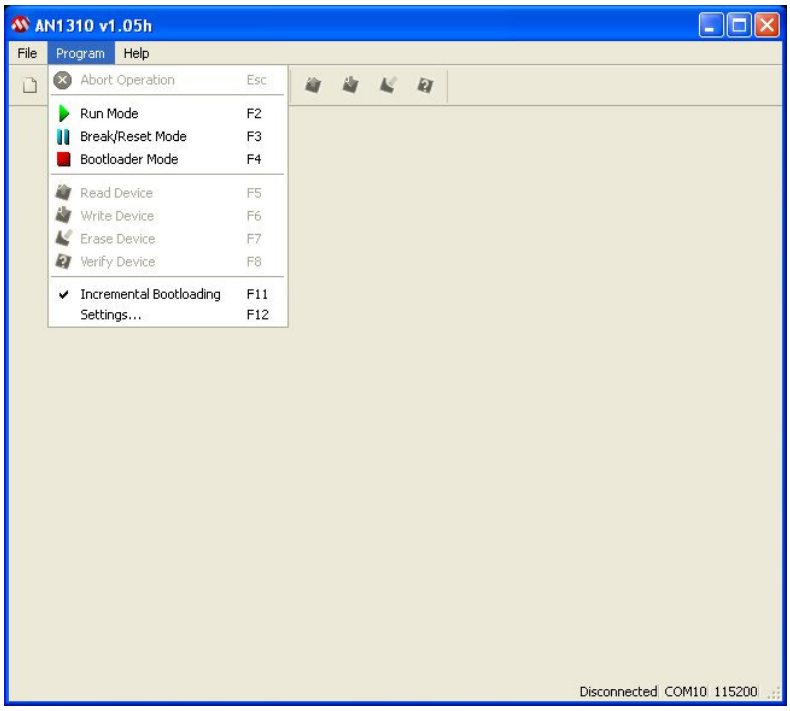


Figure 20. Finding the Bootstrap Loader Settings.

5. Click on the 'Settings' item from the drop down list or press <F12>. The Settings window will be displayed, Figure 21.

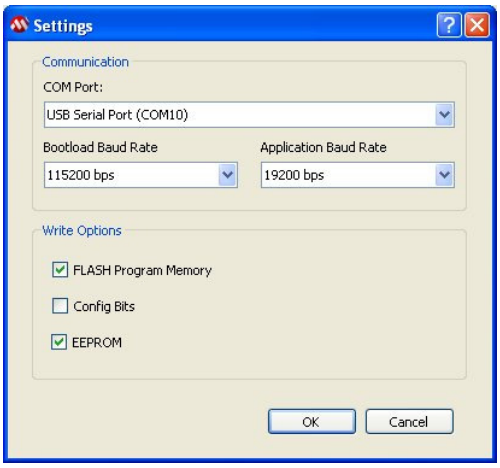


Figure 21. Bootstrap Loader Settings Window.

6. Select the COM port to which the Telran TDK USB or Sensor Board is connected. Ensure that Bootloader Baud Rate and Write Options are as shown in, Figure 21. Click the 'OK' button and return to the main screen, Figure 19.
7. To start the process of downloading a User Program to the Telran TDK USB or Sensor Boards' PIC, click on the 'Break/Reset Application Firmware' Icon :

or press <F3>. This will pause the application program running on the PIC. The Status Bar on the Bootloader's window will change as shown by Figure 22.

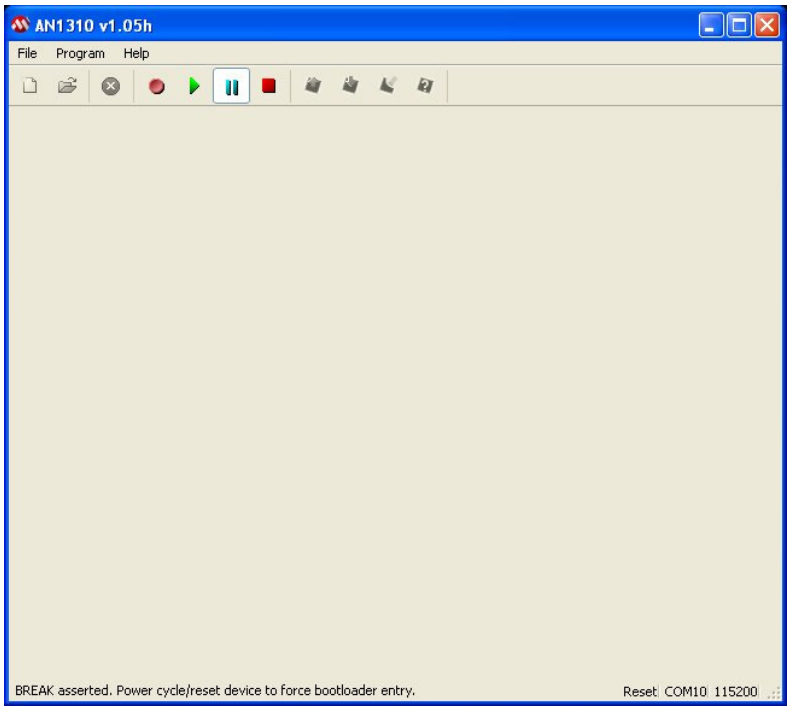
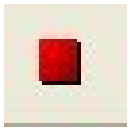


Figure 22. Bootstrap Loader Pause Application Program.

8. Press the PIC reset button on the attached TDK Board**,** see item 9 in Figure 3
9. Click on the 'Bootloader Mode' Icon :



or press <F4>. The Bootloader's window will change to be similar to that shown in Figure 23, as it connects to the Bootloader in the attached PIC.

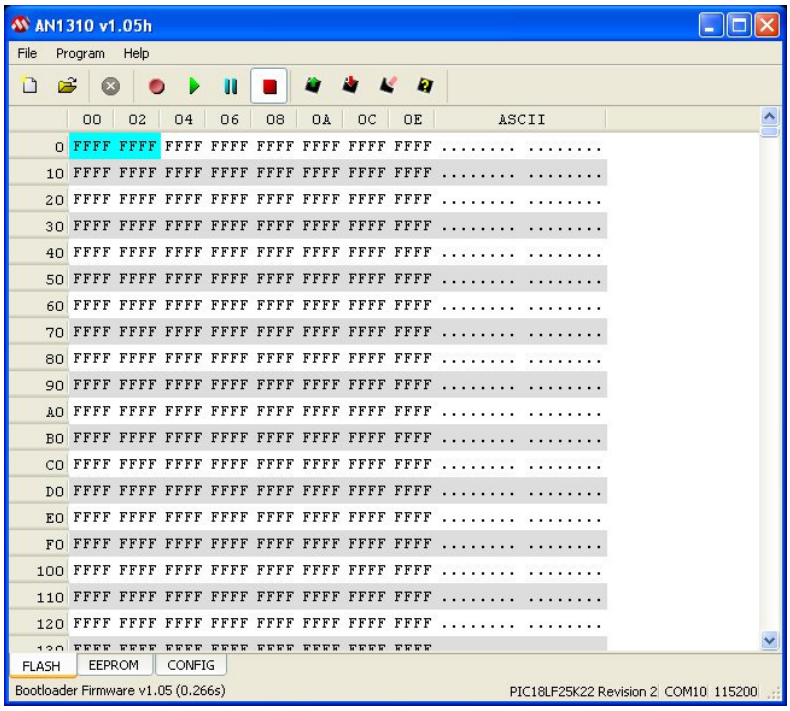


Figure 23 Bootstrap Connected.

10. Click the 'File, Menu Item and navigate to the location of the HEX file of the user code that is to be loaded into the PIC. Figure 24 shows an example of such a code location. Select the code and click on the 'Open' Button. The main Bootloader screen will be displayed.

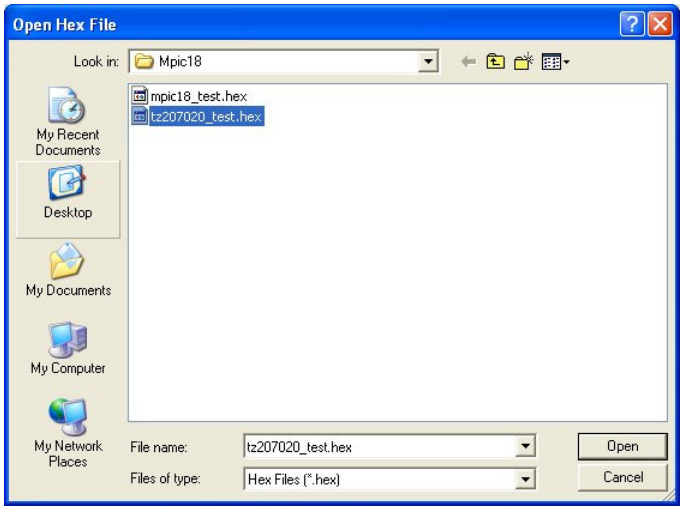
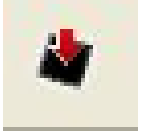


Figure 24. Locating the User Code.

11. The user code is now written to the PIC by clicking on the 'Write Device' Icon :



12. The PIC will now be programmed and on completion the Bootloader will show a screen similar to that of Figure 25.

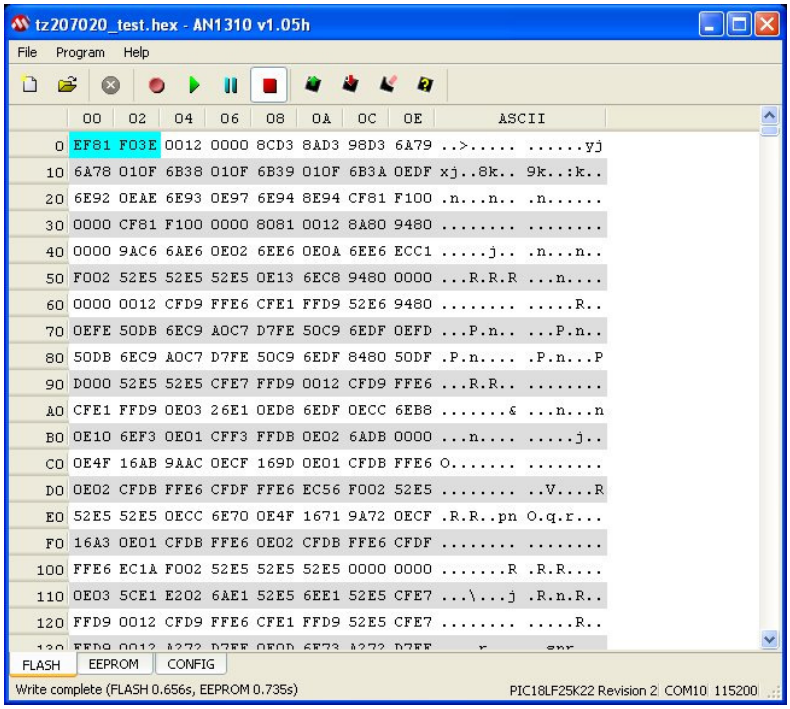
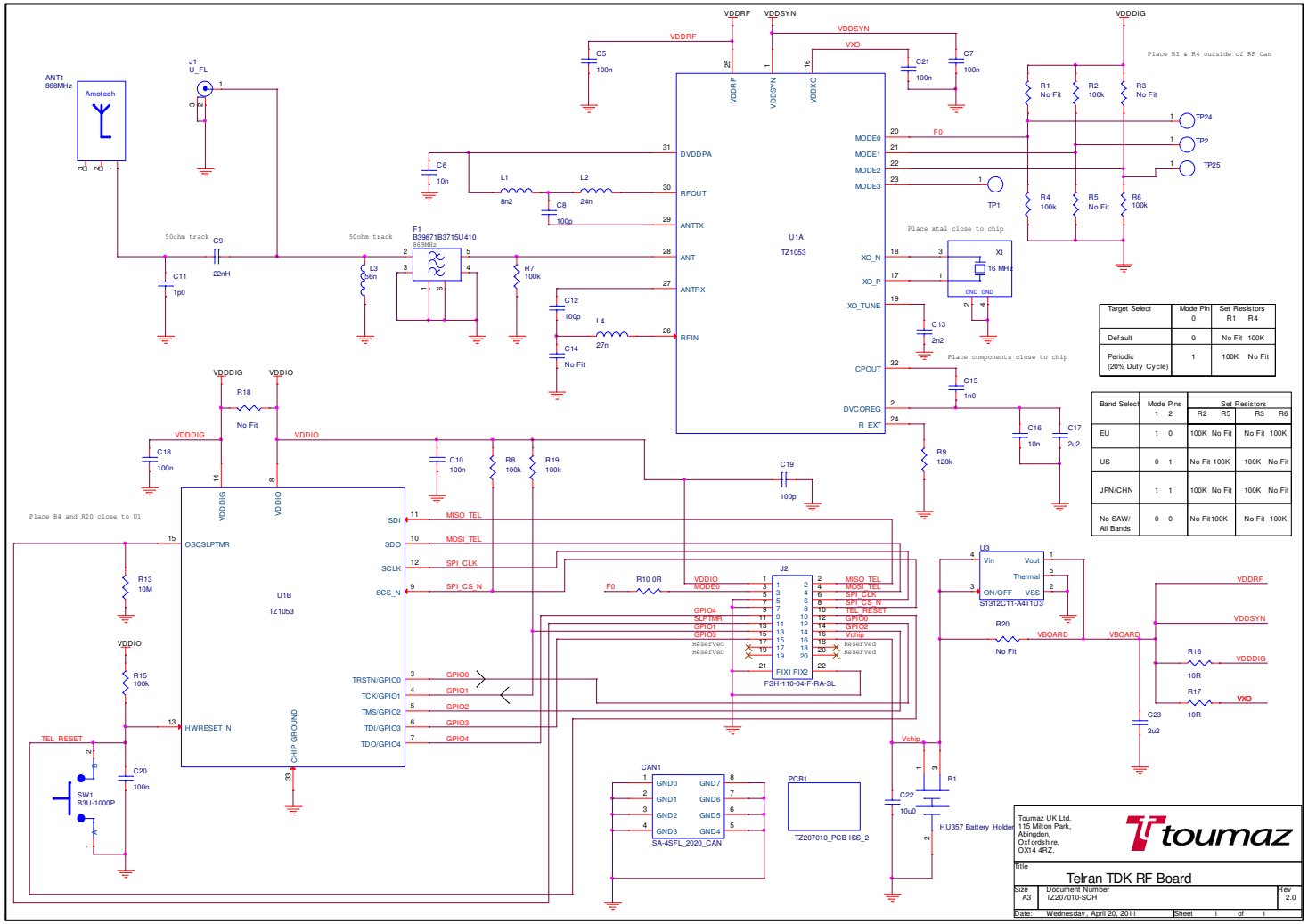


Figure 25. Programming Complete.

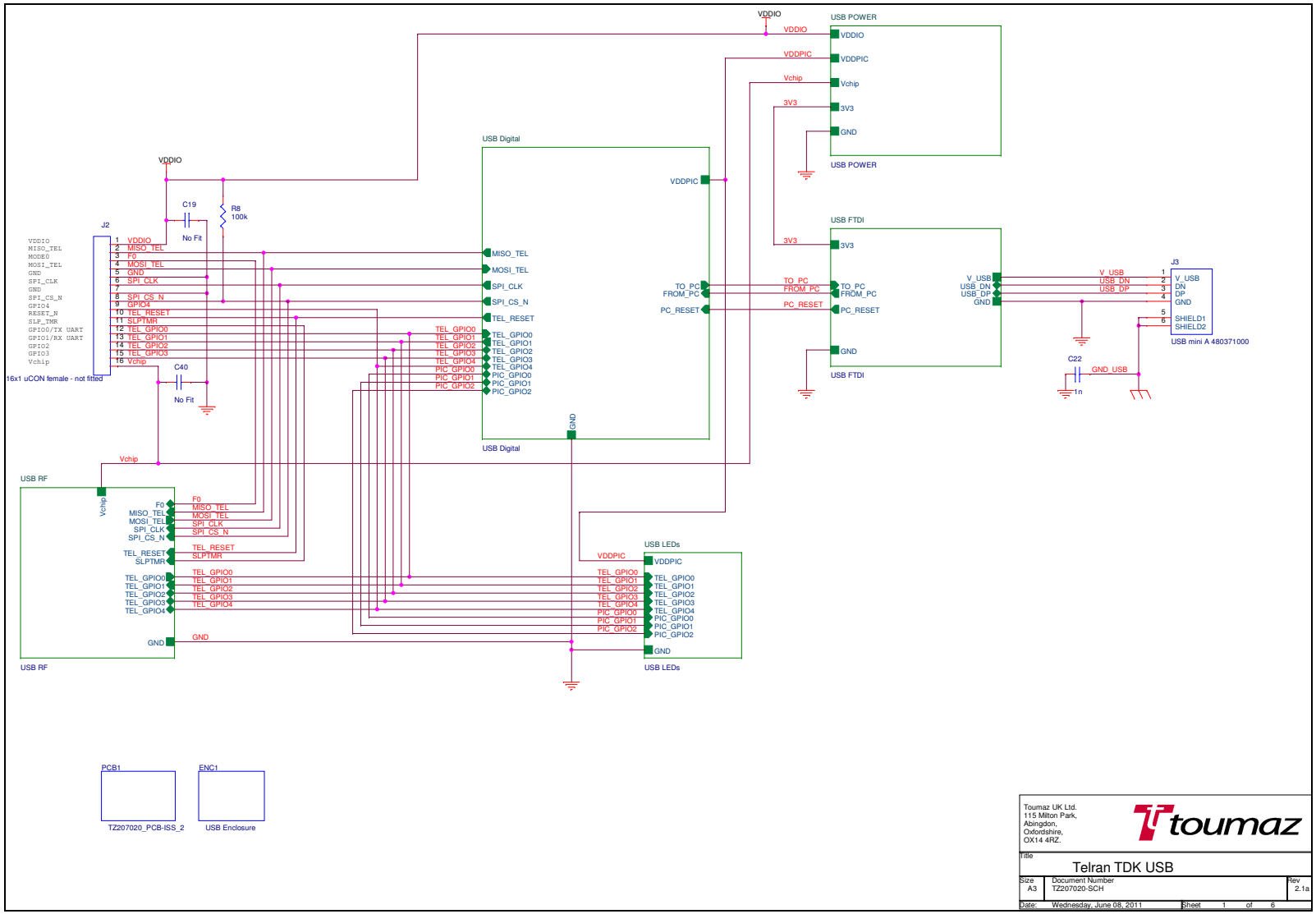
13. Reset the PIC so that the User Code can now be run. See item 9 in Figure 3

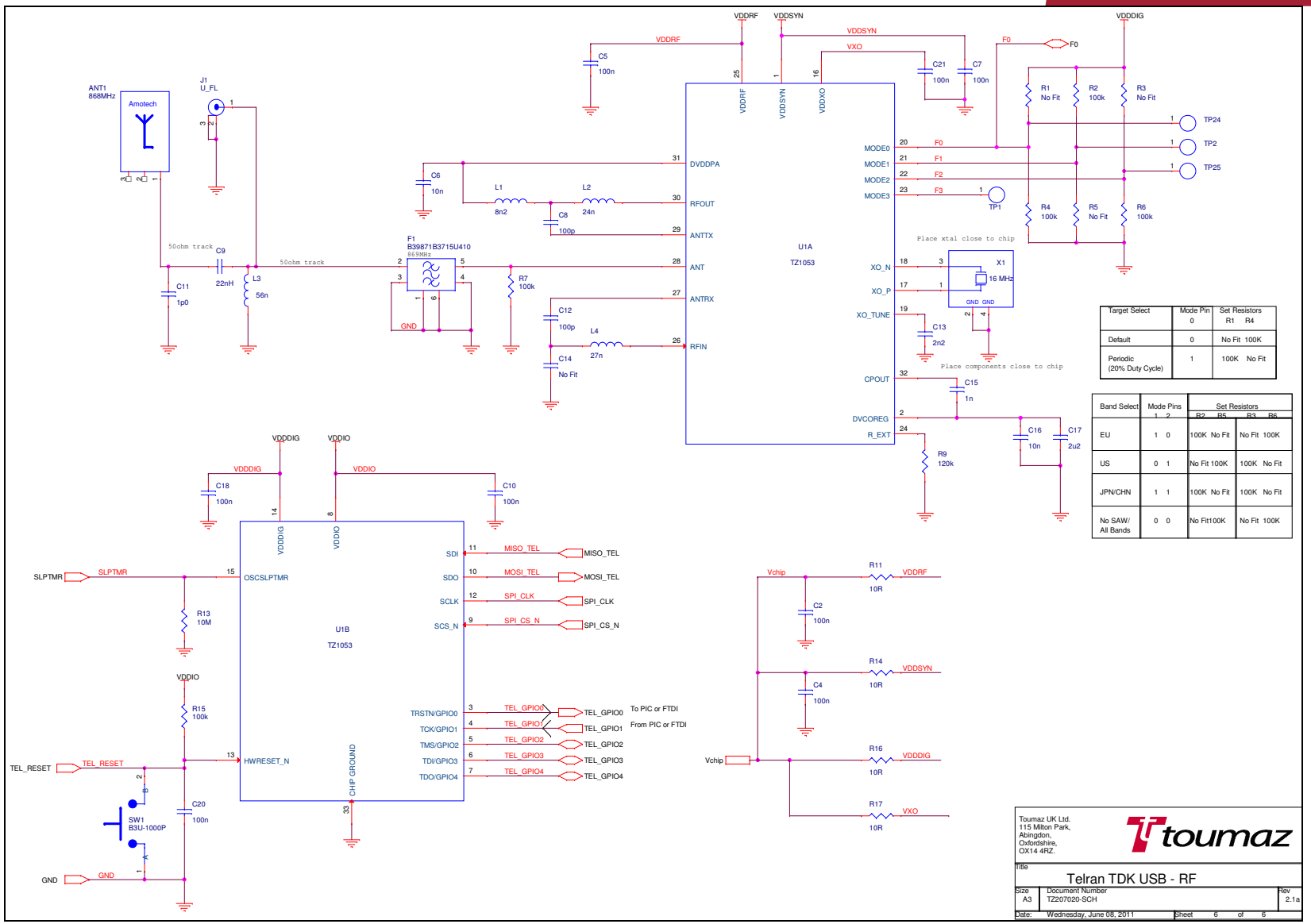
7. Reference Design Schematic Diagrams

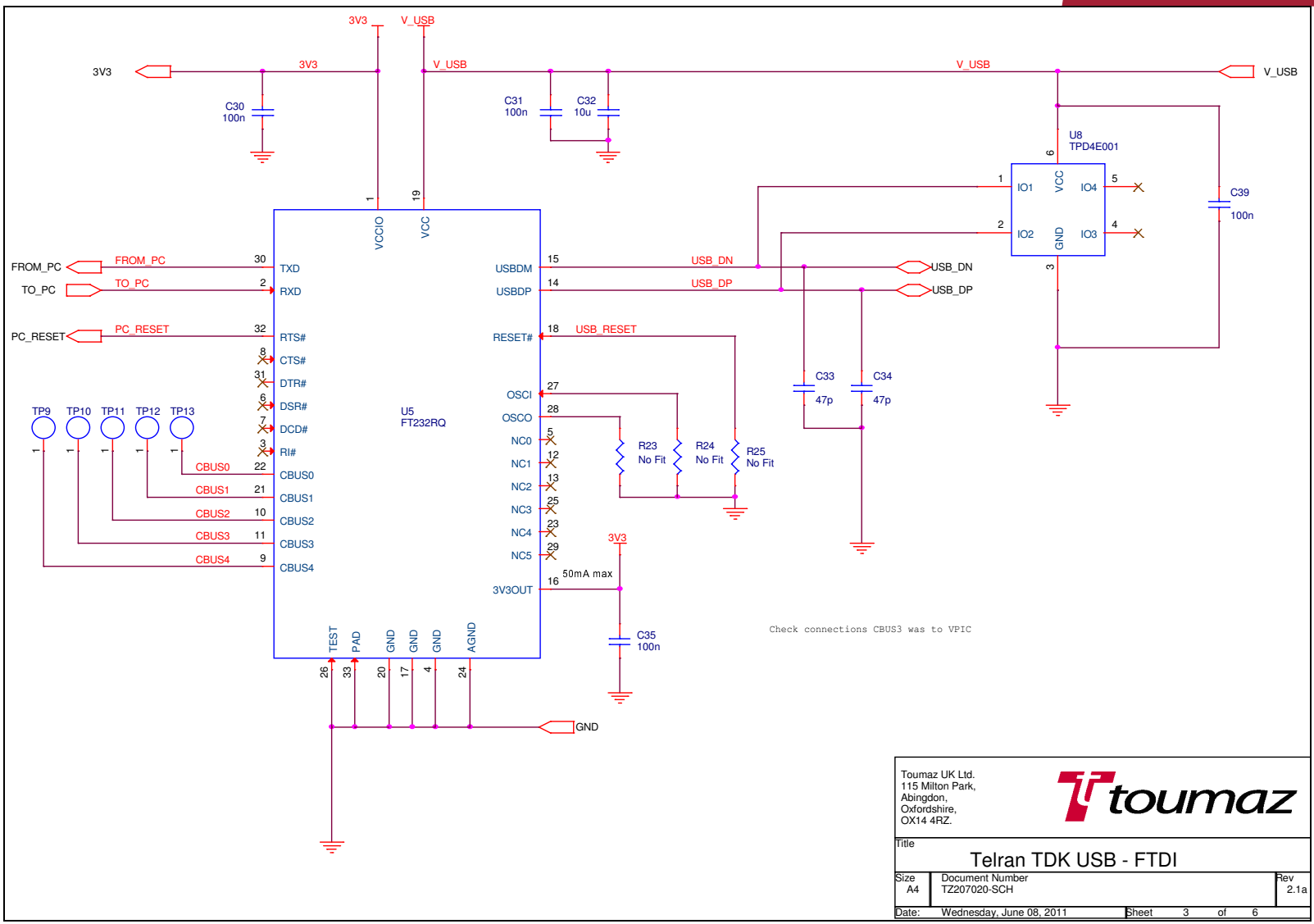
7.1 TDK RF Board TZ207010



7.2 TDK USB Board TZ207020




ANT1
868MHz
Amotech
J1
U_FL
50ohm track
C9
22nH
L3
56n
C11
1p0
C6
10n
L1
8n2
L2
24n
C8
100p
F1
B39871B3715U410
869MHz
GND
R7
100k
C12
100p
L4
27n
C14
No Fit
C5
100n
VDDRF
VDDSYN
VXO
C21
100n
C7
100n
U1A
TZ1053
DVDDPA
RFOUT
ANTTX
ANT
ANTRX
RFIN
MODE0
MODE1
MODE2
MODE3
XO_N
XO_P
XO_TUNE
CPOUT
DVCOREG
R_EXT
F0
F1
F2
F3
R1
No Fit
R2
100k
R3
No Fit
R4
100k
R5
No Fit
R6
100k
TP1
TP2
TP24
TP25
X1
16 MHz
Place xtal close to chip
C13
2n2
Place components close to chip
C15
1n
C16
10n
C17
2u2
R9
120k
VDDIO
C18
100n
C10
100n
U1B
TZ1053
SLPTMR
OSCSLPTMR
R13
10M
SDI
SDO
SCLK
SCS_N
MISO_TEL
MOSI_TEL
SPI_CLK
SPI_CS_N
TRSTN/GPIO0
TCK/GPIO1
TMS/GPIO2
TDI/GPIO3
TDO/GPIO4
TEL_GPIO0
TEL_GPIO1
TEL_GPIO2
TEL_GPIO3
TEL_GPIO4
To PIC or FTDI
From PIC or FTDI
CHIP GROUND
R15
100k
TEL_RESET
HWRESET_N
SW1
B3U-1000P
C20
100n
Vchip
R11
10R
C2
100n
R14
10R
C4
100n
R16
10R
R17
10R
Target Select
Mode Pin 0
Set Resistors R1 R4
Default
Periodic (20% Duty Cycle)
Band Select
Mode Pins 1 2
Set Resistors R2 R5 R3 R6
EU
US
JPN/CHN
No SAW/ All Bands
Toumaz UK Ltd.
115 Milton Park,
Abingdon,
Oxfordshire,
OX14 4RZ.
Title
Telran TDK USB - RF
Size A3
Document Number TZ207020-SCH
Rev 2.1a
Date: Wednesday, June 08, 2011
Sheet 6 of 6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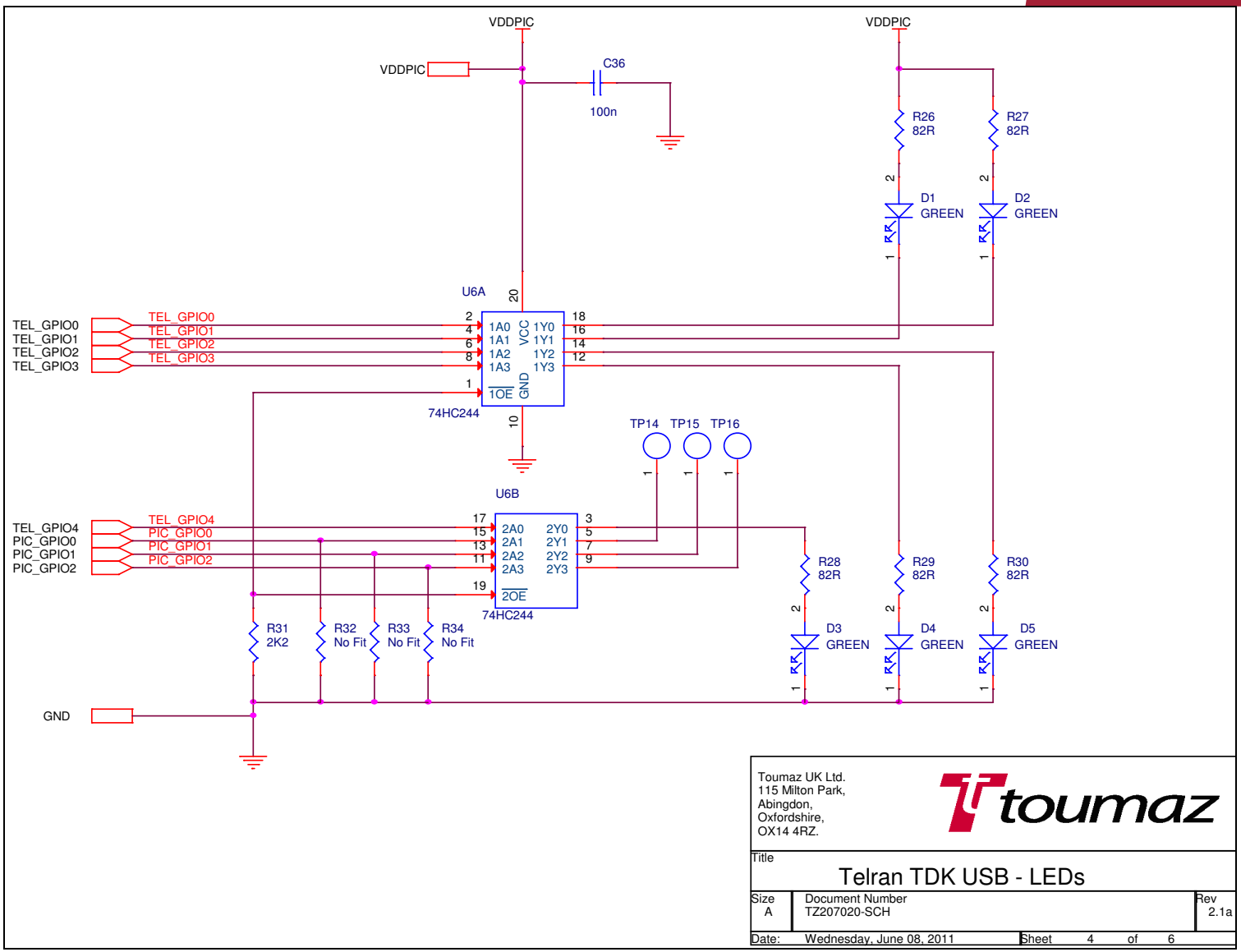
V_USB
C30
100n
C31
100n
C32
10u
U8
TPD4E001
C39
100n
FROM_PC
TO_PC
PC_RESET
TXD
RXD
RTS#
CTS#
DTR#
DSR#
DCD#
RI#
USBDM
USBDP
RESET#
USB_DN
USB_DP
USB_RESET
U5
FT232RQ
TP9
TP10
TP11
TP12
TP13
CBUS0
CBUS1
CBUS2
CBUS3
CBUS4
OSCI
OSCO
NC0
NC1
NC2
NC3
NC4
NC5
R23
No Fit
R24
No Fit
R25
No Fit
C33
47p
C34
47p
3V3OUT
50mA max
C35
100n
TEST
PAD
GND
AGND
Check connections CBUS3 was to VPIC
Toumaz UK Ltd.
115 Milton Park,
Abingdon,
Oxfordshire,
OX14 4RZ.
Title
Telran TDK USB - FTDI
Size
A4
Document Number
TZ207020-SCH
Rev
2.1a
Date:
Wednesday, June 08, 2011
Sheet
3
of
6


VDDPIC
VDDPIC
C36
100n
VDDPIC
R26
82R
R27
82R
D1
GREEN
D2
GREEN
U6A
74HC244
TEL_GPIO0
TEL_GPIO1
TEL_GPIO2
TEL_GPIO3
TEL_GPIO0
TEL_GPIO1
TEL_GPIO2
TEL_GPIO3
TP14
TP15
TP16
U6B
74HC244
TEL_GPIO4
PIC_GPIO0
PIC_GPIO1
PIC_GPIO2
TEL_GPIO4
PIC_GPIO0
PIC_GPIO1
PIC_GPIO2
R28
82R
R29
82R
R30
82R
D3
GREEN
D4
GREEN
D5
GREEN
R31
2K2
R32
No Fit
R33
No Fit
R34
No Fit
GND
Toumaz UK Ltd.
115 Milton Park,
Abingdon,
Oxfordshire,
OX14 4RZ.
Title
Telran TDK USB - LEDs
Size
A
Document Number
TZ207020-SCH
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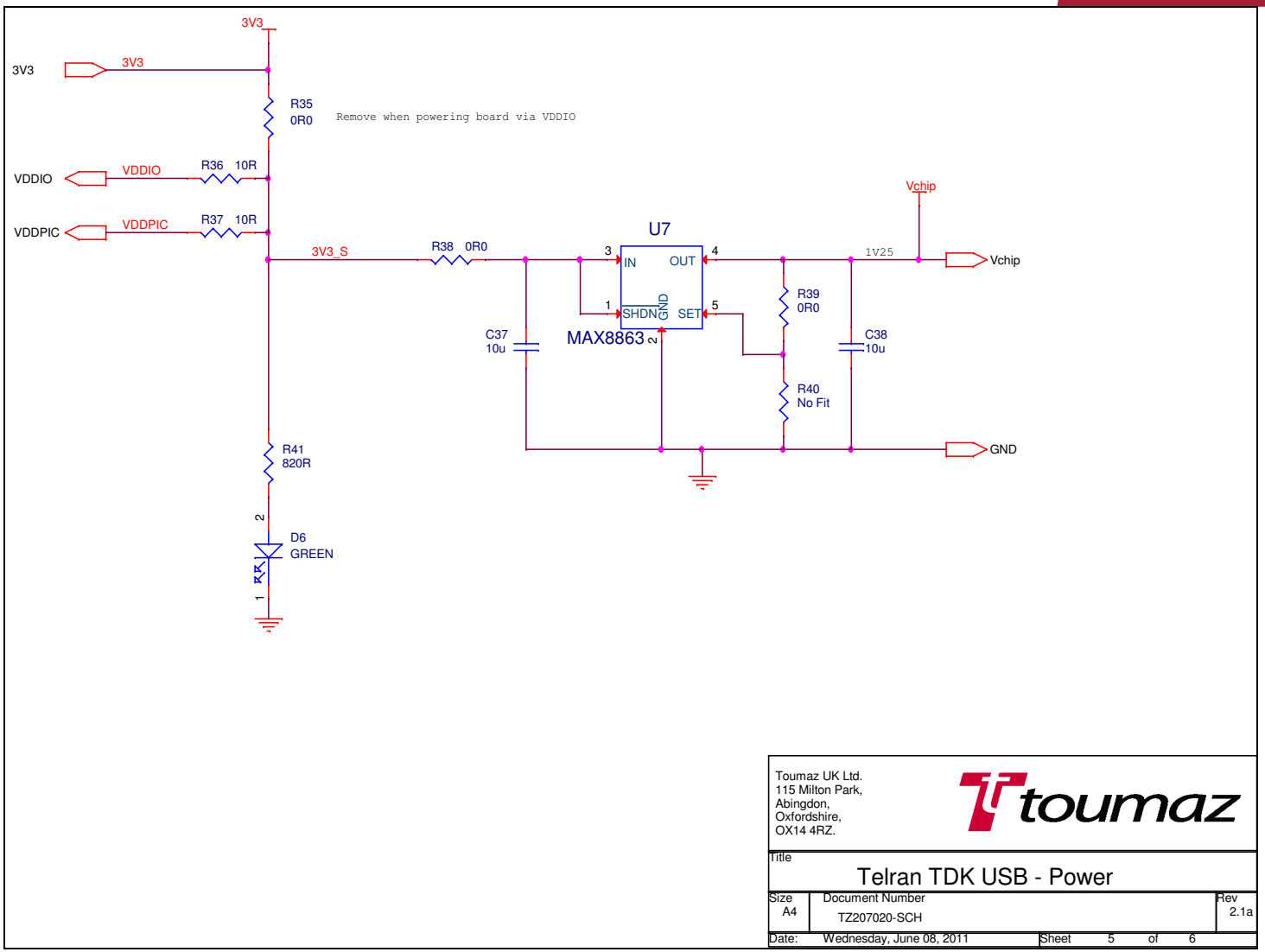
6


3V3
3V3
3V3
R35
0R0
Remove when powering board via VDDIO
VDDIO
VDDIO
R36 10R
VDDPIC
VDDPIC
R37 10R
3V3_S
R38 0R0
U7
3
IN
OUT
4
1
SHDN
GND
SET
5
MAX8863
2
Vchip
1V25
Vchip
R39
0R0
C37
10u
C38
10u
R40
No Fit
GND
R41
820R
2
D6
GREEN
1
Toumaz UK Ltd.
115 Milton Park,
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toumaz
Title
Telran TDK USB - Power
Size
A4
Document Number
TZ207020-SCH
Rev
2.1a
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Wednesday, June 08, 2011
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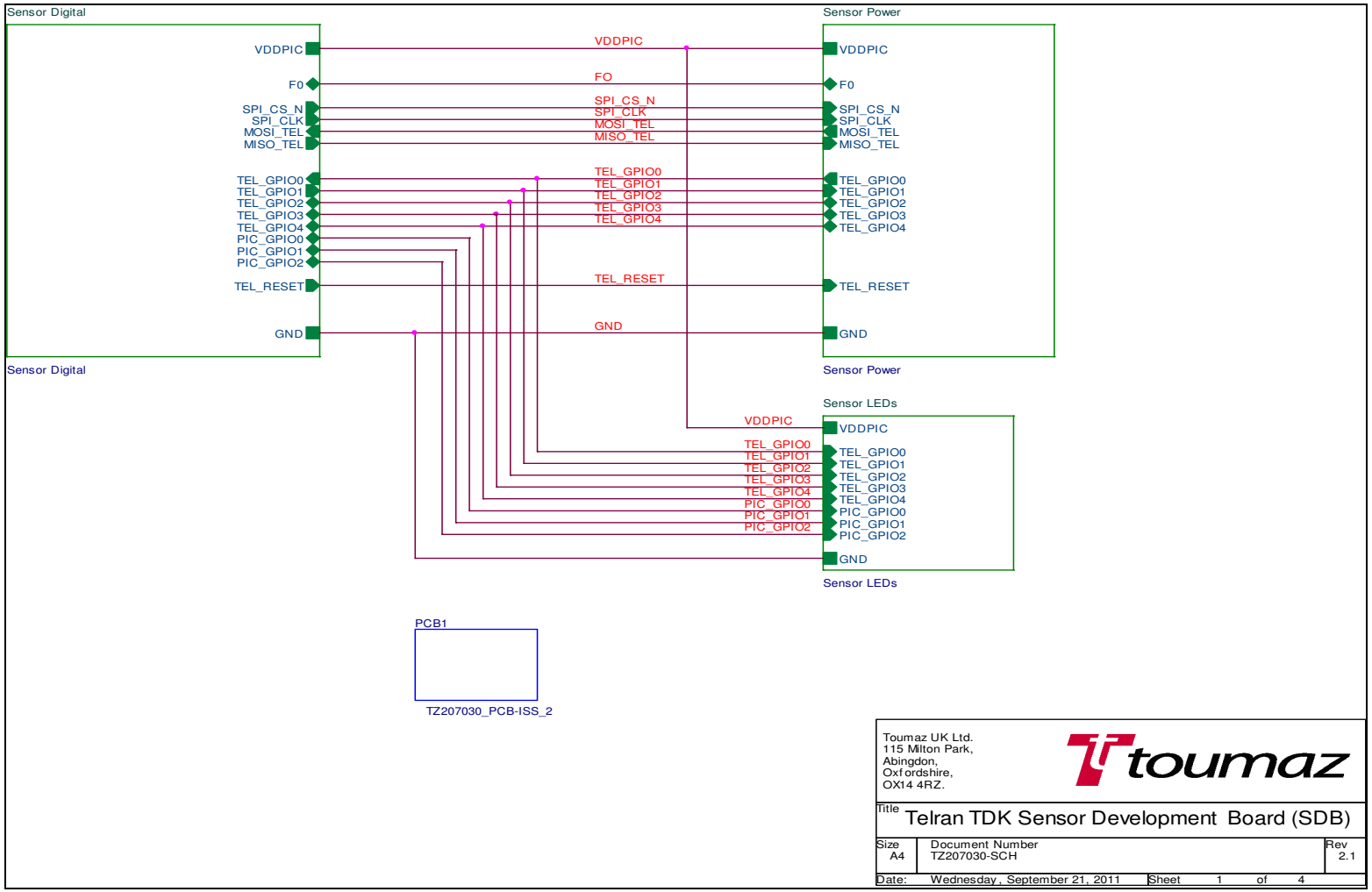
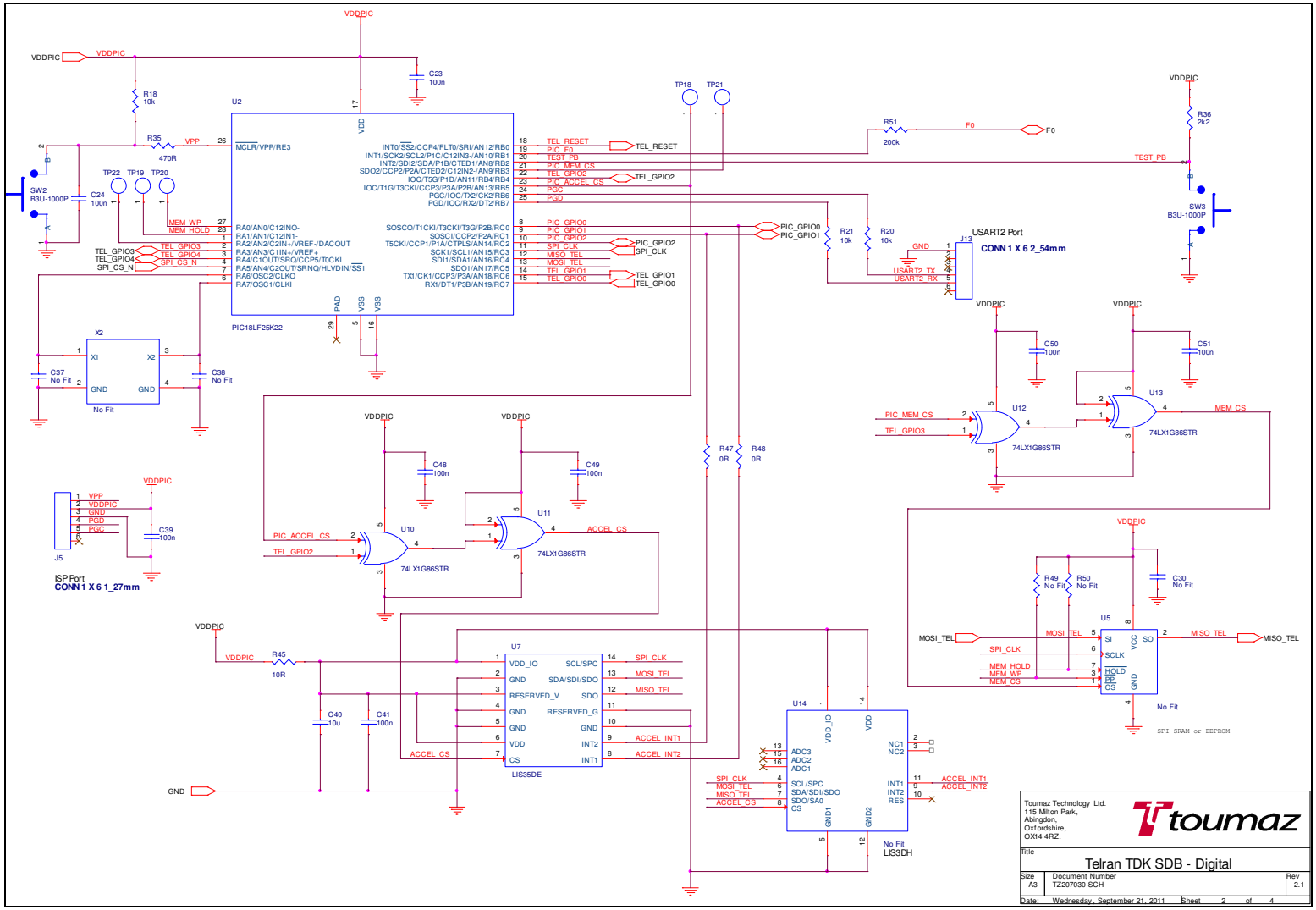
6

7.3 TDK Sensor Board TZ207030




VDDPIC
U2
PIC18LF25K22
MCLR/VPP/RE3
RA0/AN0/C12IN0-
RA1/AN1/C12IN1-
RA2/AN2/C2IN+/VREF-/DACOUT
RA3/AN3/C1IN+/VREF+
RA4/C1OUT/SRQ/CCP5/T0CKI
RA5/AN4/C2OUT/SRNQ/HLVDIN/SS1
RA6/OSC2/CLKO
RA7/OSC1/CLKI
INT0/SS2/CCP4/FLT0/SRI/AN12/RB0
INT1/SCK2/SCL2/P1C/C12IN3-/AN10/RB1
INT2/SDI2/SDA/P1B/CTED1/AN8/RB2
SDO2/CCP2/P2A/CTED2/C12IN2-/AN9/RB3
IOC/T5G/P1D/AN11/RB4/RB4
IOC/T1G/T3CKI/CCP3/P3A/P2B/AN13/RB5
PGC/IOC/TX2/CK2/RB6
PGD/IOC/RX2/DT2/RB7
SOSCO/T1CKI/T3CKI/T3G/P2B/RC0
SOSCI/CCP2/P2A/RC1
T5CKI/CCP1/P1A/CTPLS/AN14/RC2
SCK1/SCL1/AN15/RC3
SDI1/SDA1/AN16/RC4
SDO1/AN17/RC5
TX1/CK1/CCP3/P3A/AN18/RC6
RX1/DT1/P3B/AN19/RC7
TEL_RESET
PIC_F0
TEST_PB
PIC_MEM_CS
TEL_GPIO2
PIC_ACCEL_CS
PGC
PGD
PIC_GPIO0
PIC_GPIO1
PIC_GPIO2
SPI_CLK
MISO_TEL
MOSI_TEL
TEL_GPIO1
TEL_GPIO0
MEM_WP
MEM_HOLD
TEL_GPIO3
TEL_GPIO4
SPI_CS_N
R18 10k
R35 470R
VPP
C23 100n
C24 100n
SW2 B3U-1000P
TP22
TP19
TP20
TP18
TP21
R51 200k
F0
R36 2k2
SW3 B3U-1000P
R21 10k
R20 10k
J13
USART2 Port
CONN 1 X 6 2_54mm
USART2_TX
USART2_RX
GND
X2
C37 No Fit
C38 No Fit
No Fit
C50 100n
C51 100n
U12
U13
74LX1G86STR
MEM_CS
C48 100n
C49 100n
U10
U11
ACCEL_CS
R47 0R
R48 0R
J5
ISP Port
CONN 1 X 6 1_27mm
C39 100n
R49 No Fit
R50 No Fit
C30 No Fit
U5
SPI SRAM or EEPROM
R45 10R
C40 10u
C41 100n
U7
LIS35DE
ACCEL_INT1
ACCEL_INT2
U14
LIS3DH
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Title
Telran TDK SDB - Digital
Size A3
Document Number TZ207030-SCH
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Date: Wednesday, September 21, 2011
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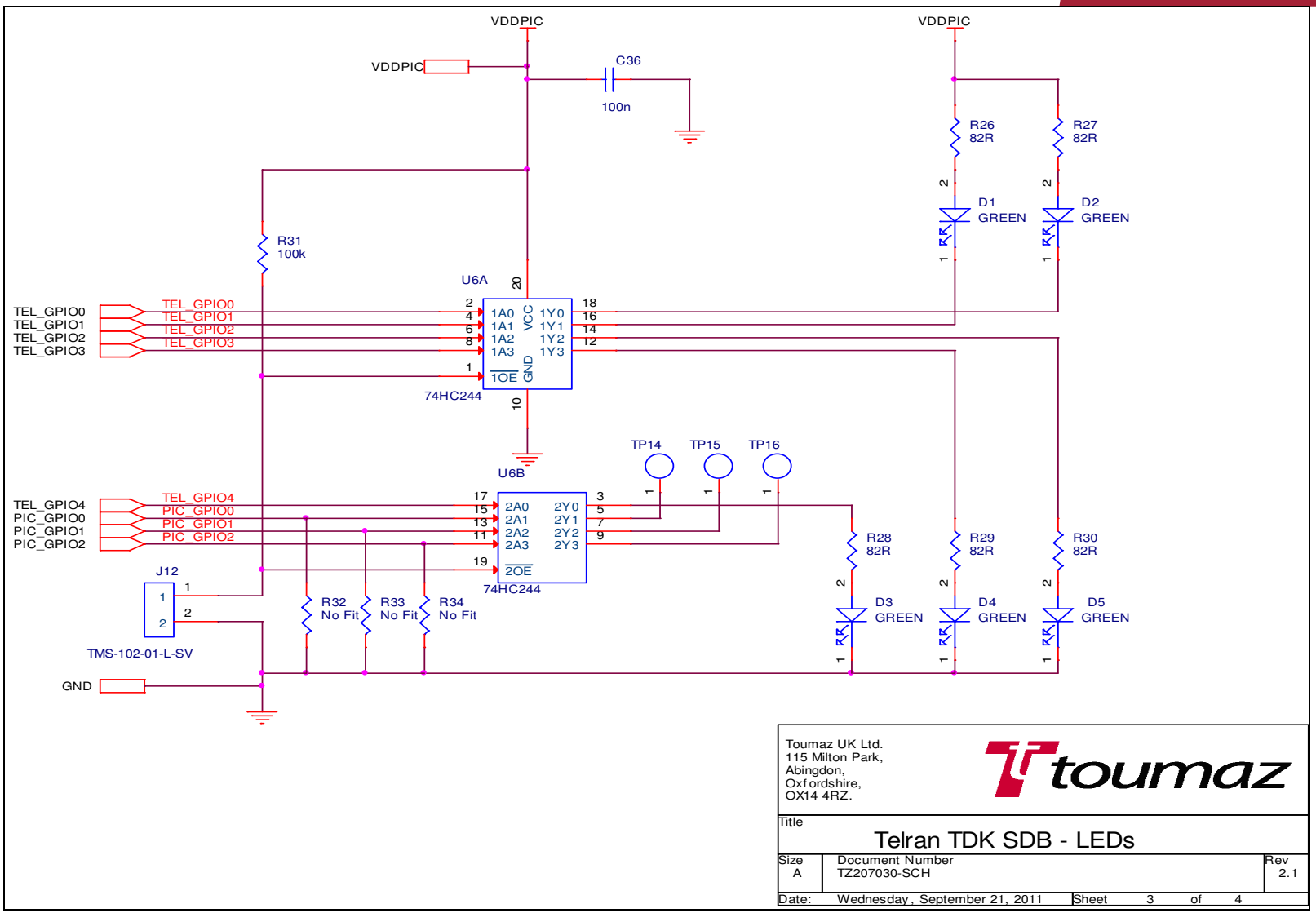
VDDPIC
VDDPIC
C36
100n
VDDPIC
R26
82R
R27
82R
D1
GREEN
D2
GREEN
R31
100k
U6A
TEL_GPIO0
TEL_GPIO1
TEL_GPIO2
TEL_GPIO3
TEL_GPIO0
TEL_GPIO1
TEL_GPIO2
TEL_GPIO3
1A0
1A1
1A2
1A3
1OE
VCC
GND
1Y0
1Y1
1Y2
1Y3
74HC244
U6B
TP14
TP15
TP16
TEL_GPIO4
PIC_GPIO0
PIC_GPIO1
PIC_GPIO2
TEL_GPIO4
PIC_GPIO0
PIC_GPIO1
PIC_GPIO2
2A0
2A1
2A2
2A3
2OE
2Y0
2Y1
2Y2
2Y3
74HC244
R28
82R
R29
82R
R30
82R
D3
GREEN
D4
GREEN
D5
GREEN
J12
TMS-102-01-L-SV
R32
No Fit
R33
No Fit
R34
No Fit
GND
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OX14 4RZ.
Title
Telran TDK SDB - LEDs
Size
A
Document Number
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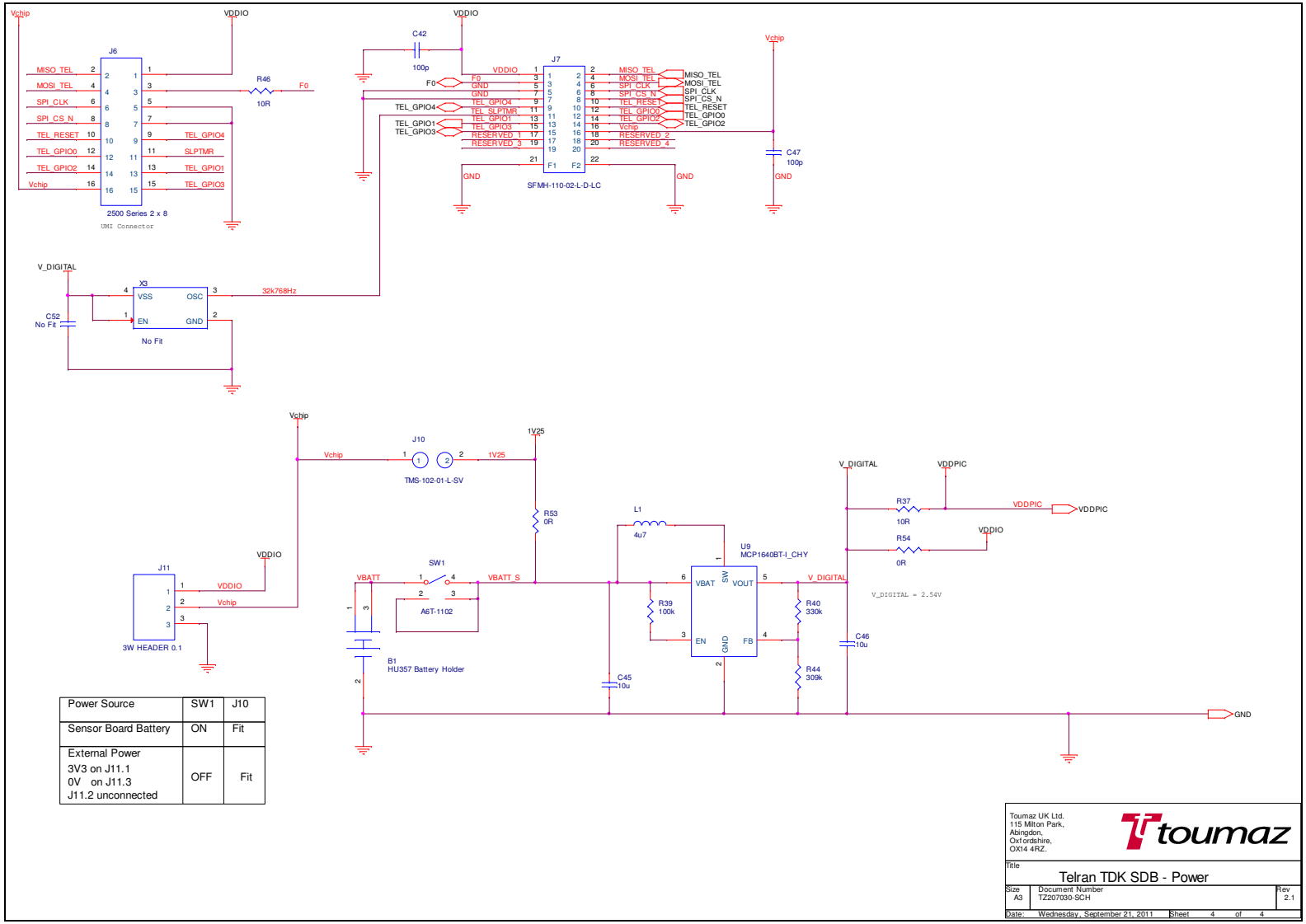
Vchip
VDDIO
J6
MISO_TEL
MOSI_TEL
SPI_CLK
SPI_CS_N
TEL_RESET
TEL_GPIO0
TEL_GPIO2
Vchip
TEL_GPIO4
SLPTMR
TEL_GPIO1
TEL_GPIO3
2500 Series 2 x 8
UMI Connector
R46
10R
F0
C42
100p
J7
SFMH-110-02-L-D-LC
GND
C47
100p
V_DIGITAL
X3
VSS
OSC
EN
GND
32k768Hz
C52
No Fit
No Fit
J10
TMS-102-01-L-SV
1V25
R53
0R
J11
3W HEADER 0.1
SW1
A6T-1102
VBATT
VBATT_S
B1
HU357 Battery Holder
L1
4u7
U9
MCP1640BT-I_CHY
VBAT
VOUT
SW
EN
FB
GND
R39
100k
R40
330k
R44
309k
C45
10u
C46
10u
V_DIGITAL = 2.54V
VDDPIC
R37
10R
R54
0R
Power Source | SW1 | J10
Sensor Board Battery | ON | Fit
External Power 3V3 on J11.1 0V on J11.3 J11.2 unconnected | OFF | Fit
Toumaz UK Ltd.
115 Milton Park,
Abingdon,
Oxfordshire,
OX14 4RZ.
Title
Telran TDK SDB - Power
Size A3
Document Number TZ207030-SCH
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Appendices
A1. Installing the Bootstrap Loader.

Program the PIC on the TDK USB Board, TZ207020, or the TDK Sensor Board, TZ207030, with the Bootstrap Loader using a Microchip PICkit™ 2 or similar programmer.

This section will describe the process of programming the Bootstrap Loader using a Microchip's PICkit™ 2 using the following steps:

Open the PICkit™ 2 programming tools, using the latest version downloaded from Microchip's website. Figure 26 shows the opening screen.

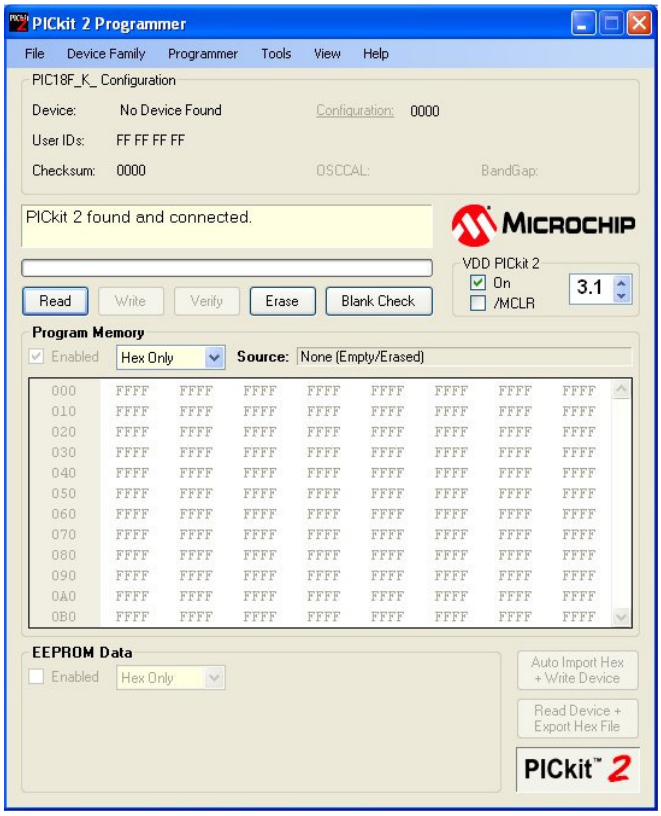

Figure 26. PICkit™ 2 opening screen shot.

Connect the PICkit™ 2 to the ISP connector J5 the TDK USB Board, TZ207020, or the TDK Sensor Board, TZ207030, using a suitable cable to convert the 2.54 mm pitch connector of the PICkit™ 2 to the 1.27 mm pitch of J2. When the PICkit™ 2 identifies the PIC on either TDK USB Board, or the TDK Sensor Board it will display the screen as shown in Figure 27.

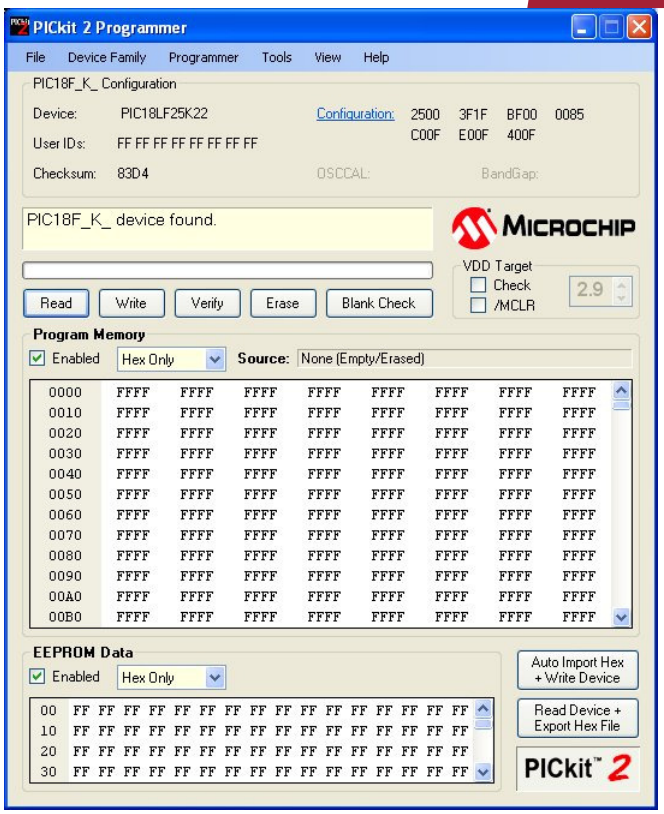

Figure 27. PICkit™ 2 connected to the PIC18LF25K22 on the TDK USB Board or TDK Sensor Board.

Click on ‘File’ from the Menu Bar a drop down list will appear as shown by Figure 28.

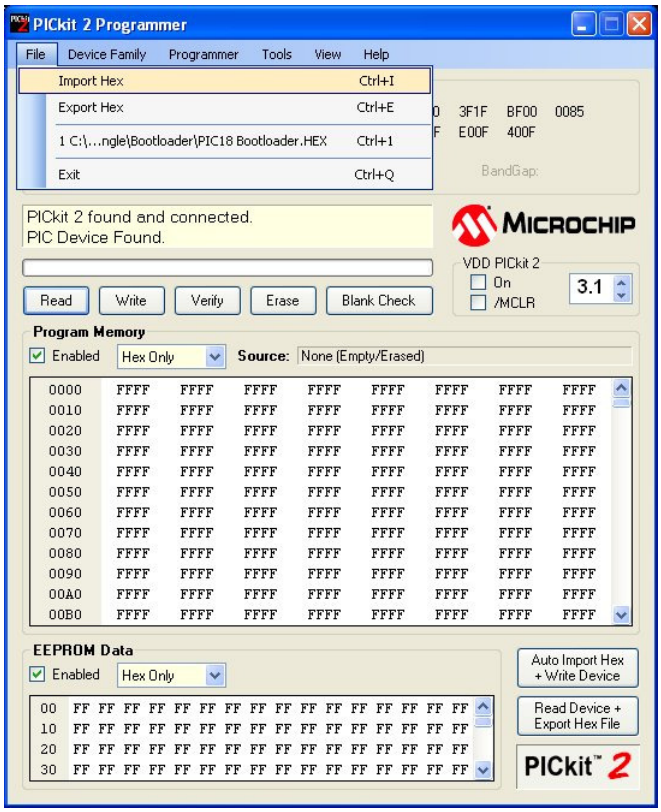

Figure 28. Selecting an Import Hex File.

Click on ‘Import Hex’ File and navigate to the location where the ‘PIC18 Bootloader.HEX’ file is stored, as shown by Figure 29.

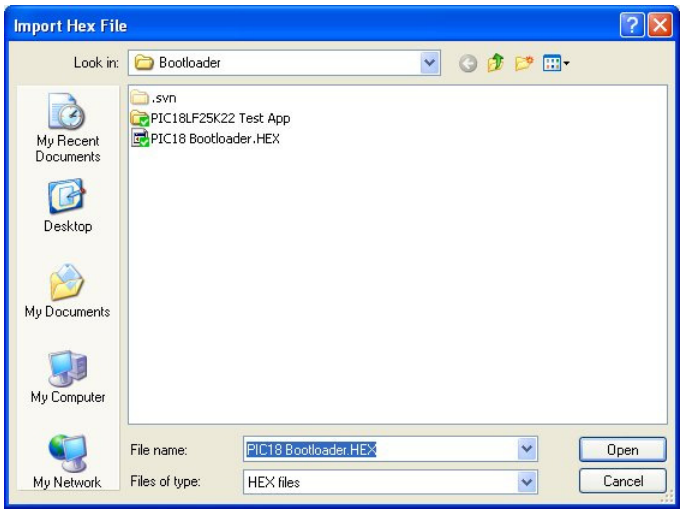

Figure 29. Locating the ‘PIC 18 Bootloader.HEX’ file.

Click on the ‘Open’ button. The screen will now be as shown by Figure 30, if the file is imported successfully.

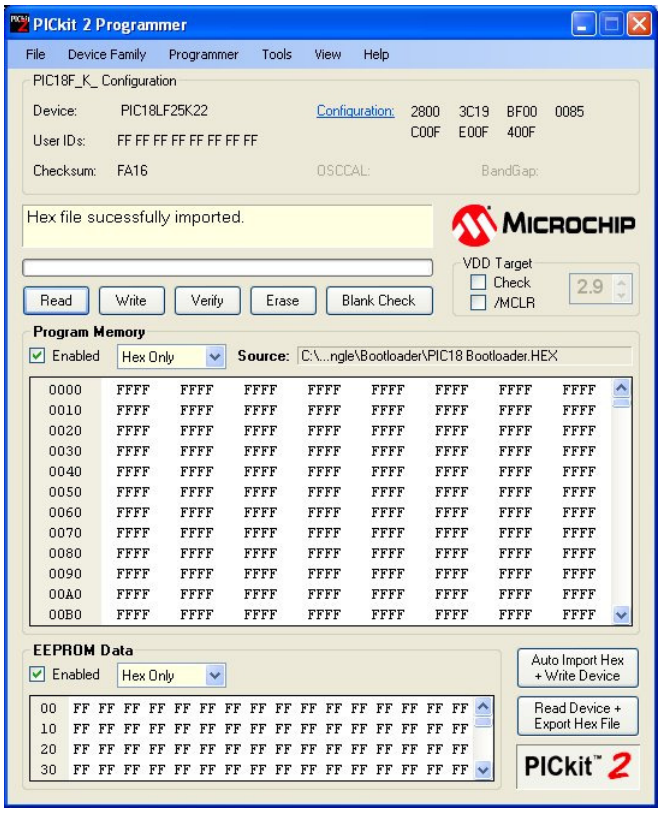

Figure 30. ‘PIC 18 Bootloader.HEX’ file Imported.

Click on the ‘Write’ button. The screen will show a running progress bar as the Bootstrap loader is programmed into the PIC. Once programming is complete the display will be as shown by Figure 31.

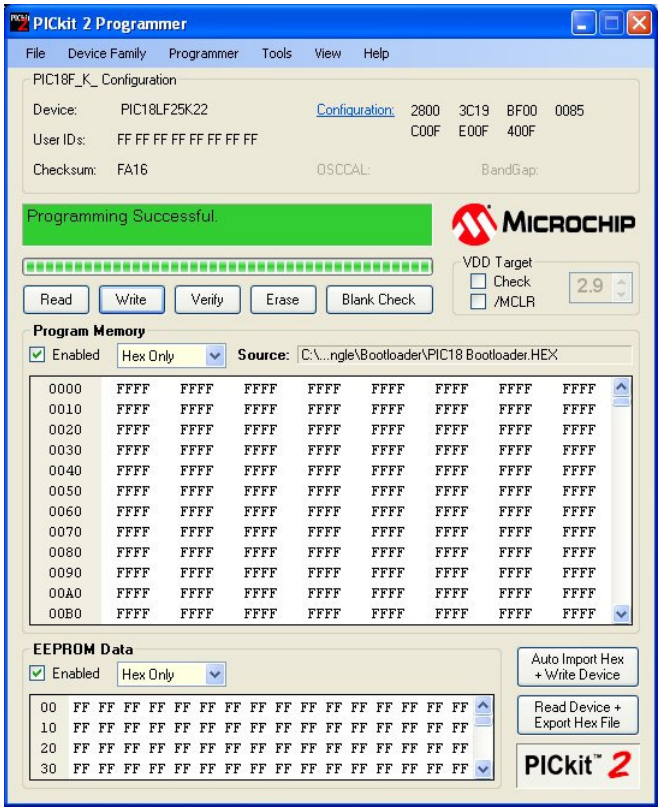

Figure 31. Programming Complete.

The Bootloader is now installed and available for use.
Disconnect the PICkit™ 2 from the ISP connector J5 the TDK USB Board, or the TDK Sensor Board.

A2. Configuring the Toumaz GUI.

To setup the Telran TDK TZ207020 USB board as a base station, carry out the following

A3. Configuring BareTail.

The Baretail display window can be made more user friendly by highlighting various message displayed in its window. This can be done as follows:

1. Click on the ‘Highlighting’ menu item shown on the menu bar in Figure 32.

Figure 32. BareTails Opened.

2. The window shown in Figure 33.

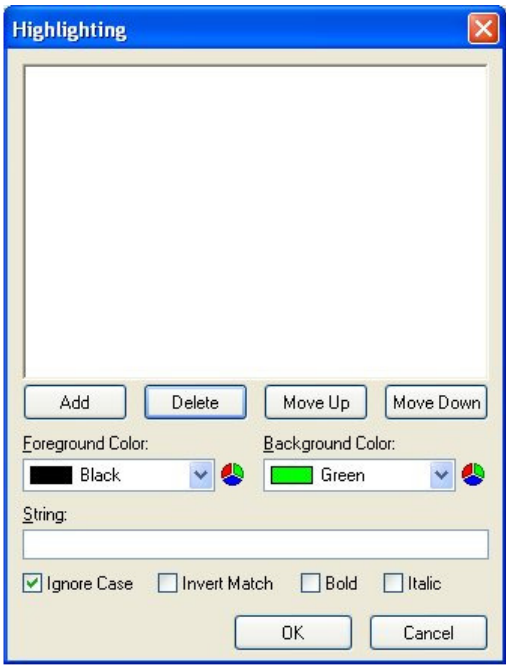

Figure 33. Highlighting Window.

3. Add the string to be highlighted in the ‘String’ Box as shown by Figure 34, and select the ‘Background Colour’ in the appropriate box.

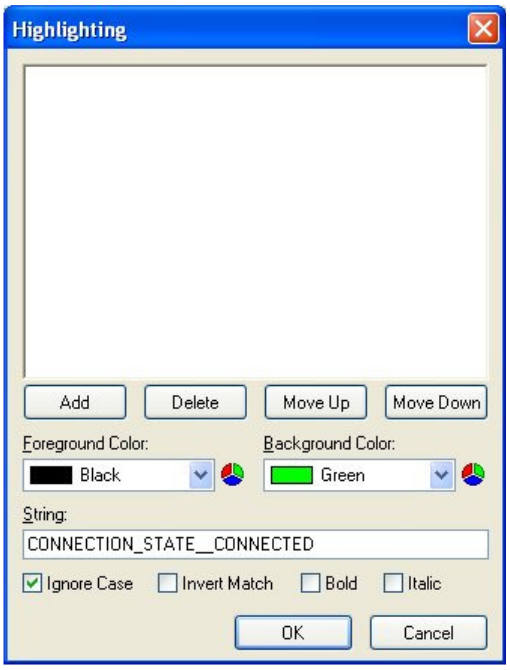

Figure 34. Set String to be Highlighted.

4. Figure 35 shows as an example the string required to be highlighted if a link is to be looked for.
5. Click the 'Add' button.
6. Figure 35 shows the results of highlighting. Repeating the previous steps and using different colours other messages can be selected from the data stream displayed by the BareTail main window.
7. Click the 'OK' button and return to normal operation.

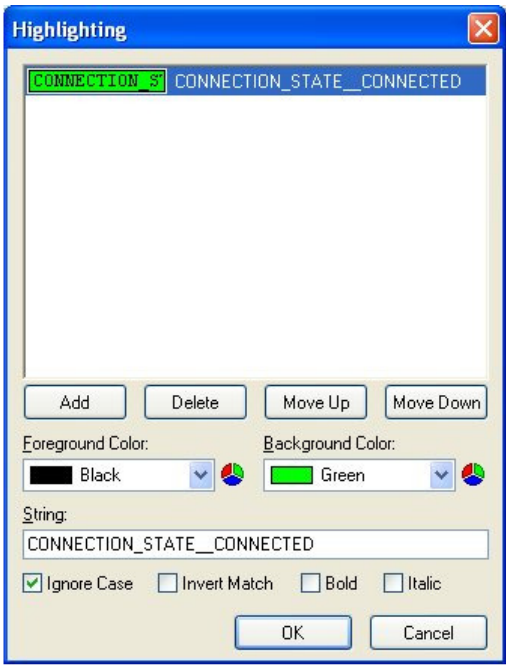

Figure 35. Highlighting Completed.