Mini-DLT wireless radio transceiver

User Manual

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Revision history

Revision	Released	Firmware level covered
1.00	July, 2010	
1.01	September, 2010	mn11T2.e
1.02	December, 2010	11T1.g
1.03	September, 2011	11T2.o
1.04	September, 2011	11T2.o
1.05	March, 2012	

Notice

Changes or modifications not expressly approved by Lexycom Technologies, Inc. could void the user's authority to operate this equipment. Any and all product information in this document is subject to change without notice.

Export Control Information*

The U.S. Government views the sale, export, and re-transfer of defense articles and defense services as an integral part of safeguarding U.S. national security and furthering U.S. foreign policy objectives.

*Specific transceiver products may be subject to U. S. International Traffic in Arms Regulations (ITAR).

The Mini DLT Wireless Data Transceiver is made in the United States of America.
Printed in the United States of America.

General Safety Information

Lexycom Technologies, Inc. does not recommend the use of its products in life support applications where the failure or malfunction of a component may directly threaten life or lead to an injury.

Do not operate radio equipment near electrical blasting caps or in an explosive atmosphere.

Do not operate radio transmitter unless all RF connectors are secure and any open connectors are properly terminated.

Do not allow the antenna to come close to, or touch, the eyes, face, or any exposed body parts while the radio is transmitting.

Be sure that your Mini DLT transceiver has been provided with sufficient DC voltage and current.

All equipment should be installed according to the manufacturer's instructions and in accordance with all regulatory agencies.

Electro Static Discharge (ESD)

Static build up can cause serious damage to electronic devices when improperly handled. Appropriate precautions should be taken when handling the transceiver(s).
This unit must be operated as supplied by Lexycom Technologies, Inc. Any changes or modifications made to the device without the express written approval of Lexycom Technologies may void the user's authority to operate the device.

WARNING: The Mini-DLT transceiver has the maximum transmitted output power of 1 Watt.

NOTE: 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

1. Introduction

1.1 Mini-DLT Description

The Mini-DLT is designed to operate in three different configurations:

- as a stand-alone board-level ARDS compatible transceiver;
- to be placed into a separate ruggedized Enclosure;
- to be placed onto a customized PC/104 Carrier board for use as part of a PC/104 card stack (note that for PC/104 use, the combined Mini-DLT and Carrier board should be placed at the top of the PC/104 card stack);
- to be placed in Lexycom's ESD protection enclosure with Ethernet interface.

The Mini-DLT board-level radio module measures 3.1"x 2.9" x 0.5" and weighs less than 2.5 oz.

The transceiver is equipped with six mounting holes – three along two sides of the transceiver.

1.2 Mini DLT Electrical Interfaces

The Mini-DLT is equipped with the following interfaces:

- Antenna Port (right angle 50-Ohms MCX connector located at the front of the radio);
- Data Port (high density connectors placed on the bottom of the transceiver);
- DC Power Input.

1.3 Quick Overview

When purchased, the Lexycom wireless data transceivers are shipped from the factory pre-configured to operate in the ARDS mode with certain default settings.

These settings, however, can be changed by the user at any time by using the transceiver's CDU Menus. Also, if needed, the settings on the transceivers can always be changed back to the original factory default settings.

When shipped from the factory, the transceiver's FirmwareBank0 is loaded with the latest firmware supporting the ARDS Network protocol.

Per the user's request, the transceiver can also be shipped with specific settings already loaded into the transceiver. In this case, the transceiver's settings will be saved in an '*.epm' file and delivered to the user electronically or on a CD.

1.4. Electronic ID

When manufactured, each Mini-DLT is assigned an electronic ID. The Electronic ID can be accessed by going to the CDU Menus. From the Main Menu select letter "L" (upper or lower case). The following information will be displayed:

LEXYCOM Technologies, Inc.
Software Defined Radio Transceiver

Model	Telion-1300
Serial Number	I0EA85
Firmware Rev	11T1.g
Hardware Number	TMA1-I06-R16-R037
BOOT Rev	002a
FCC ID	GovrmntUseOnly

PRESS "M" TO EXIT THIS MENU

Please, note that the "Serial Number" and "Hardware Number" will be transceiver specific. The "Firmware Rev" and "BOOT Rev" will depend of the level of the software loaded into the transceiver.

2. Transceiver Set Up (Board Level)

1. Connect the four pin power cable to the power plug on the interface board as shown on the picture below.

2. Make sure that your power source is adequate to power up the transceiver. The power supply range should be between 5 VDC and 32 VDC.

3. Connect the red wire of the four pin power cable to the positive terminal of your power source. Connect one of the black wires of the four pin power cable to the ground terminal of your power source.

4. Connect one end of the data cable supplied to you by Lexycom to the RS232 diagnostics connector and the other end of the same cable to the programming computer's COM port.

WARNING. Polarity of this connector is very important!

If reversed, the transceiver may be permanently damaged.

Setup switch

RS232 cable is connected to the diagnostics port. This port is also used for CDU Menus if the transceiver is in ARDS mode.

Data Port.

5. Apply power to the transceiver by turning the power source On.

6. On the computer, start Hyper Terminal or a similar terminal program. Make sure the Hyper Terminal has 19,200 bps, 8-N-1 settings. Once the computer's COM port is open, press any key to access the Mini-DLT Main Menu.

3. Operating Modes

Firmware version "mn11T2.a" and later support Participant mode of operation in the ARDS Network.

4. CDU Menu Screens

To access the CDU Menus, connect Mini-DLT's CDU port to a computer running Hyper Terminal or any other COM Port terminal software.

When attached to the PC/104 Carrier Board, the Mini-DLT will route its CDU screens to the CDU UART on the PC/104 Carrier Board.

4.1. Main Menu

The Mini-DLT Main Menu has six Menu options:

1. EDIT PARAMETERS
2. RESET DLT
3. BIST RESULTS
4. MAINTENANCE
5. DLT TABLE DISPLAY
6. QUALCOMM DLT DEBUG

To switch from any of the sub-menus back to a higher level Menu, press the "M" key (upper or lower case).
The Mini-DLT Main Menu is shown below:

Mini-DLT Main Menu
Ver XXXXXX (Firmware version)
Date (Firmware version date)

1. EDIT PARAMETERS
2. RESET DLT
3. BIST RESULTS
4. MAINTENANCE
5. DLT TABLE DISPLAY
6. QUALCOMM DLT DEBUG

MENU SELECTION:

4.2. 'Edit Parameters' CDU Screen

When option "1. Edit parameters" is selected from the Main Menu, the Mini-DLT will display the following screen:

EDIT DLT PARAMETERS

1. SERIAL NUMBER
2. CONFIGURATION
3. FREQUENCY

PRESS “M” TO EXIT THIS MENU

4.2.1. Edit Mini-DLT Serial Number

When option “1. SERIAL NUMBER” is selected from the Edit DLT Parameters Menu, the Mini-DLT will display the following screen:

EDIT SERIAL NUMBER

VERIFY PASSWORD:

NEW SERIAL NUMBER (1 – 2097151):

PRESS “M” TO EXIT THIS MENU

To change the Serial Number used by the Mini-DLT, enter the valid password followed by <Enter> key.

The screen will then display “PASSWORD ACCEPTED” message in the password field if the password is correct. The cursor will move to the Serial Number field to allow the user to enter a new Serial Number. When the desired Serial Number is entered, hit the <Enter> key and the Mini-DLT will accept and apply the newly entered Mini-DLT Serial Number.

The screen will display “CHANGE CONFIRMED”. At this point, any key will return the user to the Main Menu and the Mini-DLT will immediately reset itself.

If an incorrect password was entered, the cursor will stay at the password field and the user will receive an “INVALID PASSWORD” message. The correct password must be entered before any changes can be made to the Mini-DLT’s Serial Number.

4.2.2. Edit Mini-DLT Configuration

When option “2. CONFIGURATION” is selected from the Edit DLT Parameters Menu, the Mini-DLT will display the following screen:

EDIT DLT CONFIGURATION

RANGE ID (0 – 63) :	5
DLT TYPE:	PARTICIPANT
GPS (HDIS/CPU):	PRESENT
TIMING SOURCE:	RF SYNC
DLT MOUNTING:	MINI-DLT
ANTENNA CONFIG:	SINGLE
ANTENNA OVERRIDE:	NOT AVAILABLE

PRESS “M” TO EXIT THIS MENU

The cursor will prompt at the Range ID field to allow the user to enter the new Range ID.

Enter the desired Range ID value followed by <Enter>. The Mini-DLT will accept and apply the newly entered data. At this point the screen will display “CHANGE CONFIRMED”.

The Range ID parameter is the only value that the user is able to change on this screen.

The Mini-DLT will reset itself upon exit from this Menu.

4.2.3. Edit Mini-DLT Frequency

When option 3, Frequency, is selected from the Edit DLT Parameters Menu, the Mini-DLT will display the following screen:

EDIT DLT FREQUENCIES

FREQUENCY (F1) :
FREQUENCY (F2) :
DEFAULT FREQUENCY :

FREQUENCIES MUST BE IN THE 1350-1390 MHZ
RANGE, AND ON 25 KHZ INCREMENT

PRESS “M” TO EXIT THIS MENU

The cursor will prompt at the Frequency field to allow the user to enter a new frequency.

Enter the desired frequency of operation followed by <Enter>. The Mini-DLT will accept and apply the newly entered data. The screen will display “CHANGE CONFIRMED”.

4.3. 'Reset DLT' CDU Screen

When option "2. RESET DLT" is selected from the DLT Main Menu, the Mini-DLT will display the following screen:

RESET DLT VERIFICATION

ENTER/HIT "R" TO RESET THE DLT:

WARNING: THE DLT WILL EXIT THE
NETWORK IF IT RESETS.

PRESS "M" TO EXIT THIS MENU

If the user enters either a capital "R" or a lowercase "r", the Mini-DLT will immediately reboot and, upon completion, the user will be returned to the Main Menu screen.

4.4. 'BIST Results' CDU Screen

When option "3. BIST RESULTS", is selected from the DLT MAIN MENU screen, the Mini-DLT will display the following screen:

DLT BIST RESULTS	FAILURES	
	CURRENT	TOTAL
GROUND LINK UPLINKS:	0	0
DATA BUFFER OVF. :	0	0
CDU BUFFER OVF.:	0	0
	---	---
	VALUES	
	CURRENT	TOTAL
AVERAGE NOISE:	0	0
DLT TEMPERATURE, CELSIUS:	0	0
SLOT IRQ:	0	0
DLT SLOT SYNCH ADJ:	0	0

PRESS "M" TO EXIT THIS MENU

The CURRENT field depicts the number of failures detected within the past second, while the TOTAL field depicts the total number of failures detected since power up.

4.5. 'Maintenance' Menu Screen

When option "4. MAINTENANCE" is selected from the DLT Main Menu screen, the Mini-DLT will display the following screen:

DLT MAINTENANCE

VERIFY PASSWORD:

WARNING: THE DLT WILL LEAVE THE NETWORK
UPON ENTERING MAINTENANCE MODE.

PRESS "M" TO EXIT THIS MENU

Enter the password followed by <Enter>. If an incorrect password is entered, the cursor will prompt at the password field and the user will receive an "INVALID PASSWORD" message. The user will then be required to re-enter the password.

If the password has been entered correctly, the Mini-DLT will display the following screen:

DLT MAINTENANCE

1. DISTANT ACQ/OSCILLATOR FREQUENCY
2. CLEAR BUILT-IN-SELF-TEST ERROR COUNTS
3. SPECIFY AND RUN BUILT-IN-SELF-TEST
4. ENTER SETUP MODE
5. SET SDLC CLOCK SOURCE
6. SET SDLC IDLE FLAGS
7. SET SDLC RX BACK-TO-BACK FRAMES
8. SET SDLC RX CRC

ESC RESETS THE DLT.

PRESS "M" TO EXIT THIS MENU (resets the DLT)

4.5.1. 'Distance ACQ/oscillator frequency'

When selected, option "1. DISTANT ACQ/OSCILLATOR FREQUENCY" will display the following screen:

DLT DISTANT ACQ/OSCILLATOR FREQUENCY

DISTANT ACQUISITION: DISABLED
OSCILLATOR FREQUENCY (HZ): 26000546

PRESS "M" TO EXIT THIS MENU

The DLT distant ACQ/oscillator frequency screen is for informational purposes only. The user is not able to change any field on this screen.

4.5.2. 'Clear built-in-self-test error counts'

When selected, option "2. CLEAR BUILT-IN-SELF-TEST ERROR COUNTS" will display the following screen:

CLEAR BIST FAILURE COUNTS VERIFICATION

HIT "C" TO CLEAR THE BIST FAILURE COUNTS

WARNING: THIS IS A PERMANENT ACTION

PRESS "M" TO EXIT THIS MENU

The Clear BIST failure counts verification screens allows the user to clear the BIST failure counts.

4.5.3. 'Specify and run built-in-test'

When selected, option "3. SPECIFY AND RUN BUILT-IN-SELF-TEST" will display the following screen:

PRESS <SPACE> TO TOGGLE THRU SPECIFIC BIT

TEST TO PERFORM: EXT DATA PORT LOOPBACK

LOOPBACK:

HIT "R" TO RUN THE SELECTED TEST
PRESS “M” TO EXIT THIS MENU

The “Specify and run built-in-self-test screen” allows the user to select and run two different tests:

- External Data Port Loopback and
- Waveform flash memory CRC.

When enabled, the ‘External Data port Loopback’ bridges Mini-DLT’s data port receive and transmit lines. This test can be used to check the connection between the Mini-DLT’s data port and the user’s equipment. There is no pass/fail for this test.

When enabled, the ‘Waveform Flash Memory CRC’ test checks the waveform (firmware) currently loaded into the Mini-DLT’s FirmwareBank0 for a valid checksum (CRC). If the test is passed, the Menu will display zero failures. Otherwise, the failures count will increment every time the test is ran.

4.5.4. ‘Enter Setup Mode’

When selected, option “4. ENTER SETUP MODE” will display the following screen:

ENTER "SETUP MODE" VERIFICATION

HIT "S" TO ENTER SETUP MODE

WARNING: THE DLT WILL EXIT THE
NETWORK!

PRESS “M” TO EXIT THIS MENU

The Enter Setup Mode screen allows the user to user to force the Mini-DLT into the setup mode thus allowing for firmware updates and other maintenance procedures involved Lexycom’s utility software.

Once the Mini-DLT is forced into the Setup mode, it will stay in it perpetually until the next power cycle or a special command received from Lexycom’s Configuration Software.

4.5.5. 'SDLC Clock Source'

When selected, option "5. SET SDLC CLOCK SOURCE" will display the following screen:

SDLC CLOCK MODE

CURRENT SDLC CLOCK SOURCE: DISABLED

HIT SPACE TO TOGGLE MODE
ENTER SAVES SELECTION & ESC RETURNS TO MAIN MENU

The SDLC clock source options are:

- INTERNAL: Tx+ Rx+
- INTERNAL: Tx+ Rx-
- INTERNAL: Tx- Rx+
- INTERNAL: Tx- Rx-
- EXTERNAL: Tx+ Rx+
- EXTERNAL: Tx+ Rx-
- EXTERNAL: Tx- Rx+
- EXTERNAL: Tx- Rx-
- DISABLED

The selection of Tx+/Tx- or Rx+/Rx- depends on the SDLC clock polarity with respect to data transitions. The '+' means no clock inversion; the '-' means that the MiniDLT's SDLC engine will invert corresponding clock.

> **Note.** When MiniDLT is used with GLite (C2R) device, MiniDLT's SDLC transmit and receive clocks need to be inverted. Hence, the SDLC clock should be set to "Internal: Tx- Rx-" or "External Tx- Rx-".

Selecting SDLC Clock Source to be 'Disabled' configures the Mini-DLT to operate using RS232 interface (fixed settings of 921.6 kbps, 8-N-1).

The 'Internal'/'External' SDLC clock selection defines whether the Mini-DLT's SDLC transmit clock is generated internally (SDLC Clock is 'Internal') or bridged from the SDLC receive clock line.

4.5.6. 'SDLC Idle Flags'

When selected, option "6. SET SDLC IDLE FLAGS" will display the following screen:

SDLC IDLE FLAG TYPE

CURRENT IDLE FLAG TYPE: ONES

HIT SPACE TO TOGGLE TYPE
ENTER SAVES SELECTION & ESC RETURNS TO MAIN MENU

Under this Menu the choices are:

- Ones (when idle, the SDLC sends continuous sequence of '1');
- 0x7E (when idle, the SDLC sends continuous sequence of 0x7E).

4.5.7. 'Set SDLC Rx Back-to-Back Frames'

When selected, option "7. SET SDLC RX BACK-TO-BACK FRAMES" will display the following screen:

SDLC BACK-TO-BACK FRAME MODE

CURRENT RX BACK-TO-BACK FRAME MODE: DISALLOW

HIT SPACE TO TOGGLE MODE
ENTER SAVES SELECTION & ESC RETURNS TO MAIN MENU

Under this Menu the choices are:

- Allow;
- Disallow.

4.5.8. 'SDLC Rx CRC Mode'

When selected, option "8. SET SDLC RX CRC" will display the following screen:

SDLC RX CRC MODE

CURRENT RX CRC MODE: NORMAL

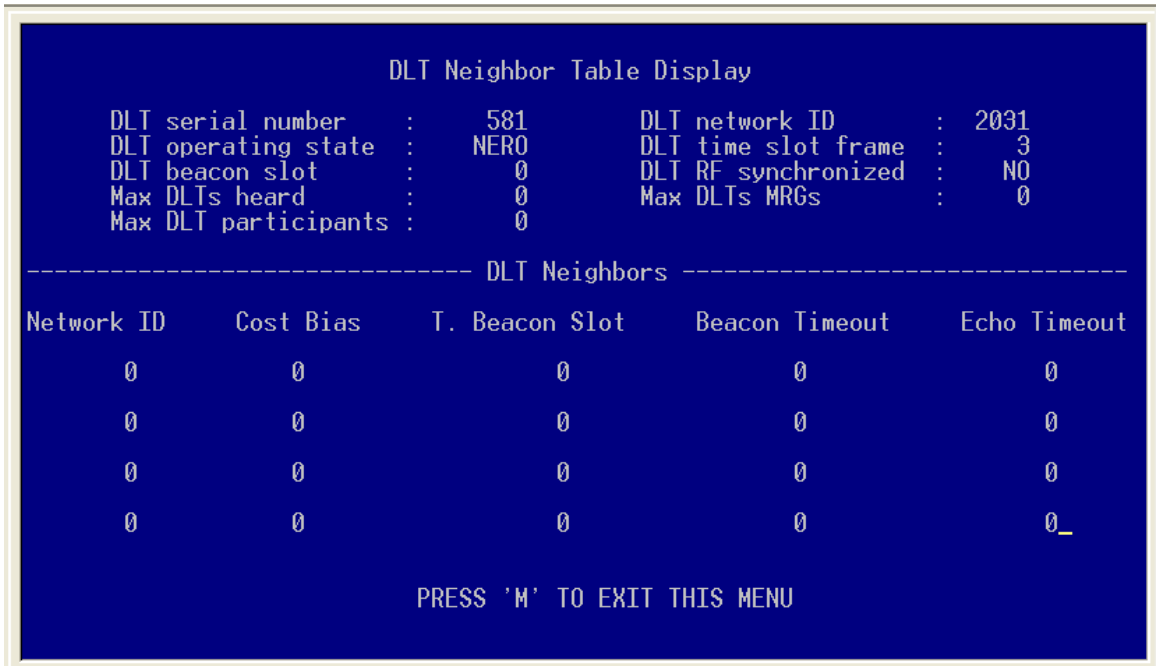
HIT SPACE TO TOGGLE MODE
ENTER SAVES SELECTION & ESC RETURNS TO MAIN MENU

Under this Menu the options are:

- Normal (the Mini-DLT's SDLC engine will check CRC of every frame it receives);
- No Check (the Mini-DLT will ignore the CRC of every frame it receives).

4.6. 'DLT Table Display' CDU Screen

When option "5. DLT TABLE DISPLAY" is selected from the DLT Main Menu screen, the Mini-DLT will display the following screen.



This screen is for information purposes only. No user input is required or accepted.

4.6.1. DLT Serial Number

The DLT Serial Number is assigned by the user via the "EDIT DLT PARAMETERS" Menu and its submenus. Valid numbers range between 1 and 2097151.

4.6.2. DLT Network ID

The DLT Network ID is a unique network identifier assigned to the Mini-DLT during the RF network entry process by the ARDS Control System and is contained within the Initial Beacon Assignment (Message 259) Broadcast packet.

4.6.3. DLT Operating State

This field indicates the current Operating State of the Mini-DLT. Operating States are: INIT, NERO, NEFTA, or OPERATE.

4.6.4. DLT Time Slot Frame

This field indicates the current Time Slot Frame and is a value ranging from 0 to 9.

4.6.5. DLT Beacon Slot

This value is the Timing Beacon Slot number assigned to the Mini-DLT contained within the Broadcasted IBA (Message 259) from the ARDS Control System.

4.6.6. DLT RF Synched

This field will initially be displayed as “NO” while the Mini-DLT is in NERO State and has not yet heard any Original Timing Beacons from a MRGS.

This value will change to “YES” after the Mini-DLT has heard an Original Timing Beacon(s) from any other Emitter(s) and reset its Superframe Time Slot Counter to match that contained within the received Timing Beacon messages.

4.6.7. Max DLTs Heard

This field is based upon the total number of Emitters that the Mini-DLT has heard and which exist within its Emitter List. The Mini-DLT will adjust the number based upon the total number of Emitters within its Emitter List.

4.6.8. Max DLT MRGS

This field is based upon the Network ID and Cost Bias information contained within the Mini-DLT Emitter List, with a linked MRGS having a Network ID number of less than 18.

4.6.9. Max DLT Participants

This field is based upon the Network ID contained within the Mini-DLT's Emitter List, with a Participant having a Network ID number greater than or equal to 18.

4.6.10 DLT Neighbor Listing

The values in this table are based upon the Network ID, Cost Bias, Timing Beacon Slot, Timing Beacon Timeout, and Echoed Timing Beacon values contained within the Mini-DLT's Emitter List.

The Beacon Timeout field shows the elapsed time (in seconds) since the Mini-DLT last heard an "Original" Timing Beacon from that particular DLT Emitter. The Mini-DLT resets this value to zero upon receipt of an "Original" Timing Beacon from a particular DLT Emitter.

The Echo Timeout field shows the elapsed time (in seconds) since the Mini-DLT heard an Echoed Timing Beacon from the DLT Emitter on the list. The Mini-DLT resets this value to zero upon receipt of "Echoed" Timing Beacon from that particular DLT Emitter.

4.7. Selecting Foreground and Background colors of the CDU Menus

By default, all Mini-DLTs are shipped from the factory with the CDU Menus' foreground color set to 'white' and the background color set to 'blue'.

However, the Mini-DLT's firmware allows the user to change the foreground and background colors of the Menus. The colors are controlled by an EEPROM byte stored in the radio.

The color control byte is stored at address 0x3A0 and contains two nibbles. The upper nibble of this byte sets the color of the background and its lower nibble set the foreground color. The color choices are:

0 - black,
1 - red,
2 - green
3 - yellow,
4 - blue,
5 - magenta,
6 - cyan,
7 - white.

Using the color mapping above, one can see that if the color byte would be set to 0x47 (the default settings), then the CDU Menus will be displayed as white text on a blue background.

If both nibbles of the color control byte are set to the same value, then the Mini-DLT will ignore the color control settings and the background will be set to black and the foreground will be set to white. The Mini-DLT will not, however, overwrite the color control byte value in the Mini-DLT's EEPROM.

Also, if one of the nibbles of the color control byte is set to a value that is outside of the allowed range (valid range is from 0 to 7), then the Mini-DLT will ignore the color control byte and will set the background to black and the foreground to white. The Mini-DLT will not, however, overwrite the color control byte value in the Mini-DLT's EEPROM.

If the color control byte is set to 0x00, then the Mini-DLT will not send the color setting escape sequence to the terminal program. Hence, the terminal program will display the CDU menus as white text on black background.

If needed, contact Lexycom Technologies for instructions on how to change the color control byte in the Mini-DLT's EEPROM.

5. Environmental Operating Conditions

The Mini-DLT is designed to operate under the specific environmental conditions which are outlined below.

5.1. Surrounding Air Temperatures

The Mini-DLT is designed to operate in surrounding air temperatures within the range of -45 degrees C to +85 degrees C.

5.2. Explosive Atmosphere

The Mini-DLT will not cause ignition or detonation in the presence of potentially explosive mixtures of air and any fluid that may be encountered during maintenance and air vehicle operation. Ignition cause being any spark, flame, or arc arising from any installation, operation, or removal activity.

5.3. Humidity and Moisture

The Mini-DLT is designed to operate when and after exposure to 95% relative humidity with a temperature range of 30 degrees C to 60 degrees C.

5.3.1 Salt-Sea Atmosphere

The Mini-DLT is designed to deliver specified performance during and after exposure to salt-sea atmosphere with salinity as high as 36.0 parts per thousand.

5.4. Acoustic, Vibration, and Shock Environments

The Mini-DLT is designed to operate correctly in the acoustic, vibratory, and mechanical shock environments of the air vehicle during the flight test program.

5.5. Acoustic Noise Performance Level

The Mini-DLT is designed to provide specified performance after a one hour exposure to an overall sound pressure level of 128 to 146 dB, given a reference of 0.0002 dynes/cm2.

5.6. Random Vibration Performance Level

The Mini-DLT is designed to provide specified operation when exposed to vibration shown in the appropriate section of the test report (contact Lexycom for more details).

5.7. Gunfire Vibration

The Mini-DLT is designed to provide specified operation while exposed to the vibration shown in the appropriate section of the test report (contact Lexycom for more details).

5.8. Mechanical Shock

The Mini-DLT is designed to be capable of withstanding the dynamic response resulting from the application of transient loads during flight, land impact, store ejection, jet wake encounter, etc.

The waveform and amplitude of the shock impulses are as specified in the appropriate section of the test report (contact Lexycom for more details).

5.9. Crash Safety Shock

The Mini-DLT is designed to withstand crash safety shocks in opposite directions along each of three orthogonal axes with excursion stops or bumpers in place. The shock impulse waveform and amplitude is specified for crash safety as shown in the appropriate section of the test report (contact Lexycom for more details).

The Mini-DLT is not designed to operate after being exposed to crash safety shocks.

5.10. Limit Loads

The Mini-DLT is designed and constructed to withstand limit load factors as shown in the appropriate section of the test report (contact Lexycom for more details) without structural or functional damage.

5.11. Crash Landing Ultimate Load Factors

The Mini-DLT is designed to have sufficient static strength to withstand the ultimate load factors specified in the appropriate section of the test report (contact Lexycom for more details) without structural failure.

The Mini-DLT is not designed to function after being subjected to the crash landing load factors listed below.

5.12. Altitude

The Mini-DLT is designed to operate up to an altitude of 50,000 feet.

5.13. Electromagnetic Environment Effects (E3)

The Mini-DLT is designed to meet specified performance when exposed to radiated and conducted environments as shown below:

- CE102 Conducted Emissions, Power Leads, 10 kHz to 10 MHz
- CS101 Conducted Susceptibility, Power leads, 30 Hz to 150 kHz
- CS115 Conducted Susceptibility, Bulk Cable Injection, Impulse Excitation
- RE102 Radiated Emissions, Electric Field, 10 kHz to 18 GHz
- MIL-STD-464 Para. 5.2.3 Power Line Transients
- RTCA/DO-160D Section 25 Electrostatic Discharge

5.14. Safety-of-Flight

The Mini-DLT is designed to meet the following applicable MIL-STD-461 laboratory test requirements

- RE102 Radiated Emissions, Electric Field, 10 kHz to 18 GHz
- CS114 Conducted Susceptibility, 10KHz-200MHz
- CS115 Conducted Susceptibility, Bulk Cable Injection, Impulse Excitation
- CS116 Conducted Susceptibility, 10KHz-100MHz

5.15. Electrical Bonding

The electrical bonding resistance requirement for the Mini-DLT is 2.5 milliohm across and single bond interface.

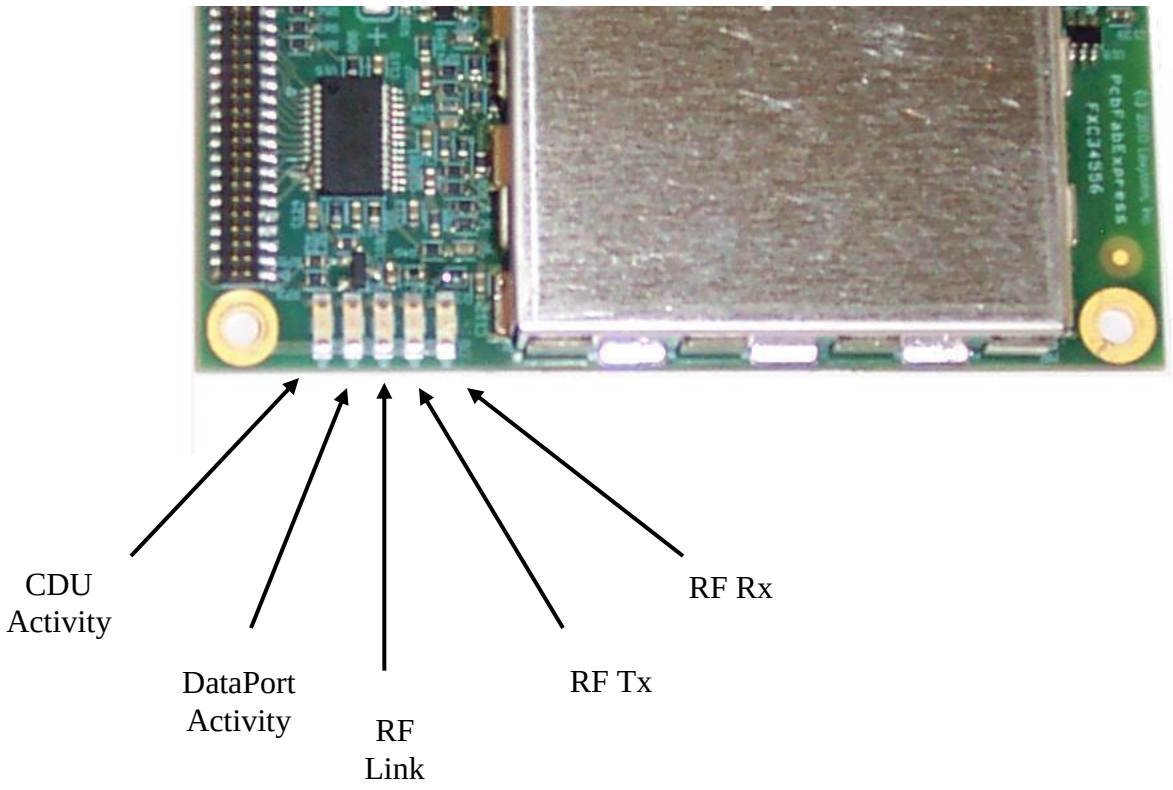
The Mini-DLT is capable of maintaining the electrical bonding interface resistance measurement requirement described below throughout the intended service life of the Mini-DLT.

5.16. Electrostatic Discharge

The Mini-DLT complies with ESD protection and handling requirements of MIL-STD-1686.

6. Transceiver's LEDs

The Mini-DLT transceiver is equipped with total of 5 red color LEDs. The LEDs' position and their 'names' are shown on the picture below.



The functionality of the LEDs is described in the Table 6-1.

Table 6-1. Description of the LEDs functionality during normal modes of the transceiver's operation

LED 'name'	Functionality
CDU Activity	Turns On when the radio is sending or receiving data on its CDU port.
DataPort Activity	Turns On when the radio is sending or receiving data on its DataPort.
Link	Blinks when the radio is searching for the Network and has not established RF synch with it yet. Turns On when the radio has synchronized to ARDS Network.
RF Tx	Turns On when radio transmits a RF packet.
RF Rx	Turns On when the radio receives a RF packet.

Additionally, the LEDs indicate different stages of the transceiver's operation while the transceiver is in one of its special operation modes. These cases are explained in the table below.

Table 6-2. Description of LEDs functionality during special modes of transceiver's operation

Which LEDs are On					What does it mean
CDU Act	DataPort Act	Link	RFTX	RFRX	
○	○	●	●	●	***Setup Mode*** The transceiver is in the setup mode. Use the "Configuration Program" to view/modify/store transceiver's settings. The transceiver will enter this mode if the Setup switch was pressed OR if the transceiver detected a falling edge on its Setup pin OR if the transceiver was forced into the Setup mode using CDU Menus. The transceiver will stay in this mode until the power to it is cycled.
○	●	●	●	○	***Sector0 Erase Mode*** The transceiver is erasing its memory Sector0 so another pre-stored firmware (f/w) can be copied into it (see the "Firmware Upgrade" software documentation for more details). The transceiver will enter this mode only if the user specified that the f/w in transceiver's main f/w bank is to be updated at the next power up. The time the transceiver will stay in this mode may vary and usually it takes no longer than 5-6 seconds. **WARNING.** It is highly recommended not to disturb power to the transceiver while it is in this mode. If the transceiver stays in this mode for longer than 20 seconds, contact the Lexycom Technologies' technical support department.

Table 6-2. Description of LEDs functionality during special modes of transceiver's operation (Continued)

Which LEDs are On					What does it mean
Link	RF Rx	RF Tx	CTS1	CTS2	
○	●	●	○	○	***Program Sector0 Mode*** The transceiver is copying the firmware from one of its memory Sectors into Sector0 (see the "Firmware Upgrade" software documentation for more details). The transceiver will enter this mode if the user specified that the f/w in the transceiver's main f/w bank is to be updated at the next power up and only if the transceiver already went through the "Sector Erase" phase. The time the transceiver will stay in this mode may vary and usually it takes no longer than 30 seconds. **WARNING.** It is highly recommended not to disturb power to the transceiver while it is in this mode. If the transceiver stays in this mode for longer than 2 minutes, contact the Lexycom Technologies' technical support department.

7. Diagnostics

See Operating and Maintenance Manual for Diagnostic information.

8. Technical Support

Technical support for Lexycom products is available from 8:00 a.m. to 5:00 p.m. (MST) mountain standard time, Monday through Friday, excluding holidays.

Please contact technical support at:

(303) 774-7822 phone
(303) 774-7828 fax

9. Ftp site login instructions

STEP 1. Open 'My Computer'

STEP 2. In the address bar type: ftp://lexycominc.com

STEP 3. A login window will open. Under the 'User name' type "MiniDLT"; under the 'Password' type password used by the DLT to change DLT's Serial Number followed by "$" symbol with no spaces in between (total password length will be 11 symbols).

You should see several folders with files in them. To download any of the files, simply highlight the file, right mouse click while the cursor is on top of the highlighted file, choose 'Copy'. When done, paste the copied file wherever you need it.

10. Return Authorization and Shipping Information

To obtain product service, please contact Lexycom Technologies for a Return Material Authorization (RMA) number before returning any equipment.

All products should be returned to the following address:

Lexycom Technologies Inc.
ATTN: RMA#
425 South Bowen Street, Unit 1
Longmont, CO 80501

For warranty and non-warranty shipments, domestic and International shipments, all shipping costs, including freight charges, insurance, customs clearance, and broker's fees, incurred in returning equipment to Lexycom Technologies Inc must be ***prepaid.***

All product service requests should include the appropriate customer contact information and return shipping information.

11. Warranty

The Lexycom Technologies Wireless Data Transceivers are warranted against defects in materials and manufacturing for a period of 2 years from the date of purchase. In the event of a product failure due to materials or workmanship, Lexycom Technologies will, at its discretion, repair or replace the product. Lexycom Technologies, its suppliers, and its licensors shall in no event be liable for any damages arising from the use of or inability to use this product. This includes business interruption, loss of business information, or other loss which may arise from the use of this product.

Appendix A. Explanation of algorithm used by SDR to calculate Cost of a RF link

The transceiver calculates the Cost of each RF link using the following formulae:

Cost formulae:

Cu = InitialCuValue + HighPowerAmp_NotPresent_Penalty + (RelayCount * 2^RelayPenalty) + EchoPenalty + + DistancePenalty

Please note that the Cost calculation algorithm limits the { InitialCuValue + HighPowerAmp_NotPresent_Penalty + (RelayCount * 2^RelayPenalty)} portion of the Cu to 255 (0xff)

and

{EchoPenalty} portion of the Cu to 255 (0xff)

and

{DistancePenalty} portion of the Cu to 255 (0xff).

The user has the following adjustable values:

Variable name	Meaning	EEPROM address	RAM address	Valid range
InitialCuValue	There is an initial Cost value that the MDLT assigns to a heard DLT based on the mode that the DLT is operating in (linked GS, linkless GS, or Participant).			

Variable name	Meaning	EEPROM address	RAM address	Valid range
	The default values are: for Linked GS = 0 (0x00);	N/A	N/A	hardcoded
	for Linkless GS = 16 (0x10);	0x0388	$10001850	0…128
	for Participant = 32 (0x20).	0x0389	$10001851	0…128
HighPowerAmp_NotPresent_Penalty	This is the penalty that the MDLT assigns to the Cost of the heard DLT if this DLT does not have a HighPower RF Amplifier installed. The MDLT gathers information about the HighPower RF Amplifier from the 'DLT Info' WORD of the Original Beacons sent by the DLT (WORD18 of the Msg256, bit#1). The default value is 16 (0x10).	0x0387	$10001857	0…128

Variable name	Meaning	EEPROM address	RAM address	Valid range
RelayPenalty	This is the penalty that the MDLT assigns to the Cost of the heard DLT for every Relay used by this DLT. The penalty that the MDLT assigns for Relays is calculated as: RelayCnt * 2^RelayPenalty. The RelayCnt for each heard DLT is calculated using the following method: • if DLT is linked MRGS, then RelayCnt = 0; • if DLT is linkless_MRGS, then RelayCnt = 1 • if DLT is Participant, then RelayCnt = ({RemainingRelaySlots + 1} MOD MaxRelayCnt), where ✓ 'RemainingRelaySlots' is read from the Headers of the RF packets transmitted by this DLT; ✓ MOD is the 'modulus' function; and ✓ 'MaxRelayCnt' is maximum allowed by ARDS relay count = 5. For example, if the heard DLT is the third DLT from the GS (not counting the GS), then its 'RemainingRelaySlots' file would read '2'. Also, if the user defined RelayPenalty is to be '3', then the overall additional Cost penalty that the MDLT will add in this case would be: RelayCnt * 2^RelayPenalty = 2 * 2^3 = 2 * 8 = 16. The default value of the RelayPenalty is 3 (0x03).	0x038A	$10001852	0…6

Variable name	Meaning	EEPROM address	RAM address	Valid range
EchoPenalty	This is the penalty that the MDLT adds to the Cost for the Beacons that were not echoed by the DLT they were sent to. The MDLT increments this penalty by the EchoPenaltyIncrement value every time it sends its Beacon to a particular DLT. Similarly, the MDLT decrements this penalty by the EchoPenaltyDecrement value every time it hears the Beacons echoed by a particular DLT. The EchoPenaltyIncrement and EchoPenaltyDecrement values depend on the mode that the DLT is operating in (linked GS, linkless GS, or Participant. For each, the MDLT uses separate EchoPenaltyIncrement and EchoPenaltyDecrement values: The default values are:			0…255
	Linked_EchoPenaltyIncrement = 1 (0x01)			hardcoded
	Linked_EchoPenaltyDecrement = 3 (0x03)			hardcoded
	Linkless_EchoPenaltyIncrement = 2 (0x02)	0x038E	$10001855	0…128
	Linkless_EchoPenaltyDecrement = 4 (0x04)	0x038F	$10001856	0…128
	Participant_EchoPenaltyIncrement = 1 (0x01)	0x038B	$10001853	0…128
	Participant_EchoPenaltyDecrement = 3 (0x03)	0x038C	$10001854	0…128

Variable name	Meaning	EEPROM address	RAM address	Valid range
DistancePenalty	The MDLT adds this penalty to the Cost due to the Distance from it to a particular DLT. The MDLT divides the Distance measured to a particular DLT by the DistancePenalty value using the: Cost increment = 2^DistancePenalty * Distance[miles]. The default value of the DistancePenalty is 2 (0x02). This means that the MDLT will divide Distance it measures to a particular DLT by 8 before adding this penalty to the overall Cost.	0x0391	$1000185A	0…8

Once the MDLT is in the OPERATE State, it may switch from one DLT to another as its packets route based on the Cost it calculated for this particular DLT.

The MDLT will try to switch to another DLT in two cases:

- It has to do so because it did not hear its Beacons echoed in 20 seconds or longer. This would be a switch due to Need.
- Or when it has an opportunity to use another DLT because the Cost of this DLT is lower than the Cost of the DLT that the MDLT is using at the moment. This would be a switch due to Opportunity.

When the MDLT is switching to a different DLT due to Need or due to Opportunity, it checks to make sure that the Cost associated with this DLT is lower than the Cost associated with the DLT currently used by the MDLT. There are two different user-defined thresholds:

Variable name	Meaning	EEPROM address	RAM address	Valid range
GS_NeedSwitchCostDiff	This is the threshold used by the MDLT in order to switch from one DLT to another due to Need (the MDLT is in OPERATE and did not hear its Beacons echoed in at least 20 seconds). The MDLT checks to see if it needs to switch to another DLT when OPERATE_CountDown gets to 8, 6, 4, and 2. The OPERATE_CountDown gets reset to 10 every time the MDLT is in OPERATE State and it hears its Beacon echoed. This value gets decremented during Slot0 of every SuperSlot (every 10 seconds). The MDLT will not switch to another DLT if the Cost difference between the current DLT and the newly considered DLT is lower than the value of GS_NeedSwitchCostDiff. The default value is 8 (0x08).	0x038D	$10001858	0…255

Variable name	Meaning	EEPROM address	RAM address	Valid range
GS_OpportunitySwitchCostDiff	This is the threshold used by the MDLT in order to switch from one DLT to another due to Opportunity (the MDLT is in OPERATE and hears its Beacons echoed, but it just checking to see if there is a better DLT out there to use). The MDLT checks to see if there is a better DLT to use every SuperFrame (every 10 seconds). The MDLT won't switch to another DLT if the Cost difference between the current DLT and the newly considered DLT is lower than the value of GS_OpportunitySwitchCostDiff. The default value is 8 (0x08).	0x0390	$10001859	0…255