

Tortoise

manual version 1.6





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Tortoise TOP PANEL

TX1:

XMIT(Green)- Lit when the associated transmitter is on.

UNLOCK(Red)- is lit if the associated transmitter has an RF problem - contact factory.

TX2:

same as TX1

CONTRAST SLIDE CONTROL:

Adjusts the contrast of the LCD display.

AUDIO SPEAKER:

Outputs tones that indicate Tortoise functions.

128 x 240 PIXEL LCD DISPLAY

KEYPAD:

1-9,0 are used for frequency and channel entry.

ENTER is used to initiate parameter entry in the main screen and to display unit information in the main menu.

ESC is used to exit entry and to enter the main menu. It is also used to exit menus to return to the main screen.

TX1 is used to turn on and off transmitter 1.

TX2 is used to turn on and off transmitter 2.

RECALL is used to enter the frequency/power recall menu.

SAVE is used to enter the frequency/power save menu.

MAIN POWER ON/OFF SWITCH

POWER/FREQUENCY KNOB:

Is used to change selected transmitter parameters (frequency or power), the current parameter controlled by the knob is displayed on the last line of the main screen and selected using the main menu.



TORTOISE REAR PANEL

TX1 transmitter module 1 output

TX2 transmitter module 2 output

GPS GPS antenna input

ETHERNET 10/100 Mbit ethernet comm port

USB USB 2.0 comm port

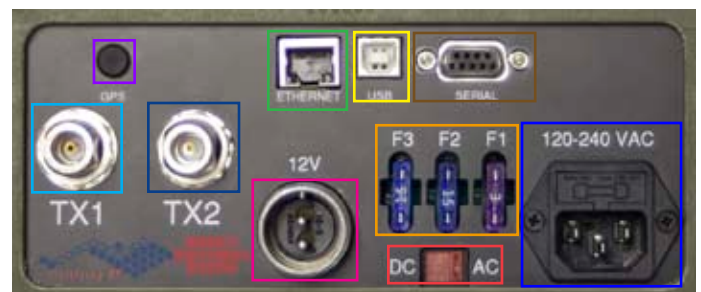
SERIAL DB9 serial comm port

12V 12VDC power input

FUSE user replaceable fuses

AC/DC AC or DC input switch

120-240 VAC 120-240 VAC power input



All control and setting of operating parameters for the TORTOISE TRANSMITTER are accomplished using the top-panel keypad/knob combination (Figure 1). All valid parameters are saved by the TORTOISE and are the parameters used whenever the unit is powered up.

TORTOISE KEYPAD AND KNOB

Figure 1

The current TORTOISE parameter that can be modified by the keypad or knob is indicated by the marker as shown in Figure 2 on the left hand side of the TORTOISE main display (Figure 3).



Figure 2



TORTOISE MAIN DISPLAY

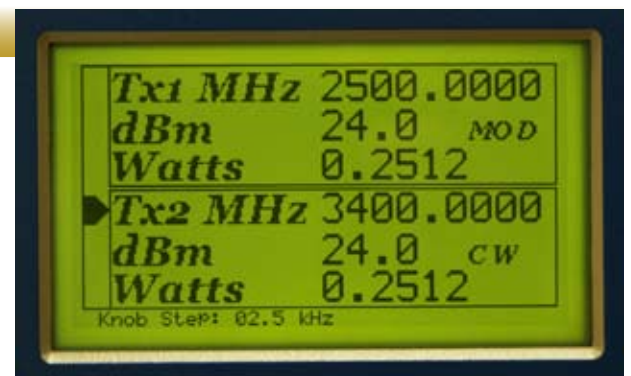
Figure 3

MAIN DISPLAY PARAMETERS

TX1 MHz indicates the current frequency setting of transmitter 1.
dBm indicates the current power output of transmitter 1.
Watts indicates the equivalent wattage for the displayed dBm. The Watts display converts the dBm value entered to watts. And is controlled by the dBm entry.

The bottom line of the display indicates the change in frequency that will occur if BOTH TX1 or TX2 is pointed to by the marker AND the knob is turned. The step for the knob is fixed at .1dBm if either TX1 or TX2 dBm is pointed to by the marker AND the knob is turned.

The minimum and maximum values for these parameters can be found by viewing the unit data screens.



PARAMETER MODIFICATION

The TORTOISE main display indicates the current settings of the installed transmitters. Parameters that can be changed by the user are indicated by the marker (Figure 2) on the left side of the display. Parameters that can be modified are TX1, TX2 frequency and TX1, TX2 dBm.

In Figure 3 the marker indicates that the Frequency for Transmitter 1 can be modified (using the keypad or knob). To move the marker down to the next adjustable parameter, press the ENTER key on the keypad.

When either TX1 or TX2 frequency are thus marked, turning the knob increases or decreases frequency by the amount indicated on the last line, the knob step.

If either TX1 or TX2 dBm are marked, turning the knob increases or decreases power by .5 dBm (TBD),

When either transmitter is on, both the knob and keypad (except TX1 and TX2 keys) are ignored (TBD).

TORTOISE UNIT DATA SCREEN 1

Whenever the MAIN SCREEN is displayed (Figure 3), pressing the ESC key will display the first of 6 unit data and setup screens. Screen 1 (Figure 4) displays non rf related information about the TORTOISE (firmware version, serial number and owner) and general RF information about each transmitter.

Figure 4

When the first unit data screen is displayed (Figure 4), press any key to move to TRANSMITTER 1 RF information screen (Figure 5).



TORTOISE UNIT DATA SCREEN 2

Figure 5
UNIT DATA SCREEN 2 and 3
TRANSMITTER RF PARAMETERS
(Figures 5 and 6)

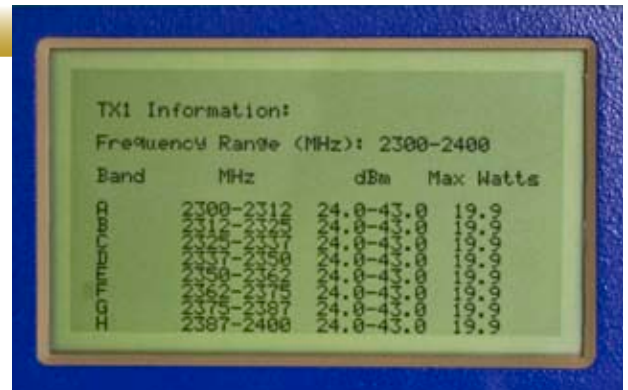
Frequency Range indicates the minimum to maximum frequency that the installed transmitter can tune. The smallest increment that can be changed by the knob is displayed on the Resolution line in unit data screen 1. Note that a black square cursor indicates the current band of the main screen frequency.

The Frequency range can be split into up to 8 bands, each band with a frequency range in MHz and dBm range. The maximum RF power in Watts for each band is displayed to the right of the dBm range.

Whenever a frequency is entered in the main screen, the Tortoise selects the proper band for the entered frequency. Any frequency entered not in any band is ignored. DBm entry is limited by the band selected. Any dBm entered less than or greater than the band min-max will be forced to either the min or max value for that band.

Band RF ranges are determined at the factory. Band name (A-H) can be set by the user with optional PC software.

When unit data screen 2 is displayed (Figure 5), press any key to move to TRANSMITTER 2 RF information screen (Figure 6).



TORTOISE UNIT DATA SCREEN 3

Figure 6

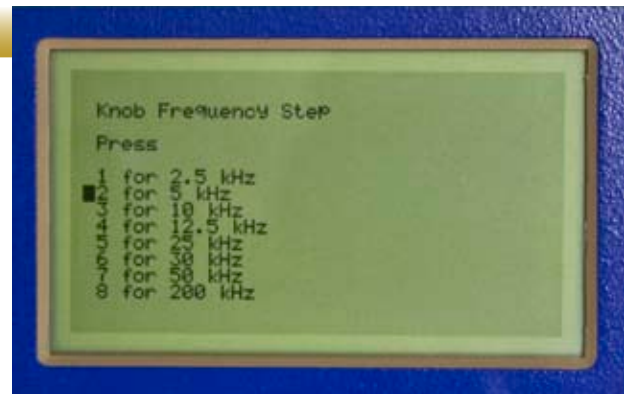
When unit data screen 3 is displayed (Figure 6), press any key to move to KNOB STEP screen (Figure 7).



TORTOISE UNIT DATA SCREEN 4 - SET KNOB FREQUENCY STEP

Figure 7

Press 1 through 8 key to change the knob step to the indicated value. After doing so, Tortoise proceeds to setup screen 5, with the updated knob setting saved. Any other key press causes Tortoise to move on to setup screen 5 with no change in the knob step. The current setting is indicated by the cursor.



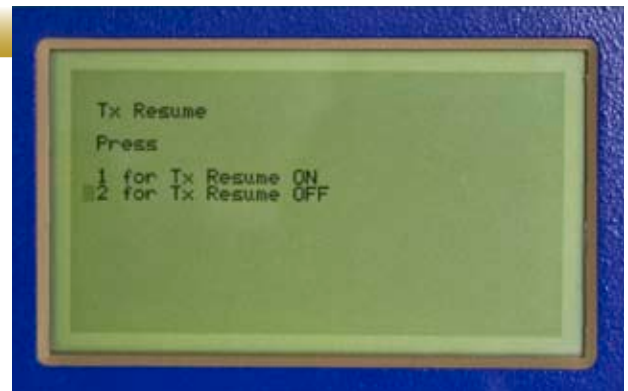
TORTOISE UNIT DATA SCREEN 5 - TX Resume setting

Figure 8

Press 1 to turn on, 2 to turn off the TX Resume feature.

TX Resume Operation:

If either or both transmitters is ON when the unit loses power (or is manually turned off) and TX Resume is ON, the transmitter(s) that were on when power is restored will resume transmitting after the TX resume screen is displayed as shown in figure 9. Pressing any other key causes Tortoise to go to setup screen 6 without changing the TX Resume setting.



TORTOISE TX RESUME SCREEN

Figure 9

When the screen in figure 9 is displayed after power up, the operator has 10 seconds to abort transmission by pressing any key. At the bottom of the screen a count down of seconds remaining before re-transmission is displayed along with an audible dual tone speaker output.

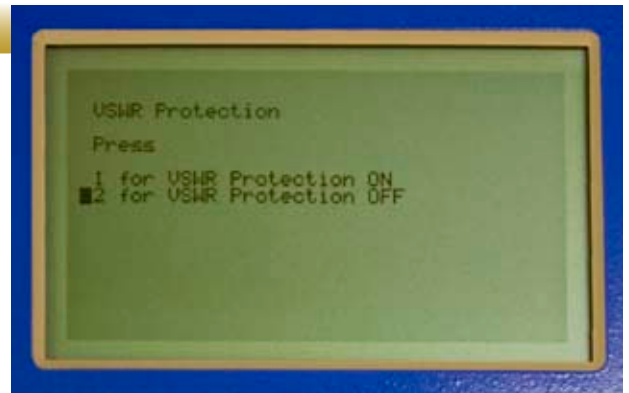


TORTOISE VSWR UNIT DATA SCREEN 6

VSWR Protection

Figure 10

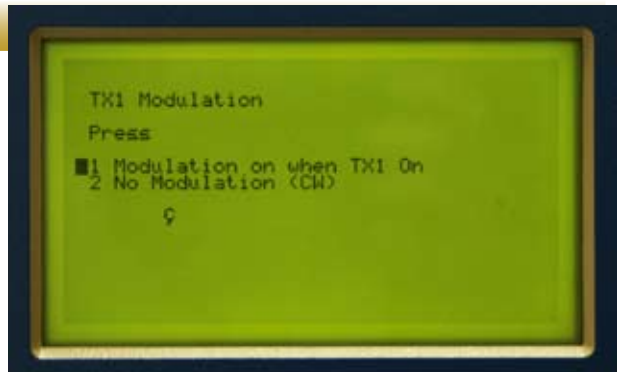
The screen in figure 10 is used to turn on or off the VSWR protection for BOTH transmitters. Use the OFF setting when the transmitter shuts off with a good load, this can happen at low power levels.



TORTOISE MODULATION UNIT DATA SCREEN 7

TX1 MODULATION SELECT

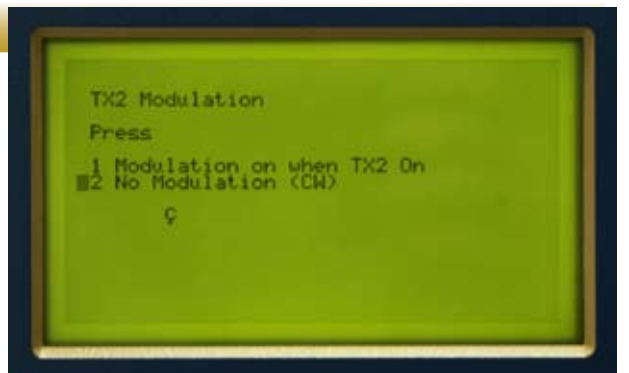
Figure 11



TORTOISE MODULATION UNIT DATA SCREEN 8

TX2 MODULATION SELECT

Figure 12



For any modulator equipped Tortoise transmitter, the modulation that will be transmitted is displayed below selection 1 and 2 as shown in Figures 11 and 12. Pressing 1 in either screen will cause the transmitter to output the indicated modulation when it is turned on. Pressing 2 in either screen will cause the selected transmitter to output a non-modulated (CW) signal when turned on. Additionally, the transmission mode is displayed on the Tortoise main screen as shown in Figures 13 and 14.

Figure 13

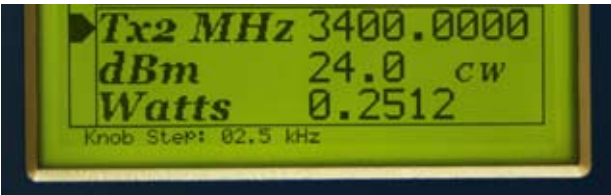


Figure 14



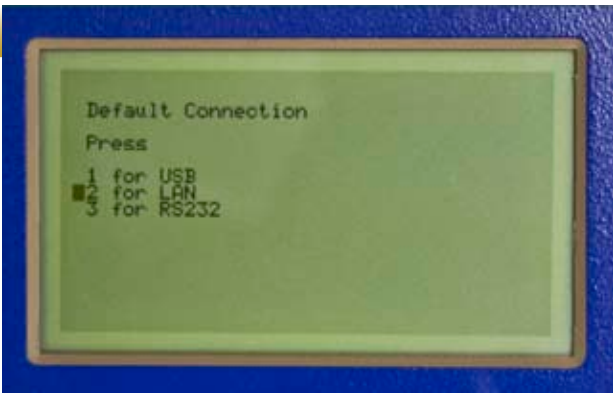
Figure 13 is an example of the display when CW is selected in screen 7. Figure 14 is the display when modulation is selected in screen 7. The same applies for TX2.

TORTOISE CONNECTION UNIT DATA SCREEN 7

Default Communication Setting

Figure 15

The Tortoise will select USB communication if a USB cable is connected between the Tortoise and a powered up PC when Tortoise is turned on. To use LAN or RS232, select option 2 or 3. Select USB if the Tortoise will be powered up without a “live” USB cable connected and USB connection is desired.

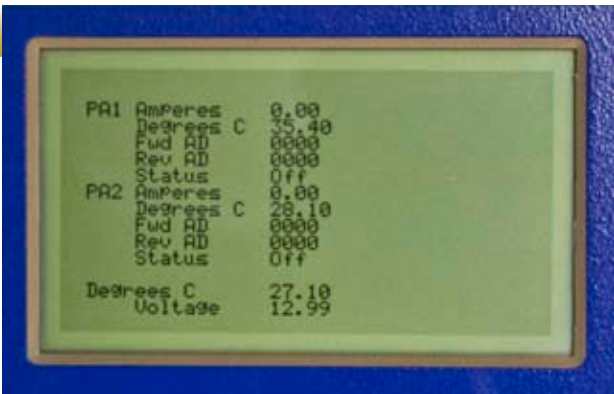


TORTOISE SYSTEM STATUS UNIT DATA SCREEN 8

System Status

Figure 16

This screen follows unit data screen and displays the condition of the Tortoise RF power amplifiers, the input Voltage and interior temperature. This screen is displayed automatically on any error condition, and a power amplifier (PA1 or PA2), Voltage or interior temperature will cause outputs to be shut off. Service may be required.



ERROR (either PA1 or PA2) causing display of this screen:

PA1 or PA2	Action
RF unlock	PA shut off
Bad Match	PA shut off
PA Temperature	PA temperature is greater than 70 degree C, both PA shut off
DAC error	PA has gone beyond its control range, PA shut off
Voltage	Voltage is less than 11.4 V or greater than 13.2 V, both PA shut off
Interior Temp	If “Degrees C” is greater than 70 degree C, both PA shut off

Fwd and Rev AD (both PA) indicate PA range and are used for factory trouble shooting.

If the Tortoise is equipped with GPS, the following screen is displayed after the status screen,

TORTOISE GPS UNIT DATA SCREEN 9

Figure 17

The screen in Figure 17 shows the condition of the GPS receiver.

GPS Status:

Acquiring - the GPS receiver is searching for satellites to track.
3D Lock - GPS is locked with 3D solution. Height is reliable.
2D Lock - GPS is locked with 2D solution. Height is NOT reliable.
Propagate - GPS is not locked
Hold - Position Hold (NOT USED BY TORTOISE)
Bad Geometry - GPS is not locked. Visible satellites cannot be used for a solution.

The GPS Status is displayed on the last display line in the right corner of the screen. More details (such as Lat,Lon) can be found in setup screen 9, Figure 17.

Please note that the GPS Status is displayed in the main screen only if EITHER TX1 or TX2 Frequency is selected with the arrow. Full details are always available through setup screen 9.

GPS Details

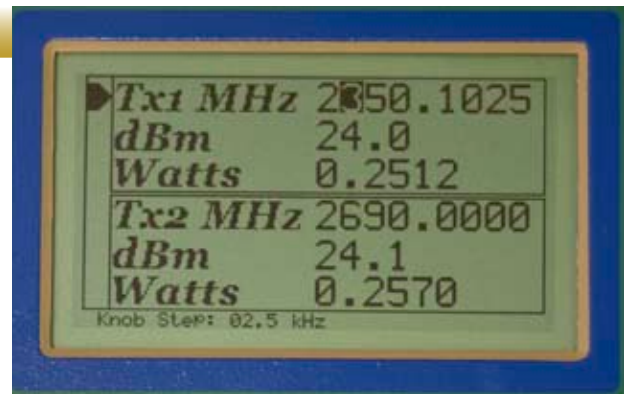
Date: 09-11-2008
Time: 14:04:41
Satellites: 00
Status: Acquiring
Latitude: 40.5470 North
Longitude: 74.3802 West
Height: 0005 Meters

FREQUENCY ENTRY

Figure 19

STEP By STEP Example

- 1) Make sure the MAIN screen is displayed.
- 2) Place the marker on the row displaying the frequency to change using the ENTER key.
- 3) Press the first digit of the frequency.
- 4) The next digit to enter is highlighted . If the first or any other digit is in error, use the CLEAR key to backup one digit.
- 5) Enter all digits in this fashion. Note that the decimal point is automatically skipped. When past the last digit displayed, the value is used (and displayed). To exit without using the digits entered press ESC. To use before typing all digits, press ENTER.
- 6) If the frequency entered is out of range, it is ignored. Otherwise, the nearest frequency (given the resolution of the transmitter) is displayed.

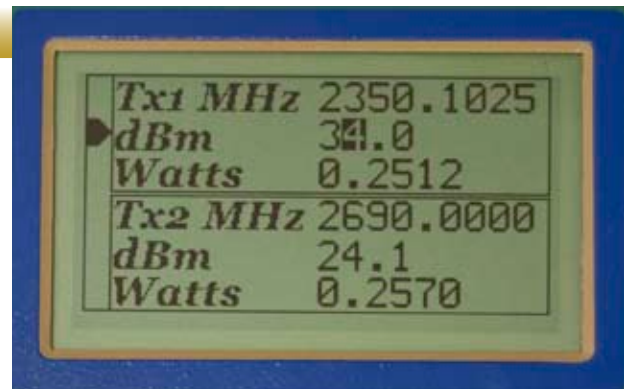


POWER ENTRY

Figure 20

STEP By STEP Example

- 1) Make sure the MAIN screen is displayed.
- 2) Place the marker on the row displaying the dBm to change using the ENTER key.
- 3) Press the first digit of the dBm.
- 4) The next digit to enter is highlighted . If the first or any other digit is in error, use the CLEAR key to backup one digit.
- 5) Enter all digits in this fashion. Note that the decimal point is automatically skipped. When past the last digit displayed, the value is used (and displayed). To exit without using the digits entered press ESC. To use before typing all digits, press ENTER.
- 6) If the dBm entered is out of range, it is ignored. Otherwise, the entered dBm is used and the Watts portion of the display is updated.



TRANSMITTING

To begin transmitting with TX1 or TX2 or BOTH (TDB) be sure that the parameters displayed by the MAIN screen are set as desired. Also be sure that the output(s) are properly terminated **BEFORE** starting the output.

LED INDICATORS

Figure 21

The led indicators to the left of the LCD display (Figure 13) show the current output status of both transmitters. When both transmitters are off, they appear as depicted in Figure 13.

KEYPAD AND KNOB WHILE OUTPUT IS ON

Whenever either transmitter is **ON**, the knob is ignored and the only keys that are not ignored are the TX1 and TX2 keys.



AUTOMATIC SHUTDOWN

Any detected fault will cause the effected transmitter to shut off.

Possible faults that can turn off a transmitter are:

- RF error (unlock)
- Excessive VSWR
- Excessive current (TBD)
- Excessive temperature (TBD)

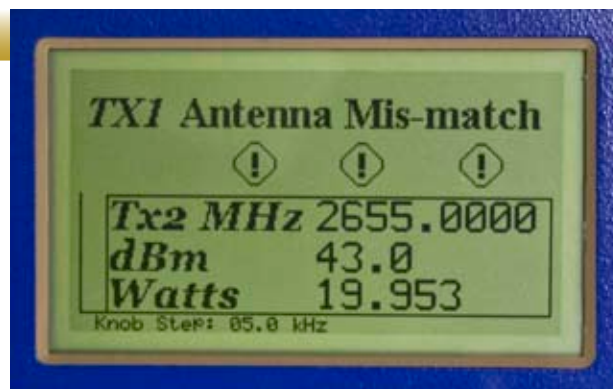
Figure 22

The screen depicts a VSWR error detected by Tortoise transmitter # 2 while it was transmitting. The problem must be corrected before attempting to use the indicated transmitter again. The most common causes for this error are:

- 1) No antenna connected to the output.
- 2) Faulty N connector used to connect to the Tortoise.
- 3) Shorted or Open antenna cables.

A similar screen is displayed if the error is encountered by transmitter # 2. Either error also causes the System Status screen display (Figure 11).

VSWR protection can be turned OFF using setup screen 6. **USE CAUTION** when turning off the Tortoise VSWR protection.



STEP By STEP Example

Set TX1 to output 37 dBm at 2550 MHz and transmit:

Figure 23

- 1) Assuming a screen such as Figure 15 BEFORE transmitting with both status led's as shown in Figure 13.
- 2) Check that TX1 output is connected properly to the antenna.
- 3) Change frequency of TX1 to 2550.0000 and dbm to 37. When the display appears as in Figure 16 press the TX1 key.

Figure 20

- 4) After TX1 reaches 37 dBm, the XMIT led for TX1 will turn on as in Figure 17.

Figure 21

- 5) To turn off TX1, press the TX1 key again.
- 6) If TX1 has an RF problem, the led's will appear as in Figure 18 and the output would NOT be turned on.

Figure 24

This error also causes the System Status screen display (Figure 11).

Tx1 MHz	2500.0100
dBm	30.00
Watts	1.0000
Tx2 MHz	1875.0000
dBm	43.00
Watts	19.953
Knob Step: 02.5 kHz	

Tx1 MHz	2550.0000
dBm	37.00
Watts	5.0119
Tx2 MHz	1875.0000
dBm	43.00
Watts	19.953



SAVING and RECALLING settings

To save the current frequency and dBm settings for both TX1 and TX2, press the SAVE key and the display in Figure 19 appears. To save, press the 0 through 9 key.

Figure 25

To recall settings previously stored by the SAVE key, press the RECALL key and the display in Figure 20 is presented. Press the appropriate key (0-9) to transfer the settings to the right of the digit pressed from the recall screen to the MAIN screen.

Figure 26

Save Settings				
	Tx1 Frequency	dBm	Tx2 Frequency	dBm
0	2350.1825	24.0	2690.0000	24.2
1	Empty	----	Empty	----
2	Empty	----	Empty	----
3	Empty	----	Empty	----
4	Empty	----	Empty	----
5	Empty	----	Empty	----
6	Empty	----	Empty	----
7	Empty	----	Empty	----
8	Empty	----	Empty	----
9	Empty	----	Empty	----

Recall Settings				
	Tx1 Frequency	dBm	Tx2 Frequency	dBm
0	2350.1825	24.0	2690.0000	24.2
1	Empty	----	Empty	----
2	Empty	----	Empty	----
3	Empty	----	Empty	----
4	Empty	----	Empty	----
5	Empty	----	Empty	----
6	Empty	----	Empty	----
7	Empty	----	Empty	----
8	Empty	----	Empty	----
9	Empty	----	Empty	----

Power Conversion dBm to Watts

dBm	milli Watts
26.0	398
26.5	447
27.0	501
27.5	562
28.0	631
28.5	708
29.0	794
29.5	891
30.0	1000
dBm	Watts
30.5	1.12
31.0	1.26
31.5	1.41
32.0	1.58
32.5	1.78
33.0	2.00
33.5	2.24
34.0	2.51
34.5	2.82
35.0	3.16
35.5	3.55
36.0	3.98
36.5	4.47
37.0	5.01
37.5	5.62
38.0	6.31
38.5	7.08
39.0	7.94
39.5	8.91
40.0	10.00
40.5	11.22
41.0	12.59
41.5	14.13
42.0	15.85
42.5	17.78
43.0	19.95
43.5	22.39
44.0	25.11
44.5	28.18
45.0	31.62
45.5	35.48
46.0	39.81
46.5	44.67
47.0	50.12
47.5	56.23
48.0	63.10
48.5	70.79
49.0	79.43
49.5	89.13
50.0	100.00

Return Loss vs. VSWR

Return Loss (dB)	VSWR
32.256	1.05
26.444	1.10
23.127	1.15
20.828	1.20
19.085	1.25
17.690	1.30
16.540	1.35
15.563	1.40
14.719	1.45
13.979	1.50
13.324	1.55
12.736	1.60
12.207	1.65
11.725	1.70
11.285	1.75
10.881	1.80
10.509	1.85
10.163	1.90
9.842	1.95
9.542	2.00
8.999	2.10
8.519	2.20
8.091	2.30
7.707	2.40
7.360	2.50
7.044	2.60
6.755	2.70
6.490	2.80
6.246	2.90
6.021	3.00
5.811	3.10
5.617	3.20
5.435	3.30
5.265	3.40
5.105	3.50

Glossary of Acronyms

AC	Alternating Current
A/D or ADC	Analog to Digital Converter
AGC	Automatic Gain Control
BER	Bit Error Rate
BPSK	Binary Phase Shift Keying
BW	Band Width
CDMA	Code Division Multiple Access - a spread spectrum modulation
DC	Direct Current
D/A	Digital to Analog
dB	deciBel
dBm	deciBels referenced to 1 milliwatt
DOS	Digital Operating System
DSP	Digital Signal Processing
FIR	Finite Impulse Response
GHZ	GigaHertz
GPS	Global Positioning System (satellite based)
GPS diff.	GPS error correction signal which enhances GPS accuracy
IF	Intermediate Frequency
I and Q	In phase and Quadrature
kHz	kiloHertz
LCD	Liquid Crystal Display
LO	Local Oscillator
Mbits	Megabits
MHz	MegaHertz
modem	acronym for modulator/demodulator
PCMCIA	Personal Computer Memory Card International Association
PC	Personal Computer
PCS	Personal Communications Service (1.8 to 2.1 GHz)
PN	Pseudo Noise
QPSK	Quaternary Phase Shift Keying, 4-level PSK
RF	Radio Frequency
RSSI	Receiver Signal Strength Indicator
UTC	Universal Time Code
VAC	Volts Alternating Current
VGA	Video Graphics Array
VSWR	Voltage Standing Wave Ratio
X	horizontal axis
Y	vertical axis

GENERAL SAFETY INSTRUCTIONS

When using your telephone equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons, including the following:

- 1) Read and understand all instructions.
- 2) Follow all warnings and instructions marked on the product.
- 3) Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
- 4) Do not use this product near water, for example, near a bath tub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool.
- 5) Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.
- 6) Slots and openings in the cabinet and the back or bottom are provided for ventilation, to protect it from overheating these openings must not be blocked or covered. The openings should never be blocked by placing the product on the bed, sofa, rug or other similar surface. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation unless proper ventilation is provided.
- 7) This product should be operated only from the type of power source indicated on the appliance. If you are not sure of the type of power supply to your home, consult your dealer or local power company.
- 8) Do not allow anything to rest on the power cord. Do not locate this product where the cord will be abused by persons walking on it.
- 9) Do not overload wall outlets and extension cords as this can result in the risk of fire or electric shock.
- 10) Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electric shock. Never spill liquid of any kind on the product.
- 11) To reduce the risk of electric shock, do not disassemble this product, but take it to a qualified service facility when some service or repair work is required. Opening or removing covers may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electric shock when the appliance is subsequently used.
- 12) Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
 - A) When the power supply cord or plug is damaged or frayed.
 - B) If liquid has been spilled into the product.
 - C) If the product has been exposed to rain or water.
 - D) If the product does not operate normally by following the operating instructions. Adjust only those controls, that are covered by the operating instructions because improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal operation.
 - E) If the product has been dropped or the cabinet has been damaged.
 - F) If the product exhibits a distinct change in performance.
- 13) Avoid using the product during an electrical storm. There may be a remote risk of electric shock from lightning.
- 14) Do not use the telephone to report a gas leak in the vicinity of the leak.

GENERAL INSTALLATION INSTRUCTIONS

1. Never install telephone wiring during a lightning storm.

2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
3. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
4. Use caution when installing or modifying telephone lines.

GENERAL INSTRUCTION FOR BATTERIES

CAUTION: To Reduce the Risk of Fire or Injury to Persons, Read and Follow these Instructions:

1. Use only the type and size of batteries mentioned in owner's manual.
2. Do not dispose of the batteries in a fire. The cells may explode. Check with local codes for possible special disposal instructions.
3. Do not open or mutilate the batteries. Released electrolyte is corrosive and may cause damage to the eyes or skin. It may be toxic if swallowed.
4. Exercise care in handling batteries in order not to short the battery with conducting materials such as rings, bracelets, and keys. The battery or conductor may overheat and cause burns.
5. Do not attempt to recharge the batteries provided with or identified for use with this product. The batteries may leak corrosive electrolyte or explode.
6. Do not attempt to rejuvenate the batteries provided with or identified for use with this product by heating them. Sudden release of the battery electrolyte may occur causing burns or irritation to eyes or skin.
7. When replacing batteries, all batteries should be replaced at the same time. Mixing fresh and discharged batteries could increase internal cell pressure and rupture the discharged batteries. (Applies to products employing more than one separately replaceable primary battery.)
8. When inserting batteries into this product, the proper polarity or direction must be observed. Reverse insertion of batteries can cause charging, and that may result in leakage or explosion. (Applies to product employing more than one separately replaceable primary battery.)
9. Remove the batteries from this product if the product will not be used for a long period of time (several months or more) since during this time the battery could leak in the product.
10. Discard "dead" batteries as soon as possible since "dead" batteries are more likely to leak in a product.
11. Do not store this product, or the batteries provided with or identified for use with this product, in high-temperature areas. Batteries that are stored in a freezer or refrigerator for the purpose of extending shelf life should be protected from condensation during storage and defrosting. Batteries should be stabilized at room temperature prior to use after cold storage.

Tortoise PC Manual version 1.5

TERMS

BVS: **Berkeley Varitronics Systems, Inc.**

Features

The Tortoise transmitter application allows the user to connect to and control the transmitter using a Local Area Network (LAN), Universal Serial Bus (USB) or RS232 serial port. In addition, the user can label any of the Tortoise frequency bands with text of their choosing for ease of identification.

Installation



Figure 1

Insert the CD supplied into the PC's CD drive and the application will install automatically. If the installation does not start, with the supplied installation CD still in the PC drive, locate the icon's in Figure 1 and double left click either.

When installation begins, the screen in Figure 2 is displayed.



Figure 2

Click the “Next >” button and the dialog in Figure 3 is displayed.

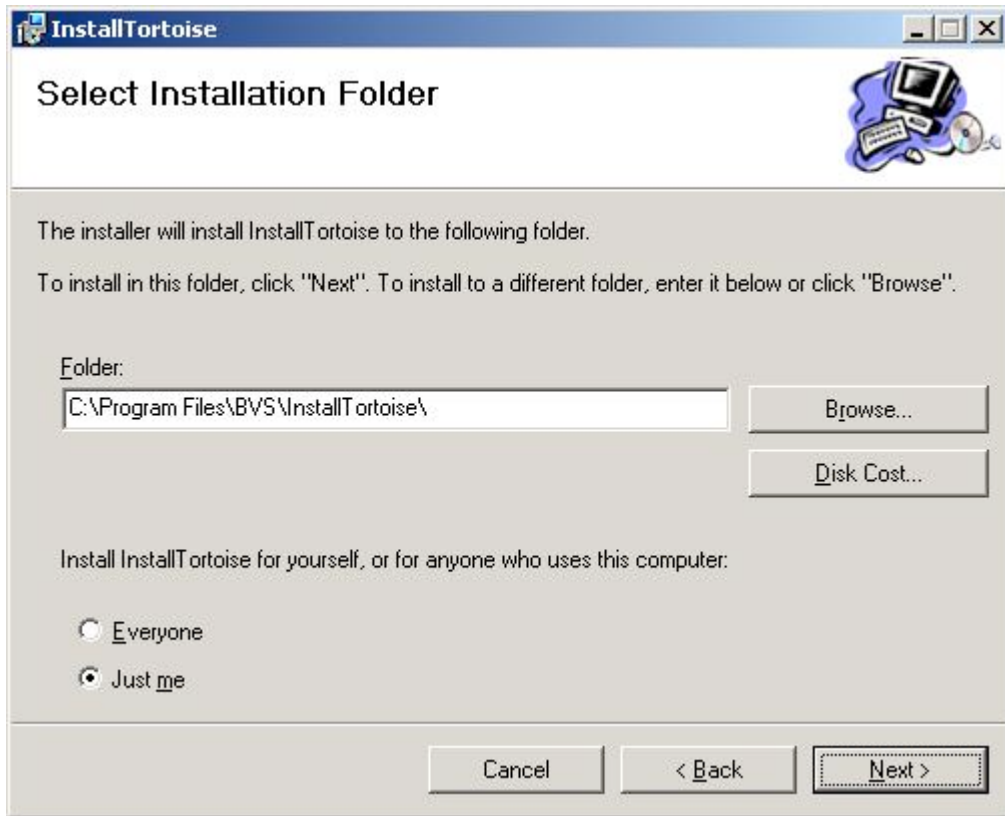


Figure 3

Click “Just me” or “Everyone” radio button to determine application access rights on the PC.

If the displayed file path is acceptable, click the “Next > “ button or enter the path where the application should be installed followed by clicking the “Next > “ button.

After the “Next” button is clicked, Figure 4 is displayed.

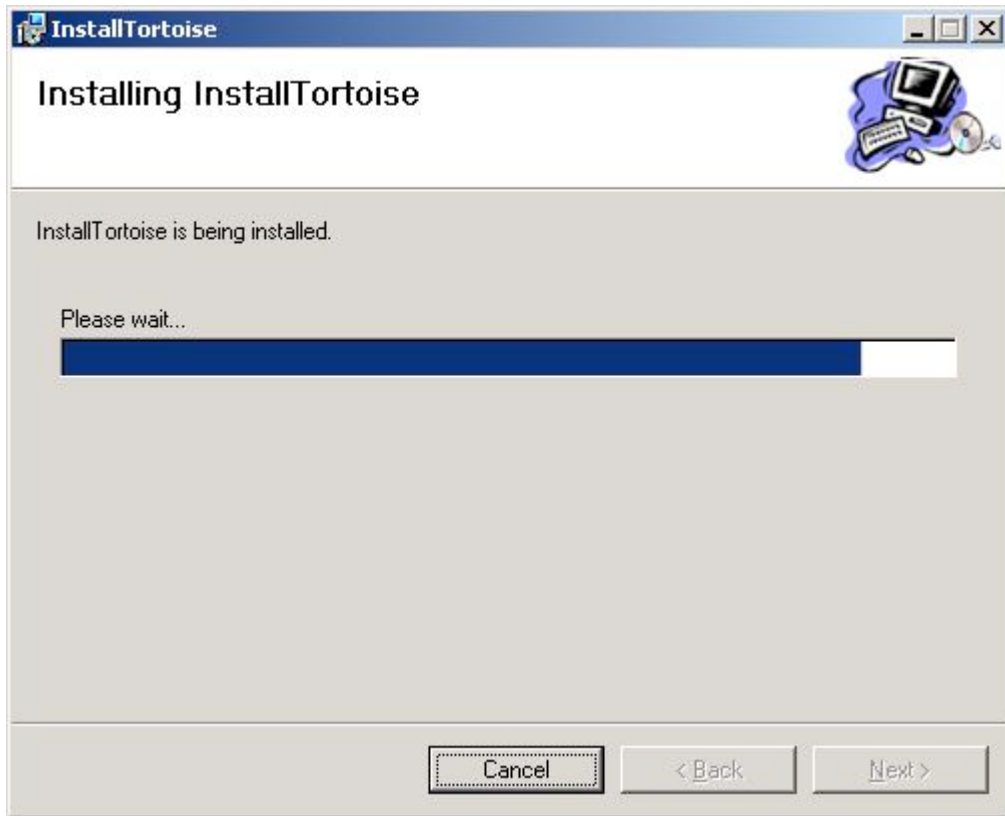


Figure 4

When installation is complete, the final installation dialog is displayed as shown in Figure 5.

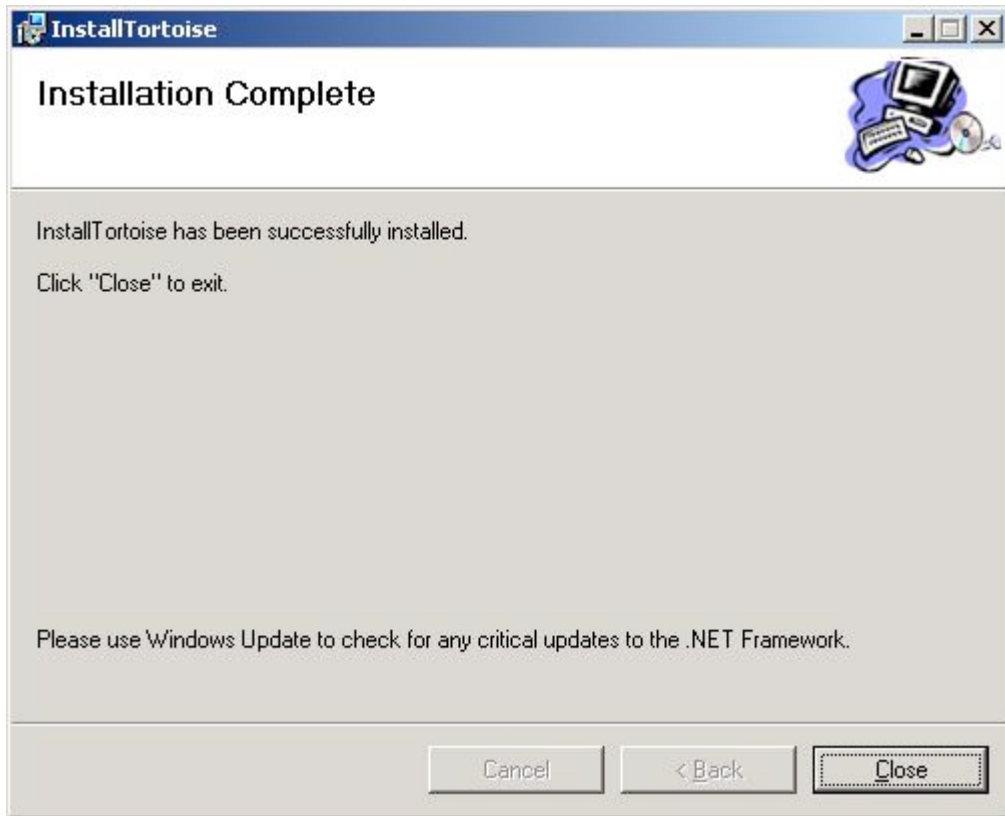


Figure 5

Clicking “Close” in Figure 5 completes installation and an Icon has been placed on the PC Desktop.

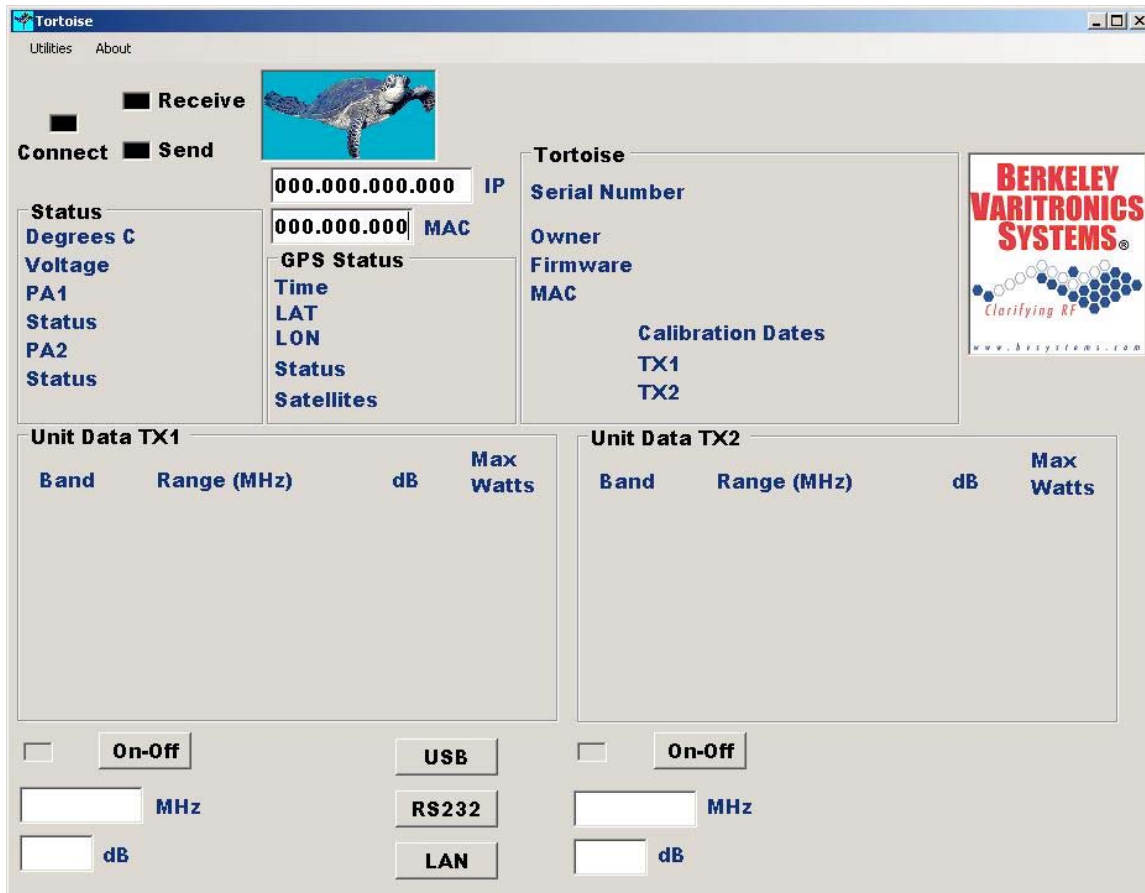
Application Startup

Double click the application icon in Figure 6 and the main PC screen will be displayed (Figure 7).



Figure 6

Tortoise Desktop Application Icon



Initial PC Screen (Figure 7)

Figure 7 – Initial PC screen before MAC entered.

Note the application Menu Bar is above the Tortoise related portion of the screen and it contains functions required to control the PC application.

In order to activate the application for LAN use, the supplied MAC address of the Tortoise (supplied by BVS) must be entered. Once activated, the MAC is saved in the PC so that it is only necessary to enter it once.

The LAN interface in Tortoise as shipped from BVS is programmed to get its IP address via the users LAN Dynamic Host Configuration protocol (DHCP).

To activate the LAN interface, click the LAN button in Figure 7 and the following dialog appears:



To enter the MAC, click OK and the entry dialog is displayed:



Type in the supplied MAC exactly as supplied (including the '.'s) so that the dialog appears as:



Click OK and the MAC is saved on the PC.

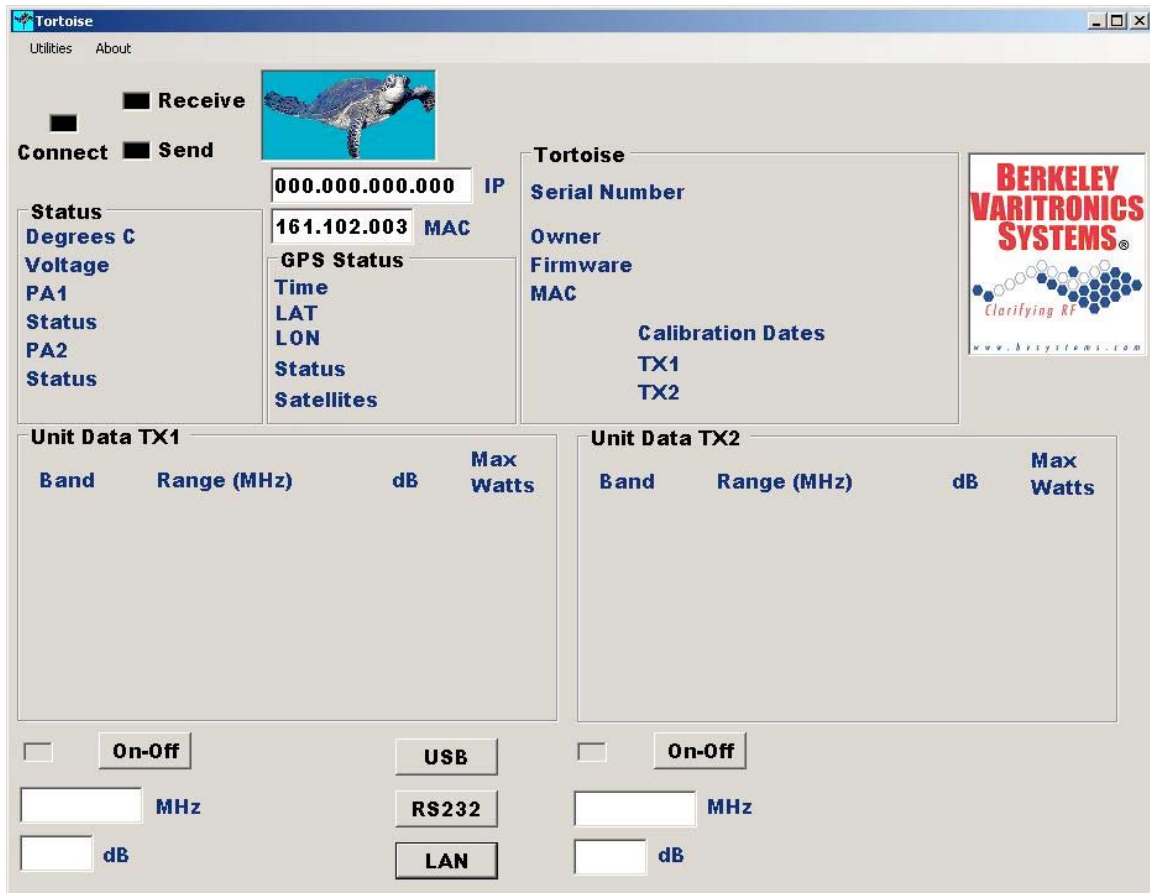


Figure 8 - PC screen after MAC entered

Connecting the PC to the Tortoise

Before the Tortoise can be connected to a PC, the Tortoise default connection method must be selected using Tortoise setup screen 6 (Figure 4 – Tortoise manual)

```

Default Connection
Press
1 for USB
2 for LAN
3 for RS232

```

Figure 9 - Tortoise setup screen 6

Connecting the PC to the Tortoise using LAN

With the screen as shown in Figure 8, click the button labeled LAN on the application and the following sequence is initiated:

- 1) All Tortoise IP addresses assigned by the LAN are collected.
- 2) The Tortoise attempts to connect to the Tortoise with the MAC address shown in Figure 8. This sequence can take up to 4 seconds.
- 3) **NOTE:** the PC and Tortoise **MUST** be on the same sub-net.
- 4) If this MAC is not found on the LAN, the dialog in Figure 10 is displayed.
- 5) Otherwise, the screen in Figure 11 is displayed (including the Tortoise IP address found assigned by the LAN).
- 6) If dialog in Figure 10 is displayed, click OK or Cancel and check that the MAC address in Figure 8 is correct. If it is not correct, retype in the supplied MAC and restart from 1 above.

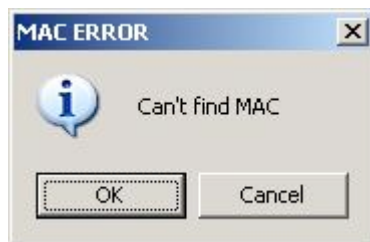


Figure 10 – MAC not found

Connecting the PC to the Tortoise using USB

- 1) Set the Tortoise default connection to USB (Tortoise setup screen 6) and turn off both the PC and Tortoise.
- 2) Connect the Tortoise to the PC with a USB cable.
- 3) Turn on the Tortoise and then the PC.
- 4) When the Tortoise is displaying its main screen, click the application button labeled USB.
- 5) **Note:** first time use of the USB may require installing the USB drivers. They are located in the installation folder in Figure 3. The USB drivers in thier own folder “USB_Install”.

Example – using the folder in Figure 3 and system drive C:, the path to the USB driver folder is:

“C:\Program Files\BVS\InstallTortoise\USB_Install”

Connecting the PC to the Tortoise using RS232

- 1) Set the Tortoise default connection to RS232 (Tortoise setup screen 6) and turn off both the PC and Tortoise.
- 2) Connect the Tortoise to PC COM 1 with the serial cable (or change the port using the application menu Utilities option RS232 before step 3)
- 3) Turn on the Tortoise and then the PC.
- 4) When the Tortoise is displaying its main screen, click the application button labeled RS232.

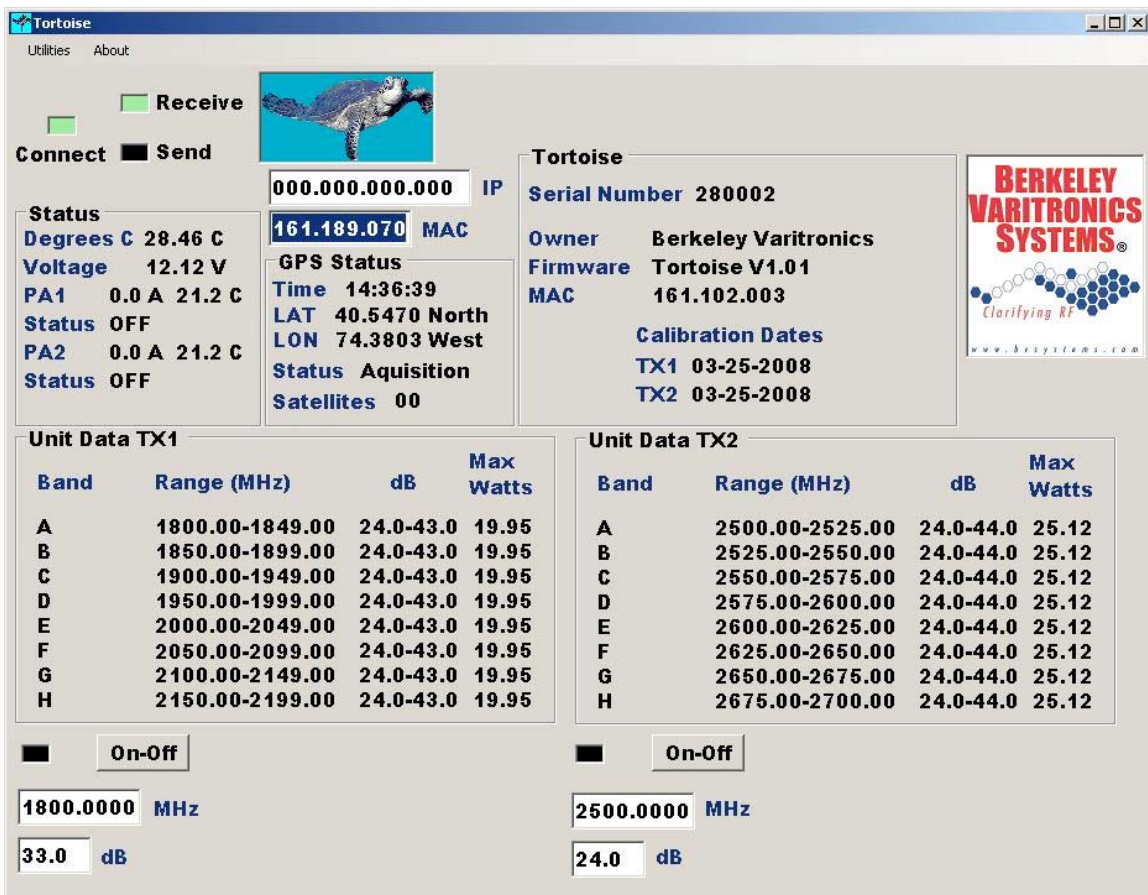


Figure 11 – Tortoise connected and unit data collected

Tortoise Connected Screen (SAME FOR ALL CONNECT MODES)

General Screen Layout

- 1) When connected, the connect (LAN, USB, RS232) buttons disappear.
- 2) When connected, the Connect LED is GREEN.
- 3) When connected, the Receive and Send LED light briefly every second indicating that the application has requested unit status and the PC has received the Tortoise's response. The Status box is updated as are the TX1 and TX2 LED's.
- 4) On initial connection, all unit data is collected from the Tortoise and displayed as shown in Figure 11.

Status Box

Updated every second:

Degree C – indicates the Tortoise interior temperature.

Voltage – indicates the Tortoise DC voltage.

PA1 – indicates RF PA 1 current in amperes and Temperature in Degree C.

PA1 Status – ON or OFF

PA2 – indicates RF PA 2 current in amperes and Temperature in Degree C.

PA2 Status – ON or OFF

GPS Status Box

If the Tortoise is NOT equipped with GPS, this status box is labeled “GPS Not Installed”.

If GPS IS installed this box is updated every second and displays:

GPS Time, Latitude, Longitude, Status and the number of satellites the GPS receiver is tracking.

Time, Latitude, Longitude are ONLY reliable if the Status indicates 2D or 3D lock.

Unit Data TX 1, TX 2 Box

For each of 8 frequency bands:

Name of the Band.

Frequency range of the band in MHz.

db range of the band.

Max power of the band (Watts).

Below each Unit Data box is:

TX LED – Green if on, Yellow if ramping to level, Black if off.

Below this LED is the Frequency entry box.

Below the Frequency entry box is the db entry box.

Tortoise General data box

Tortoise Serial Number.

Owner Name.

Tortoise Firmware Version.

LAN MAC Address.

Calibration date for each transmitter.

Operation of the transmitter (TX1 or TX2)

Turn ON (TX led is black)

- 1) Enter the frequency desired (in MHz) in the Frequency entry box.
- 2) Enter the desired db output (in db) in the db entry box.
- 3) Click the On-Off button.
- 4) The Tortoise will ramp up (LED yellow) to the requested power level as shown in Figure 12.

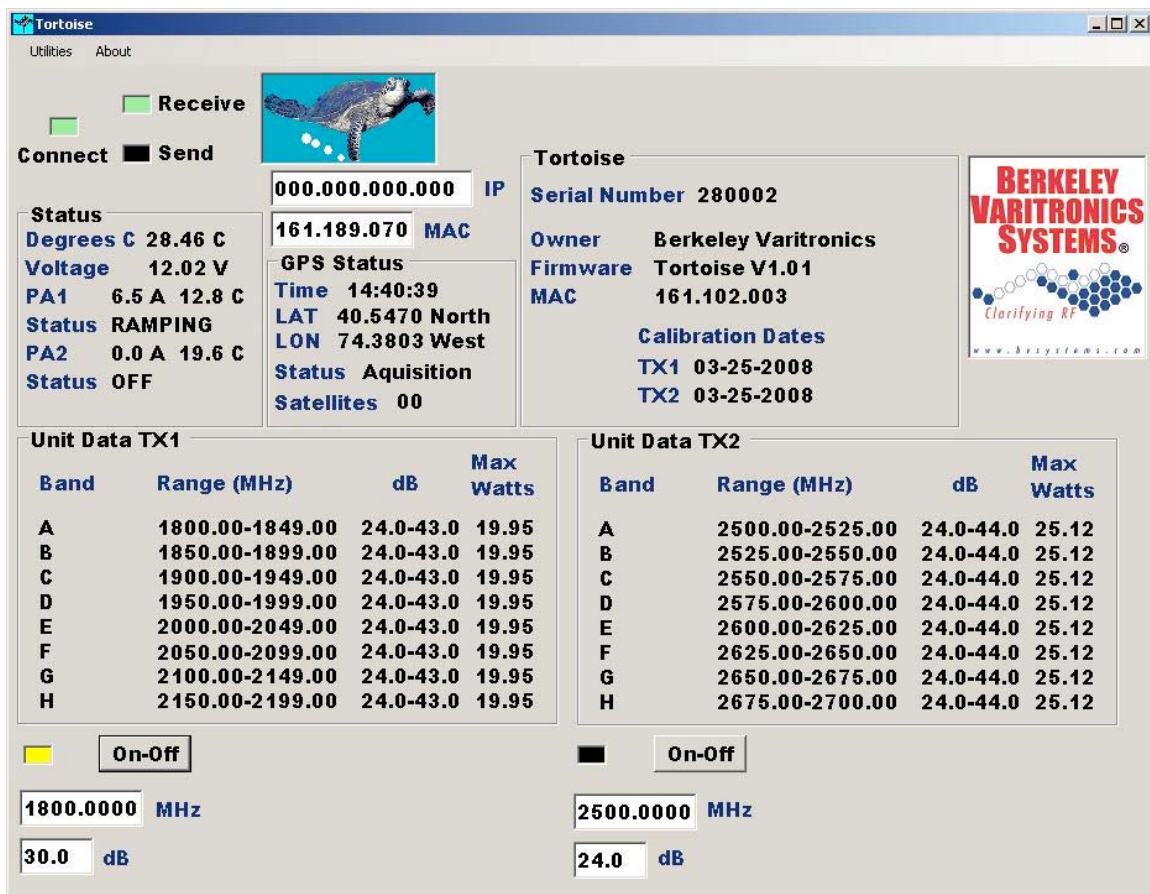


Figure 12 – TX 1 ramping to 30 db output at 1912 MHz.

- 5) Once the Tortoise has reached the calibrated level, the screen changes to that shown in Figure 13 (TX 1 LED green). Note that when either transmitter is ON, the Tortoise above the IP entry box “swims”.

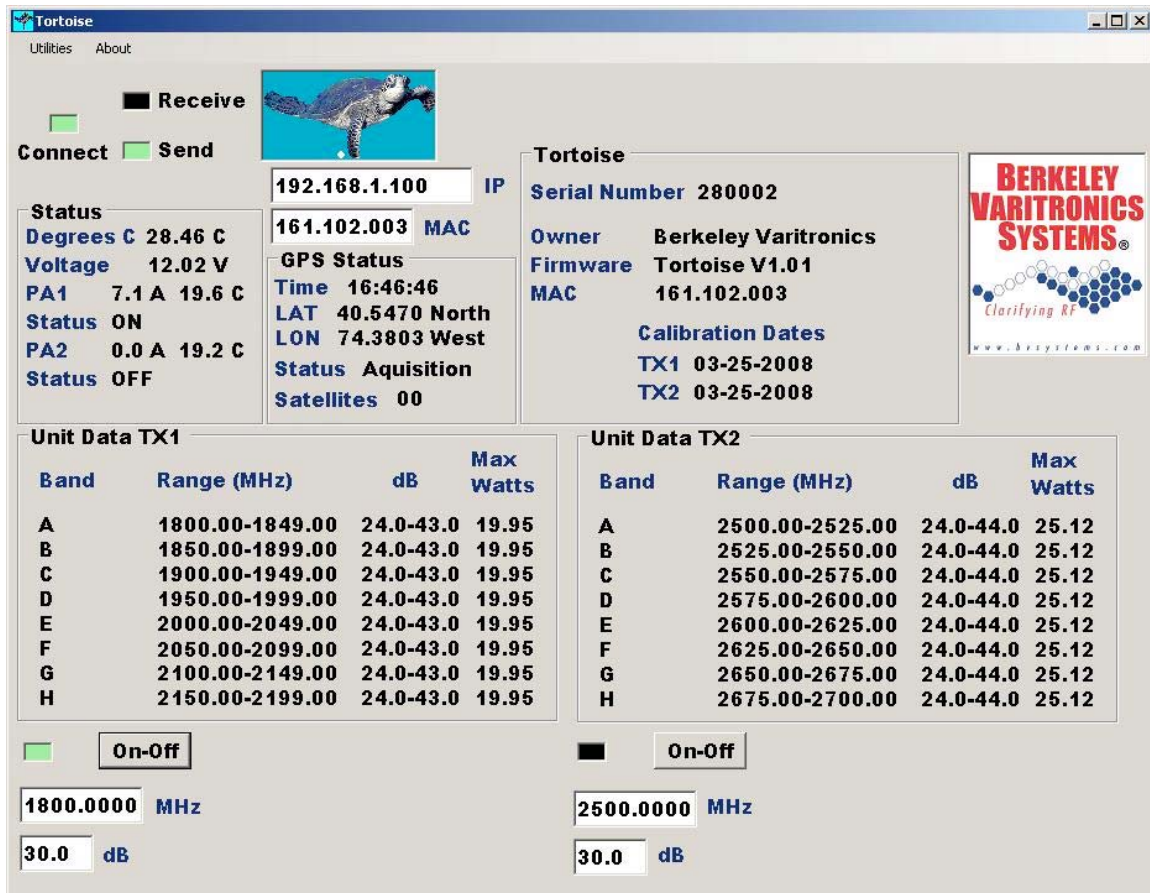


Figure 13 - TX 1 On

To turn off, click the On-Off button to the right of the transmitter's led. The screen reverts to Figure 11.

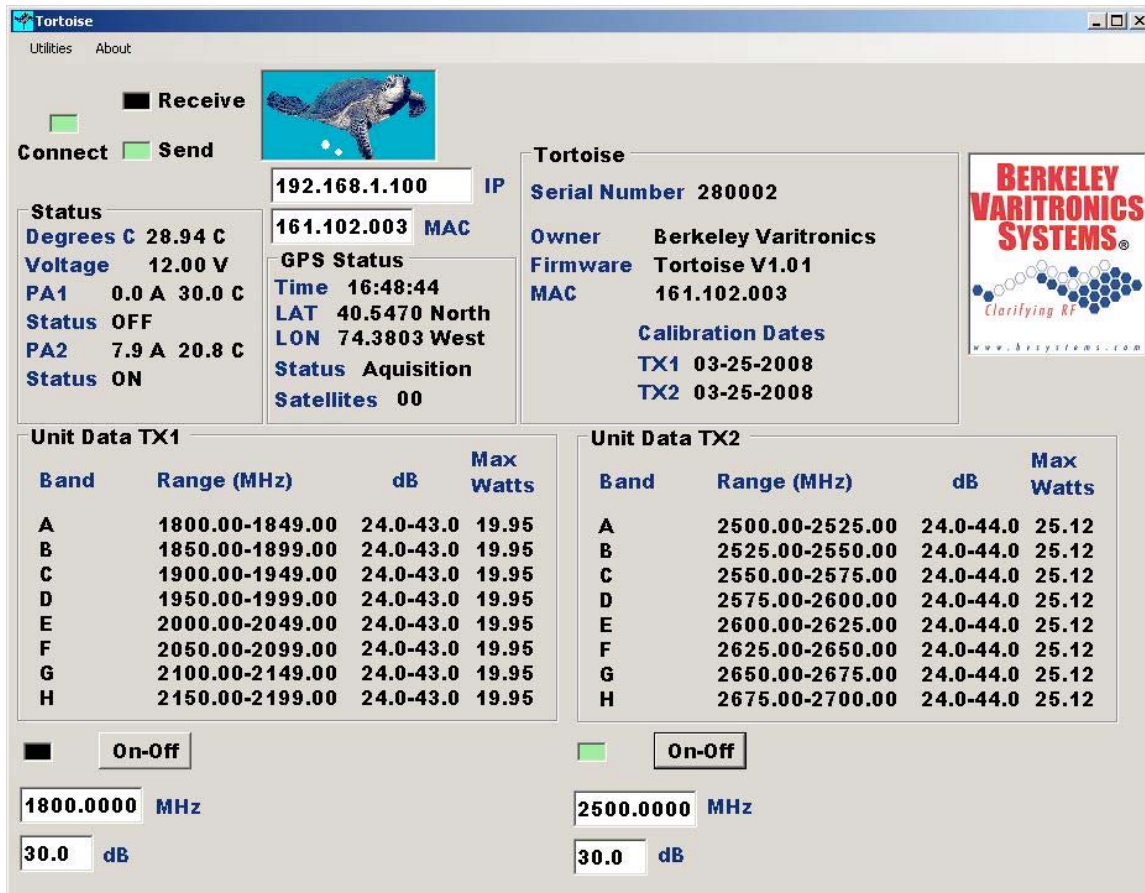


Figure 14 – TX2 on

Status screen (above Unit Data TX1 in Figure 14)

TORTOISE FANS

To keep the interior of the Tortoise at an optimal temperature, the fans on the side of the unit (one set for each installed PA) turn on when the PA temperature reaches approximately 45 C and turn off again when the PA returns to 40 C or less.

Changing BAND Text

Move the mouse pointer over the first character of the band name to change and left click. The dialog in Figure 14 is displayed.



Figure 15 – Changing Band text

The Dialog shows the transmitter and band number along with the current text.

Enter the desired new text for the band in the text entry box (up to 8 characters).

Click the Cancel button to ignore any entry.

Click the OK button to save the new text on the PC SCREEN ONLY.

Click the Save button to save the new text on the PC SCREEN and in the Tortoise.

When the text is saved using the Save button, the text will remain in the Tortoise until changed.

Menu BAR Functions

About the Tortoise PC Application

To find out the current version of the PC application and BVS contact information, left click the “About” menu button and Figure 15 is displayed.



Figure 16 – Tortoise ABOUT display.

In order to use a PC serial port other than COM 1, left click the menu bar “Utilities” button then select “RS232”. The dialog in Figure 16 is displayed.

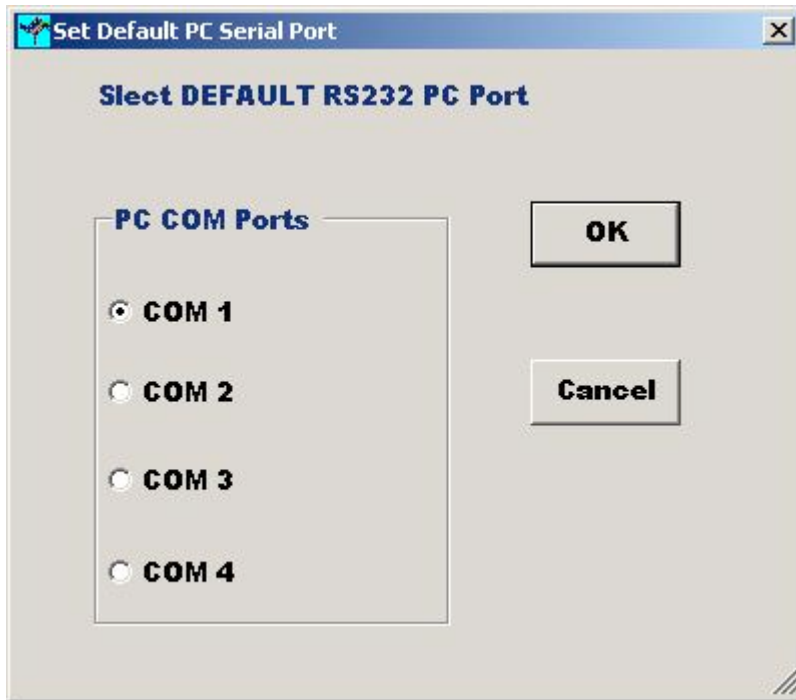


Figure 17

Click the radio button for the COM port to use then click the OK button.

The selection made using this dialog is saved on the PC along with the LAN MAC address.

In case the MAC address was entered in error, left click the menu bar “Utilities” button the select “MAC”. The dialog in Figure 17 is displayed

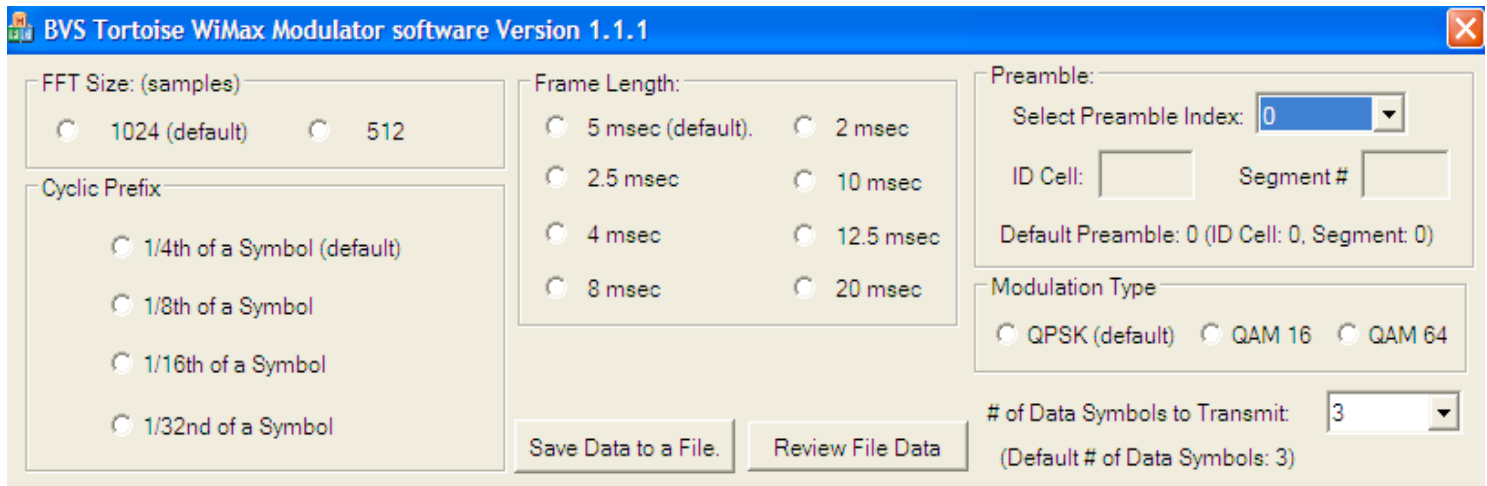


Figure 18

Enter the BVS supplied MAC address of the Tortoise and click the OK button.

WiMAX Modulator (optional) Software Manual

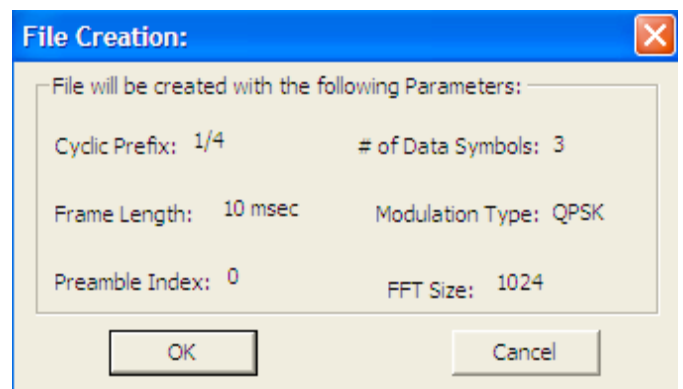
The WiMAX Modulator software is used to generate a WiMAX data packet containing a preamble and some appropriately modulated data symbols. This data packet is then stored in a file which is then loaded into the WiMAX Modulator in the Tortoise. The Tortoise Transmitter then transmits the modulated information which is observed on the Yellow Fin Receiver.



The different settings which can be made are:

1. **FFT Size:** The FFT Size for generating the data carriers. This can be either 1024 or 512.
2. **Cyclic Prefix:** The cyclic prefix can be one of 1/8, $\frac{1}{4}$, 1/16 and 1/32.
3. **Frame Length:** values of (all msec) 2, 2.5, 4, 5, 8, 10, 12.5 and 20 msec.
4. **Preamble Index:** between 0 and 113.
5. **Number of Data Symbols:** can be one of 0 to 9.
6. **Modulation Type:** Can be QPSK, QAM 16 or QAM 64.

Once all the relevant settings have been selected, click "Save Data To File" to save all this selected information to a file on the PC. A dialog box showing all the settings made will pop up. If all



the settings look correct, click OK and the settings will be saved to a file.

Once the file is transferred to the Tortoise Modulator, the file description is available on the front panel display:



The "Review File Data" button on the software dialog allows the review of the file data for a previously saved file.