



## *Installation & User Manual*

### *Trailblazer Digital Radio*

**TB 2.4-5.8 and TB 4.9 series**

Part Number 490-2000  
Rev 1.04

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## **US Headquarters:**

1180-B Evergreen Road  
Redway, CA 95560 USA

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Tel: +1 707.923.3000

Fax: +1 707.923.1913

Email: [sales@carlsonwireless.com](mailto:sales@carlsonwireless.com)

URL: <http://www.carlsonwireless.com>

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Tel: +1 707.923.3000

Email: [support@carlsonwireless.com](mailto:support@carlsonwireless.com)

URL: <http://www.carlsonwireless.com/support.html>

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## **QUALIFIED PERSONNEL WARNING**

The installation procedures described in this manual must be performed by qualified personnel aware of the hazards involved. The personnel involved in equipment installation must be trained in the installation of telephone equipment and associated power systems; these personnel must strictly observe all the safety precautions related to the installation of communication equipment. Never install, remove, or adjust equipment and associated cables. Do not work on roofs, masts, or towers during a lightning storm.

## **ATTENTION! STATIC SENSITIVE DEVICES**

## **PROPER HANDLING AND GROUNDING WARNING**

Components within the Trailblazer system are sensitive to electrostatic discharge (ESD). To avoid and prevent ESD damage and device failure maintain proper grounding during configuration, repair or maintenance. This is achieved through the use of an antistatic wrist strap securely connected to chassis ground. Do not use conductive tools for adjusting channel select switch.

## **FCC, RF SAFETY HAZARD WARNING**

Due to the energy radiated from the antenna, this product must never be mounted such that the cabinet containing the antenna can be closer than 2 meters (6.7 feet) to any person. Refer to Section 4.2 for further restrictions.

## **UL INSTALLATION SAFETY INSTRUCTIONS**

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in a wet location unless the jack is specifically designed for wet locations.
- Never touch telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

## **Connection to the Telephone Network**

The equipment complies with Part 68 of the FCC rules. You will find the label located on the device. This label contains the FCC Registration Number and the Ringer Equivalence Number (REN) for this equipment. You must, upon request, provide this information to your telephone company. The REN is used to determine the quantity of devices that may be connected to the telephone line and still have all of those devices ring with an incoming call signal. In most areas the sum of the RENs of all devices connected to one line should not exceed five (5.0). Confirm the number of devices possible on the telephone line (in REN) by contacting the local telephone company who provides the service.

## **Incidence of Harm**

If your telephone equipment causes harm to the telephone network, the telephone company may disconnect your service temporarily. When possible, the telephone company will notify you in advance. If advanced notice is not practical, you will be notified as soon as possible. You will also be informed of your right to file a complaint with the FCC.

## **Rights of the Telephone Company**

Your telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper functioning of your equipment. In this case, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.

## **Coin Service or Party Use Line**

This equipment may not be used on the coin service provided by the telephone company. Connection to party lines is subject to state tariffs.

## **Compliance and US Regulatory Information**

### **Model TB 4.9**

FCC Reg No., Part 68  
FCC Reg No., Part 90 subpart Y  
Industry Canada CS-03

BMD8 USA – 27773-PT-E  
FCCID: OPA-TB49  
3448A-10241A

### **Model TB 2.4-5.8**

FCC Reg No., Part 68  
FCC Reg No., Part 15  
Industry Canada CS-03  
Industry Canada RSS-210

BMD8 USA – 27773-PT-E  
FCCID: OPA-TB24-58  
3448A-10241A  
3448A-TB24-58

## **Compliance Classification**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, 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.

## **Radio Interference: Carlson Wireless USA Model TB 2.4-5.8**

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. Changes of modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

## Declaration of Conformity

**Manufacturer's Name:**  
**Manufacturer's Address:**

Carlson Wireless Technologies Inc.  
1180-B Evergreen Rd.  
Redway, CA 95560  
USA

**Declares that the product:**

**Product Name:**

**Trailblazer TB 2.4-5.8**

Conforms to the following standard(s) or other normative document(s):  
EMC:

FCC Part 15.247

**And also declares that the product:**

**Product Name:**

**Trailblazer TB 4.9**

Conforms to the following standard(s) or other normative document(s):  
EMC:

FCC Part 90 subpart Y

Supplementary Information:  
Published Specifications

William Mc Bride  
Director of Quality Management

Redway, CA  
Jan 2006

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# 1 Introduction

## 1.1 Scope of Manual

The purpose of this manual is to provide planning and installation personnel with the appropriate procedures to plan and install the 2005 Trailblazer Digital Microwave Radio and accessory equipments. In order to avoid harm to persons or damage to the product, please ensure that you have read and understand the safety, unpacking, and installation sections before proceeding.

## 1.2 Functional Overview and Applications

Using state-of-the-art digital electronics, the Trailblazer provides 512kbps of high-quality, reliable, wireless voice and/or high-speed data connection over distances of up to 32mi/ 50 km or more in repeated applications. This radio integrates seamlessly with POTS voice cards and Leased Line cards, V.35 protocol or standard 10baseT Ethernet devices. CWT provides competitive price and performance solutions for many of the world's telecommunication needs in both point-to-point and point-to-multipoint applications. Applications include:

- Security Monitoring Cameras
- Public Safety Data Links
- Internet Cafés and Telephone Calling Centers
- Point-to-Point Commercial Data Links
- Cellular Backhaul Data Needs
- Permanent or Temporary Telephone Service
- Temporary or Emergency Restoration of Service
- Public Calling Phones
- Retrofit for Exhausted Wire line Systems
- Islands and other Isolated Areas
- Inaccessible, Environmentally Sensitive and Historic Areas
- Harsh Climates and Geologically Adverse Environments

### 1.2.1 Main Features and Advantages

#### **Advantages Over Wire Line**

The Trailblazer's wireless link eliminates the expense of right-of-way and wire line costs, provides solutions for areas where adverse geology, climate or inaccessibility exclude the installation of wire lines, and preserves the beauty and integrity of sensitive environments and historic structures.

#### **Wire Line Quality Voice and Data**

You can configure your Trailblazer for data speeds up to 512 kbps or designate part of your bandwidth to POTS lines, as the Trailblazer seamlessly integrates

our 64kbps full bandwidth PCM POTS or Leased Line cards for high quality, uncompressed audio with an excellent signal-to-noise ratio.

### **Easy Installation**

The units mount on a 1"- 2.25" pipe or pole or to any vertical surface, use an external antenna, and have their own power supply (optional) or operate on 12-24 VDC, easily powered by solar.

### **Low Power Draw: Ideal for Solar Applications**

The low power consumption of 2 Watts makes the units very energy efficient. They accept any DC voltage from 12V to 24V and are thus easily powered by solar. CWT solar powering kits are available with up to 7 days of back-up power.

### **Flexible & Programmable**

All Trailblazer models are bench or field programmable. Using the GUI (Graphical User Interface) application with a Windows PC and serial COM port, you can configure the amount of bandwidth, allocate voice and data channels, select different frequencies and CDMA codes, use antenna alignment aids and other diagnostic tools, as well as upgrade software and firmware. The Trailblazer models support all CLASS features, fax, and V.90 dial-up modems.

### **Rugged & Weatherproof**

All components, including the digital radio cards, multiplexer, power supplies & CPU, are fully integrated into the 8lb/ 3kg waterproof enclosure. The units are housed in a NEMA 4X waterproof enclosure, built to last in tough climates. The lockable polycarbonate enclosure with a neoprene gasket will protect against wind, rain, and ice ensuring years of service.

### **No License Required for the 2.4 and 5.8 GHz, Simple license for 4.9 MHz Private and Secure**

The Trailblazer TB 2.4-5.8 uses the, in most countries, the license-exempt 2.4 GHz or 5.8 GHz frequency bands, while fully encrypted spread-spectrum CDMA modulations, proprietary framing structure and packet size assure complete privacy and security.

### **Standard ISO 2593 V.35 DTE port**

Because the Trailblazer models feature a standard ISO 2593 V.35 DTE port, most other V.35 devices plug right into the Trailblazer Phone Extender.

### **Repeater Mode**

This product can be used as a digital repeater by simply connecting two units via the V.35 data port and optional repeater cable.

### **Expandable**

Starting with only one link, you can add CPE units, gaining the features of a point-to-multipoint topology for your current and future growing needs without losing any of your original investment.

### 10BaseT On-Board Ethernet Port

On-board Ethernet satisfies simultaneous LAN / IP data and PCM voice needs with an Industry Standard RJ45 10BaseT connection. Some of its advanced features include 802.3 Ethernet supported by Transparent LAN bridging and Automatic LAN MAC address filtering at the MAC level, making it transparent to higher level protocols such as TCP/IP, DECnet, NETBIOS, and IPX network protocols. Broadcast, multicast, or frames set up for peered LAN are forwarded while reserving maximum RF bandwidth.

### 1.2.2 General Specifications

**Note:** More technical details are found in the Appendix of this manual

<b>Product Description</b>	Digital Microwave Radio with POTS, Leased Lines and 10BaseT / V.35 port
<b>Data Interfaces</b>	
Primary Serial Data Port	(1) RJ45 port providing 10BaseT
Data Rate and Type	256/512 kbps, synchronous
Serial Command Port	RS 232, 57.6 kbps, N, 8, 1, No flow, Echo on
Latency	< 4.4ms depending on speed selected
<b>Power Requirements</b>	
Input Voltage	12 to 24 VDC or 100-260 VAC with AC power supply (optional)
Power Consumption	2 Watts (not including add-on cards)
Battery Backup (optional)	Up to 8 hours with a 2.2mAh SLA battery.
<b>RF Specifications</b>	
RF Frequency Range	2.400 to 2.4835 GHz
Modulation Type	BPSK (256) or QPSK (512kbs) DSSS
Transmitter Output Power	+20dBm max, auto set for CDMA operation
Receiver Sensitivity (10 <sup>-6</sup> BER)	-93dBm @ 256 kbps, -90dBm @ 512 kbps
<b>Operating Temp</b>	-30 to +60 Degrees C with solar shielding, 0-90% Non-Condensing
<b>Physical Characteristics</b>	
Enclosure Dimensions	13 x 11 x 6 in / 33 x 28 x 15 cm
Unit Weight	8 lbs / 3.7kg
Enclosure Specifications	NEMA 4X, rain, wind and ice protected GE Valox99 <sup>®</sup> polycarbonate w/ neoprene gasket
Mounting	1"-2.25" or 2.5cm-5.7cm pipe/pole

## 2 Pretest and System Planning

### 2.1 Site Requirements and System Planning

#### 2.1.1 Grounding

A ground is a low impedance electrical connection to earth that is used to dissipate energy. Grounding your Trailblazer is very important for safety reasons as well as to protect your system from damage due to lightning and static charge build up. Since lightning strikes and surges follow the path of least resistance, all ground wires must be as short and straight as possible and not be coiled or looped. Choose the largest diameter ground wire your ground connectors will accept for good electrical conductivity.

**Recommended grounds are:** the utility company ground, a ground rod, well casings, and cold water pipes that are of continuous metal. A note of caution: sometimes the metal-cold water pipes are repaired and/or extended with PVC piping hidden behind drywall. The introduction of PVC material disrupts the material's conductivity and thus renders it unacceptable as a ground.

**Unacceptable grounds are:** sprinkler pipes, PVC pipes, conduit, buried wire, and any ground that cannot be verified.

#### 2.1.2 Lightning Protection

**Lightning protection with a poor ground is the same as having no protection at all!**

Lightning is one of the most dangerous and unfortunately most frequently encountered natural hazards to your Trailblazer. Ensure that your system is adequately protected. A good connection to ground is indispensable for your lightning protection to work correctly and thus preventing lightning and surge damage to your Trailblazer. The Trailblazer system is equipped with on-board **secondary active lightning protection** only. The lightning protection is only effective when the system is powered up. If you power down your Trailblazer, disconnect the antennas and phone lines to prevent damage from lightning strikes. Install **primary lightning protection** with a good ground on all RF, data/voice line connections that have even a moderate outdoor line build out. A good rule of thumb is that all lines entering or exiting a building need protection. Both ends of the cables between buildings must be protected! See section 5.2 for detailed specifications and usage information on primary lightning protection available from Carlson Wireless.

### 2.1.3 Line of Sight

Visual line of sight (LOS) is the straight, unobstructed line between the Base unit's antenna and the CPE's antenna. In other words, when you stand next to one antenna, you can see the other one. Because RF waves spread out three dimensionally rather than in a straight line, LOS is important in microwave transmission but **not adequate**. As the waves travel out from the transmitting antenna, the signal density decreases and more three dimensional space around the visual LOS is necessary to be able to receive a reasonable signal at the receiving antenna. This three dimensional space is called the RF LOS or Fresnel zone for the French physicist who first discovered its importance.

### 2.1.4 Fresnel Zone

The Fresnel zone is the three dimensional cone around the line-of-sight that radio waves spread out into after they leave the antenna. The cross section of the first Fresnel zone is circular; subsequent zones' cross sections are annular. The signal strength is strongest in zone 1 and decreases in each successive zone.

Not only trees, buildings and mountains can occupy a Fresnel Zone, the curvature of the earth, even for some short paths, also has to be taken into consideration. Because 2.4 GHz is one of the resonant frequencies at which water absorbs energy, path obstructions such as trees, rivers, lakes or any other water containing objects are especially detrimental to the microwave signal. A rule of thumb is that **60% of the first Fresnel zone must be free of any obstructions for tolerable attenuation of the signal.**

In addition to absorbing the RF signal, objects in the RF path can also reflect it, making the signal out of phase with the original signal, and effectively causing signal cancellation. In zone 1 the signal will be 0 to 90° out of phase in zone 2, 90 to 270° in zone 3, 270 to 450° and so on. Even numbered zones have the maximum phase canceling effect and in odd numbered zones the reflected waves will add to the signal.

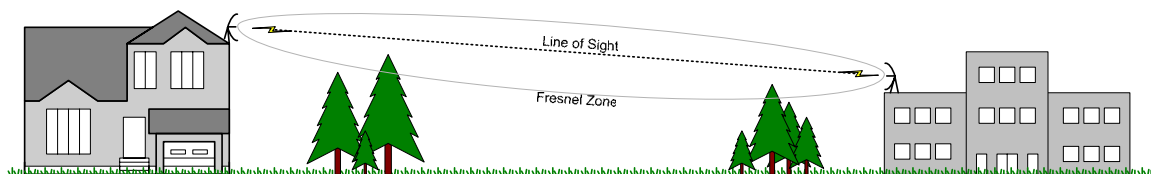


Figure 1: Line of Sight is clear, the first Fresnel Zone is NOT clear.

Zone	Frequency (MHz)	Wavelength (feet)	Distance to start		Distance to end		Fresnel Radius		60% of Zone	
			(miles)	(km)	(miles)	(km)	(feet)	(m)	(feet)	(m)
1	2400	0.41	2.0	3.2	2.0	3.2	46.53	14.18	27.92	8.51
2	2400	0.41	2.0	3.2	2.0	3.2	65.80	20.06	39.48	12.03
1	2400	0.41	1.5	2.4	4.5	7.2	49.35	15.04	29.61	9.03
1	2400	0.41	3.0	4.8	3.0	4.8	56.98	17.37	34.19	10.42
1	2400	0.41	4.0	6.4	10.0	16.0	78.65	23.97	47.19	14.38
1	2400	0.41	6.0	9.6	6.0	9.6	80.59	24.56	48.35	14.74
1	2400	0.41	12.0	19.2	12.0	19.2	113.97	34.74	68.38	20.84

**Table 1: Fresnel Zone Chart**

Some examples are given in the table above. On the software CD that comes with each system there is a folder called “Calculators”. In that folder you will find an excel spreadsheet called *fresnel zone calculator.xls* you can use to calculate your own path.

Set the Fresnel zone to even numbered values when plotting a profile to see potential areas of phase canceling present in the path. You can improve your path by optimizing the height of antennas so that the first Fresnel zone is clear.

### 2.1.5 Path Loss

After confirming line of sight and adequate Fresnel zone clearance, add the Free Space Loss of the radio signal, RF cable losses, and antenna gains to determine your system’s remaining signal, i.e. fade margin. The chart below shows various antenna and distance combinations.

Distance in miles	Distance in km	Ant Gain in dBi	Ext RF Cable(s)	Path Loss in dB	RF power in dBm	ERP in dBm	Link Margin in dB
1.5	2.4	14.0	0.0	108	17	31	28.0
2.0	3.2	14.0	0.0	110	17	31	25.5
5.0	8.0	14.0	0.0	118	17	31	17.6
8.0	12.9	14.0	0.0	122	17	31	13.5
10.0	16.1	14.0	0.0	124	17	31	11.5
12.0	19.3	14.0	0.0	126	17	31	10.0
14.0	22.5	14.0	0.0	127	17	31	8.6
20.0	32.2	24.0	1.4	130	17	41	24.1
35.0	56.3	24.0	1.4	135	17	41	19.3
50.0	80.5	24.0	1.4	138	17	41	16.2

**Table 2: Fade Margin Chart**

You can also calculate your own path loss using the integrated radio link margin calculator included on the CWT product CD in a folder called “Calculators”.

What's an acceptable fade margin? A rule of thumb theory is that 10 dB of fade margin will deliver about 90% reliability, and 20 dB will deliver about 99% reliability. Because there is only a small ground wave component involved in the radio propagation at 2.4 GHz, the above numbers presume both clear LOS (line of sight) and clearing at least 60% of the first Fresnel zone. A fade margin of 16 to 20dB is suggested to overcome multi-path degradation and polarization.

### **2.1.6 Interference**

The ISM (Industrial, Scientific, and Medical) band at 2.400-2.483 GHz is an unlicensed, shared band. All users in the band must accept all other signals within the band, interfering or not. There are only a few devices operating in this band, but they could become a source of interference for the Trailblazer products. If the interfering signal is stationary and has a bandwidth less than 3 MHz, it will not create any significant problem even if it is 100 times (20dB) stronger than the receive threshold. If the interfering signal has a bandwidth wider than 4 MHz and is 10 times (10dB) stronger than the receive threshold, it can render channel(s) unusable. If the interfering signal is frequency hopping throughout the band, such as the LAN bridge device, and is only 1/10 (-10dB) as strong as the receive threshold, it can cause significant dropouts. Some examples are:

#### **Video Transmitters**

These devices use analog radios which are usually fixed in frequency, utilize 6 to 10 MHz of bandwidth and are low power with an ERP of less than +10dBm.

#### **Cordless phones**

These devices are narrow band and fixed in frequency (during each use), utilize 1 to 2 MHz of bandwidth, are low power with an ERP of less than +10dBm. It is strongly recommended to avoid the use of 2.4GHz cordless phones in the vicinity of Trailblazer products.

#### **Local Area Network (LAN) Bridges**

These devices are true spread spectrum devices. They either frequency hop a 1 MHz bandwidth over the complete band or utilize CDMA of 16 MHz bandwidth and are stationary. ERPs can range up to +30dBm.

#### **Microwave Ovens**

Microwave oven outputs have been measured at levels up to +20dBm ERP. The circulators built into the ovens cause transmission of narrow pulses that sweep the 2.4GHz band. The higher power spikes are mostly concentrated in the upper half of the band between 2.450 and 2.485 GHz.

### **2.1.7 RF Cable Sizing and Recommendations**

Before making any decisions as to which cable to use, first consider several factors; the final length of the cable, the amount of power you want the cable to tolerate, the loss factor of the cable at your chosen frequency and the outdoor climate conditions the cable will be exposed to. For most general installations,

LMR400 will work fine. Helix™ is recommended for any cable runs over 100 feet. The chart below provides the loss factor for several popular cable sizes.

<i>Coax Cable Attenuation (dB per 100 feet)</i>		
<i>Cable Type</i>	<i>at 2.5 GHz</i>	<i>at 5.8 GHz</i>
LMR 400	6.8 dB	10.8 dB
LMR 500	5.5 dB	8.9 dB
LMR 600	4.4 dB	7.3 dB
1/2 inch LDF Helix™	3.9 dB	7.0 dB
LMR 900	3.0 dB	4.9 dB
7/8 inch LDF Helix™	2.3 dB	3.7 dB

**Table 3: Coax Cable Loss Table**

### **2.1.8 Data Cable Recommendations**

The new design of the Trailblazer replaces proprietary cables with standard CAT5 Ethernet cables terminated with RJ45 connectors for the sync and repeater functions.

**NOTE:** Feed the cable through the weatherproof cord grip **before** terminating it. The cord grip is too small to accept an RJ45 connector especially while occupied by other cables!

### **2.1.9 General Tools**

- ESD Gear
- Desktop PC or Laptop Computer with Windows™
- Wrench Set
- Socket Set
- Screwdriver Set
- Multi Meter
- Butt-set or Test Telephone with bare wire connection
- Wire Cutters
- Wire Strippers
- Vapor Wrap
- Electrical Tape
- Small Non-Conductive adjustment tool
- Safety Gear



## 2.2 Unpacking

**NOTE: Always observe ESD precautions when handling circuit boards!**

Before opening inspect the shipping box (es) and report any damage to the shipping carrier. Unpack and compare the contents against the packing slip and inspect for damage. Report any damage to the units or missing components to your CWT sales representative.

Included in your purchase is:

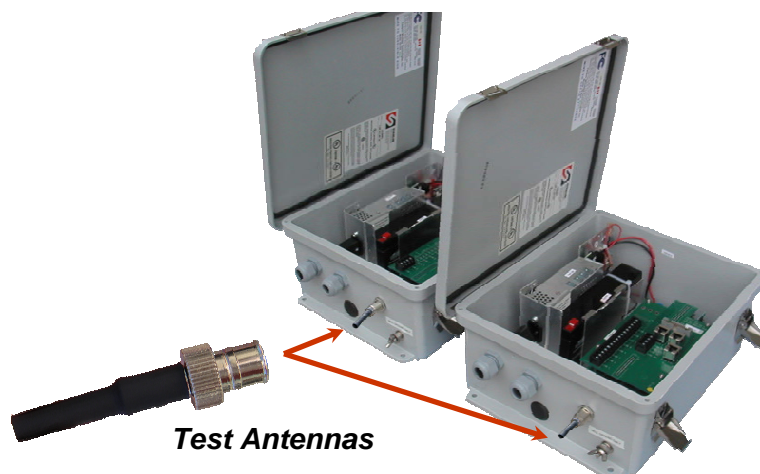
- The Quick Start Guide to help you become familiar with your system
- The CWT Product CD (contains the user manuals, back up configuration software, and other needed items!)
- (2) Test Antennas for bench testing
- One Serial Interface Cable per unit to connect to the GUI
- Mounting Hardware (optional)
- Power Supplies (optional) will be pre-installed in the enclosures
- Surge Protectors (RF and phone lines) (optional)
- Antennas (optional)

## 2.3 Bench Testing Instructions

Before going into the field set up the units on your bench to become familiar with their set up, operation, configuration, and verify their functionality. Each system is shipped with a handy, full-color “Quick Start Guide” for simplified step-by-step instructions for bench testing. The following section will provide you with the same information in greater detail.

### 2.3.1 Setting up Your Trailblazer on the Bench

Set your units next to each other and attach the included test antennas to the N female connectors on the enclosures as shown. The units may not achieve an RF connection without these little antennas.



### 2.3.2 Powering the Trailblazer

The Trailblazer units accept 12 -24VDC **negative ground**. There are special provisions for using a positive ground, please contact your CWT sales representative for more information. If your system is equipped with a battery backup, verify that the battery output is 12VDC or more. If the battery output is less than 12VDC, disconnect the power supply's black and red power cables, connected to the terminal block, from your unit, and simply connect the power supply's terminated red (+) and black (-) power cables to their respective terminals on the battery. Plug the AC power supply cable into an AC source to charge the battery, and verify that the battery is charging. Ensure that the battery is fully charged before proceeding into the field. When the battery is fully charged, verify that the unit powers up by noting that the LEDs are lit.

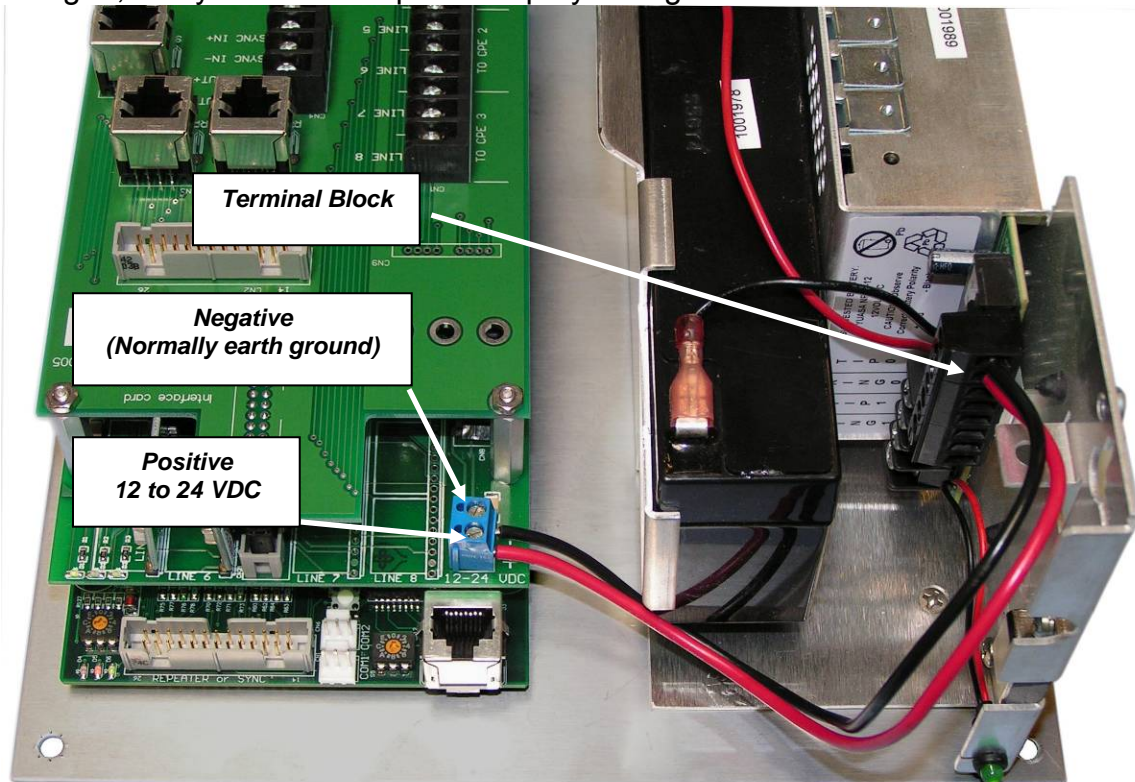


Figure 2: Base Unit Power Connections

If you are not using the CWT power supply, size your power supply adequately using Ohm's law. For example, if you provide 12VDC you consume 2/12 A or about 167mA. If you provide 24VDC you use about half of that or 85mA. CWT recommends providing at least 4 times the power consumption. The Trailblazer consumes 2 Watts. CWT's power supply with battery backup supplies 13.8VDC @ 1 A or 14 Watts.

You can also power your Trailblazer by using several of the unused voice/data pairs in a standard 6 pair telephone cable. Don't forget to allow for additional current if add-on card options are selected.

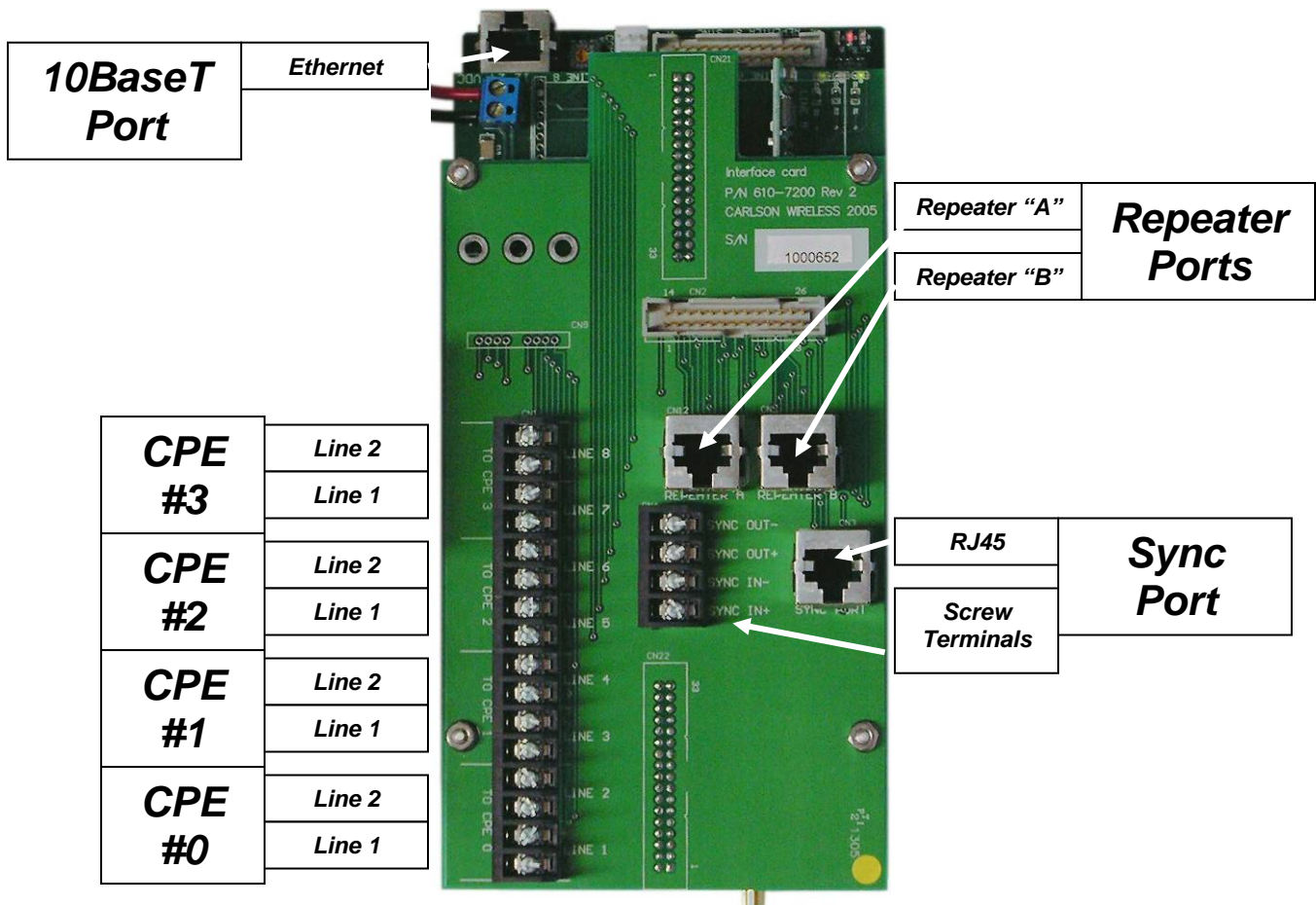
The standard 6 pair telephone cable is made of 22 AWG size copper. This means that both legs will have 3.2 ohms of resistance per 100 feet. The table below shows the distance at which you have a 5% maximum recommended voltage drop using 2 pairs of wires paralleled together.

<i>Cable Size (A.W.G.) (mm)</i>	<i>Ohms/100ft (both legs )</i>	<i>feet per Ohm (both legs)</i>	<i>if feeding 13.8, distance with 5% (voltage loss 2pr.)</i>	<i>if feeding 24, distance with 5% (voltage loss 2pr.)</i>
14	1.63	0.516	194	1783
16	1.29	0.818	122	1125
18	1.09	1.302	77	707
19	0.91	1.642	61	560
22	0.64	3.3	30	279
24	0.51	5.24	19	176
26	0.41	8.32	12	111

**Table 4: Feed Cable Sizing and Distance for the Traiblazer**

### **2.3.3 Connecting the POTS Lines**

Connect POTS lines as shown in the figure below using the black screw terminals on the units' interface cards. Remember to connect the telephone line(s) from the phone company to the Base unit and the handset(s) to the CPE unit. The location of your active lines will depend on the time slots selection made by the CPE and the bandwidth used. Note the "Active Line" label on your Base and CPE units.

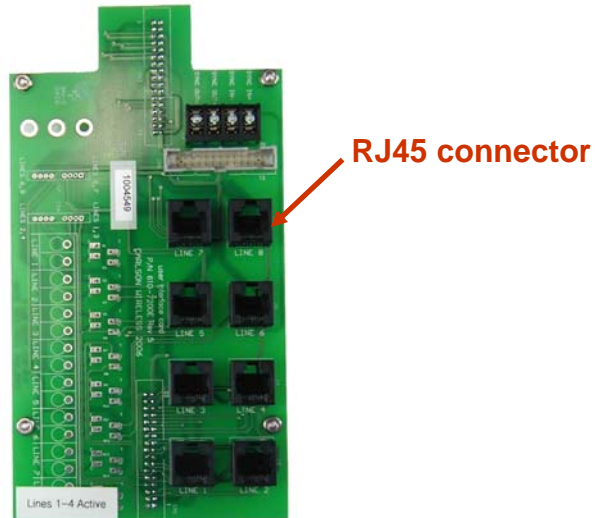


### Connecting POTS lines, Repeater, and Sync

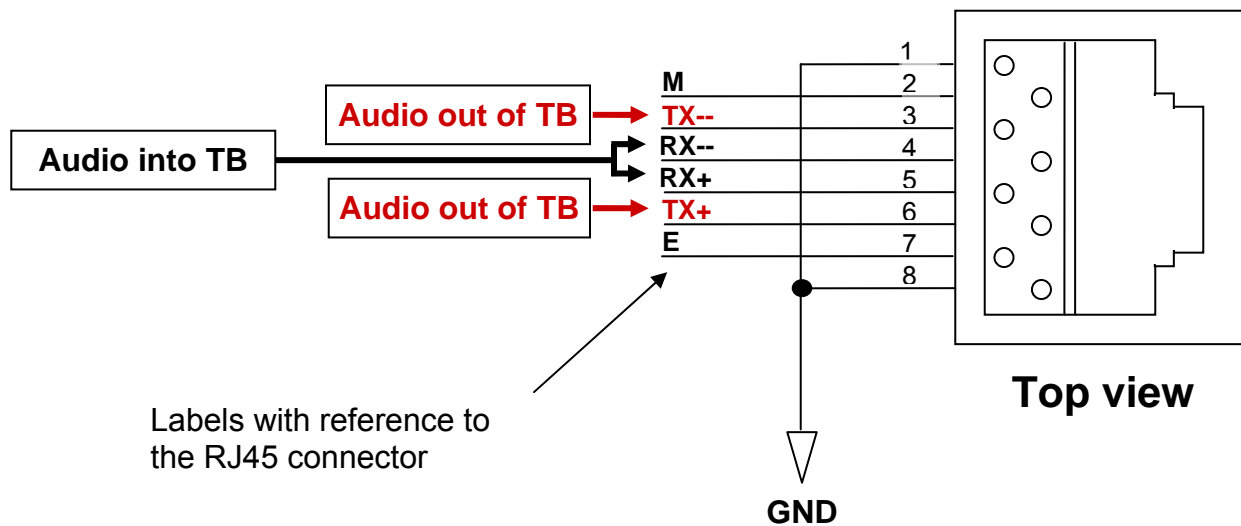
For durability as well as ease of installation and acquisition, repeater and synchronization cables require standard RJ45 connectors and CAT5 cable using standard Ethernet cable wiring. Remember to feed the CAT5 cable through the weatherproof cord grips before terminating the ends. In addition to the RJ45 connector, there are (4) screw terminals for synchronization. Wire SYNC OUT to SYNC IN and vice versa.

### 2.3.4 Connecting the Leased Lines

The Leased Line interface is provided on up to (8) RJ45 connectors on the User Interface card. See photo below.



See figure below for pin out information:





## 3 Operation

### 3.1 Configuring and Accessing the Trailblazer Unit

#### 3.1.1 Connecting the Serial Cable

You can access your Trailblazer with the GUI program, included on the CWT product CD, and the included serial cable. Simply plug the DB 9 connector of the serial cable into the serial port on your computer and the three pin connector to the three pin connector (COM1) on the radio board (bottom board) as shown.

**DO NOT USE COM2!** It is currently reserved for future applications.

**NOTE: Unpredictable results may occur if you are using a USB to serial COM Port adapter!**

Should you need to replace the serial cable, contact CWT or see *Section 6.3.1* in the appendix for a pin-out and a description on how to make one.

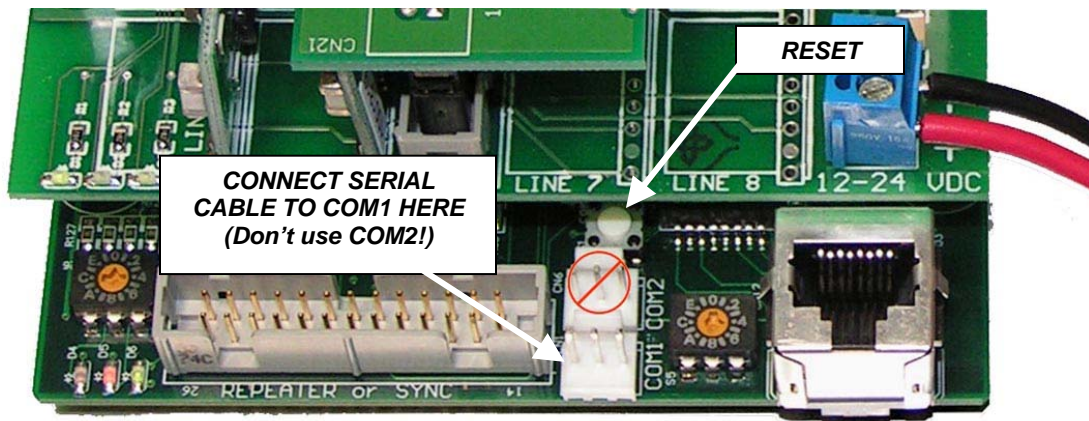


Figure 3: Connecting the Serial Cable

#### 3.1.2 Installing the CWT GUI on Your PC

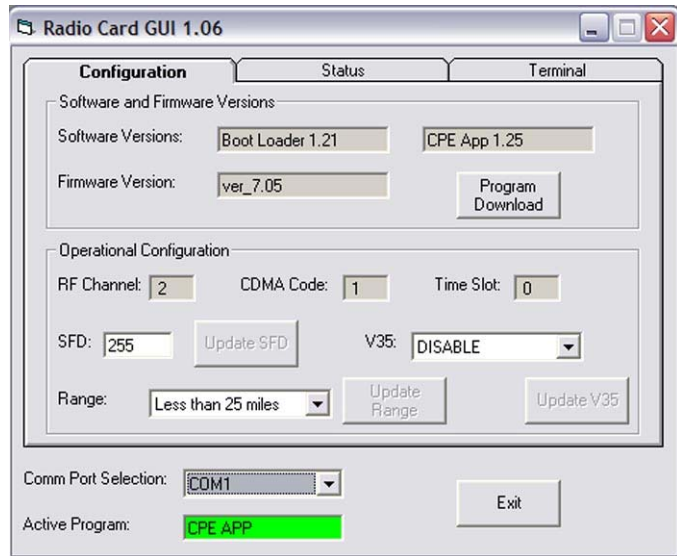
The CD included with your system contains a folder called "GUI" with the self executing file **CWT Trailblazer GUI 1.0x.xxxx [ALL-OS].exe**. Browse to the CD and open the file to install the GUI program on your PC. After you have successfully installed the GUI, start the program by either double clicking the **CWT Trailblazer GUI ver. x.xx** file on your desktop or browse start-> programs-> Carlson Wireless Technologies Inc-> **CWT Trailblazer GUI ver. x.xx**

#### 3.1.3 Using the GUI

Double click the CWT icon and choose the appropriate COM port connected to your serial cable.

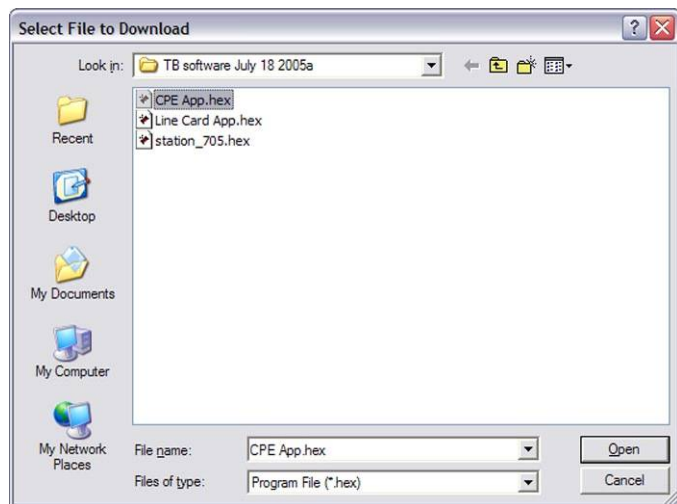
After you have selected the correct COM port, the software will display the connected unit's current configuration data.

The screen will look slightly different depending on whether you are connected to the CPE or Base unit. The box highlighted in green will display the type of unit that is currently communicating with the software. **All systems are shipped pre-configured. Do not change any parameters unless advised to do so by a CWT technician.** The integrated V.35 data port can be enabled and disabled here as well.



### 3.1.4 Software Downloads Using the GUI

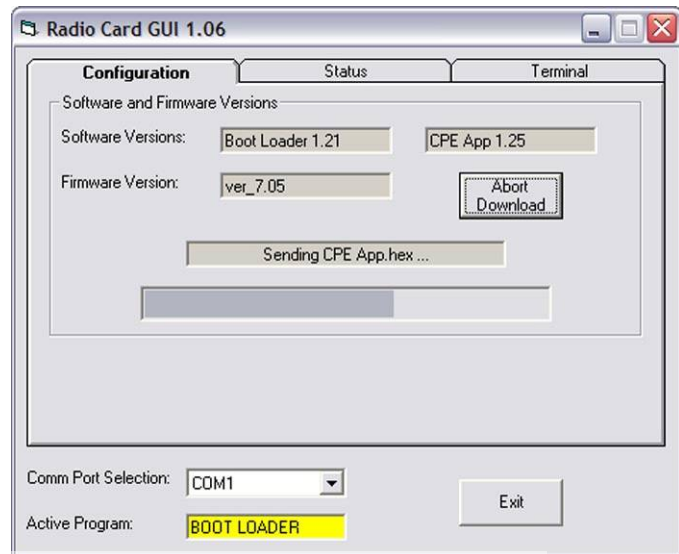
To download new software, click on the "Program Download" button on the *Configuration* tab and browse to the location of the file as shown to the right. For the CPE units, use the firmware "**station\_xxx**" file and the software **CPE APPxxx.hex** file. For the Base unit, use the firmware "**station\_xxx**" file and the software **LINE CARD APPxxx.hex** file. Select the file, and click "Open" to start downloading.



GUI Showing File Browser

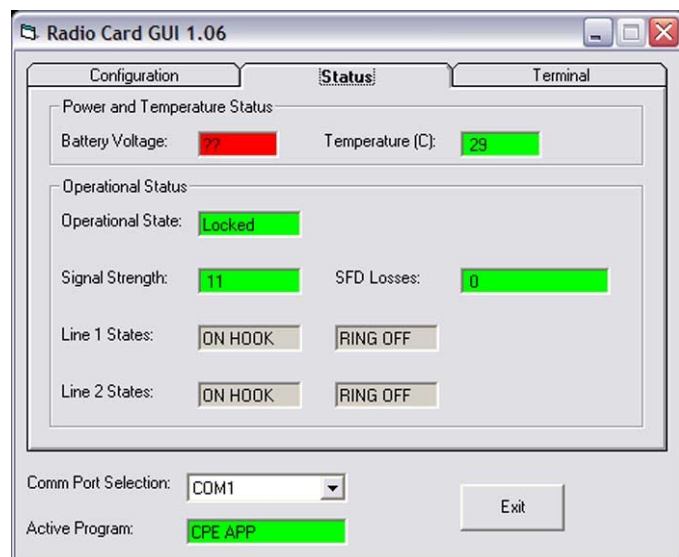
The new CPE and Base unit software will take about a minute to download. The firmware takes about 3 or 4 minutes to download. To the right you will see a sample view of what you should see during the download.

**Do not interrupt the download!** When the download is complete, the unit will automatically reboot and update the version numbers. Once the “Program Download” button reappears, you can select another file to download.



**Loading Software with the GUI**

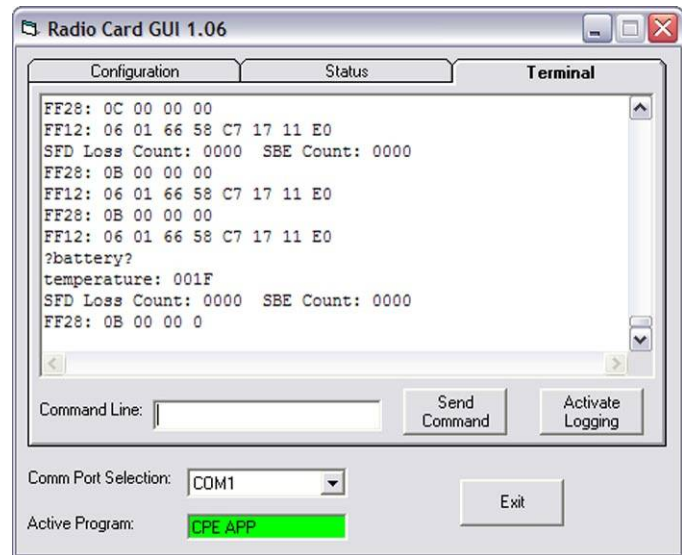
Select the *Status* tab to view the current status of RF link, signal strength, line “hook” state, SFD loss count and an on-board temperature reading. Select DISCONNECT in the COM Port selection box before moving the serial cable to another radio card. Resume connection and status readings by selecting the active COM port. The battery voltage status only applies to CPEs equipped with solar power.



**GUI Showing Status of a CPE**



Click on the Terminal tab to monitor status, view and log real-time link quality reports and manually interface with the Trailblazer radio cards via the Terminal screen. In the middle of the terminal screen you will notice a command line box. One command at a time may be entered and sent to the radio card via this terminal interface or by using terminal software.



GUI showing status of a CPE terminal

## 3.2 Accessing the Trailblazer using HyperTerminal™

### 3.2.1 Windows™ HyperTerminal™ Software

As a secondary precaution, as well as to allow user access to advanced configurations, such as allocation of bandwidth to data and voice lines not supported by the GUI software, the Trailblazer system is alternately equipped with a terminal interface. If you do not have access to a PC with the Windows™ operating system or have trouble with the GUI software, many diagnostic and setup tasks can be performed with a basic terminal program such as Windows HyperTerminal™. See Section 6.4 in the Appendix for connection instructions, settings and usage.

## 3.3 Setting the Radio Frequency and Scrambling Code

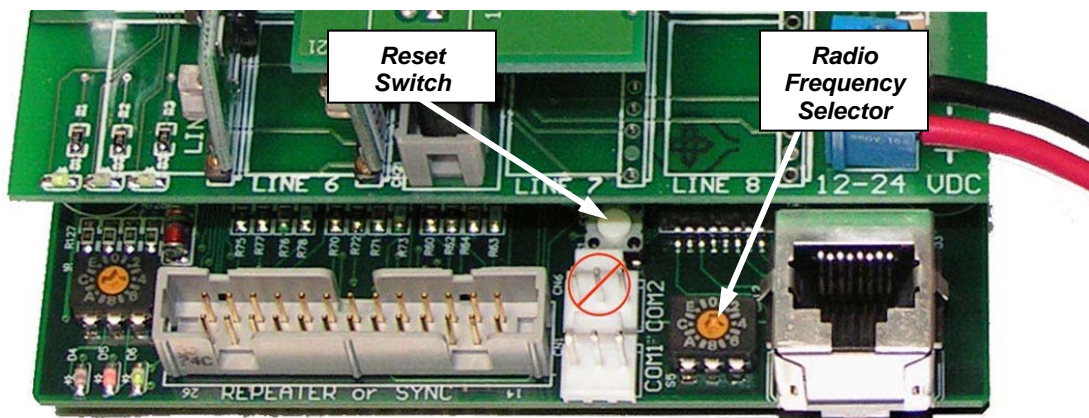


Figure 4: Rotary Switch and Reset Button

The radio frequency and scrambling code of the Carlson Wireless radios operate on numerous band selections based on **purchased** configuration. Within the selected operational band, multiple frequencies are provided in combination with code variations. Selections within the offered band are provided using the 16 position rotary switch located between the 10BaseT port and the white three pin connectors. The tables below show the switch settings for the 16 frequency/code combinations for each band currently offered.

Channel ➡	2.412 GHz	2.432 GHz	2.452 GHz	2.472 GHz
code 0	0	1	2	3
code 1	4	5	6	7
code 2	8	9	A	B
code 3	C	D	E	F

Table 5: 2.4G International Band – Frequency/Code Switch Matrix

Channel ➡	2.414 GHz	2.430 GHz	2.446 GHz	2.460 GHz
code 0	0	1	2	3
code 1	4	5	6	7
code 2	8	9	A	B
code 3	C	D	E	F

Table 6: 2.4G Domestic Band – Frequency/Code Switch Matrix

Channel ➡	4.950 GHz	4.960 GHz	4.970 GHz	4.980 GHz
code 0	0	1	2	3
code 1	4	5	6	7
code 2	8	9	A	B
code 3	C	D	E	F

Table 7: 4.9G Public Safety Lic. Band – Frequency/Code Switch Matrix

Channel ➡	5.735 GHz	5.765 GHz	5.795 GHz	5.825 GHz
code 0	0	1	2	3
code 1	4	5	6	7
code 2	8	9	A	B
code 3	C	D	E	F

Table 8: 5.8G Low Band – Frequency/Code Switch Matrix

Channel ➡	5.750 GHz	5.780 GHz	5.810 GHz	5.840 GHz
code 0	0	1	2	3
code 1	4	5	6	7
code 2	8	9	A	B
code 3	C	D	E	F

Table 9: 5.8G High Band – Frequency/Code Switch Matrix

### 3.3.1 Selecting the CPE Time Slot

Up to (4) CPE units can communicate with each Base unit when used in a STAR topology. To distinguish between the four CPEs, a different time slot is allocated to each CPE using the rotary DIP switch located immediately behind the LEDs as shown in the figure below. Use a **non-conductive** trim tool to select time slots 0, 1, 2, and 3 to avoid shorting any components. Reset the unit to put your selection in effect by pressing the reset button located behind the second white three pin connector as shown.

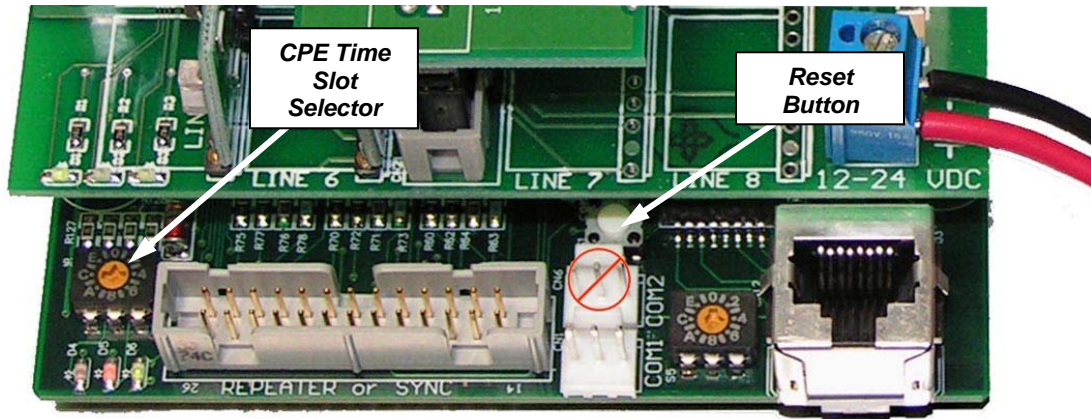


Figure 5: CPE Time Slot Selection Switch

## 4 Field Installation Options

### 4.1 Mounting the Enclosure

The versatile mounting bracket assembly (PN: 900-7200) allows the Trailblazer enclosure to be properly mounted on a pole up to 2.25" in diameter. The mounting bracket assembly also converts to a wall mount for mounting the Trailblazer enclosure on a flat surface. See below for details for the two different mounting applications.

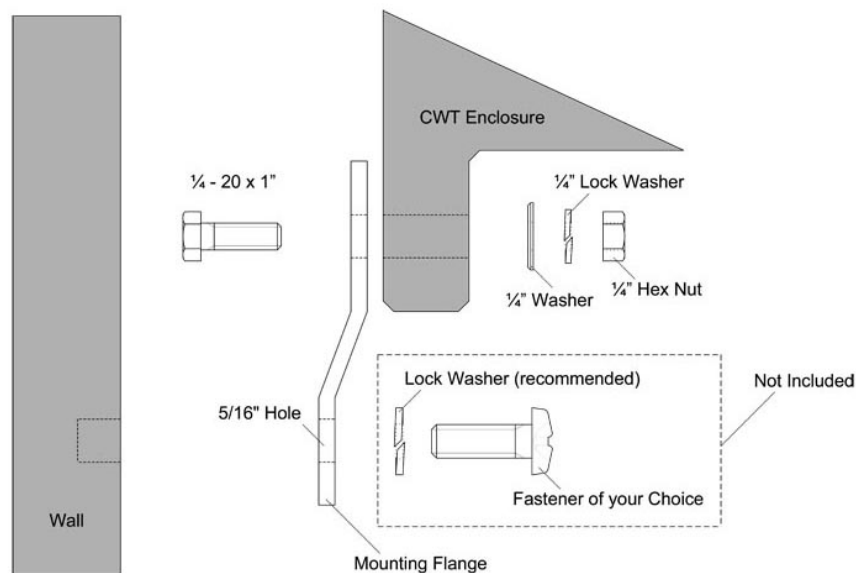
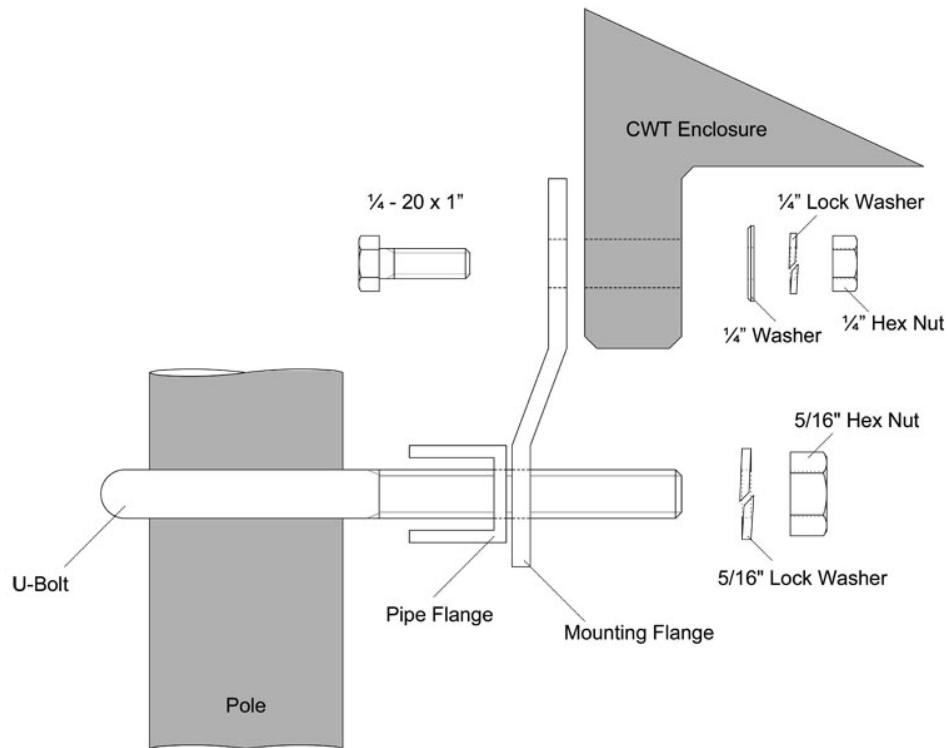


Figure 6: Wall mounting the Trailblazer enclosure

#### Wall Mounting Instructions:

- Attach the mounting flanges to the enclosure using the 1/4 -20 x 1" bolts, 1/4" flat washers, 1/4" lock washers, and 1/4" hex nuts.
- Tighten the 1/4" nuts to maximum of 25 in-lbs (2.1 ft-lbs). **Do not over tighten!**
- Position the enclosure on the wall.
- It is recommended that you attach the enclosure to the wall using a lock washer and fasteners of your choice as shown in figure 2.
- Tighten the fasteners of your choice. **Do not over tighten!**



**Figure 7: Pole mounting the Trailblazer enclosure**

#### **Pole Mounting Instructions:**

- Attach the mounting flanges to the enclosure using the 1/4 -20 x 1" bolts, 1/4" flat washers, 1/4" lock washers, and 1/4" hex nuts.
- Tighten the 1/4" nuts to maximum of 25 in-lbs (2.1 ft-lbs). **Do not over tighten!**
- Position the enclosure on the pole.
- Place the U-bolts around the pole, and slide the pipe flanges over them with the serrated sides facing the pole. See figure 1.
- Apply an anti-seizing compound to the threads of the U-bolts.
- Slide the mounting flanges (now attached to the enclosure) over the U-bolts and secure them using the 5/16" lock washers and 5/16" hex nuts.
- Tighten the 5/16" nuts. **Do not over tighten!**

## **4.2 External Antennas**

*The use of an external antenna with Model Trailblazer RC Pro system mandates professionally trained personnel to ensure compliance with FCC rules and*

*regulations. Specifically the installer must ensure that the EIRP of the transmitting antenna does not exceed the requirements of the Code of Federal Regulations, Title 47, paragraph 15.247.*

*This device has been designed to operate with the antennas listed below, and having a maximum gain of 26 dB. Antennas not included in this list or having a gain greater than 26 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.*

### **WARNING! YOU CAN BE KILLED!**

The Trailblazer system is designed to be installed by professionally trained installers only! Failure to follow basic installation procedures and safety precautions can result in one or all of: damage to tools and/or equipment, interference with and/or damage to other equipment or accessories, violation of safety code, local laws and/or building codes, personal injury or even death.

Detached antennas, whether installed indoors or out, should be installed ONLY by experienced antenna installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities. Failure to do so may void the CWT product warranty and may expose the end user to legal and financial liabilities."

"Regulations regarding maximum antenna gains vary from country to country. It is the responsibility of the end user to operate within the limits of these regulations and to ensure that the professional installer is aware of these regulations, as well. "

Installations of the Trailblazer System require topographic analysis, site survey, and link budget calculation; therefore CWT trained professionals are required to perform the installation.

#### **4.2.1 Marketing and Sales Channels**

CWT DOES NOT sell the Trailblazer PRO direct to end users. i WLL Trailblazer PRO System will be sold only to CWT's Authorized Resellers. Those authorized resellers are technically trained by CWT's Engineers periodically and must follow the rules set by CWT. The Trailblazer PRO system is designed for Long Range (15-35 miles) applications and it involves a complicated mandatory site survey, roof top mast installation, high gain antennas, accurate antenna alignment, etc. Those activities can be done ONLY by professional installers that are familiar with the FCC regulations. CWT does not sell the Trailblazer PRO in the consumer business at all. We have no resellers in this market and we do not advertise in consumers based publications or attend consumer oriented trade shows. The system will be advertised in technical trade shows and magazines.

### **4.2.2 Calculating the EIRP of an External Antenna**

For all frequency bands of the Trailblazer TB series digital radio, the peak power is calibrated at the factory to be at maximum +17dBm.

Using this example one can calculate the following:

Note that the radio is calibrated for a maximum output power of +17dBm.

Subtract the interconnecting cable and lightning protection losses of 2dB = total power arriving to antenna of 15dBm. Now add the 2.4 GHz panel antenna gain of 18dBi and this will give the total Effective Isotropic Rated Power of 33dBm.

For 2.4 GHz, the FCC uses a “3 for 1” rule. The “3 for 1” FCC rule states that for every 3dB above 6dB of antenna gain you must lower the maximum RF power available to the antenna from +30dBm ( 1 watt) by 1dB. In this example the antenna gain is (18 – 6) 12dBi above 6 or (12 / 3) or 4 times 3dB above 6dB. Checking to see if the transmit power meets the rule is done by subtracting 4 from +30dB equaling +26dBm. This transmitter output RF power is set to +17dBm so it is below the limit.

For 5.8 GHz, the FCC allows a maximum EIRP of 50dBm. This would mean that an antenna with a gain of 33dBi would be acceptable with no cable losses.

For 4.9 GHz, the FCC allows a maximum EIRP of 42dBm. If you had no losses in between the radio and were using the supplied 22 dBi gain panel antenna you would have an ERP of 39dBm which is under the maximum of 42.

Following this guideline ensures compliance with the maximum transmitter ERP allowed with the antenna provided as a system.

### **4.2.3 RF Safety Hazard Warning**

Due to the substantial energy radiated from these antennas, it is imperative that they never be mounted such that the antenna or the cabinet containing the antenna will be closer than 2 Meters (6.7 Feet) to any persons.

## **4.3 18dBi 2.4 GHz Directional Flat Panel Antenna**

This section is designed to support the installation, operation and maintenance of the 18dBi directional flat panel antenna. CWT recommends this antenna for its small size, ease of mounting and low maintenance. To avoid harm to persons or damage to the product please ensure that you have read the safety, unpacking and installation sections before proceeding.

### **4.3.1 Product Overview**

Refer to the “Product Specification” Section for specifications and characteristics.

#### **Key Features and Benefits:**

- Small size
- Patented printed circuit board design with best performance-to-price ratio
- Attractive, low profile UV stable housing that requires minimal maintenance and blends well with indoor and outdoor environments where aesthetic considerations are important
- Corner exit RG-58/U pigtail design permits the panel to be mounted in vertical or horizontal polarity
- Adjustable, heavy-duty mounting brackets provide maximum flexibility, stability even in high wind conditions, and easy mounting

### **4.3.2 Unpacking**

The 18dBi directional flat panel may be packaged and shipped with other items in the same package. Thoroughly inspect the package and the antenna for damage and immediately report any damage to the shipper.

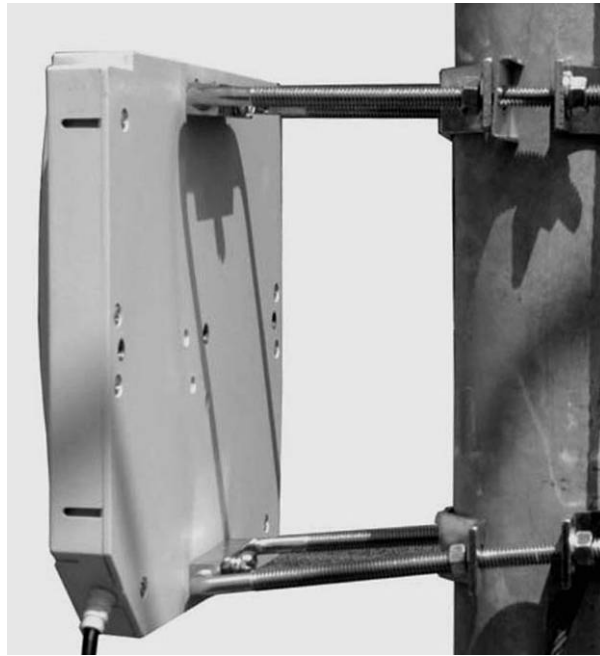
### **4.3.3 Mounting**

The MPAB8 tilt mounting bracket, included with the antenna, is used to provide down or up-tilt mounting to a mast up to 2.88 inch O.D. (2.5inch schedule 40 pipe).

#### **Recommended tools for installation:**

- (1) 7/16” wrench or #2 Philips screw driver
- (1) 9/16” open end wrench
- Vapor wrap and electrical tape for weatherproofing. See section 4.5
- Cable ties

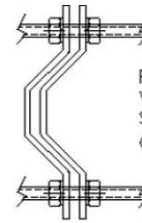




*This is a properly mounted panel antenna. Note the ability of the mount to aim the antenna up tilt or down tilt.*

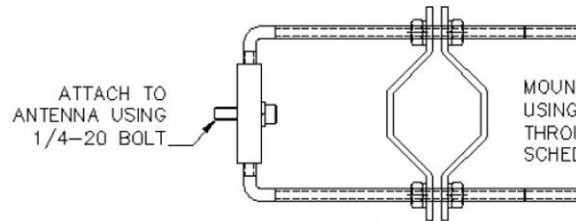
*Hint: You may want to complete the first two steps **on the ground!***

1. Assemble the mount to the antenna using the hardware provided as described in the diagram to the left.



FLIP ONE BRACKET FOR USE WITH MASTS LESS THAN SCHED 40 1.25 INCH PIPE (1.66 O.D.)

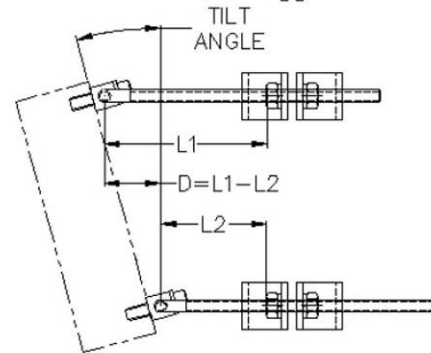
2. Adjust the nuts nearest the antenna to positions that will provide the tilt angle required. Use the mounting diagram (*left*) with the table below to roughly align the antenna to your position requirements.



ATTACH TO ANTENNA USING 1/4-20 BOLT

MOUNT WILL FIT MASTS USING 1.25 (1.66 O.D.) THROUGH 2.5 (2.88 O.D.) SCHED 40 PIPE

3. Assemble the antenna to the mast as shown at left. Fine adjustment to the tilt angle can be made after the antenna has been mounted to the mast. Spacing references for **downtilt** (L1, L2) will be as shown (*left*). Spacing references for **uptilt** (L1, L2) will be **opposite** as shown (*left*).



Once the antenna has been mounted, aligned and tested be sure to properly complete the installation by weatherproofing the cable connections. See Section 4.5 “23dBi 5.8GHz Directional Flat Panel Antenna. This antenna is similar to the 18dBi 2.4GHz antenna except that it is properly polarized when the arrow on the back indicates a vertical line.

#### 4.4 22dBi 4.9 GHz Directional Flat Panel Antenna

This antenna is similar to the 18dBi 2.4 GHz antenna except that it is properly polarized when the arrow on the back indicates a vertical line. This results in a diamond shape presented.

#### 4.5 23dBi 5.8 GHz Directional Flat Panel Antenna

This antenna is similar to the 18dBi 2.4 GHz antenna except that it is properly polarized when the arrow on the back indicates a vertical line.

## **4.6 24dBi 2.4 GHz High-Gain Parabolic Grid Antenna**

This section is designed to support the installation, operation and maintenance of the 24dBi high gain parabolic grid antenna used for extended range or improved fade margin and/or adjacent signal rejection with the Trailblazer. CWT recommends this antenna because it has been used in many successful field installations over the years. To avoid harm to persons or damage to the product please ensure that you have read the safety, unpacking and installation sections before proceeding.

### **4.6.1 Product Overview**

Refer to the “Product Specification” Section for specifications and characteristics.

#### **Key Features and Benefits:**

- Welded, galvanized steel with a gray epoxy powder coat that blends well with any background
- 50 Ohm patented passive feed dipole
- Includes reflector
- Horizontal or vertical mounting
- Type N Female connector
- Rugged, Lightweight and Waterproof
- heavy-duty adjustable mounting brackets for 1 to 2.5 inch diameter poles that provide stability even in high wind conditions

### **4.6.2 Unpacking**

Despite careful packaging, the size of these antennas invites mistreatment by shippers. Please inspect them thoroughly and report any damage to the box to the shipper before opening. The 24dBi high gain parabolic grid antenna will arrive in one box approximately 36 X 30 X 8 inches (92 X 76 X 20 cm). Small amounts of feed cable may also be included in this box if ordered.

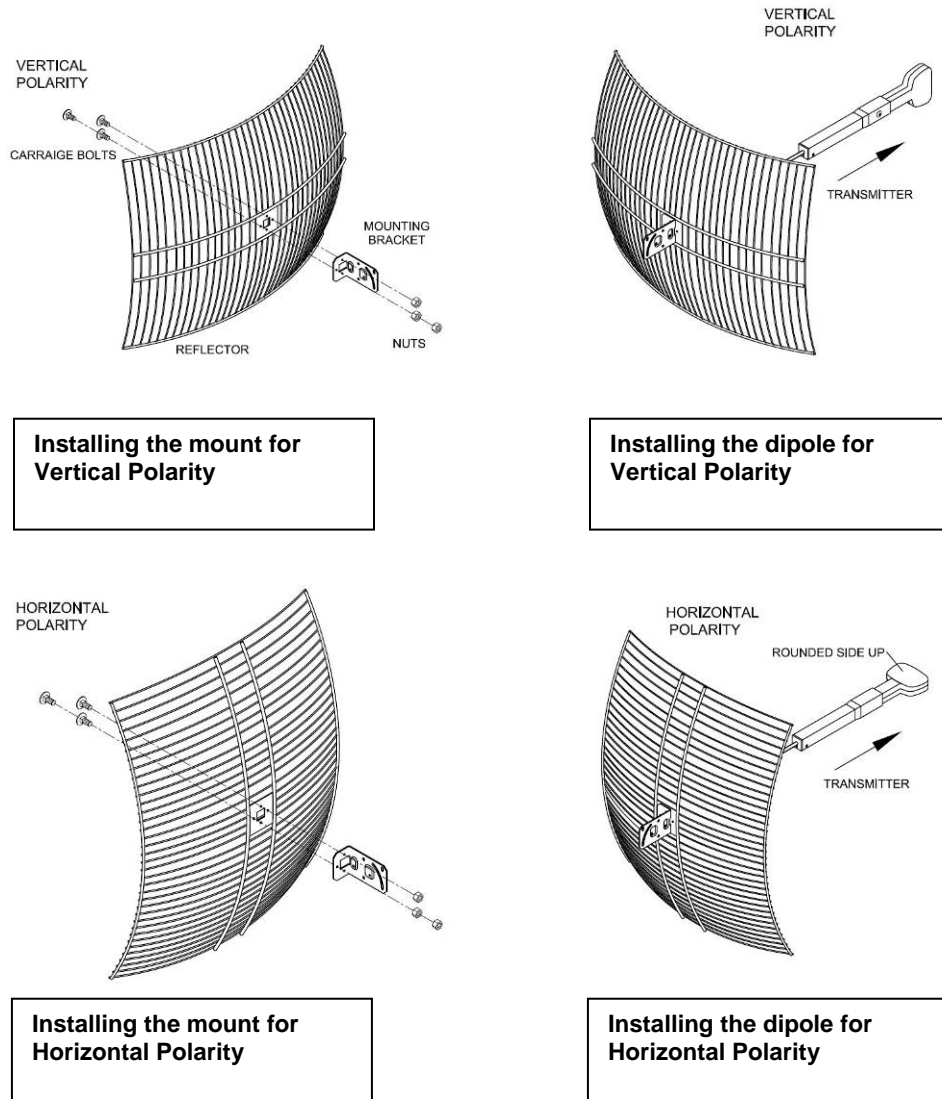
The N-Female to N-Male 36” coax cable is taped to the grid reflectors whose corners are padded. Another box containing the mounting bracket, clamp and hardware, extension tube, and dipole is taped to the bottom.

### **4.6.3 Mounting**

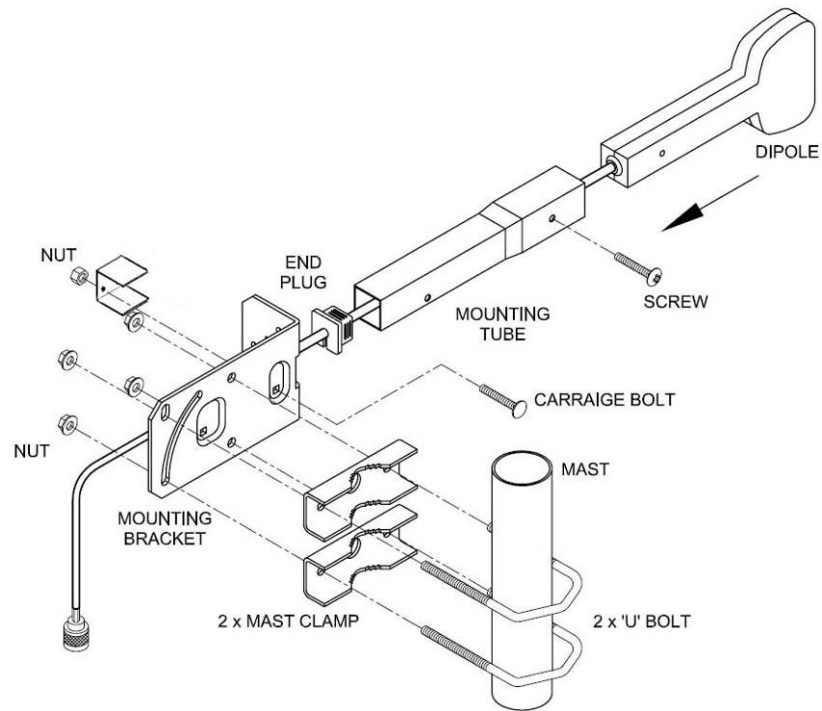
#### **Recommended tools for installation:**

- (1) 7/16” wrench
- #1 Philips screw driver
- (1) 9/16” open end wrench
- Vapor wrap and electrical tape for weatherproofing. See section 4.5
- Cable ties

**NOTE:** We recommend **assembling the antenna except for tightening the U-Bolts on the ground!**



**Figure 8: Mounting of 24dBi High-Gain Parabolic Grid Gain Antenna (horizontal or vertical)**



**Figure 9: 2.4 GHz 24dBi dipole assembly procedure (Vertical Polarity)**

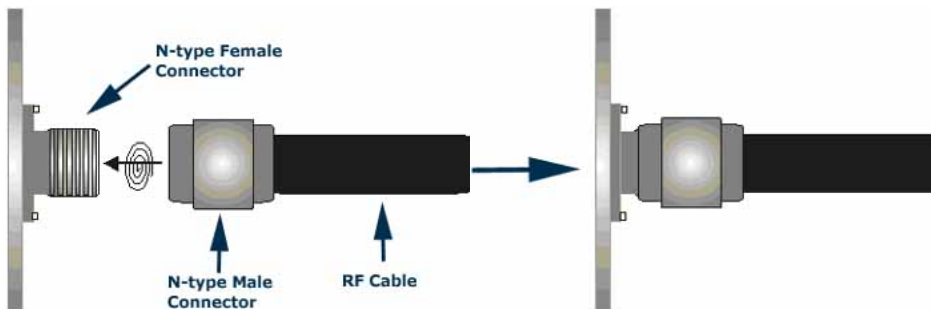
## 4.7 Weatherproofing RF Connections

Once you have mounted and secured your antenna, we recommend completing the installation by properly weatherproofing the RF connector. The connector will be waterproof, durable, and easy to service if it needs to be removed. You need:

- Electrical tape
- Rubber tape (butyl), a thick, sticky sealing tape commonly known as “vapor wrap”. We recommend 3M 3339 tape.

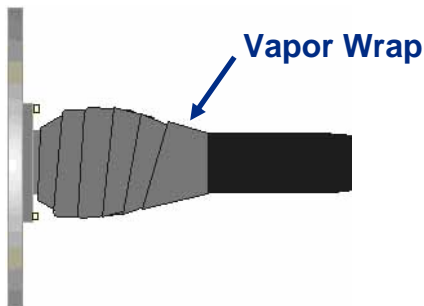
### Step 1. Connect Cable Assembly to Antenna or Enclosure

Attach the RF cable to the enclosure by fastening the N-type Male connector to the N-type Female connector. Note: Ensure both connectors are clean and dry. Hand-tighten the connector firmly.



### Step 2. Sealing the Connector Assembly

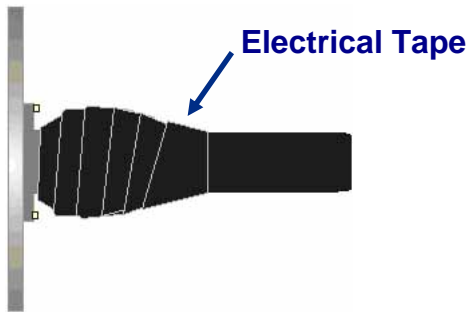
1. Tightly wrap the connectors with 1 layer of electrical tape and extend 0.5 inch beyond the N-type Male connector. This step is highly recommended, as it will make removal of the weather proofing much faster, easier and less messy.
2. Tightly wrap the connectors with 2 layers of vapor wrap. Note: The vapor wrap should seal entire connection and extend 1.5 inches beyond N-type Male connector (1inch beyond electrical tape).



### Step 3. Covering Rubber Tape with Electrical Tape

Tightly wrap the rubber tape with 2 layers of electrical tape. Note: The electrical tape should extend 1 inch beyond the vapor wrap to ensure full coverage. You

can easily remove the weatherproofing by cutting down one side of the wrap and peeling it away.



## 4.8 Antenna Alignment

**Rough alignment:** This is fairly straight forward. Since it is a prerequisite that you have line of sight between the two points, here are several ideas that have worked for installers:

- Aim the units towards each other
- During midday, use a mirror or compact disk to create a reflection directed towards the other site while someone watches for the flash
- Plot out the path on a topographical map and set the antennas using a compass

**How close in alignment do the antennas need to be?** +/- 10 degrees will be adequate for most paths using the 14dBi gain antenna. Certain paths that have a low fade margin may require a more accurate setting.

**Alignment indicators:** Due to the nature of digital modulation and the associated circuitry, there is no analog test point at which the signal strength may be monitored. Rather, use the bit error rate as an indicator. If there are obstructions or interference in the link, the middle, red LED will begin to blink. The rate of flash is an indication of the degree of signal degradation, with a higher flash rate indicating more errors.

**Final alignment can be achieved in one of two ways:**

1. Connect a standard telephone directly to the CPE terminal (FXS) and listen to the dial tone. As the antenna is moved to one side away from rough alignment, the signal will degrade (note the increasing number of "pops"), the bit error LED will flash increasingly, and eventually the link will be lost. Note where the antenna is aimed when the link is lost and rotate the antenna to the other side until the signal is lost again. The midpoint between the positions where the signal was lost indicates the best antenna position. Tighten the antenna mounts.
2. Monitor the signal strength when moving the antenna to one side away from rough alignment by using the GUI software and a laptop. Determine the exact signal peak for best alignment and then tighten the antenna mounts.

## 4.9 Interference Solutions

Sometimes after installation, final alignment is found to interfere with external devices, and/or external devices are later installed that affect the Trailblazer. To determine if the Trailblazer is an interferer, power down the radio unit and check if the interference is eliminated. To determine if an external device is interfering with the Trailblazer, shut down suspected devices while listening to an audible tone (such as dial tone) on a phone connected to the Trailblazer.



**Common Interferers:** microwaves, wireless household controls, emergency radio equipment, cordless telephones, wireless video products, etc. (Refer to Interference Section 2.1.6 for more information)

Before calling the manufacturer, the installer is encouraged to try correcting the problem by trying one or more of the following suggestions:

- Slightly reorient or move the Carlson Wireless antenna to a new position
- Change the frequency of Carlson Wireless radio or offending device
- Relocate the offending/offended device
- Separate power sources, or filter sources between the offenders
- If not installer, consult dealer or experienced technician
- Inquire about switching to a different frequency band (2.4Ghz to 5.8GHz or vice versa)

## 4.10 Lightning Protection

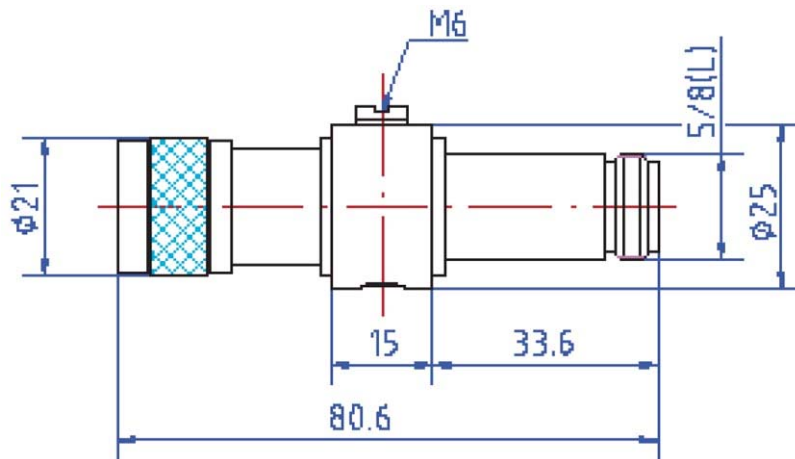
CWT stocks in-line, gas-discharge style lightning surge suppressors as primary lightning protection for their reliability, ease of installation and low cost to the customer. In-line protectors mount in series with the coaxial cable or telephone line which provides an excellent solution for a retrofit application. The protector is grounded through an external ground screw that is attached to the body of the surge protector.

### 4.10.1 Antenna Port Protection

Mount the CWT in-line, gas-discharge style lightning surge suppressor in series with the coaxial cable between the radio and the antenna. Place it as close to the radio as possible in order to limit the amount of cable that will be exposed to either direct or indirect strikes of lightning or atmospheric static charges. Connect the largest wire (usually #8 or #10AWG solid) to the ground screw on the body of the surge protector and terminate it to a proper ground (see above). If you have any question about the quality of your ground system, stop and remedy the issue before continuing.

<b>RF Gas Discharge Lightning Surge Protector Specifications</b>	
CWT Part number	640-6600
Description	High Frequency co-axial surge protector (Gas tube)
Maximum power (50 Ohms)	70 W
Breakdown Voltage (100 V/s)	90-130 V
Residual Voltage (1 kV/ $\mu$ s)	< 600 V
Power Handling (8/20 $\mu$ s waveform)	
10 shocks	10 kA
1 shock	20 kA
Return Loss and Attenuation	
@ 0.5 GHz	< -25 dB
@ 1 GHz	< -25 dB
@ 4 GHz	< -20 dB
Insertion Loss	
@ 0.5 GHz	< 0.05 dB
@ 1 GHz	< 0.03 dB
@ 2.5 GHz	< 0.067 dB
@ 4 GHz	< 0.29 dB
Connector Type	"N"
Housing Material	Copper alloy with CuZnSn finish
Contact Sockets Material	Gold Plated Copper alloy
Insulation Material	Teflon per ASTM-D-170

**Table 10: RF Lightning Protection**



**Figure 10: Surge Protection, RF**

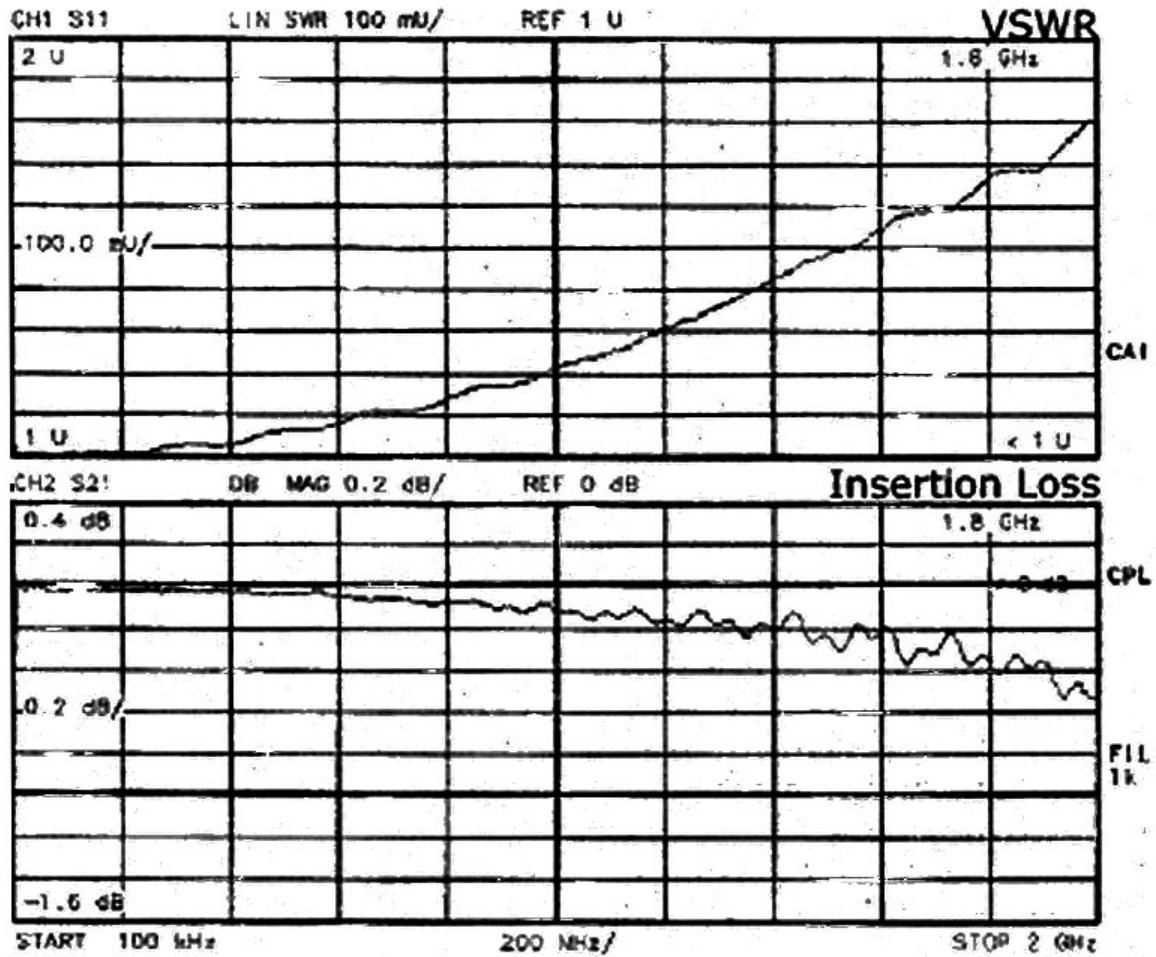
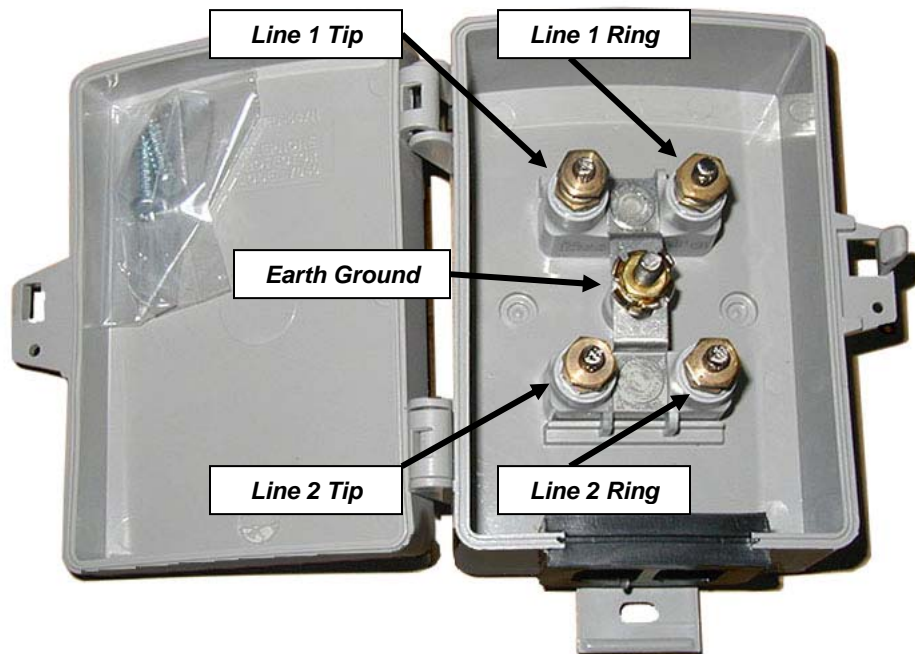


Figure 11: Antenna Port Lightning Protector, VSWR and Insertion Loss

#### 4.10.2 Customer Premise Telephone Line Surge Protection



**Figure 12: Primary Telephone Line Transient Protection**

CWT recommends using telephone line surge protectors for all active phone lines. The telephone line surge protector is designed to be used as a primary station protector at the subscriber end and works with the secondary on-board lightning protection. Its plastic enclosure is weather and fire resistant and the surge protector provides protection against lightning surges, power cross conditions, and ground potential rises for (2) phone lines. Plated #10 brass studs, washers and hex nuts provide the connection to the two phone lines. It also has a sectionalized grommet for wire entry. See figure 12 for details on connecting the phone lines.

**The surge protector element for each line consists of:**

- Heavy-duty, (2) element gas tube
- External backup gap assembly
- Unique switch grade shorting mechanism

<b>Telephone Line Gas Discharge Lightning Surge Protector Specifications</b>	
CWT Part number	640-6500
Description	Sealed gas tube station protector
DC Breakdown@100V/s	300-500V
Impulse Breakdown 100V/ $\mu$ s 10kV/ $\mu$ s 100V/ $\mu$ s, vented	600V 850V 1200V
Insulation Resistance@100V/leakage current	10e10 $\Omega$
Capacitance@1kHz	<15pF
DC Extinguishing (Network applied) @52V, 135V, 150V	<150ms
Impulse Life Characteristics	>400x500A 10/1000 $\mu$ s 10kA 8/20 $\mu$ s
AC Life characteristics	>65A, 11 cycles
Enclosure Material	Weather and UV resistant , high impact, flame retardant plastic.
Dimensions	5.7"H x 3.4"W x 2.2"D

**Table 11: Subscriber side protection**

## 5 Test & Maintenance

### 5.1 Diagnostics

#### 5.1.1 LED Function

The Trailblazer units' are equipped with multifunction status indication LEDs on the top and radio card. There are no LEDs on the interface card. You can read the link and alignment status as well as packet loss information quickly, without using a PC. Use the table below for translating the LED patterns.

	CPE Unit			BASE Unit			Description
	D4	D5	D6	D4	D5	D6	
<b>NO POWER</b>	Off	Off	Off	Off	Off	Off	Power system failure or no power applied
<b>POWER ON</b>	Off	Off	Solid	Off	Off	Solid	Initial Power up, FPGA not loaded by CPU
<b>CPE ACQUIRING</b>	Solid	Solid	Flashing	Off	Solid	Flashing	CPE – receiver on, looking for valid signal. Base - FPGA loaded, radio transmitting
<b>CPE RANGING</b>	Solid	Off	Flashing	Off	Solid	Flashing	CPE acquired and locked, CPE begins transmitting locator beacon
<b>BASE RANGING</b>	Solid	Off	Flashing	Solid	Off	Flashing	Base accepts CPE locator beacon and begins ranging operation
<b>ALIGNMENT</b>	Off	Blinks	Solid	Off	Blinks	Solid	Final alignment, minimizing bit errors
<b>LOCKED</b>	Off	Off	Flashing	Off	Off	Flashing	Units locked and aligned, ready for service
<b>PACKET ERRORS</b>	Off	Blinks	Flashing	Off	Blinks	Flashing	D5 blinking indicates packet errors, weak signal or interference

Table 12: System Status LED Information Table

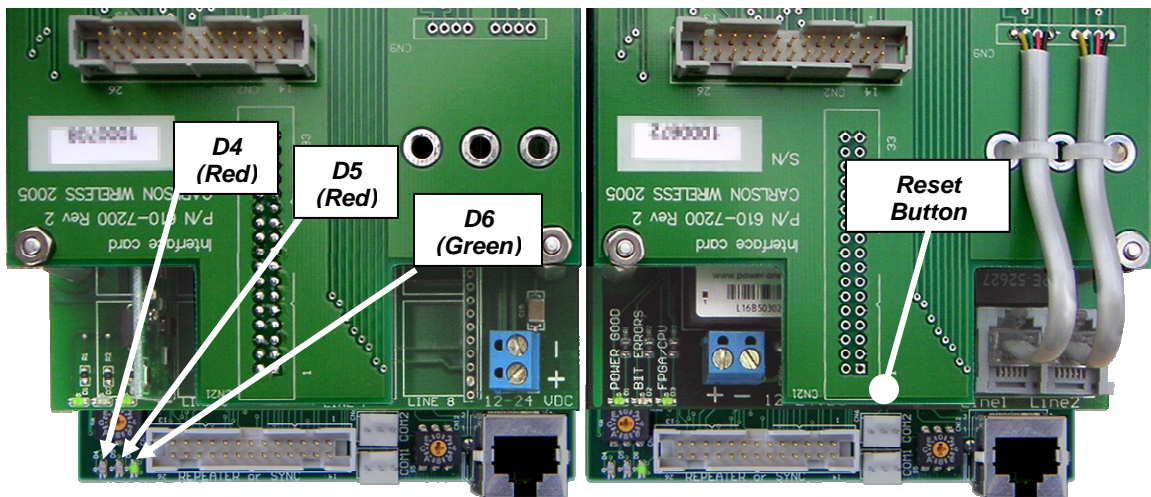


Figure 13: Trailblazer Radio Card LEDs

Setting your units next to each other on your bench with the test antennas attached to the N female connectors on the enclosure. The LED will indicate from top to bottom in the preceding table, from the *No Power* to the *Final Alignment and Errors* state. The Trailblazer system should reach the *CPU Operational* state within 20 seconds after power is applied. The *Acquired* state completes when the CPE terminal has detected and locked to the radio signal from the base unit. The *Ranged* state is complete when the CPE terminal has turned on the radio transmitter and is aligned with the base unit. After ranging both units will do an *Alignment* to minimize bit errors. During the *Operation and Diagnostics* stage, any bit errors are occurring will be indicated by D5 blinking or flashing depending on the severity of the errors. This condition may also be caused by interference or misalignment of the antennas (or weak signal). ***If D4 and D5 are OFF and D6 is FLASHING, the unit is ready for service!***

## 5.2 Maintenance

### 5.2.1 Installation of Software/Firmware Upgrades

Most maintenance and upgrading of the system can and should be performed with the included GUI software. See Section 3 for operating instructions for the GUI. If for some reason you are unable to use the GUI software, you may alternately use the Terminal Interface. See the Appendix for advanced programming and diagnostics details.

## 6 Appendix

### 6.1 About Carlson Wireless

#### 6.1.1 Mission

Carlson Wireless Technologies Inc. (CWT) is dedicated to designing, manufacturing and marketing innovative, low power digital WLL (wireless local loop) telephone systems that provide high-quality voice and data links for rural and remote telephone users worldwide.

#### 6.1.2 History

CWT (Carlson Wireless Technologies) Inc. was founded in 1999 by James Carlson and is a privately held California “C” corporation headquartered in Redway, California. CWT purchased the assets of Adicom Wireless Inc. formerly of Pleasanton, CA. Adicom Wireless had spent 4 years and over \$40 million in development of a CDMA multipoint system. The designs and patents are being used this newer Trailblazer RC Point-to-Point and Point-to-Multipoint product line.

#### 6.1.3 Summary

CWT is marketing the Trailblazer product through established telecom and wireless equipment distributors. Please contact our Sales Department +1.707. 923.3000, or email [sales@carlsonwireless.com](mailto:sales@carlsonwireless.com) for more information.



## 6.2 System Specifications

Air Interface	*Proprietary DSSS CDMA using a negotiated QOS with Time Division Duplexing
Data Throughput Rate	512, 256, 128, 64 kbps, Configurable with GUI
End-to-End System Latency	Less than 4.4 ms Depending on Speed Selected
Fax Compatibility	G3 (9.6kbps) and G4 (14.4kbps)
Modem Performance	V.34 (33kbps) via POTS, up to V.90 (56kbps) via RuralConnect™
<b>RF Performance</b>	
Frequency Range	2.4GHz Standard. 4.9 and 5.8 GHz Options Available
RF Channels	4 sub channels in 2.4 GHz band, 8 sub channels in 5.8 GHz
RF Output Power	17dBm typical in 2.4 GHz, 17dBm in 5.8 GHz
Receive Sensitivity	-93 dBm/256 kbps @10-6 BER -90 dBm/512 kbps @10-6 BER
External Antenna Port	"N" Type Female
<b>Environmental Specifications</b>	
Operating Temp	-30 to +60 Degrees C (Ambient with Solar Shielding)
Humidity	0 to 90% - Non-Condensing
Voltage Requirements	Filtered DC nominal 12 to 24 V Negative Earth Ground
Operating Current	2 Watts Minimum, 8 Watts Maximum Configuration
<b>CPE Terminal (FXS) Specifications</b>	
Regulatory	LSSGR, TR57, ITU Q.552, and G.712
Open Loop Voltage	36 to 48V
Loop Current	20 mA to 24 mA
Maximum Loop Length	1200 Ohms Including Instrument
Ringing Voltage	60 VAC RMS
Ringing Load	3 REN
Ringing Waveform	Balanced Sinusoidal, 20 Hz Standard, Factory Programmable 16 to 33Hz
Nominal Transmit Level	0.0 dBm0, Factory Programmable
Nominal Receive Level	-2.0 dBm0, Factory Programmable
2 Wire Port Return Loss	24 dB min.
Voltage Requirements	Filtered DC Nominal 12 to 24V
Operating Current: No Load, Full Load	1.4 Watts (i.e. 24v @ 60ma) Idle, 4 Watts (i.e. 24v @ 200ma) max Including Radio
<b>Base Unit Specifications</b>	
Regulatory	TIA/EIA/IS-968 (FCC), UL 1950, UL 60950, EN 60950, IEC60950, EN55022B
Maximum Loop Length	1500 ohms or 18 ma.
Ring Equivalent Number	0.3B per line
Ring Detect Threshold	24-110Vrms, 17-34 Hz
2 Wire Port Return Loss	24dB min.
Operating Voltage	Filtered DC Nominal 12 to 24V
Operating Current: No Load, Full Load	Less then 2 Watts (i.e. 24v @ 200ma) with 8 Lines Active Including Radio
<b>Certifications</b>	
	US, Canada, Brazil, Mexico, Philippians' Islands, Morocco
<b>Warranty</b>	1 Year Parts and Labor

# 6.2.1 Block Diagram

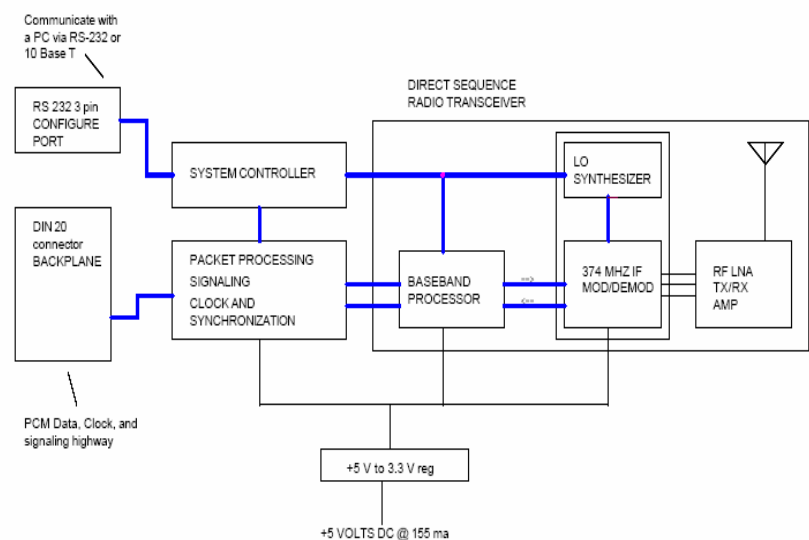


Figure 14: Block Diagram of Radio Card

## 6.3 Cable Pin outs

Should you misplace or lose your serial programming cable, you can call your CWT sales rep. and order a replacement or construct a new cable from a few simple parts using the diagram below.

### 6.3.1 Configuration Port Pinout

<b>Configuration Port Cable Construction Table</b>			
<b>A DB9 pin Female to be fit in the PC is wired with:</b>		<b>A 3 pin, .100" spacing connector, female, connecting to the Trailblazer as shown:</b>	
DCD on pin 1,	(not used)		
TX Data on pin 2,		TX Data on pin 1,	
RX Data on pin 3,		RX Data on pin 3,	
DTR on pin 4,	(not used)		
SG on pin 5,	(signal ground)	SG on pin 2,	(signal ground)
DSR on pin 6,	(not used)		
RTS on pin 7,	(not used)		
CTS on pin 8,	(not used)		
RI on pin 9,	(not used)		

Table 13: Configuration Port Cable Construction Table

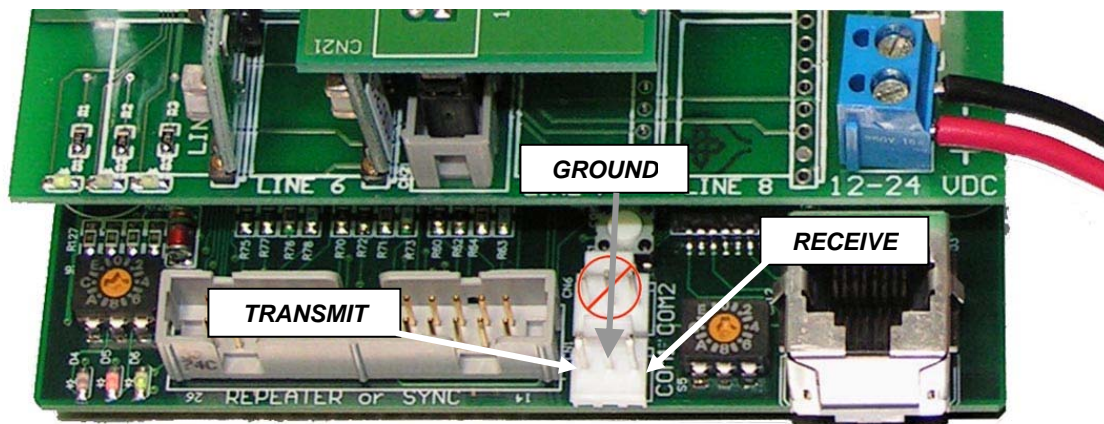


Figure 15: Serial Data Cable Pinout (PCB View)

## Standard “AT” Pinout for a DB9 Connector

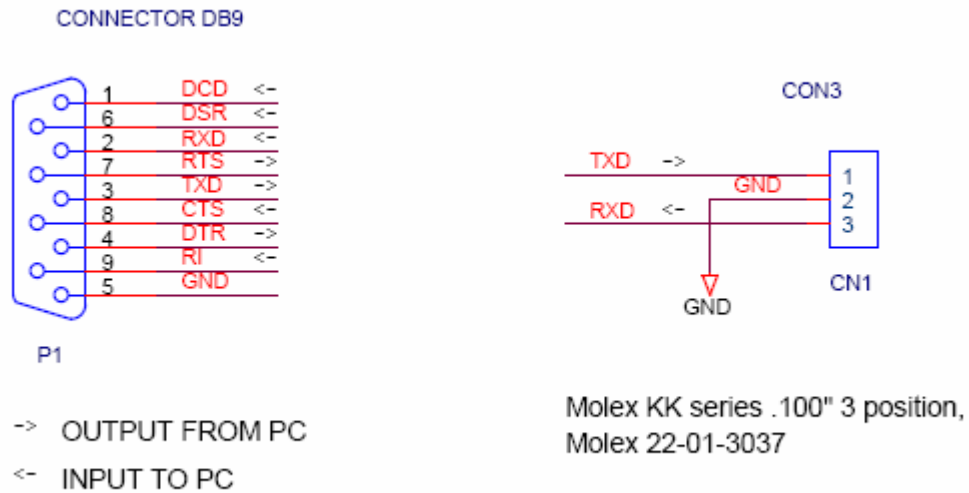


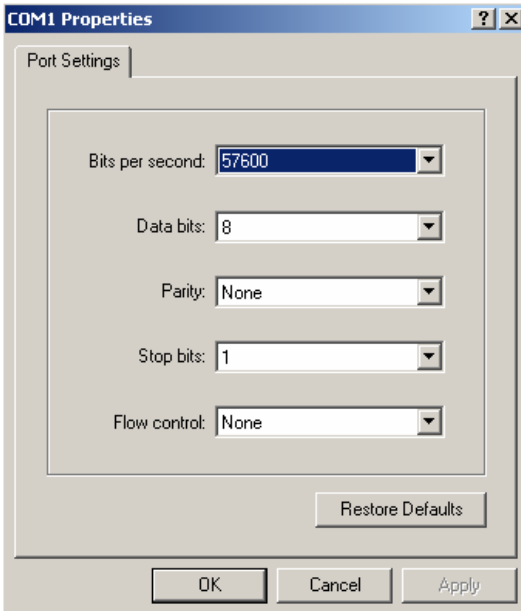
Figure 16: Serial Data Cable Schematic

<b>Serial Data Cable Pinout</b>			
<b>Pin</b>	<b>Signal</b>	<b>Description</b>	<b>Direction</b>
1	DCD	Data Carrier Detect	To PC
2	RD	Receive Data	To PC
3	TD	Transmit Data	From PC
4	DTR	Data Terminal Ready	From PC
5	GND	Signal Ground	Common
6	DSR	Data Set Ready	To PC
7	RTS	Request to Send	From PC
8	CTS	Clear to Send	To PC
9	RI	Ring Indicator	To PC

Table 14: Serial Data Cable Pinout

## 6.4 Advanced Programming and Diagnostics

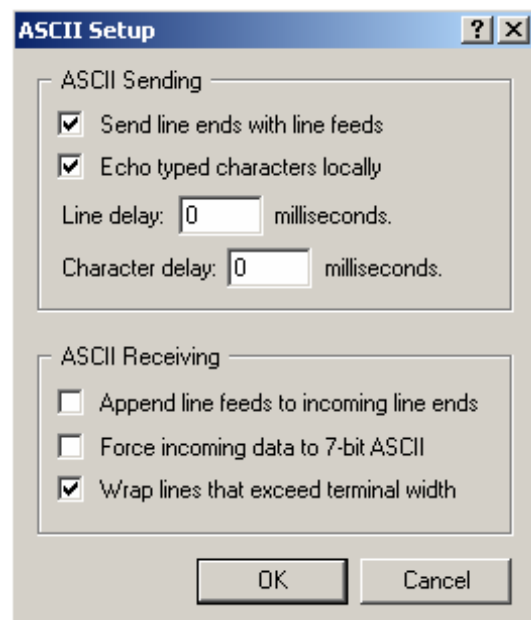
### 6.4.1 Configuring the Serial Port Parameters



In order to communicate with the Trailblazer units using the Command Line Interface, the serial port parameters need to be configured. The serial port parameters are illustrated in the following figure.

These settings were configured within the program by Hilgraeve (see left and below). This program is readily available and runs on any Windows platform, but any terminal emulation program can be used that can communicate across the asynchronous serial COM ports of a PC.

The ASCII setup screen in HyperTerminal™ needs to be configured as well in order to properly communicate with the Trailblazer units. In addition to the basic ASCII setup (shown right) which you will use most to configure the system, you must insert a 50ms **line delay** in order to be able to send scripts to the Trailblazer units. Scripts are what you will need to use in order to configure the amount of and allocation of bandwidth within the Trailblazer system. See Section **Error! Reference source not found. Error! Reference source not found.** for complete details.

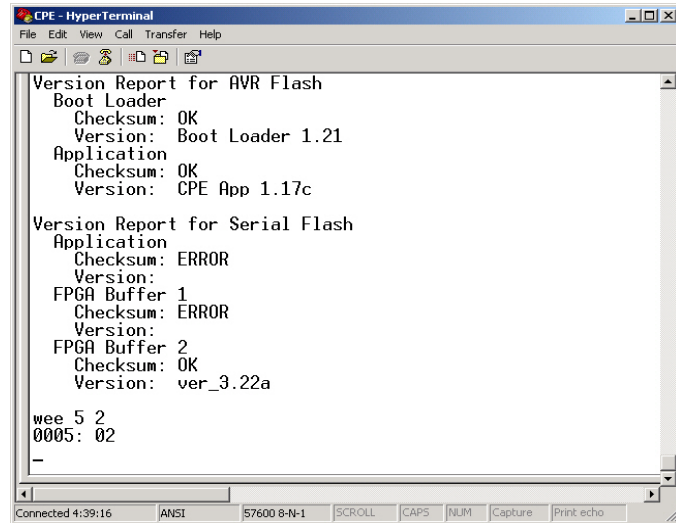


## 6.4.2 Setting the V35 enable and port location

To enable the V35 data port, open up the Hyperterminal™ interface and if you are communicating with a CPE unit after booting type: **[stop]**. If you are connected to a base unit it will stop on it's own after a minute.

Then type in:

**[wee 5 1]** or **[wee 5 2]** depending on which line no you wish to be used as a data path for the Ethernet connection. The system should respond back with: **0005: 02** as shown above.



```
CPE - HyperTerminal
File Edit View Call Transfer Help

Version Report for AVR Flash
Boot Loader
Checksum: OK
Version: Boot Loader 1.21
Application
Checksum: OK
Version: CPE App 1.17c

Version Report for Serial Flash
Application
Checksum: ERROR
Version:
FPGA Buffer 1
Checksum: ERROR
Version:
FPGA Buffer 2
Checksum: OK
Version: ver_3.22a

wee 5 2
0005: 02
_

Connected 4:39:16  ANSI  57600 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

To disable the V35 data port, open up the HyperTerminal™ interface and type in:

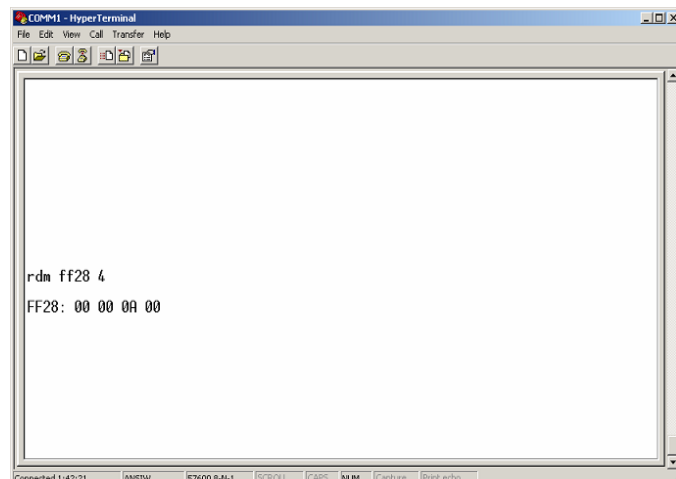
**[wee 5 FF]** . The system should respond back with: **0005: FF** .

## 6.4.3 Received Signal Strength Indicator (RSSI)

The RSSI value can be accessed through the Command Line Interface using the following command:

**rdm ff28 4 <enter>**.

The figure at right shows the output for the RSSI from the CPE unit. The RSSI value is repeated 4 times, but just look at a single number. The figure to the right shows an RSSI of 0C. The RSSI should be 8 or higher. If the value displayed contains an alphabetic character (A, B, C, D, E or F), the value is greater than 9. The undesirable RSSI values are from 00 to 07.



```
COM1 - HyperTerminal
File Edit View Call Transfer Help

rdm ff28 4
FF28: 00 00 0A 00

Connected 1:42:21  ANSI  57600 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

The RSSI command can be used on the base unit. The above figure displays the results of the command. 3 of the 4 values will always read 00, just ignore these values. 1 of the 4 numbers should be greater than 7. If the value displayed contains an alphabetic character (A, B, C, D, E or F), the value is greater than 9. In the above example the RSSI value is sufficient.

#### 6.4.4 Air Link Quality

The quality of the Air Link can be interrogated through the Command Line Interface using the following command: debug 1 <enter>. This command causes the Air Link statistics to be printed every 4 seconds. The statistics can be stopped by typing, debug 0 <enter>. The processing of the debug command is illustrated in the following figure.

```

COM4-M1 - HyperTerminal
File Edit View Call Transfer Help

debug 1
Subscriber 02: SFD Loss Count: 0000 Signal Byte Error Count: 0000
Subscriber 02: SFD Loss Count: 0000 Signal Byte Error Count: 0000
Subscriber 02: SFD Loss Count: 0000 Signal Byte Error Count: 0000
Subscriber 02: SFD Loss Count: 0000 Signal Byte Error Count: 0000
Subscriber 02: SFD Loss Count: 0000 Signal Byte Error Count: 0000
debug 0

```

With a completely clean link, the SFD Loss Count and Signal Byte Error Count should be both zero. A SFD Loss Count greater than (6) could indicate a low signal strength or external interference.

#### 6.4.5 Installation of Software/Firmware Upgrades

In addition to maintenance using the GUI software, as a failsafe the software/firmware for the Trailblazer systems can be upgraded in the field through the serial port using a terminal emulation program and the Command Line Interface.

1. Reset the board using the RESET button near the rotary channel switch.
2. Stop the program through the Command Line

Interface. The figure above illustrates this step. When the Boot program starts, the software version information is displayed. When the prompt “Boot Loader Ready” appears, type: [stop] and press: <enter>. The Boot program confirms the stop command by displaying the text “Boot Loader Stopped”. If the text “Boot Loader Stopped” is *not* displayed immediately, RESET the unit and try again. Although timing is not *extremely* critical, try to type the command in the first couple of seconds.

```

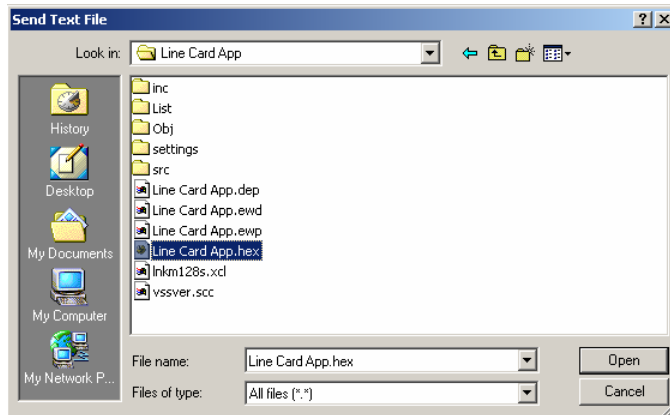
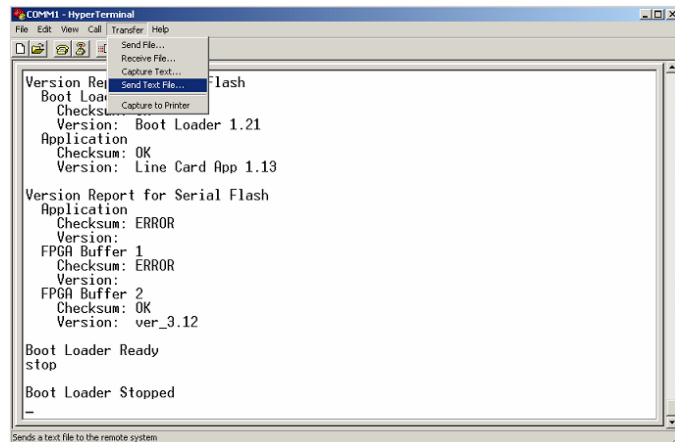
COM4-M1 - HyperTerminal
File Edit View Call Transfer Help

Version Report for AVR Flash
  Boot Loader
    Checksum: OK
    Version: Boot Loader 1.21
  Application
    Checksum: OK
    Version: Line Card App 1.13
Version Report for Serial Flash
  Application
    Checksum: ERROR
    Version:
  FPGA Buffer 1
    Checksum: ERROR
    Version:
  FPGA Buffer 2
    Checksum: OK
    Version: ver_3.12

Boot Loader Ready
stop
Boot Loader Stopped

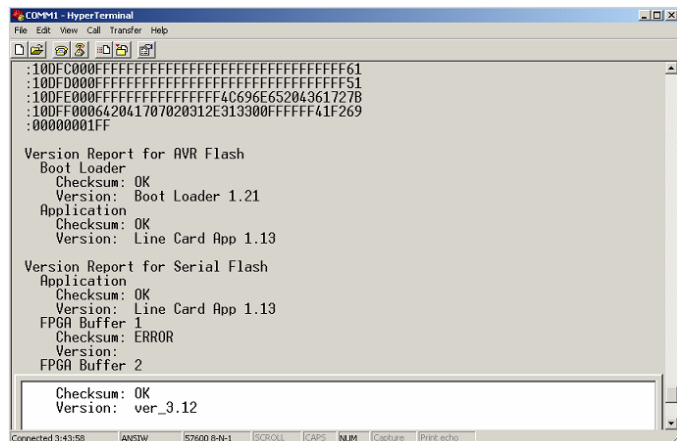
```

- Download the new software/firmware program. The following two figures illustrate this step. The menu option “Send Text File ...” is selected. Next, the dialog box will appear which allows the selection of the file to download to the Trailblazer unit. After the file is selected, click the “Open” button. The download will proceed automatically from this point.



- Download has completed. The end of the download is illustrated below. The version information at the end of the download will indicate the successful completion of the download. Re-display the version information again by typing <versions>.

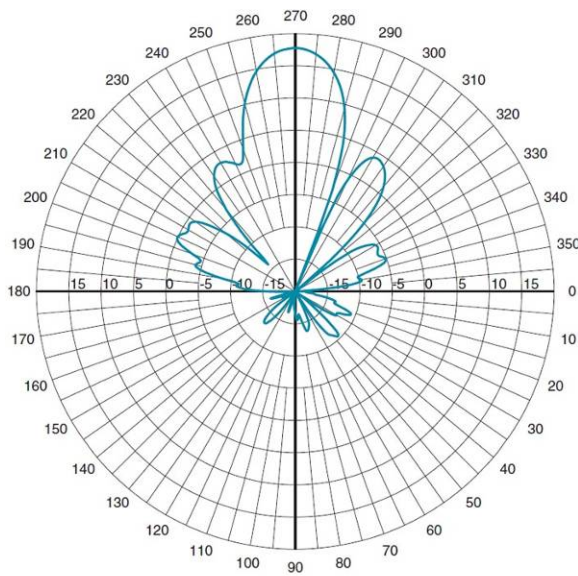
- Reset the board either manually using the reset button or by typing <reset>. The Trailblazer unit will need to be reset before the new software/firmware upgrade will take effect.



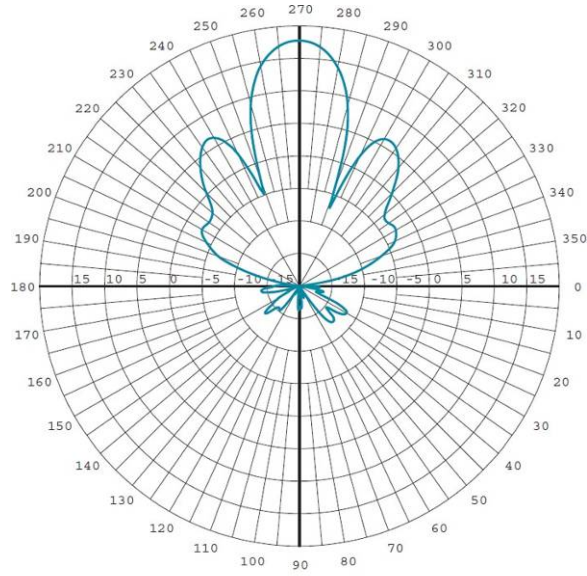


## 6.5 Antenna Patterns and Specifications

### 6.5.1 18dBi Directional Panel Plots and Specs



WISP24018PTNF Elevation Cut



WISP24018PTNF Azimuth Cut

<b>18dBi Directional Panel Specifications</b>					
<b>Pole Size</b>		1" (25)	to	2.88" (73)	In (mm)
<b>Weight</b>		3.9(1.76)			Lbs. (kg)
<b>Dimension (W x L)</b>		15.1 x 13.9 x 1.9 (384x353x48)			In (mm)
<b>Wind Load</b>		85			@100MPH
<b>Frequency Range</b>		2300-2500			MHz
<b>3 deg beam width</b>		19 vertical, 18 horizontal			deg
<b>Front to Back</b>		25			dB
<b>VSWR</b>		1.6:1			
<b>Impedance</b>		50			ohms
<b>Input Power</b>		20			watts
<b>Operating Temperature</b>		-40 to +70			Deg C.
<b>Gain</b>		18			dBi
<b>Bracket Tilt</b>		45			Deg

Table 15: 18dBi Directional Panel Specifications

## 6.5.2 24dBi High-Gain Parabolic Grid Plots and Specs

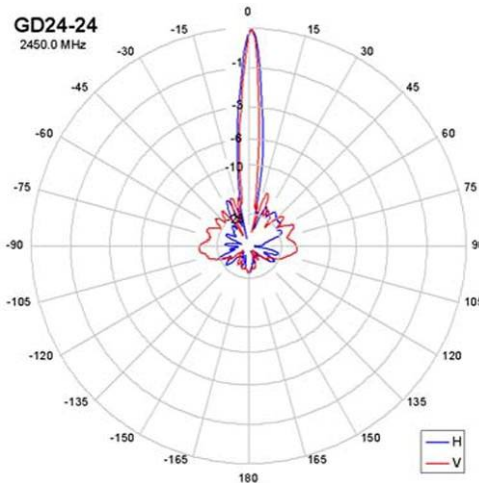


Figure 17: 24dBi Forward plot

<b>24dBi High-Gain Parabolic Grid Antenna Specifications</b>					
<b>Pole Size</b>		1" (25)	to	2" (50)	In (mm)
<b>Weight</b>		11 (5)			Lbs. (kg)
<b>Dimension (W x L)</b>		28.5 x 36" (724 x 914 )			In (mm)
<b>Wind Load</b>		41			@100MPH
<b>Frequency Range</b>		2400-2485			MHz
<b>3 deg beam width</b>		8 vertical, 10 horizontal			deg
<b>Front to Back</b>		25			dB
<b>VSWR</b>		1.5:1			
<b>Impedance</b>		50			ohms
<b>Input Power</b>		100			watts
<b>Operating Temperature</b>		-40 to +70			Deg C.
<b>Gain</b>		24			dBi
<b>Bracket Tilt</b>		25			Deg

Table 16: 24dBi High-Gain Parabolic Grid Antenna Specifications

## 6.6 Warranty

### Limited Warranty, USA

Carlson Wireless Technologies Inc. (CWT) or Carlson Wireless USA, collectively referred to as "Carlson"), will repair this product with new or rebuilt parts, free of charge, in the USA or Puerto Rico for one (1) year from the date of original purchase in the event of a defect in material or workmanship. Mail-in service in the USA can be obtained during the warranty period from a Carlson Factory Service center by calling +1.707.923.3000 or online by visiting [http://carlsonwireless.com/service/rma\\_request.php](http://carlsonwireless.com/service/rma_request.php) for an RMA (Return Materials Authorization) number. After receiving your RMA confirmation via telephone or email, ship your product adequately packed, postage paid and insured to the address provided. This warranty extends to the original purchaser only. A purchase receipt or other proof of the date of original purchase will be required before warranty services are rendered. This warranty only covers failures due to defects in materials or workmanship which occur during normal use. It does not cover damages incurred in shipment or failures caused by products not supplied by Carlson. It also does not cover failures which result from accident, misuse, abuse, neglect, mishandling, misapplication, alteration, modification, lightning, power line surge, introduction of sand, dust, humidity and/or liquids, or service by anyone other than a Carlson Factory Service Center or authorized Carlson Service Center, or damage that is attributable to acts of God.

### Limits and Exclusions

There are no express warranties except as listed above.

CARLSON SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THIS PRODUCT OR ARISING OUT OF ANY BREACH OF THIS WARRANTY. ALL EXPRESS AND IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE APPLICABLE WARRANTY PERIOD SET FORTH ABOVE.

Some states do not allow the exclusion or limitation of incidental or consequential damages or limitations on how long an implied warranty lasts, so the above exclusions or limitations may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state. If a problem with this product develops during or after the warranty period you may contact your dealer or Service center.

## 6.7 Acronyms/Abbreviations

<b>ANSI</b> .....	American National Standards Institute
<b>async</b> .....	asynchronous
<b>CCITT</b> .....	<b>Comité Consultatif International Téléphonique et Télégraphique</b>
<b>CD</b> .....	carrier detect
<b>CPE</b> .....	customer premise equipment
<b>CS</b> .....	clear to send
<b>CSU</b> .....	channel service unit
<b>CTS</b> .....	clear to send
<b>CO</b> .....	central office
<b>dB</b> .....	decibel
<b>DCE</b> .....	data communications equipment
<b>DDS</b> .....	digital data service
<b>DSR</b> .....	data set ready
<b>DSU</b> .....	data service unit
<b>DTE</b> .....	data terminal equipment
<b>DTR</b> .....	data terminal ready
<b>EA</b> .....	extended address
<b>FR</b> .....	frame relay
<b>FSU</b> .....	frame relay service unit
<b>GUI</b> .....	graphical user interface
<b>HDLC</b> .....	high-speed data link control
<b>IP</b> .....	internet protocol
<b>ISDN</b> .....	integrated services digital network
<b>ITU</b> .....	International Telecommunications Union
<b>kbps</b> .....	kilobits per second
<b>LAN</b> .....	local area network
<b>LED</b> .....	light emitting diode
<b>MIB</b> .....	management information base
<b>ms</b> .....	millisecond
<b>PPP</b> .....	point-to-point protocol
<b>RD</b> .....	receive data
<b>RDL</b> .....	remote digital loop-back
<b>RFC</b> .....	request for comments
<b>RIP</b> .....	routing information protocol
<b>RMA</b> .....	return material authorization
<b>RR</b> .....	receiver ready
<b>RTS</b> .....	request to send
<b>Rx</b> .....	receive
<b>SDLC</b> .....	synchronous data link control
<b>SNA</b> .....	systems network architecture
<b>SNMP</b> .....	simple network management protocol
<b>SW56</b> .....	switched 56
<b>sync</b> .....	synchronous
<b>TD</b> .....	transmit data
<b>TR</b> .....	data terminal ready
<b>Tx</b> .....	transmit
<b>UNI</b> .....	user-to-network interface
<b>WAN</b> .....	wide area network

## 6.8 Glossary

### **ANSI**

Acronym for American National Standards Institute. Devises and proposes recommendations for international communications standards.

### **asynchronous**

A method of data transmission which allows characters, that are preceded by a start bit and are followed by a stop bit, to be sent at irregular intervals.

### **bandwidth**

A range within a band of frequencies or an amount of data that can be transmitted in a preset amount of time. The bandwidth determines the rate at which information can be sent.

### **bridge**

A connectivity advice that operates at the OSI Data Link Layer and filters and forwards packets by physical addresses. See also router.

### **CD**

Acronym for Carrier Detect. It is a signal generated by a modem or DSU/CSU and indicates the presence of a carrier signal on a communications link.

### **CSU**

Acronym for Channel Service Unit. A device used to connect a digital phone line from the phone company to a multiplexer, channel bank, or directly to another device producing a digital signal. A CSU performs line-conditioning and equalization functions, responds to loop-back commands sent from the central office, regenerates digital signals and monitors them for problems, and provides a way of testing a digital circuit.

### **CLASS features**

Acronym for Custom Local Area Signaling Services. Consists of number-translation services, such as call-forwarding and caller identification.

### **clock**

Is an oscillator-generated signal that provides a timing reference and generates periodic signals for the timing of certain functions in a transmission link.

### **CPE**

Acronym for Customer Premise Equipment. It includes all telecommunications terminal equipment located on the customer premises, including telephone sets, PBXs, data terminals, and customer-owned coin-operated telephones.

### **CTS**

Acronym for Clear To Send. A signal on the DTE interface indicating that the DCE is clear to send data.

### **dB**

Is an abbreviation for decibel, a logarithmic unit used to measure sound level or signal strength.

### **DCE**

Acronym for Data Communications Equipment. A device that provides all the functions required for connection to telephone company lines and for converting signals between telephone lines and DTE. Also see DTE.

### **DSR**

Acronym for Data Set Ready. It is a signal on the EIA-232 interface that indicates a connection and readiness to start handshaking control signals for communication to begin.

### **DSU**

Acronym for Data Service Unit. A hardware component needed to transmit digital data over a hardware channel. It converts signals from bridges, routers, and multiplexers into the bipolar digital signals used on the telephone company digital lines and ensures that voltage levels are correct.

### **DSU loop back**

Is a Telco initiated test which loops the DSU back to the Telco and is used to test the DDS circuit as well as the DSU/CSU.

### **DTE**

Acronym for Data Terminal Equipment. It is the end-user terminal or computer that plugs into the termination point (DCE) of a communications circuit.

**gateway**

Is a device which enables information to be exchanged between two dissimilar systems or networks.

**HDLC**

Acronym for High Level Data Link Control. It is a generic link-level communications protocol developed by ISO, that manages synchronous code-transparent serial information transfer over a link connection. See also SDLC.

**host computer**

The primary or controlling computer in a multiple computer operation.

**in-band signaling**

is signaling over the same channel used for data.

**IP**

Acronym for Internet Protocol. It provides for transmitting blocks of data between hosts identified by fixed-length addresses.

**ISDN**

Acronym for Integrated Services Digital Network. It is a network architecture that enables end-to-end digital connections. It supports diverse services through integrated access arrangements and defines a limited set of standard, multipurpose interfaces for equipment vendors, network providers, and customers.

**LAN**

Acronym for Local Area Network. A privately owned network that offers high-speed communications channels connecting information processing equipment in a limited geographic area.

**MIB**

Acronym for Management Information Base. It is a database of network management information used by SNMP.

**multi-point**

Is a configuration or topology designed to transmit data between a central site and a number of remote terminals on the same circuit. Individual terminals are not able to send data to each other.

**out-of-band signaling**

Is signaling that is separated from the channel carrying information (voice, data, video, etc.) by a filter.

**packet**

Is a bundle of data that contains both control information and the data itself. The control information is used for routing the packet through a network to its final destination.

**packet-switching network**

Is a telecommunications network based on packet-switching technology, wherein a transmission channel is occupied only for the duration of the transmission of the packet.

**parameter**

Is a numerical code that controls an aspect of terminal and/or network operation. Parameters control page size, data transmission speed, and timing options.

**ping**

Is an internet protocol standard that provides loop-back on demand for any device in an IP network. One device "pings" another by sending a loop-back request to the device's IP address.

**point-to-point**

Is a type of communications link that connects a single device to another single device, such as a Base unit to a CPE unit.

**remote configuration**

A feature that allows the CPE unit to be configured from the Base unit or VT-100 compatible terminal.

**router**

Is a device that supports LAN-to-LAN communications. IT reads logical addressing information and directs data across a network to its destination. See also bridge.

**SNMP**

Acronym for Simple Network Management Protocol. It is a control and reporting scheme widely used to manage devices from different vendors and operates on top of the Internet protocol.

**switched network**

Is a network of dial-up telephone lines that uses circuit switching to provide communications services to network users.

**synchronous**

A method of data transmission in which timing information is sent along with the transmitted data.

Synchronous communication is achieved when timing shares a single clock.

**SDLC**

Acronym for synchronous data link control. A link-level communications protocol that manages synchronous, code-transparent, serial information transfer over a link connection.

**TELNET**

The standard TCP/IP remote login protocol

**VT-100**

A non-intelligent terminal or terminal emulation mode used for asynchronous communications.

Rev. 1.04 Manual corrections –

Setting the Radio Frequency and Scrambling Code