

User Guide

Universal GPS and Time Code Processor

Model RTG-510

P/N 030000001

Revision B

December 2013

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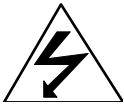
| Revision | Date | Comments |
|----------|----------|-----------------------------|
| A | 12-20-12 | Initial Release |
| B | 12-16-13 | Fixed rear panel connectors |
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Safety Warnings



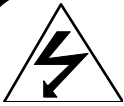
WARNING:

This unit contains lethal AC voltages. Disconnect the unit from the AC supply before removing the cover.



WARNING:

This unit contains dual power supplies. Isolate BOTH power supplied from AC Power before removing the top cover.



WARNING:

The lightning flash with an arrowhead inside of an equilateral triangle is intended to alert the user to the presence of un-insulated “dangerous voltage” within the product’s enclosure. The “dangerous voltage” may be of sufficient magnitude to constitute a risk of electrical shock to people. Do not attempt to repair the unit without first unplugging it.



CAUTION:

The exclamation point inside of an equilateral triangle is intended to alert the user to the presence of important operation and maintenance instructions in the user guide. This unit should only be repaired by qualified personnel. Several board assemblies contain static sensitive devices. Appropriate procedures must be used when handling these board assemblies.

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1 Introduction

Brandywine's RTG-510 has been designed for customers in need of the latest technology and precision time to upgrade their current systems with a universal GPS time code processor able to output multiple time codes simultaneously. The RTG-510 is a master clock that will synchronize to almost any timing input, (GPS, IRIG A, B, E, G, H, Have Quick, NASA36, and 1PPS), and simultaneously will output IRIG A, B, E, G, Have Quick, 1PPS, and dual NTP to your system. This versatile unit includes a 12 channel GPS receiver with a large 9-digit time display, a built-in web browser for easy use, and has dual redundant power supplies for reliability. Built with either: TCXO, OCXO (std) or rubidium oscillators, the RTG-510 has the ability to track incoming time code over +/- 200ppm to allow time code conversion from legacy tape playback systems.

Brandywine has created an intuitive, easy to use web browser interface allows simple setup of the RTG510 from any network connected computer, tablet or smart phone.

Features

Universal GPS , IRIG A, B, E, G, NASA36, Have Quick inputs

12 channel GPS receiver

20 programmable outputs for time codes and pulse rates

Output codes include NTP, IRIG A, B, E, G, NASA36, Have Quick, 1PPS

Electrical and Optical time code input/output

Dual Independent Ethernet ports with integrated web server control

High Stability Oven Controlled Oscillator Standard

9-Digit Time Display

Redundant Hot Swap Power Supplies

1U 19" rack mount



Figure 1 - RTG 510

2 Specifications

Inputs

Input synchronization source selectable from:
 GPS
 12 Channel C/A Code L1
 Antenna and 100ft cable included
 Antenna Connector BNC

Time Code
 Time Code Types
 Optical Intensity Modulated (AM and DCLS)
 Electrical Amplitude Modulated
 DC Level Shift

Time Code Formats (x= User Selectable)
 IRIG A00x, A13x
 IRIG B02x, B12x, CF per IEEE-1344
 IRIG E00x, E11x
 IRIG G00x, G14x
 NASA 36
 Have Quick

Time Code Characteristics
 Electrical
 Modulated
 Amplitude: $0.2V_{pp} - 8V_{pp}$
 Input Impedance: 50Ω, 600Ω s/w
 Selectable
 DC Level Shift (single ended)
 Amplitude: 0-5V
 Connector BNC
 DC Level Shift (Differential)
 RS422
 Connector DB9-F

Optical
 Wavelength 850nm
 ST connector 62.5/125μm multimode
 Frequency range: +/- 200ppm (for tape playback)

Manual setting
 1PPS sync with manual time of year entry
 1PPS input characteristics
 Single Ended
 Amplitude: 0-10Vp-p /50Ω
 Connector: BNC
 Differential
 RS422 compliant
 Connector: DB9-F

Countdown option
 Run/Hold/Stop inputs

Internal Oscillators supported

TCXO (opt)
 1ppm 0-50 deg/5x10⁷/year aging
 High Stability OCXO (std)
 2x10⁻³ 0-50 deg/1x10⁻¹⁰/day aging
 Rubidium (opt)
 5x10⁻¹⁰ 0-50 deg/5x10⁻¹¹/mo aging

Accuracy (std HSOCXO)
 Time Accuracy GPS <30ns
 Modulated Time Code <5us
 DCLS time code <1us
 Ext 1PPS <30ns

Holdover <1us/hr

Outputs

1PPS
 No of outputs: 2
 Amplitude: 2.5V or 5V into 50Ω, via link
 Pulse width: 1μs -500ms s/w settable
 Connector BNC

Have Quick time code
 No of outputs: 2
 Amplitude: 2.5V or 5V into 50Ω, via link
 Format HQII per ICD-GPS-060A/STANAG4430
 Connector BNC

Time code output
 Outputs: 20 outputs total
 Output Types
 4ea single ended modulated
 5ea DC Level Shift or Pulse s/w settable

5ea Differential DCLS or pulse @ RS422 levels
 (opt) 4ea Optical

Output Characteristics

Electrical
 Connector: BNC
 Modulated
 Amplitude: 3vp-p
 Modulation Ratio: 10:3
 DCLS/Pulse Rate
 Connector DB-15
 Single ended: Amplitude 2.5V and 5V into 50Ω
 Differential: RS422
 (Opt) Optical follows electrical port selection
 Intensity Modulated AC code
 Intensity Modulated DCLS code

Time Code Formats available
 IRIG A002, A006, A007, A132, A133, A134
 IRIG B002, B006, B007, B122, B123, B124
 IRIG E002, E006, E007, E122, E126, E127
 IRIG G002, G006, G14, G142, G144
 IRIG H001, H111
 NASA 36
 (Opt) 54 bit Parallel BCD
 Days through microseconds, strobe(3)
 Connector: HD62-F

Network Interface
 Type: 10/100 BaseT Ethernet
 No of Outputs: 2
 Protocols Supported: HTTP, NTP, SNMP

Power Supplies

Single or Dual (std) Hot Swappable Power Supplies
 AC supply: 85-264 VAC (50/60 Hz) 40 W ea
 Connector:
 IEC 320 (std)
 MS3102A-10SL-3P (opt)
 DC supply: -48 VDC
 Connector:
 MS3102A-10SL-2P (std)

Terminal Block (opt)

Control and Display Functions

Display
 Front Panel display of DDD:HH:MM:SS (LED colons indicate reference lock status)
 Power LED (2)
 Fault LED
 Holdover LED

Brightness Control s/w control

Physical

Size: 19" rack-mount 1U high (1.75"), 9" deep
 Weight: 5 lbs nominal

Environmental Conditions

Temperature

Operating -20 to +50C
 Storage -55 to +85C

Humidity

Up to 95% RH (non-condensing)

Altitude

20,000 ft

EMC

FCC Part 15
 EN55022
 EN5502

3 Rear Panel Connections

| CONNECTOR REFERENCE | CONNECTOR TYPE | CONNECTOR PIN | SIGNAL |
|------------------------------|---------------------|---------------|---|
| J1 GPS ANTENNA | BNC FEMALE | CENTER | ANTENNA |
| | | SHIELD | GROUND |
| J2 1PPS INPUT | BNC FEMALE | CENTER | 1PPS |
| | | SHIELD | GROUND |
| J3 TIME CODE IN | BNC FEMALE | CENTER | MODULATED IRIG TIME CODE |
| | | SHIELD | GROUND |
| J4 TIME CODE IN | ST | INPUT | MODULATED IRIG TIME CODE |
| J5 IRIG OUT | BNC FEMALE | CENTER | MODULATED IRIG TIME CODE |
| | | SHIELD | GROUND |
| J6 IRIG OUT | ST | OUTPUT | MODULATED IRIG TIME CODE |
| J7 IRIG OUT | BNC FEMALE | CENTER | MODULATED IRIG TIME CODE |
| | | SHIELD | GROUND |
| J8 IRIG OUT | ST | OUTPUT | MODULATED IRIG TIME CODE |
| J9 IRIG OUT | BNC FEMALE | CENTER | MODULATED IRIG TIME CODE |
| | | SHIELD | GROUND |
| J10 IRIG OUT | ST | OUTPUT | MODULATED IRIG TIME CODE |
| J11 IRIG OUT | BNC FEMALE | CENTER | MODULATED IRIG TIME CODE |
| | | SHIELD | GROUND |
| J12 IRIG OUT | ST | OUTPUT | MODULATED IRIG TIME CODE |
| J13 1PPS OUTPUT 1 | BNC FEMALE | CENTER | 1 PPS |
| | | | GROUND |
| J14 1PPS OUTPUT 2 | BNC FEMALE | CENTER | 1 PPS |
| | | SHIELD | GROUND |
| J15 HAVE QUICK OUT 1 | BNC FEMALE | CENTER | HAVE QUICK II TIME CODE per ICD-GPS-060 |
| | | SHIELD | GROUND |
| J16 HAVE QUICK OUT 2 | BNC FEMALE | CENTER | HAVE QUICK II TIME CODE per ICD-GPS-060 |
| | | SHIELD | GROUND |
| J17 DIGITAL IN / ALARM | DB-9 FEMALE | 1 | 1PPS IN + |
| | | 2 | 1PPS IN- |
| | | 3 | DCTC/HQ IN+ |
| | | 4 | DCTC/HQ IN- |
| | | 5 | ALARM OUT N.C. |
| | | 6 | GROUND |
| | | 7 | ALARM OUT COM |
| | | 8 | ALARM OUT N.O. |
| | | 9 | ALARM OUT COMMON |
| J18 CONSOLE | DB-9 MALE | 1 | - |
| | | 2 | RXD |
| | | 3 | TXD |
| | | 4 | - |
| | | 5 | GROUND |
| | | 6 | - |
| | | 7 | - |
| | | 8 | - |
| | | 9 | - |
| J19 DIGITAL OUT DIFFERENTIAL | 15 WAY D-SUB FEMALE | 1 | DIFF OUT 1+ |
| | | 2 | DIFF OUT 1- |
| | | 3 | DIFF OUT 2+ |
| | | 4 | DIFF OUT 2- |
| | | 5 | DIFF OUT 3+ |
| | | 6 | DIFF OUT 3- |
| | | 7 | DIFF OUT 4+ |
| | | 8 | DIFF OUT 4- |
| | | 9 | DIFF OUT 5+ |

| CONNECTOR REFERENCE | CONNECTOR TYPE | CONNECTOR PIN | SIGNAL |
|------------------------------|---------------------|---------------|------------------|
| | | 10 | DIFF OUT 5- |
| | | 11 | GROUND |
| | | 12 | INPUT RUN |
| | | 13 | GROUND |
| | | 14 | INPUT STOP |
| | | 15 | INPUT HOLD |
| J20 DIGITAL OUT SINGLE ENDED | 15-WAY D-SUB FEMALE | 1 | S/E OUT 6 (10V) |
| | | 2 | S/E OUT 6 (5V) |
| | | 3 | GROUND |
| | | 4 | S/E OUT 7 (10V) |
| | | 5 | S/E OUT 7 (5V) |
| | | 6 | GROUND |
| | | 7 | S/E OUT 8 (10V) |
| | | 8 | S/E OUT 8 (5V) |
| | | 9 | GROUND |
| | | 10 | S/E OUT 9 (10V) |
| | | 11 | S/E OUT 9 (5V) |
| | | 12 | GROUND |
| | | 13 | S/E OUT 10 (10V) |
| | | 14 | S/E OUT 10 (5V) |
| | | 15 | GROUND |
| J21 ETHERNET | RJ-45 | 1 | TX+ |
| | | 2 | TX- |
| | | 3 | RX+ |
| | | 4 | - |
| | | 5 | - |
| | | 6 | RX- |
| | | 7 | - |
| | | 8 | - |
| J22 ETHERNET | RJ-45 | 1 | TX+ |
| | | 2 | TX- |
| | | 3 | RX+ |
| | | 4 | - |
| | | 5 | - |
| | | 6 | RX- |
| | | 7 | - |
| | | 8 | - |
| J23 POWER | MS3102A-10SL-3P | A | NEUTRAL |
| | | B | GROUND |
| | | C | LINE |
| J24 POWER | MS3102A-10SL-3P | A | NEUTRAL |
| | | B | GROUND |
| | | C | LINE |

Table 1 - RTG-510 Rear Panel Connections

4 Unpacking and Installation

4.1 Unpacking

Remove the RTG-510 from the shipping carton. The following items should be included in the shipment:

- 1 RTG-510
- 1 GPS antenna
- 1x 100 feet of coaxial antenna cable
- 1 user guide (CD-ROM)

4.2 Installation

4.2.1 Mounting

The RTG-510 can be installed into a 19" rack mount cabinet either using rack slides or only using the front panel flanges. For static applications, the short depth and light weight of the RTG-510 ensures that the front panel is not stressed when only the front panel is used for support.

If the RTG-510 is installed on a mobile platform and must survive shock and vibration, the use of slides is required. Slides are installed using 10-32 UNF-2B hardware.

Optional Rack Mount Slides:

- P/N 002000123, SLIDE, RACK, 24", 21" TRAVEL, 85 LB
- P/N 002000150, SLIDE, RACK, 28", 27" TRAVEL, 80 LB

Original Manufacturer: General Devices Chassis Trak Type C300.

4.2.2 Power

Insert the power cord of the RTG-510 into an electrical socket to power up the unit. The Power LED indicator will illuminate green.

If dual redundant power is required, connect both power sources to independent power sources

4.2.3 Ethernet

Connect one end of an Ethernet patch cable to the RTG-510 Ethernet port J21 or J22. Connect the other end of the Ethernet cable to your network with an Ethernet hub or switch.

4.2.4 Input Reference Connections

4.2.4.1 GPS Antenna

Connect the GPS antenna to the J1 Antenna BNC connector on the rear panel of the unit. The GPS antenna must be located in a suitable location with a clear view of the sky. In most cases, the GPS signals do not penetrate buildings. Use the cable provided in the shipment to connect the GPS antenna and RTG-510. In the event that a longer cable is required, a low loss cable must be used so that the total signal attenuation at 1575 MHz is < 20 dB. For more information on suitable cables contact Brandywine Communications.

- Location

Several factors need to be considered when installing the GPS antenna. In most cases, the antenna is mounted externally (outdoor) and exposed to the elements. A good quality coaxial cable of 50 ohm impedance is required to connect the GPS antenna to the RTG-510. The cable provides two functions, which are to conduct the GPS RF signals (1575.42 MHz) that are received from the GPS antenna to the RTG-510 and to conduct the DC bias voltage (5 VDC) provided by the RTG-510 to the LNA (low noise amplifier) contained inside of the GPS antenna. The antenna should be mounted securely, with a clear view of the sky, and with the top of the antenna pointing upward. In some installations it may not be possible to mount the antenna such that the antenna has a clear 360 degree view of the sky. In such cases pick the location with the best view of the sky.

- Exposure to High RF Fields

Some installations may occur in locations where a variety of high power transmitters and antennas are located. The GPS antenna should not be directly exposed to or bombarded with high level RF energy. In such cases, the antenna should be located either above, below, or to the side of these high power RF transmission antennas.

- Lightning Protection

The RTG-510 does not provide any inherent protection against lightning strikes. In general, lightning protection (when desired or needed) is provided by an externally mounted protection device that is designed to shunt the high voltage transient to a well established earth ground. Lightning arresting devices designed for use with the GPS antenna system are available at Brandywine Communications (P/N 001000914).

- RF Loss

The most important source of signal loss is the RF signal attenuation experienced in the cable. The amount of attenuation is related to the type (quality) of coaxial cable and cable length. The antenna provides about 30 dB of gain to the received GPS signal. The purpose of this gain is to offset the loss that is experienced in the cable between the GPS antenna and RTG-510. It is recommended that the overall antenna system gain (antenna gain - cable loss) be between 10 dB - 33 dB. Using an antenna with 30 dB of gain allows for about 20 dB of cable loss. The RTG-510 is shipped with 100' of Belden 8240 antenna cable with a cable loss of approximately 18 dB. For distances beyond 100', Brandywine recommends low loss Belden 9914 with a loss of 5.84 dB/100ft

Standard antenna cable using this configuration is available from Brandywine as shown in Table 2.

For distances beyond 330', an in-line amplifier is required.

- Tempest Facilities/Extremely Long Cable Runs

For applications where no conductive penetration of EMC shielding can be tolerated or for extremely long cable runs, Brandywine Communications offers a remotely powered fiber optic antenna link. This comprises two external units. The remote down-converter and fiber unit is connected to the antenna and it converts the GPS RF signal to an optic signal at lower frequencies that is suitable for transmissions over a fiber optic cable. The local fiber and up-converter unit accepts the optical signal and converts it back into an electrical RF signal that is processed by the RTG-510.

| PART NUMBER | CABLE LENGTH | CABLE TYPE |
|-------------|---|------------------------|
| 002-0037 | 100 feet | RG58 (supplied) |
| 002-0040 | 150 feet | RG8 |
| 002-0052 | 250 feet | RG8 |
| 002-0039 | 330 feet | RG8 |
| 051000001 | In-line amplifier 20 dB | TNC/TNC connectors |
| 002-0065 | Fiber optic cable converter up to 1500 meters | Multi-mode fiber optic |

Table 2 - RTG-510 Antenna Cable options

4.2.4.2 External GPS Receiver (Have Quick/1PPS)

The RTG-510 can also be synchronized to an external GPS receiver such as the AN/PSN-13 Defense Advanced GPS Receiver (DAGR), or AN/PSN-11 PLGR. Both of these receivers incorporate a 1PPS Time Mark and Have Quick time code output that are used by the RTG-510 as references. Both signals are required for automatic operation. The RTG-510 requires that the TFOM is ≤ 4 before it will accept the time.

The cable connections to the RTG-510 are shown in Table 1 - RTG-510 Rear Panel Connections.

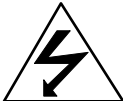
4.2.4.3 External 1PPS Receiver

The RTG-510 can also be synchronized to an external receiver that incorporates a 1PPS Time Mark only as a reference. An accurate manual time entry is necessary in this case.

5 Getting Started

5.1 Powering up the RTG-510

The RTG-510 contains dual redundant power supplies, allowing for continuous operation in the event that one fails. Connect the included power cords to port J34 and J24 of the unit. Flip the power switches, (S1 and S2) on the rear of the unit to the "ON" position.



WARNING:

The RTG-510 contains dual power supplies and dual power sources. Ensure BOTH supplies are powered off and isolated before servicing.

5.2 Connecting a GPS antenna.

Connect the GPS antenna to the antenna port J1. The antenna should be positioned and installed according to the installation guide located in section 4.2.4.1.

5.3 Connecting the RTG-510 to the network.

Connect an Ethernet connector from your local area network to port J21 or J22. During the device's power up sequence, the front panel display will flash the device's IP address.

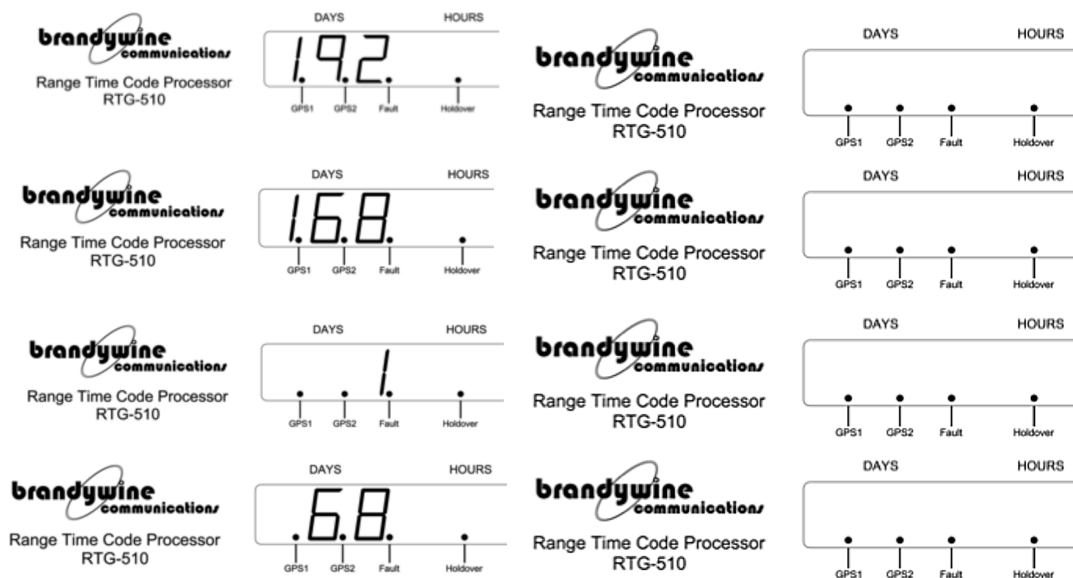


Figure 2 - RTG-510 startup sequence showing device IP address of 192.168.1.68

5.3.1 GPS Operation

When GPS is selected as reference, ensure that a GPS antenna is connected to the unit.

It typically takes approximately five to six minutes for the RTG-510 to complete its Rubidium warm-up cycle, acquire satellites and start displaying valid time. Until it does, the RTG-510 will display a simple count value starting from 00:00 on Jan. 1 2000. In a cold start scenario, where the unit has been powered down for longer than 24 hours or has been moved more than 60 miles since last use, it may take as long as 15 minutes to acquire satellites and start displaying valid time.

A number of GPS parameters can be tracked on the Status page of the web-browser interface. Select the Status tab at the top of the browser. The number of satellites tracked as well as the position data from the GPS can be viewed.

5.4 Accessing the RTG-510's Network Interface

Enter the IP address shown by the RTG-510 into a web browser window on your PC, Smartphone or Tablet. You should be greeted with the web page interface of the RTG-510.

5.5 Accessing Functions on the RTG-510

To access different functions of the RTG-510 management web page, select the button labeled "MENU" in the top left hand corner of the web page.

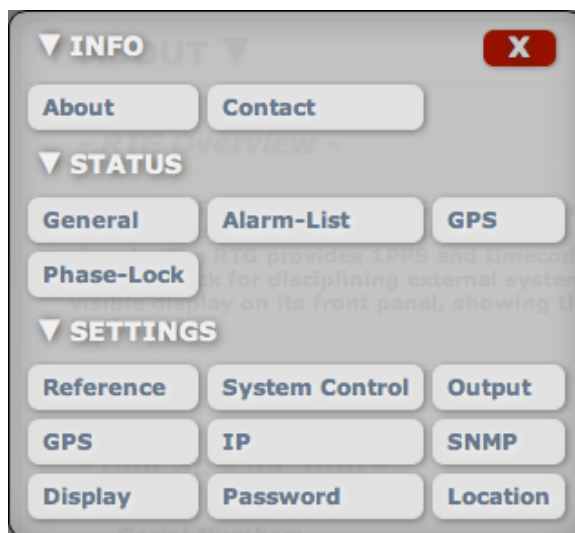
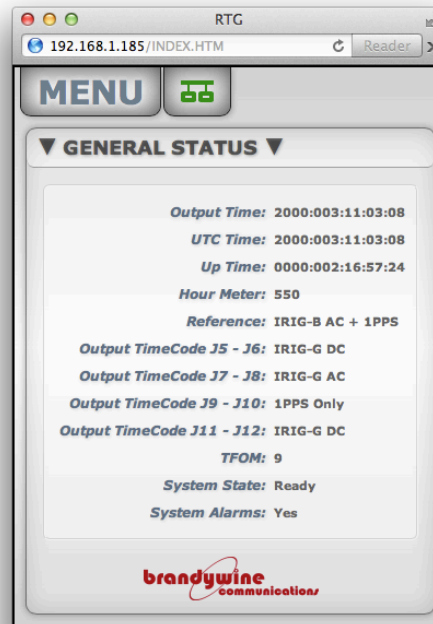


Figure 3 - RTG-510 Main Menu

5.5.1 Viewing the Current Status of the RTG-510 system

From the “MENU” button, select “General” from the status menu. This shows information such as the current output time, UTC time, up time, the current input reference, the current output format, current system state, alarm status, battery status, and current internal temperature.

Figure 4 - RTG-510 Status Page



Output Time: The current time of day being displayed or being output by the RTG-510

UTC Time: The current time of day from the GPS constellation in Universal Time Coordinate (UTC)

Up Time: The length of time that the RTG-510 has been powered on

Hour Meter: This is the accumulated number of operating hours since the RTG-510 was first built.

Reference: The current reference input being used by the RTG-510

Output TimeCode: The current timecode format in use by the RTG-510's outputs

TFOM: Time Figure Of Merit – the difference between the unit's time and the reference input. A 1 means the unit is accurate to within 1ns, a 2 means the unit is accurate to within 10ns, a 3 means 100ns, etc

System state: The current mode of the RTG-510's internal clock

Possible Modes:

Holdover: The system is using the internal oscillator as a reference, and is counting from the last time it synchronized to an external reference

Lock: The system is locked to an external reference source such as GPS or IRIG, and is displaying or outputting that time.

System Alarms: If the system is currently displaying any alarms

5.5.2 Viewing the current list of alarms

Select "Alarm-List" from the status menu, this will display a list of the current system alarms

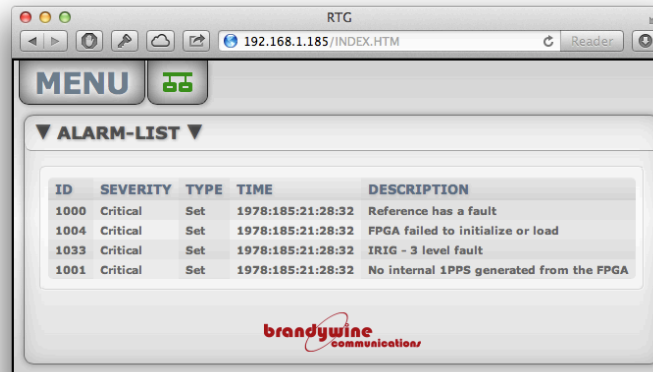


Figure 5 - Alarm List

The possible alarms that the RTG-510 can have are as follows:

- "No internal 1PPS generated from the FPGA"
- "Serial FLASH failed"
- "Serial EEPROM memory failed"
- "FPGA failed to initialize or load"
- "Oscillator (rubidium) is showing unlocked"
- "Reference has a fault."
- "FPGA Failed to initialize or load"
- "IRIG – 3 level fault"

5.5.3 View the current GPS status

If the unit is connected to a GPS antenna, and is using a GPS reference as an input source, select “GPS” from the status section of the main menu. This will display a webpage showing the current GPS status, including Latitude, Longitude, Altitude, Heading and Speed. This page also displays an interactive 3D map of the current GPS constellation visible to the connected GPS antenna. (See Figure 6 - Current GPS Status)

5.5.3.1 Navigating the interactive GPS status page

To navigate the interactive map of the GPS constellation, click and drag the map to reposition the map hemisphere, using the left and right motion of your pointer to adjust the orientation of the map, and the up and down motion of your pointer to adjust the angle of the map.

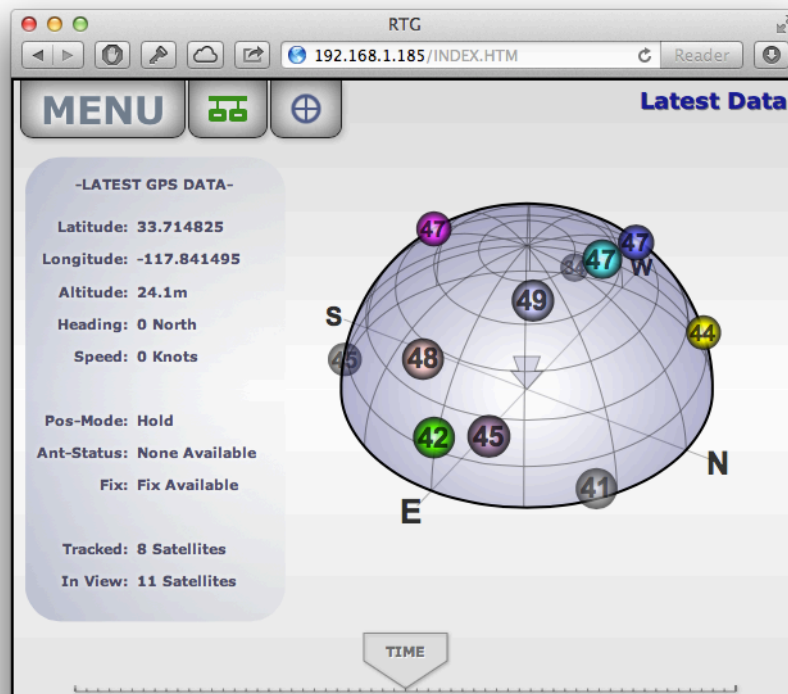


Figure 6 - Current GPS Status



Figure 7 - Target Button.

The number in each satellite indicator represents the signal strength on a scale of 1-50. Selecting a satellite will show the satellite details (PRN, Elevation, Azimuth). Select the target button to reset the satellite view.

5.5.4 Viewing the Current Phase Lock Status

From the “MENU” button, select “Phase-Lock” from the status section, this will display an interactive graph showing the current Tuning Value and both Raw Phase and Filtered Phase.

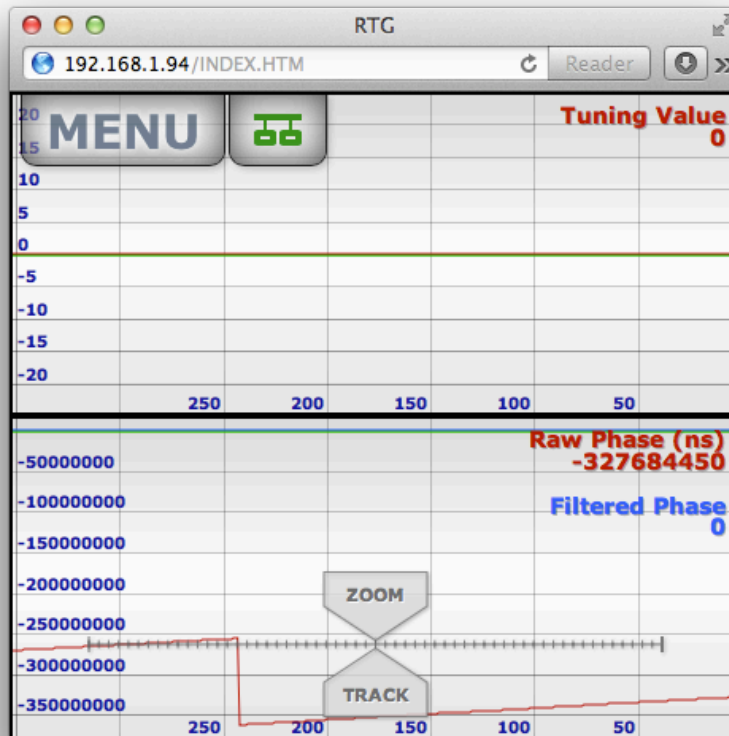


Figure 8 - RTG-510 Phase Status Page

The Raw Phase shows the difference between the reference and the RTG-510 timing. The filtered phase shows the value of the phase after passing through a software filtering algorithm to remove the pulse-to-pulse jitter typically found in a GPS receiver, the tuning value shows the control input to the RTG-510 Oscillator. The tuning value units are in parts in 10^{-12} .

6 Changing the Settings on the RTG-510

6.1 Selecting a Reference

From the menu, select “Reference” from the settings submenu. From the “Select Reference” dropdown menu, select your input source. For 1PPS-based reference sources, the time and date will have to be entered manually. See Figure 10 - Available Reference Sources for a list of the available reference sources that the RTG-510 can use.

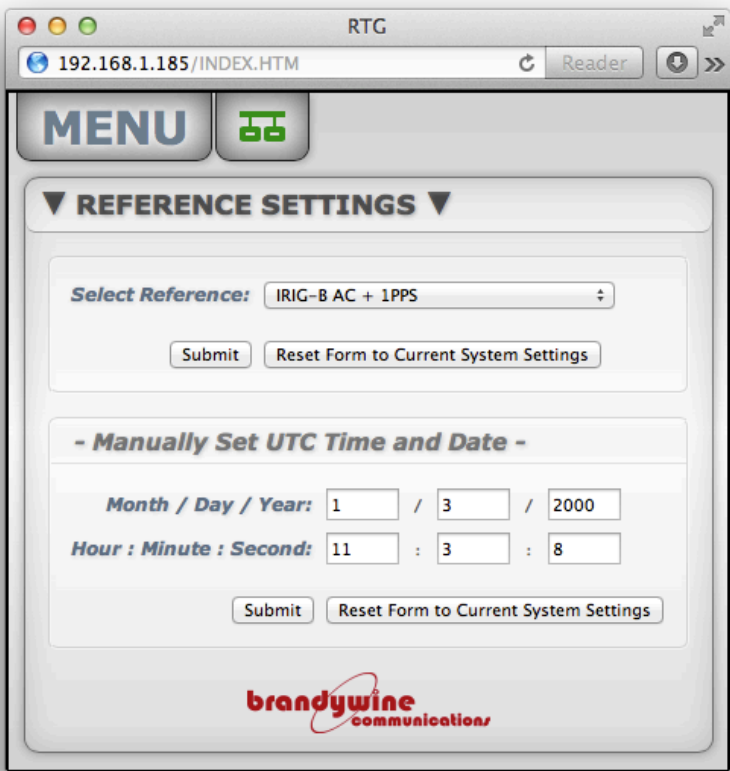


Figure 9 - RTG-510 Reference Settings

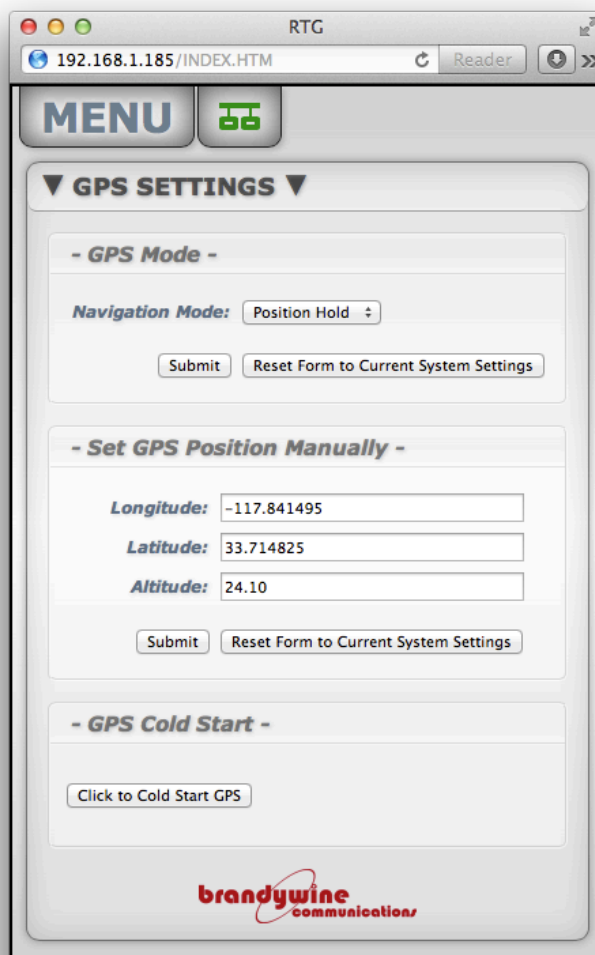
- Free-run
- GPS
- IRIG-A AC
- IRIG-B AC
- IRIG-E AC
- IRIG-G AC
- IRIG-A DC
- IRIG-B DC
- IRIG-E DC
- IRIG-G DC
- HaveQuick + 1PPS
- HaveQuick Differential + 1PPS
- IRIG-A AC + 1PPS
- IRIG-A AC Differential + 1PPS
- ✓ IRIG-B AC + 1PPS
- IRIG-B AC Differential + 1PPS
- IRIG-E AC + 1PPS
- IRIG-E AC Differential + 1PPS
- IRIG-G AC + 1PPS
- IRIG-G AC Differential + 1PPS
- NASA-36 + 1PPS
- NASA-36 Differential + 1PPS
- IRIG-A DC + 1PPS
- IRIG-A DC Differential + 1PPS
- IRIG-B DC + 1PPS
- IRIG-B DC Differential + 1PPS
- IRIG-E DC + 1PPS
- IRIG-E DC Differential + 1PPS
- IRIG-G DC + PPS
- IRIG-G DC Differential + 1PPS
- 1PPS Input
- 1PPS Differential Input
- IRIG-A AC Optical
- IRIG-B AC Optical
- IRIG-E AC Optical
- IRIG-G AC Optical
- IRIG-A AC + 1PPS Optical
- IRIG-A AC Differential + 1PPS Optical
- IRIG-B AC + 1PPS Optical
- IRIG-B AC Differential + 1PPS Optical
- IRIG-E AC + 1PPS Optical
- IRIG-E AC Differential + 1PPS Optical
- IRIG-G AC + 1PPS Optical
- IRIG-G AC Differential + 1PPS Optical

Figure 10 - Available Reference Sources

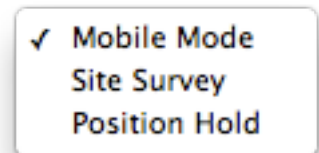
Note that time codes may be demodulated and the time epoch (1PPS) extracted from the code, or a separate 1PPS may be used for synchronizing, and the time code used only for time of year initialization.

6.2 Setting the GPS Mode

From the menu, select “GPS” from the settings submenu. From here, you can select your GPS Mode (see Figure 11 - Available GPS Modes), set your GPS position manually, or force a cold start of the GPS system.



The screenshot shows a web browser window titled "RTG" with the address bar displaying "192.168.1.185/INDEX.HTM". The page features a "MENU" button and a "GPS" icon. The "GPS SETTINGS" section is expanded, showing three main options: "GPS Mode", "Set GPS Position Manually", and "GPS Cold Start". The "GPS Mode" section includes a "Navigation Mode" dropdown set to "Position Hold" and buttons for "Submit" and "Reset Form to Current System Settings". The "Set GPS Position Manually" section has input fields for "Longitude" (-117.841495), "Latitude" (33.714825), and "Altitude" (24.10), along with "Submit" and "Reset Form to Current System Settings" buttons. The "GPS Cold Start" section has a "Click to Cold Start GPS" button. The Brandywine Communications logo is at the bottom.



A list of available GPS modes with a checkmark next to "Mobile Mode". The modes are: Mobile Mode, Site Survey, and Position Hold.

Figure 11 - Available GPS Modes

Figure 12 - GPS Settings Menu

6.2.1 GPS Modes

Mobile Mode: The unit will continuously update its recorded position in accordance to the GPS constellation, the internal GPS receiver will not perform any position averaging, and will continuously compute both position and time from all satellites in view. This mode requires a minimum of five satellites to be visible at all times.

This mode **MUST** be used for portable applications.

Site Survey: The GPS receiver is in the position fix mode while it averages a specified number of sample positions. Once the averaged value is determined, the receiver enters into position hold mode.

Only use this mode for **FIXED** antenna locations such as a rooftop antenna.

Position Hold: In this mode, the RTG-510 will begin to survey its location by collecting and averaging the position that it computes from the GPS satellites. The averaged position is then stored into the GPS receiver, and the receiver transitions to a timing mode, where the averaged position is assumed correct, and time is only calculated from all satellites in view. Erroneous satellite tracking data can be detected and removed from the over-determined timing solution using the receiver's built in Receiver Autonomous Integrity Monitoring (RAIM) function. In locations where the satellite visibility is poor, the RTG-510 can operate with as little as 1 satellite visible in this mode.

This mode gives the best results with a **FIXED** antenna.

6.2.1.1 Cold Start GPS

Forcing a cold start on the GPS deletes all the current GPS almanac and real-time clock data in the GPS receiver, and forces the GPS receiver to perform a sky-search to acquire GPS satellite signals. Completion of a cold start can take up to 60 minutes.

6.3 Adjusting the Output Settings

From the main menu, select “Output” from the settings submenu. This lets you change the Output timecode format, 1PPS settings, and change the time zone and daylight savings settings. Each output can be independently configured.

Figure 13 - RTG-510 Output Settings

Figure 14 - RTG-510 Output Options

6.3.1 Adjusting the Time Zone Offset

To adjust the Time zone offset, enter the number of hours EAST of UTC as a positive value, and the number of hours WEST of UTC as a negative value.

6.3.2 Adjusting 1PPS Output settings

The RTG-510's 1PPS output is adjustable in both width and phase.

The RTG-510 incorporates a unique feature that allows the 1PPS outputs to be offset from the main internal time base (which is synchronized to the reference). This feature may be used to compensate for propagation delay in the cables between the RTG-510 and the point of use.

A negative delay will ADVANCE the 1PPS relative to the reference.

A positive delay will RETARD the 1PPS relative to the reference.

Each individual 1PPS output can be delayed over a full second range (± 0.5 seconds) in 1ns steps, independent of the settings of the other outputs.

The Pulse width may be varied over the range of 10ns to 650 μ s in increments of 5ns. Enter the desired pulse width (in nanoseconds) in the box labeled Output 1PPS Width and click Submit. The pulse width setting applies to all 1PPS outputs.

Select the checkbox labeled "Output 1PPS Invert" to invert the 1PPS Output. Under normal settings, the 1PPS output provides 0V of current and increases to 5V for each pulse. Inverting it changes the 1PPS output to 5V and drops to 0V for the duration of the pulse.

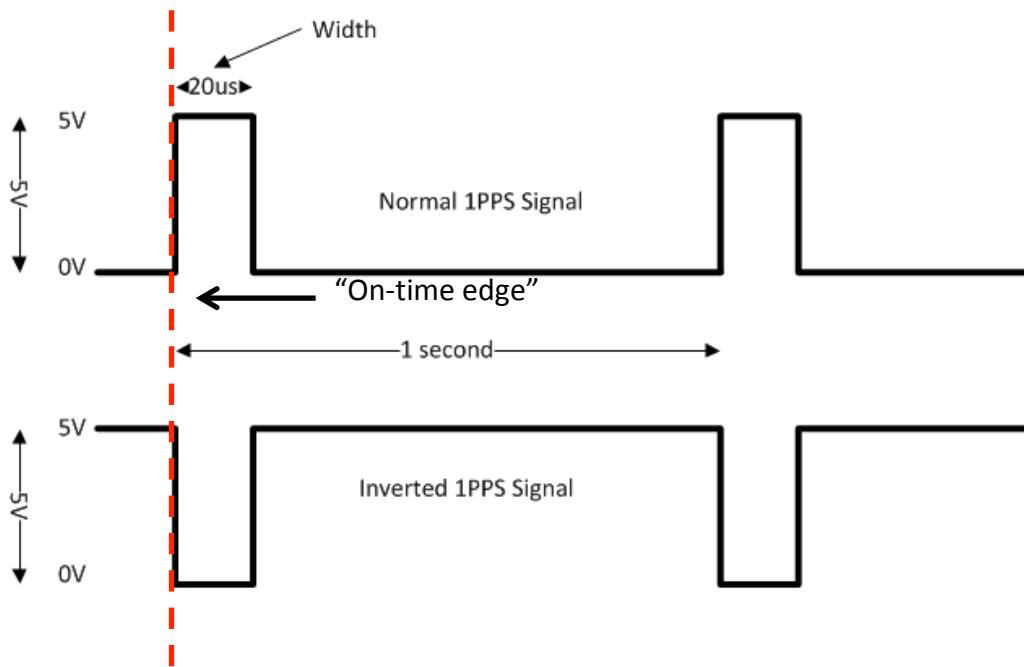


Figure 15 - 1PPS Signal, showing normal and inverted.

6.4 Changing the IP Address

From the main menu, select “IP” from the settings submenu. From here you can change the IP Address, Subnet Mask, and Gateway address of the unit. From here you can also enable DHCP, however this action is not recommended.

The image shows a web browser window displaying the RTG-150 IP Address Settings page. The browser's address bar shows the URL 192.168.1.185/INDEX.HTM. The page has a header with a 'MENU' button and a green icon. Below the header is a section titled 'IP SETTINGS' with a dropdown arrow. The settings are as follows:

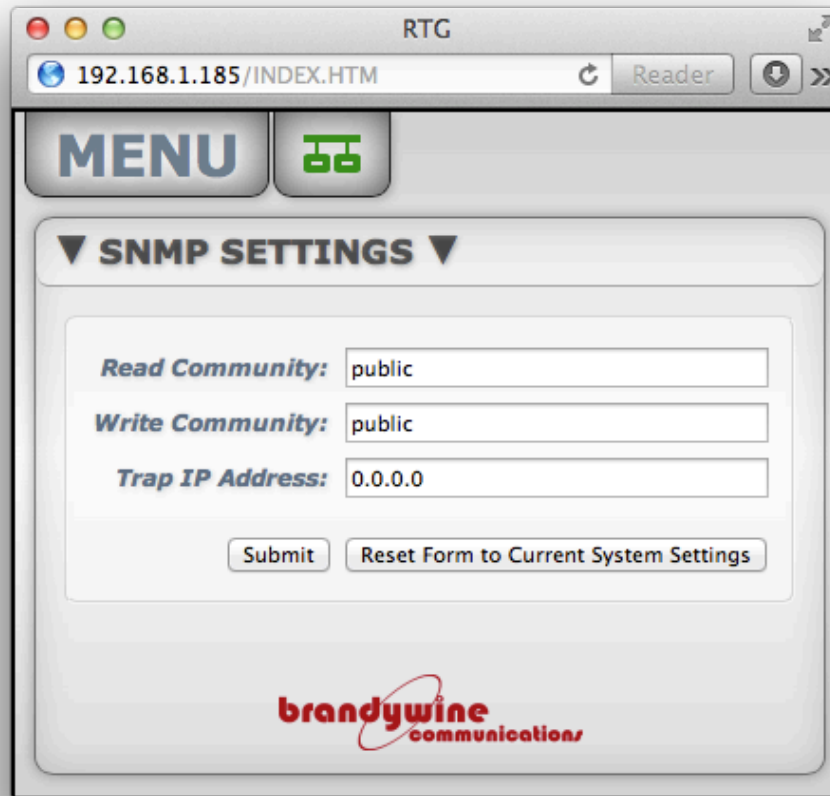
| Setting | Value |
|---------------|--------------------------|
| IP Address: | 192.168.1.185 |
| Subnet Mask: | 255.255.255.0 |
| Gateway: | 192.145.0.1 |
| DHCP Enabled: | <input type="checkbox"/> |

At the bottom of the settings section are two buttons: 'Submit' and 'Reset Form to Current System Settings'. The Brandywine Communications logo is at the bottom of the page.

Figure 16 - RTG-150 IP Address Settings

6.5 Changing SNMP Settings

From the main menu, select “SNMP” from the settings submenu. From here you can set the Read Community, Write Community, and Trap IP Address.



The screenshot shows a web browser window titled "RTG" with the address bar displaying "192.168.1.185/INDEX.HTM". The page features a "MENU" button and a network icon. The "SNMP SETTINGS" section is expanded, showing three input fields: "Read Community:" with the value "public", "Write Community:" with the value "public", and "Trap IP Address:" with the value "0.0.0.0". Below these fields are two buttons: "Submit" and "Reset Form to Current System Settings". The Brandywine Communications logo is visible at the bottom of the page.

Figure 17 - SNMP Settings

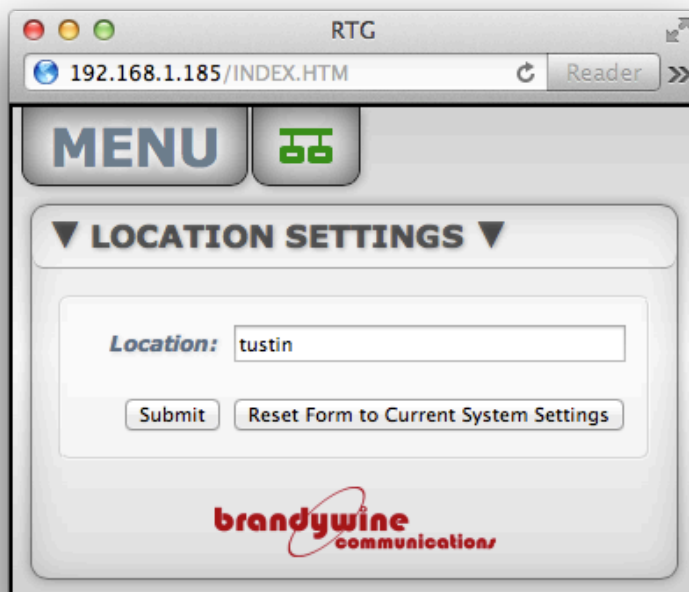
6.5.1 Monitoring the RTG-510 using SNMP

To monitor the RTG-510 via Simple Network Management Protocol (SNMP), you will need to download an MIB file from the Support Downloads section of the Brandywine Communications website.

(<http://www.bandywinecomm.com/product-support/downloads>)

6.6 Changing The Location Setting

From the main menu, select “Location” from the settings submenu. This setting tells the user where the unit is physically located within a facility. (e.g. Room 102)



The screenshot shows a web browser window titled "RTG" with the address bar displaying "192.168.1.185/INDEX.HTM". The page features a "MENU" button and a green icon. Below these is a section titled "LOCATION SETTINGS" with a downward arrow. Inside this section, there is a label "Location:" followed by a text input field containing the value "tustin". Below the input field are two buttons: "Submit" and "Reset Form to Current System Settings". The Brandywine Communications logo is visible at the bottom of the page.

Figure 18 - Location Setting

6.7 Changing The Display Brightness

From the main menu, select “Display” from the settings submenu. This dropdown setting allows you to change the brightness of the front panel display, with 0 being the least bright, and 15 being the brightest.

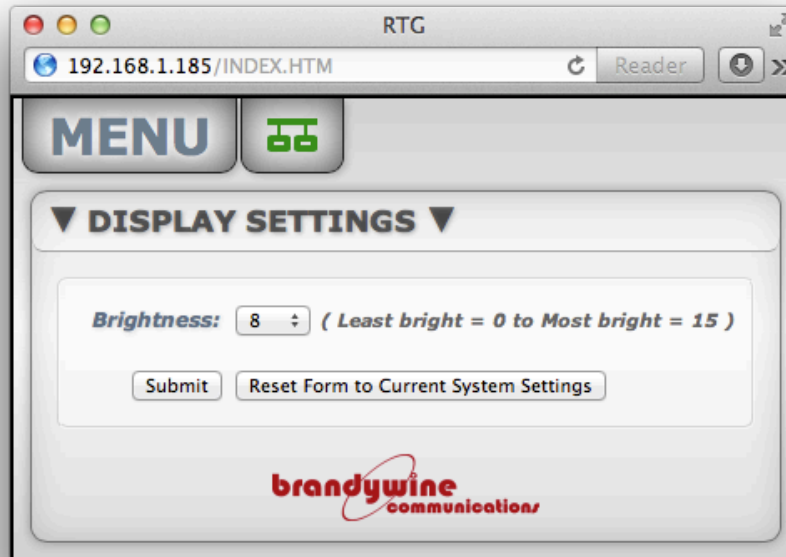


Figure 19 - Brightness Controls

6.7.1 Changing The Access Password

From the main menu, select “Password” from the settings submenu. From here you can change the access password for the unit to prevent other users from changing settings. You must have the current Username and Password in order to reset the existing username and password.

The factory default login credentials are:

Username: BRANDYWINE

Password: BRANDYWINE



The screenshot shows a web browser window with the address bar displaying "192.168.1.185/INDEX.HTM". The page title is "RTG". The interface features a "MENU" button and a green icon. Below these is a section titled "PASSWORD SETTINGS" with a downward arrow. Inside this section, there are five input fields: "Current Username:", "Current Password:", "New Username:", "New Password:", and "Confirm New Password:". A "Submit" button is located at the bottom of the form. The Brandywine Communications logo is visible at the bottom of the page.

Figure 20 - Password Settings



7 Support Information

All Brandywine Communications products come with a one-year warranty.

If your unit is still exhibiting problems not covered by the above troubleshooting guide, please contact us for technical support at support@brandywinecomm.com or call us at 714-755-1050.

If it becomes necessary to return your unit to the factory for repairs, please call us at 714-755-1050 extension 113 to arrange an RMA.

8 Front Panel



9 Rear Panel

