Installation, Operation, and Preventive Maintenance Manual

GaNLink™ Ka-band SSPA/BUC

SA49KOA

SB49KOA

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Proprietary Information

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About this Manual

This manual details the installation, operation, and preventive maintenance of CPI's GaNLink™ Ka-band SSPA/BUC. It is written for system installers and operators. Before you begin, read the Operational Warnings document provided with this manual.

Conventions

This section identifies the symbols used throughout this manual to identify notes, cautions, and warnings. Read all notes, cautions, and warnings as they reveal important information or hazards associated with the equipment provided.

Notes and Cautions

General notes, cautions, or warnings, provide additional commentary or technical information. They identify conditions, operations, or procedures that could potentially damage the equipment, induce physical strain, maim, or kill people. This includes heavy weights, sharp edges or protrusions, and chemical hazards.

Electrical or RF Warnings

Electrical warnings identify conditions, operations, or procedures that expose the operator to potentially lethal high voltages.

Microwave radiation warnings identify conditions, operations, or procedures that expose people to microwave radiation sources that could cause serious injuries, particularly to the eyes.

Temperature Warnings

Parts or surfaces on the equipment may become heated during operation. To warn users, a triangular label will be placed on or near the heated surface to identify the hazard. See below:

Text Conventions

When operator action is required for software entries, the action required is capitalized and the action object is capitalized and may be bold for emphasis. For example, press ENTER.

Control and indicator labels are capitalized. For example, RESET.

Sometimes the actual labels are abbreviated. For Example, TEMP would be short for temperature.

Italics are used for references or results, such as: *See the Service Manual* or *the amplifier is in the transmit state*.

Disclaimer

This document is intended solely as a guideline and its content is subject to change without notice. CPI is not responsible for any system design containing CPI amplifiers or other CPI equipment, unless otherwise specified in a mutually agreed upon contract.

Safety

This section contains safety information regarding high voltage, microwave radiation, and the physical hazards associated with installing, operating, and maintenance of CPI products. The information presented in this section is intended for system installers and operators. These guidelines were developed by engineers and technicians who have years of experience with high voltage and microwave equipment.

Warning: Only use the equipment provided as specified in this manual or product damage and personal injury can result. Product damage and personal injury caused this way will void your products warranty.

High Voltage Safety

High voltage is any voltage that can injure or kill a person. For purposes of this manual any voltage exceeding 50 VAC or 50 VDC is considered high voltage. Many of the amplifiers manufactured by CPI have an operating voltage in the range of 115-440 VAC. In the worst circumstances it takes as little as 50 VAC can cause death. Prime power voltages do not generally jump the air gap but are dangerous since 115-440 VAC can stimulate an involuntary muscle response.

Involuntary muscle responses can either,

- Throw a person across a room or,
- Seize and hold a person across the terminals.

Electrical circuits operate quickly and do not provide second chances. Hazards associated with high voltage are consistent and predictable-voltage will always take the path of least resistance to ground. Some CPI equipment uses high voltage capacitor banks which are capable of storing high voltage even after prime power is removed.

General High Voltage Guidelines

In addition to the information already provided, the following guidelines are proven practices for working safely with high voltage.

- **Hands off**—avoid contact with potential sources of high voltage. If high voltage work is required, consider using a certified local electrician to perform the work.
- **Create a safe working environment**—never work with high voltage when distracted, medicated, or tired. Keep your work area clean and remove all trip hazards.
- **Never work with high voltage alone**—use a "buddy" system. In a "buddy" system, one person performs the work while the other watches from a safe distance. The "buddy" must have clear instructions on what to do during an emergency.
- **Ground all equipment**—before applying prime power verify all equipment is grounded.
- **Do not remove protective covers—protective covers are barriers put in place to protect system installers and operators from hazardous conditions. Do not remove protective covers unless you directed to do so in a procedure.**
- **Disconnect all sources of power**—before working on high voltage equipment make sure you disconnect all sources of power. If a power source cannot be disconnected safely, use a lock out and tag out procedure before disconnecting the power source. The lock out tag out procedure assures prime power cannot be turned on accidentally or unexpectedly. Never rely on others to power off equipment for you.

Note: There may be additional notes, cautions, and warnings provided throughout this manual. Make sure you read and understand them before working on the equipment.

Microwave Radiation Safety

Microwave radiation may not have immediate physical effect but can cause long term health complications. To prevent unwanted biological side effects limiting your exposure by performing surveys. We suggest the level of microwave radiation should not exceed 1mW/cm^2 for a period of thirty minutes.

General Microwave Radiation Guidelines

In addition to the information already provided, the following guidelines are proven practices for working safely with microwave radiation.

- **Terminate all sources of microwave radiation during operation**—open sources of microwave radiation may cause the amplifier to oscillate or cause you physical harm. Microwave loads must be capable of dissipating the amplifiers maximum output power. All microwave input, output, and monitoring ports must be connected to a matched source or terminated during operation.
- **Use a radiation monitor to check for microwave leakage**—check for microwave radiation leaks anytime the microwave chain is disconnected, connected, or reconnected. Perform checks at a low output power level and then at every 3dB increments until the rated output power level is reached. If microwave radiation is detected above permissible levels—safely remove prime power and verify all microwave connections are tight.

Physical Safety

Physical hazards are created when the weight of the equipment exceeds forty pounds or if the equipment is mounted in a rack cabinet. If possible, use a lifting device to move heavy equipment because lifting heavy equipment can cause injury when done incorrectly. Rack cabinets can tip over if they are not bolted to the floor or if heavy equipment is loaded in them from the top down.

Lifting Guidelines

An average person can safely lift approximately 40 lbs and this weight can vary from person to person depending on fitness level, size of the object, and the technique used. Use a lifting device if possible or if a lifting device is not available—a two person lift is recommended. The weight of the amplifier is indicated on the heavy object label.

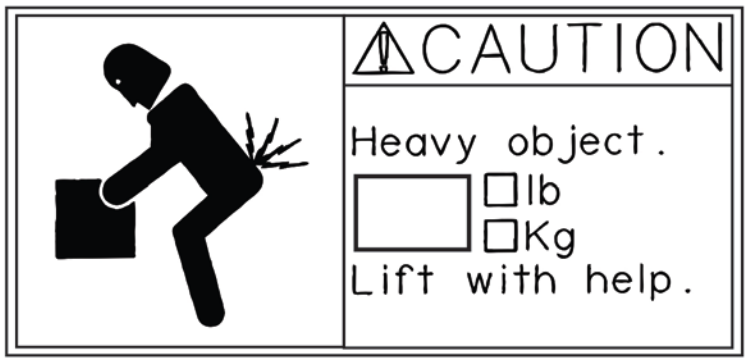

Figure 1. Heavy Object Label

Compliance Information

To satisfy global requirements, this product has been designed to comply with certain directives and standards as listed in this section.

Regulatory Directives

- 2014/35/EU Low Voltage
- 2014/30/EU Electromagnetic compatibility (EMC)
- 2011/65/EU Restriction of the use of certain hazardous substances (RoHS)

The CE Mark is a declaration by the manufacturer that the product complies with the requirement of the applicable European Union (EU) directives and that the product has been subject to the conformity assessment procedures as provided in that directive

Safety Compliance

- IEC/EN/UL/CSA 62368-1 Audio/video, information and communication technology equipment - Part 1: Safety requirements
- IEC/EN/UL/CSA 60950-22 Information technology equipment - Safety - Part 22: Equipment to be installed outdoors
  - Type of protection against electric shock: Class III equipment

Warning: This equipment protective earthing conductor must be connected to the installation protective earthing conductor.

  - Connection to the mains: DC power distribution system
  - Access location: Restricted access location
  - Pollution degree classification: 2
  - Mode of operation: Continuous operation
  - Altitude during operation: 3000m
  - Ingress protection rating: IP67

This test mark is proof of compliance with Canadian National standards and U.S. National standards. It demonstrates an electrical product has been successfully tested and certified by a Certification Body accredited by the Standards Council of Canada (SCC) and by a Nationally Recognized Testing Laboratory (NRTL) accredited by the Occupational Safety and Health Administration (OSHA)

EMC Compliance

- EN 61000-6-2 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments
- EN 55035 Electromagnetic compatibility of multimedia equipment - Immunity requirements

Note: All referenced standards are considered to be at the latest harmonized or recognized.

Standard	Description	Immunity Test Level
EN 61000-4-2	Electrostatic Discharge	±4kV contact ±8kV air
EN 61000-4-3	Radiated RF EM Fields1	10V/m, 80MHz – 1GHz 3V/m, 1.4-6.0GHz
EN 61000-4-4	Electrical Fast Transient	AC Mains: 2kV DC Mains and I/O Lines: 1kV
EN 61000-4-5	Surge Withstand	AC Mains ±2kV Line to Ground AC Mains ±1kV Line to Line DC Mains and I/O Lines: ±1kV
EN 61000-4-6	Conducted RF Immunity	10Vrms, 150kHz-80MHz
EN 61000-4-11	Voltage dips and interrupts2	0% for 1 cycle 40% for 10/12 cycles at 50/60 Hz 70% for 25/30 cycles at 50/60 Hz 0% for 250/300 cycles at 50/60 Hz
Notes: Full list of frequencies and services listed in EN61000-6-2 sec 9 and EN55035 sec 5 For AC Mains only, full list of residual voltage cycles listed in EN61000-6-2 sec 9 and EN55035 sec 5		

- EN 61000-6-4 Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
- EN 55032 Electromagnetic compatibility of multimedia equipment - Emission Requirements

Frequency Range	Measurement Type	Standard Limit
Conducted Emissions		
0.15 to 0.5 MHz	Average	66 dBµV

	Quasi-Peak	79 dBµV
0.5 to 30 MHz	Average	60 dBµV
	Quasi-Peak	73 dBµV
Telecom Emissions		
0.15 to 0.5 MHz	Average	84-74 dBµV The limits decrease linearly with the logarithm of the frequency
	Quasi-Peak	97-87 dBµV The limits decrease linearly with the logarithm of the frequency
0.5 to 30 MHz	Average	74 dBµV
	Quasi-Peak	87 dBµV
Radiated Emissions		
30 to 230 MHz	Quasi Peak	40 dBµV/m at 10m
230 to 1 000 MHz		47 dBµV/m at 10m
1 to 3 GHz	Peak	76 dBµV/m at 3m
	Average	56 dBµV/m at 3m
3 to 6 GHz	Peak	80 dBµV/m at 3m
	Average	60 dBµV/m at 3m

Warning: This equipment is NOT intended for use in residential environments/low-voltage power supply network and may not provide adequate protection to radio reception in such environments.

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1. Introduction

CPI's GaNLink™ Ka-band SSPA/BUC is designed for LEO/MEO/GEO systems, Satcom on the Move, VSATs, and antenna-mount applications. The key feature of this amplifier is direct mounting to antenna structures—thereby eliminating transmission line losses encountered in conventional arrangements.

For product specifications refer to the marketing document.

Table 1. Model and Frequency Listing

Model	Output Frequency (GHz)	P_{LIN} (Watts)
SB49KOA-A-A	27.5–30.0	40
SB49KOA-B-A	29.0–31.0	40

Figure 2. GaNLink™ Ka-band SSPA/BUC Product Picture

1.1 Equipment Description

The power supply and RF components are housed in a rugged, compact, weatherized enclosure. The GaNLink™ Ka-band SSPA/BUC is digital ready for wideband, single or multiple-carrier satellite service in the Ka frequency band. The overall dimensions are 13.2” x 6.4” x 6.3” (336 x 163 x 160 mm), excluding connectors, isolator, and top screws. The typical weight is 16.5 lbs (7.5 kg) for SA49KOA models or 19.8 lbs (9.0 kg) for SB49KOA models. This equipment operates in ambient temperatures from -40°C to +60°C with up to a relative humidity of 100% condensing.

The equipment operates with a prime power input of 48 VDC ±10%. Up to 600 VA maximum is consumed during operation at a linear output power—defined as P_{LIN}, however 420 VA is the typically consumption. Forced air is used to regulate the internal heat production during operation. The power supply distributes regulated power to the solid-state brick, cooling system, and monitor and control circuits. A detachable power supply cord is used for this equipment.

The air intake and exhaust require a minimum clearance of four inches. Special attention has been given to allow for the dissipation of thermal energy. To regulate heat produced by the equipment during operation a heat sink, variable speed fans, and thermal switches are integrated into the final design. These protective features minimize damage to the electronic components and prolong operating life.

1.2 Product Features

This section provides a summary of the standard and optional product features. Specific details about these product features appear in later sections of this manual.

1.2.1 Ethernet Interface Port (J2)

The Ethernet interface port provides a portal through which you can monitor and control the amplifier using a standard web browsing application. Supported web browsing applications include Chrome, Internet Explorer, and Safari. Make sure that the web browsing application you plan on using is the latest version.

System designers who choose to write their own control and monitor software can reference the CIF protocol document provided in the *Drawings* section of this manual. This interface supports TCP/IP, FTP, and NTP protocols.

1.2.2 Computer Interface Port (J10)

The standard computer interface (10 pin) includes RS-232 and RS485 (Tx/Rx) CIF, and interlock/user mute discrete input. If the optional computer interface (14 pin) is purchased, it will also include keyline and fault discrete inputs. Connector details for both the standard and optional computer interface port can be found in the *"Unpacking and Installation"* chapter. The CIF protocol document is included in the *"Drawings"* chapter of this manual and can be used to write monitor and control (M&C) software.

1.2.3 Weatherized, Compact, and Reliable Design

This outdoor amplifier is environmentally sealed allowing it to *play in the rain*. The small size and weight make it ideal for Gateways and antenna mounted applications. The internal power amplifier is rock-solid, expertly designed, and backed by CPI's worldwide 24-hour customer support network which includes sixteen regional factory service centers.

1.2.4 Direct Mounting

The lightweight design allows for direct mounting to an antenna structure. This minimizes cable losses and reduces system design costs. Threaded mounting holes—located on each side of the amplifier—are used for mounting the amplifier at the installation site.

1.2.5 Power Monitor and Sampling

As a standard feature, built-in internal circuits monitor the RF output power. The RF output power can be viewed on the web interface or queried from the serial interface.

As an optional feature, external input and output monitor ports are available on this equipment. The external input and output monitor ports can be connected to external meters to measure the power.

1.2.6 Event Log with Time and Date Stamp

The internal memory contains a log which can be used to understand the long-term operating conditions. This log can be downloaded and emailed which is helpful in identifying long term trends or potential future problems.

1.2.7 MCC Technology

Multicarrier Compatible (MCC) technology mitigates the 'Memory Effect' on GaN solid-state devices during multicarrier operation. CPI developed MCC technology by mapping the tonal spacing behavior using IMD sweeps and spectral regrowth charts.

You can learn more about MCC technology here.

1.2.8 Open BMIP Support (Optional)

Open BMIP is an iDirect open protocol used for communication between a BUC and modem. This allows exchange of BUC calibration data which is then used by the modem to control the BUC output power.

1.2.9 Keyline (Optional)

Keyline is a requirement for compatibility with OpenBMIP. A discrete signal is used to rapidly turn the power on/off in the middle of TDMA bursts. This conserves power for power sensitive applications.

1.2.10 Integral Dual or Tri Output Band BUCs (Optional)

This option adds an integral L-band BUC with a dual-band or tri-band output. The output band is user selectable via the M&C interface. Dual-band BUCs have two selectable Ka-band outputs and tri-band BUCs have three selectable Ka-band outputs.

2. Unpacking and Installation

This chapter contains instructions for unpacking and installing the amplifier. Read all instructions to become familiar before proceeding.

2.1 Pre-Inspection

Inspect the exterior of the shipping container(s) for evidence of damage in shipment. If damage is evident, immediately contact the carrier that delivered the equipment and submit a damage report. Failure to do so could invalidate future claims.

2.2 Unpacking

Carefully unpack and remove all items from the shipping container(s). Inspect the interior of the container for damage. Save all packing material until all inspections are complete. It is recommended that all packing material be saved for potential future use. Verify that all items listed on the packing slips have been received.

Inspect all items for evidence of damage in shipment. If damage seems evident, immediately contact the carrier that delivered the equipment and file a claim. Failure to do so could invalidate future claims.

2.3 Mechanical Installation

Refer to the *outline drawing* provided in the *Drawings* chapter of this manual for product dimensions and mounting information. Threaded holes are provided on each side of the chassis for mounting—six in total. Use all mounting holes to install the amplifier. Each of the #8-32 threaded holes has a depth of 10 mm (0.40 in). To provide secure mounting, use a lock and flat washer on all mounting bolts.

Warning: The installation site must be protected from direct lightning strikes. Failure to do so will void the warranty.

Caution: Avoid installation sites subject to electrical interference, such as that from a motor contactor.

Note: Antenna structures must be capable of supporting the load of the amplifier plus any wind loading effects, which may occur.

2.4 Cooling Considerations

This section provides cooling considerations for the installation site which promote safe and efficient operation of the equipment provided. The equipment provided is force air-cooled. Refer to the *Preventive Maintenance* section for cleaning instructions.

Note: The installation must not allow the hot air exhaust to be directed into the cool air intake. This can cause overheating and greatly reduce the operating life of your equipment.

Use the following guidelines to ensure proper cooling,

- Four inches of clearance is required for the air intake/exhaust.
- Hot air exhaust must be directed away from the cool air intake.
- Air intake/exhaust must be free of foreign debris.

2.5 Electrical Power Connections

The equipment provided is designed for an industrial environment—connected through a separate distribution transformer. All equipment must be connected in accordance with local and national electrical codes. CPI recommends a local electrician is contracted to assemble the prime power input cable.

Warning: This equipment protective earthing conductor must be connected to the installation protective earthing conductor.

Warning: Do not connect the equipment to a public low voltage distribution system.

2.5.1 Prime Power Requirements

The equipment protection against electric shock is class III. The primary voltage supply must be fused with no more than 20A.

Construct the prime power cable using circular connector,

- Amphenol #C016 10D006 000 12 or equivalent.

The wire used to construct the prime power cable must be sized appropriately for the current—as determined by the prime power input voltage label.

It is a good practice to test the prime power input cable for shorts after it is constructed and before connecting it to the equipment.

J1 pin-out,

- Pin 1, Return Input
- Pin 2, No connect
- Pin 3, Return Input
- Pin 4, +Input
- Pin 5, No connect
- Pin 6, +Input
- Pin 7, Protective Earth

2.5.2 Grounding Requirements

For personal and equipment safety, connect the equipment to protective earth. Use the 6-32 inch threaded hole (↧ 0.25 inch) below the J1 power input for earthing. The earthing wire gauge must be rated for the maximum current of connected equipment.

2.6 RF Connections

RF connections available on this equipment include the RF input, RF monitor, and RF output.

Warning: Terminate all RF ports before applying prime power to the equipment. Failure to do so can cause microwave radiation leakage or equipment damage.

2.6.1 RF Input, J3

This section details the RF input connector. The RF input connector type is determined by the model.

RF input connector,

- For model SA49KOA the RF input connector is 2.92mm (socket) and mates with a 2.92mm (plug).
- For model SB49KOA, N-type (socket) and mates with an N-type (plug).

A 50 ohm coaxial termination cap is provided to protect this port from oxidization and mechanical damage.

Caution: Do not exceed a maximum connector torque of 4.5 in-lbs for 2.92mm connectors or 12-15 in-lbs for N-type connectors.

2.6.2 RF Output, J8

This section details connecting waveguide to the RF output (J8). The RF output flange is a WR-28G and mates with WR-28F flange.

Recommended gasket for WR-28G flange,

- Parker Chomerics #20-02-6510-1212

Caution: Do not allow dirt and debris to enter the waveguide flange or mating waveguide as this will result in high VSWR and may damage equipment or the amplifier.

To install mating waveguide to RF output,

1. Remove the packing material from the output waveguide flange. The gasket is inside the output waveguide flange.
2. Place the gasket in the grooved section of the output flange.
3. Align the mating waveguide with the output flange. If flange alignment is not precise or if the installation is subject to severe vibration, a flexible waveguide piece can be used.
4. Loosely install four 4-40 inch stainless steel screws dressed with lock and flat washers to the waveguide joint.
5. Tighten all screws using the progress tightening sequence shown below.

Caution: Do not exceed a maximum torque of 4.3 in-lbs or damage can result.

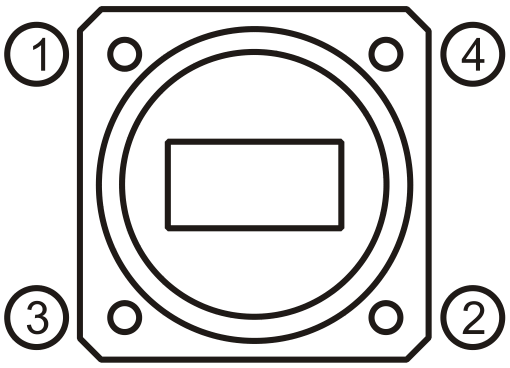


Figure 3. Progressive tightening sequence for joining waveguide

2.6.3 RF Monitor Option, J9

The optional RF monitor (J9) is a coaxial 2.92mm type socket and mates with a 2.92mm plug. The system installer is responsible for supplying the mating cable for this interface.

A 2.92mm 50 ohm coaxial termination cap is provided to protect this port from oxidization and mechanical damage.

Caution: Do not exceed a maximum torque of 4.3 in-lbs for this connector or damage can result.

The RF monitor port has a nominal coupling of 40 dB and is calibrated at fixed frequencies points across the amplifiers operating entire frequency band.

2.7 External Interfaces

The external interfaces provide users with a variety of ways to control and monitor the amplifier. These interfaces are detailed in the following subsections.

2.7.1 Ethernet, J2

The Ethernet port (J2) is a RJ-45 jack, 10Base-T. System installers are responsible for supplying the mating Ethernet cable and plug.

Recommended mating plugs,

- CONEC #17-10001

Use shielded twisted pair Ethernet cable in the construction of the Ethernet interface cable to minimize noise interference. When the Ethernet interface is not used install protective cap.

Warning: Failure to use the weatherized mating plug will allow moisture into the amplifier and void the warranty.

Note: The baud rate is fixed at 9600 and cannot be changed. This ensures both Ethernet and serial communications can be established.

2.7.2 Serial I/O, J10

The serial I/O port (J10) is an extreme exposure mini-circular connector. This connector will be one of two versions; standard or optional Keyline mode.

Default Serial Port Parameters,

- **Address**—48 (Decimal)
- **Protocol**—BCIP
- **Baud Rate**—9600, N81

2.7.2.1. Serial I/O (Standard)

The standard serial I/O port is Amphenol PT02E12-10S(25), 10 contact socket and mates with Amphenol PT06E12-10P(470). This port supports serial communication standards for either RS-232 or RS-485 and includes mute functionality.

Serial I/O (Standard) pin designations,

- Pin A, RS-485 Tx(+)
- Pin B, RS-485 Tx(-)
- Pin C, RS-485 ground
- Pin D, RS-485 Rx(-)
- Pin E, RS-485 Rx(+)
- Pin F, RS-232 Tx
- Pin G, RS-232 Rx
- Pin H, RS-232 ground/ mute return
- Pin J, mute
- Pin K, RS-232 ground/ mute return

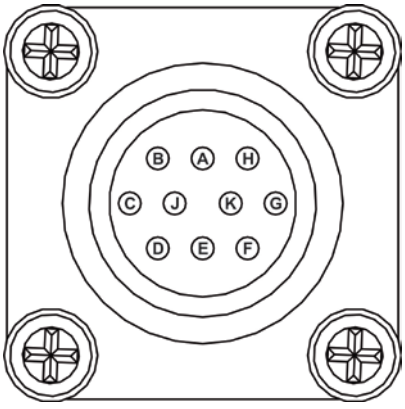


Figure 4. Serial I/O (Standard) Pin Locations

2.7.2.2. Serial I/O (Keyline Option)

The keyline serial I/O port is Amphenol PT02E12-14S(025), 14 contact socket and mates with Amphenol PT06E12-14P(470). This port supports serial communication standards for either RS-232 or RS-485. It includes pins for mute, keyline mode, and a fault relay.

Serial I/O (Keyline Option) pin designations,

- Pin A, RS-485 Tx(+)
- Pin B, RS-485 Tx(-)
- Pin C, RS-485 ground
- Pin D, RS-485 Rx(-)
- Pin E, RS-485 Rx(+)
- Pin F, RS-232 Tx
- Pin H, RS-232 Rx
- Pin J, RS-232 ground/ mute return
- Pin K, mute
- Pin L, Keyline (+)
- Pin M, Keyline (-)
- Pin N, Fault normally closed
- Pin P, Fault common
- Pin R, Fault normally open

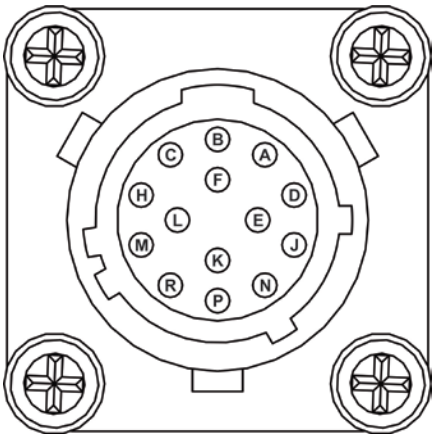


Figure 5. Serial I/O (Keyline Option) Pin Locations

3. Operation

This section details the pre-power on verification, initial power on, normal power off, prime power interruptions, and fault recovery. How to use the web interface and screen details are also provided. Read the entire operation chapter before performing any procedures.

3.1 Pre-Power On Verification

The pre-power on verification is the final check performed before applying prime power to the amplifier. It is important to perform this verification to ensure nothing during the installation phase was missed.

To perform a pre-power on verification,

1. Prime power is 48VDC ±10%, as indicated on the label.
2. The prime power distribution system is off and the prime power cable is connected to J1.
3. The RF output flange is secured to a matched source and all waveguide screws are tightened.
4. If a waveguide load is used verify it is rated for two times the rated output power of the amplifier.
5. The RF source is off and set to -40dBm.
6. The RF input cable is connected to J3.
7. There is at least 4 inches of clearance at the air intake and exhaust.
8. All external interface connectors are properly seated and securely mated.
9. All unused external interface connectors are properly terminated.

3.2 Initial Power-On

Initial power on is not a normal power on phase. It is used to determine that everything is working properly after the equipment has been installed. Initial power on consists of applying prime power and PC interfacing.

3.2.1 Applying Prime Power

This section details the Power On Self Test—POST. Becoming familiar with POST will help you determine if the amplifier is running properly.

Indicators of POST,

- The fans will turn on at full speed and then shut off. The only time the fans will not shut off during POST is if the amplifier requires cooling due to temperate climates.

Note: If the POST does not happen as indicated previously, contact CPI customer support.

3.2.2 PC Interfacing

This section describes how to setup communication with a PC using the Ethernet interface. These amplifiers are configured with the Dynamic Host Configuration Protocol—DHCP which generates an IP address on the network automatically. Alternately, a static IP address can be used to establish communication. This section details how to connect to the amplifier using DHCP or manually configured IP address.

To connect using DCHP,

Note: Amplifiers are shipped with the DHCP enabled. To use the DHCP feature the amplifier and PC must be plugged in a DHCP network.

Note: If the DHCP server is not found the static IP address can be used.

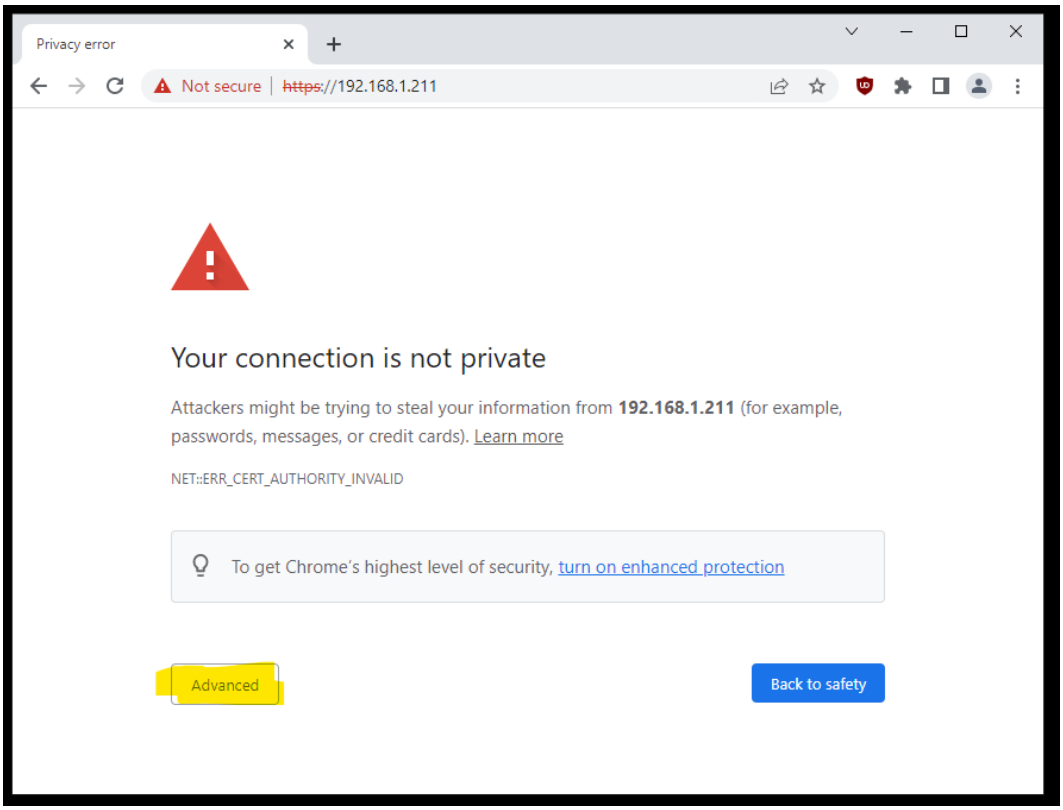
1. On the amplifier, apply prime power to connector J1.
2. If the DHCP server IP address is unknown, use the **Amp Search** software to find it. Otherwise, enter the assigned IP address in the web browser and go to the last step in this procedure. Amp Search software is provided with this product manual.
3. In **Amp Search**, click the **Search for Amplifiers** button.
4. In the **Amp Name** box, select a found amplifier by clicking on it.
5. In **Amp Search**, click the **Open Browser** button. *Your preferred web browsing application will open and the Authentication Required window will appear.*
6. In **Authentication Required**, enter the default username and password. Both the username and password are **cpi**. *The Amp Status screen will be displayed.*

To connect by setting up a manual IP address,

1. On the amplifier, apply prime power to connector J1.
2. On a Windows PC, open **Network and Sharing Center**.
3. In **Network and Sharing Center**, click **Local Area Connection**.
4. In **Local Area Connection**, click **Properties.**
5. In **Properties**, select **Internet protocol (TCP/IP)** and then click **Properties**.
6. In **Internet Protocol (TCP/IP) Properties**, select **Use the following IP address**.
7. In the **IP address** field, type 192.168.000.**100**. If 100 is in use for another device on your network replace 100 with a new number between 1–255. All devices on the network must have a unique IP address.
8. In the **Subnet mask** field, type 255.255.255.000.
9. In the **Default gateway** field, type 192.168.000.001.
10. In **Internet Protocol (TCP/IP) Properties**, click the **OK** button. *The PC has been configured to communicate with the amplifier*.
11. Open a web browsing application, such as, Chrome, IE, or Safari. Make sure the web browsing application you are using is the latest version.
12. In Address Bar, enter IP address 192.168.000.254. This is the default IP address of the amplifier. If this IP address does not work, the Address Scanner software provided with this manual can be used to connect to your amplifier.

3.3 HTTPS without an SSL Certificate

If the amplifier does not have a valid SSL certificate when connecting with a browser using HTTPS, the browser will show a page like the one below:

13. 

Sample “Your connection is not private” screen

To proceed to the amplifier web page, click **Advanced** and the select **Proceed to XXX.XXX.XXX.XXX.**

Note: The web browser will connect using HTTPS however the address line will show ‘Not Secure’ since the certificate used cannot be validated by the browser.

3.4 Connection using HTTPS

An ECDSA-256 key and SSL certificate must be created to connect using HTTPS. The SSL certificate is imported into the Trusted Root Certification Authorities directory on the controlling PC. Then the SSL certificate and Key are uploaded to the amplifier.

3.4.1 Creating a Self Signed Certificate

Note: When generating self-signed certificates selecting elliptic-curve encryption will lead to faster connection times.

Note: The certificate and key files include the IP address. Therefore, you need to create a new certificate and key for every amplifier.

It is recommended that the steps for creating a self signed certificate be performed by your network administrator. A free tool called “openss”, downloaded at https://www.openssl.org/, can be used for this task.

To generate the CA certificate,

1. Generate a CA key using ECDSA-256 using the following code,
   openssl ecparam -genkey -name prime256v1 -out CA.key
2. Use the CA key to generate the CA certificate using the following code,
   openssl req -new -config CAconfig.cnf -key CA.key -x509 -days 3650 -out CA.crt
3. The CAconfig.cnf file contains the certificate configuration information. Substitute your location and IP address details under **‘req_distinguished_name’:**

   [req]
   default_bits = 2048
   distinguished_name = req_distinguished_name
   prompt = no

   [req_distinguished_name]
   C = US
   ST = CA
   L = San Jose
   O = CPI
   OU = SVDC
   CN = 192.168.0.254

   The CA.crt file should then be loaded as a root certificate in the browsers that will connect to the amplifier.

To generating a certificate for the amplifier,

Note: Use the CA.crt certificate used in the step above to generate a certificate for the amplifier.

1. Generate the private key (device.key) for the web server:
   openssl ecparam -out device.key -name prime256v1 -genkey
2. Generate the Certificate Signing Request (CSR) using the private key:
   openssl req -new -key device.key -out Server.csr -config config.cnf -extensions v3_req

3. The config.cnf file contains the following entries. Substitute the location information under [req_distinguished_name] and make sure the CN and IP.1 fields contain the IP address of the amplifier:

```
[ req ]
default_bits            = 2048
distinguished_name= req_distinguished_name
x509_extensions     = v3_req
prompt                  = no

[ req_distinguished_name ]
C               = US
ST    = California
L               = San Jose
O               = CPI
OU    = SVDC
CN    = 192.168.1.211

[ v3_req ]
keyUsage        = critical, digitalSignature, keyAgreement
extendedKeyUsage  = serverAuth
subjectAltName              = @alt_names

[ alt_names ]
IP.1  = 192.168.1.211
```

4. Generate the SSL certificate (device.crt) with the self-signed CA:

```
openssl x509 -req -days 7300 -in Server.csr -CA CA.crt -CAkey CA.key -
CAcreateserial -out device.crt -sha256 -extfile Server.ext
```

5. The Server.ext file contains the following entries. Make sure to substitute the IP.1 field under [alt_names] with the IP address of the amplifier:

```
authorityKeyIdentifier    = keyid,issuer
basicConstraints              = CA:FALSE
keyUsage        = digitalSignature, nonRepudiation,
                          keyEncipherment, dataEncipherment
subjectAltName              = @alt_names

[alt_names]
IP.1  = 192.168.1.211
```

We now have the key (device.key) and the certificate (device.crt) that can be uploaded to the amplifier.

3.4.2 Importing a Root (CA) Certificate

This section details how to import the root (CA) certificate into the browser you plan on using to connect to the amplifier using HTTPS.

Note: The certificate file includes the IP address. Therefore, you need to upload the unique certificate for each amplifier.

To import the root (CA) certificate,

1. In the browser settings, open the location where certificates are managed.
2. In the **Trusted Root Certification Authorities** tab, select **Import**.

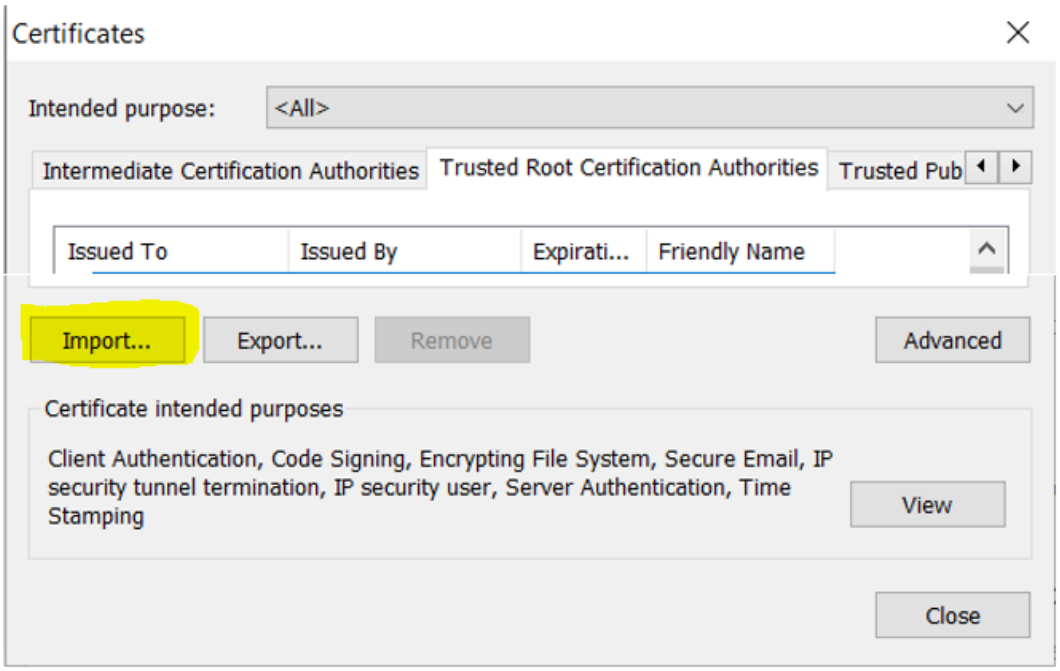


Figure 6. Trusted Root Certification Authorities

3. Follow the Certificate Import Wizard steps to import the **CA.crt** file.

3.4.3 Loading the Certificate and Key to the Amplifier

This section details how to upload the certificate and key to the amplifier. To use HTTPS, the certificate and key need to be uploaded to the amplifier.

Note: The certificate and key files include the IP address. Therefore, you need to upload the certificate and key for each amplifier that matches the assigned IP address.

To upload the device key,

1. Open a web browser and connect to the amplifier.
2. In Amp Info, press **Choose File** and select the ‘device.key’.
3. In Amp Info, press **Upload**.

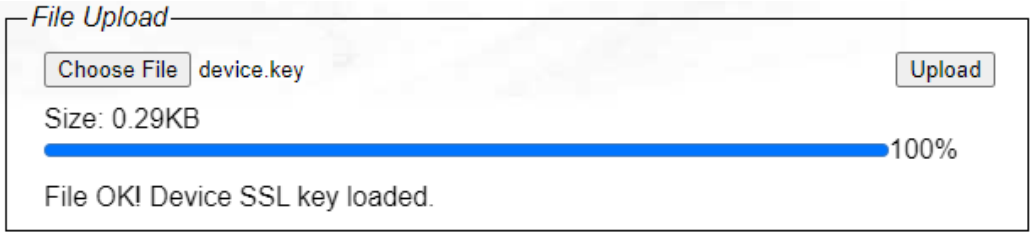


Figure 7. Uploading the Device Key

To upload the certificate,

1. Open a web browser and connect to the amplifier.
2. In Amp Info, press **Choose File** and select the ‘device.crt’.
3. In Amp Info, press **Upload**.

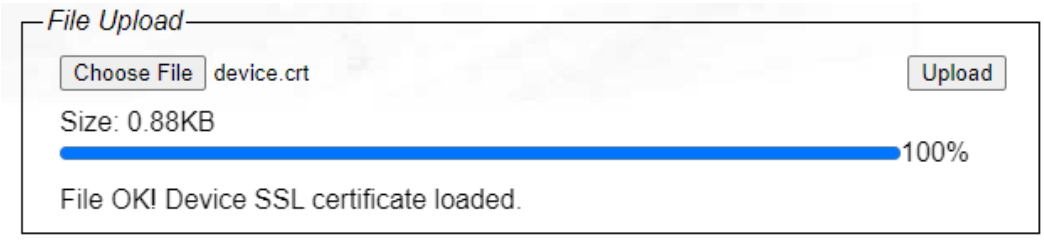


Figure 8. Uploading the Device Certificate

4. Restart the amplifier and reconnect using HTTPS. *The address line will show a padlock indicating that the connection is secure.*

3.5 Normal Power Off

This section provides a normal power off procedure. Power off may be required to service the equipment.

To power off the amplifier,

1. Put the amplifier in standby.
2. Allow the fans to cool down the amplifier.
3. Turn off the prime power distribution system.

3.6 Prime Power Interruptions

CPI amplifiers are designed to tolerate prime power interruptions. Amplifiers are factory set to automatically power on and enter the Standby state when prime power is restored. However, operators may choose to set the amplifier to automatically power on and enter the Transmit state when prime power is restored. To do this, select the **Enable Save Transmit State** checkbox in the **Options** screen.

3.7 Fault Recovery

Before resetting latched faults determine the nature of the fault.

When a fault is caused by one of the user settable limits,

- Check the limit setting is correct.
- Check the RF input drive level is correct.
- Check the RF monitor reading matches the digital display.

Contact CPI customer service for faults that do not have user settable limits.

To recover from a fault,

1. Diagnose the root cause of the fault.
2. Correct the root cause of the fault.
3. On the amplifier, issue a reset command.
4. On the amplifier, issue a transmit command.

If the fault persists and it is not a system critical fault try to determine the root cause. If trip limits must be changed make a record of the changes in the meter log screen using the text entry field.

3.8 Using the Web Interface

This section details how the web interface is organized, the navigation, and the operating states. The web interface is the main interface used by operators to monitor and control the amplifier.

3.8.1 Data Organization

The user interface is organized in three main areas— the control & monitor panel, screens menu, and screen display.

The control & status panel—is located above the screen display and shows control point, operating state, RF output level, and power mode. Amplifier controls—transmit, standby, RF inhibit, reset fault, ALC, manual, and display units—are also provided in the control & monitor panel. Active faults and alarms will appear in the control & monitor panel.

The screens menu—is a listing of all interface screens. The screens menu is used to change the current screen displayed.

The screen display—displays the screen which the user is currently viewing. Data, such as, meter readings or setpoints are organized separately in each screen display.

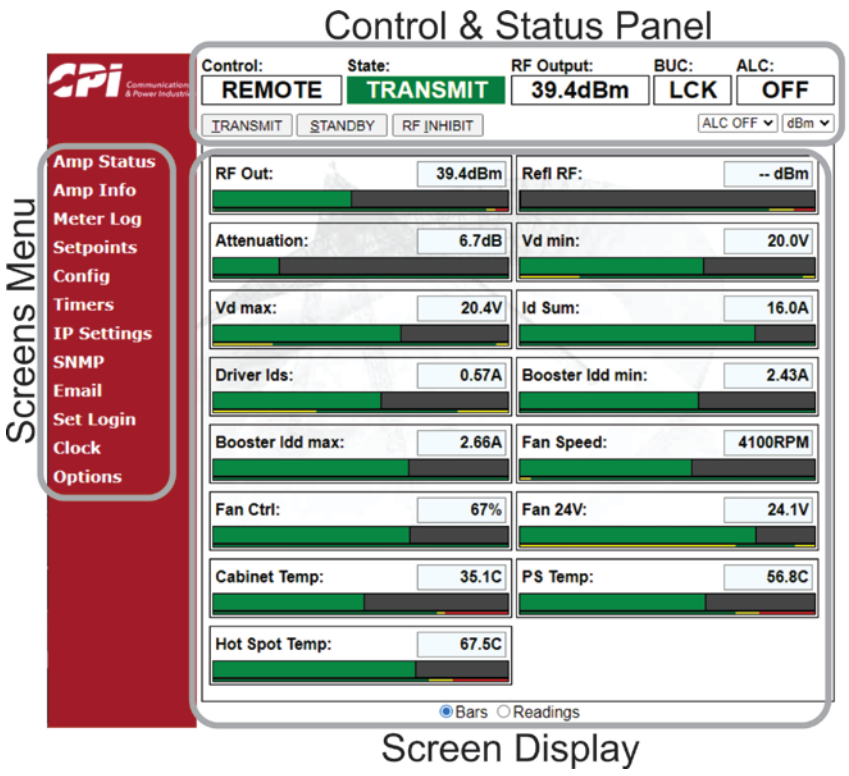


Figure 9. Organization of the user interface

3.8.2 Navigating the User Interface

This section details how to navigate the user interface. Navigation is performed using a standard keyboard and mouse. Amplifier screens are listed in the screen menu. When a screen is selected, it will be displayed in the screen display.

User interface details,

- **Buttons**—a single click will activate the button.
  Example:
  

- **Drop down menus**—predefined data selection. The user selection will be applied immediately after it was selected.
  Example:
  

- **Free form alphanumeric fields**—text and numbers entry. User must click the **Apply** button to accept field changes.
  Example:
  

- **Numeric fields**—field accepts number entries only. Users type in a new number value and press the Enter key on their keyboard. Numeric fields may contain arrow keys. The arrow keys will increment or decrement the value in the field. The increment step in dB is 0.1dB while an increment step in Watts is 1W.
  Example:
  

3.8.3 Operating States

This section details the amplifiers' operating states. The operating state is displayed in the state box of the control & monitor panel.

Operating states of the amplifier,

- **Standby**—transmission is not possible during standby state. The state box of the control & monitor panel will display Standby.
- **Transmit**—transmission state. These amplifiers are designed to operate in the transmit state for extended periods of time. The control & monitor panel will display Transmit.
- **RF Inhibit**—when enabled the RF input signal is isolated from the amplifier circuits. RF inhibit may become active due to user command, external interlocks, or waveguide switch inhibit control signals. The State box of the control will display RF inhibit & monitor panel will flash blue and white.
- **Fault**—occurs when a fault limit is exceeded. Except for critical faults the amplifier will attempt to recycle itself three times. If the fault condition is cleared during the recycle attempts the amplifier will continue to operate normally. If the fault condition is not cleared after the three recycle attempts the fault will become latched. To recover a latched fault the user must clear the fault condition and issue a reset command. Fault messages appear underneath the control & monitor panel in red.
- **Alarm**—occurs when the alarm limit is exceeded. Alarm limits notify the user that current operation is getting close to a fault limit. Alarm messages appear underneath the control & monitor panel in yellow.

3.9 Amplifier Controls

This section details the amplifier controls. Amplifier controls include the control point and controlling the RF output power. These are the two main functions users will be concerned with during operation.

3.9.1 The Control Point

The control point setting determines which control commands the amplifier will execute or ignore. For example—when the amplifier is set to ETH CIF—a remote control point—Ethernet control commands will be executed while serial control commands will be ignored. The amplifier will always respond to query commands—regardless of the control point setting.

The following control points are available,

- **Ethernet CIF**—control commands issued from the Ethernet interface are executed. Commands from the web interface are not included. Ethernet CIF control commands are addressed serial data packets inside of the Ethernet packet.
- **Serial CIF**—control commands issued from the serial interface are executed. These control commands are inside address serial data packets.
- **WEB**—the amplifier executes control commands issued from web browser interface. You must be running the latest web browsing software version which supports HTML5 or above.
- **SNMP**—the amplifier executes SNMP control commands from the Ethernet interface.
- **ALL**—all remote control commands are executed.

To select a new control point,

1. In the screens menu, select **Config**.
2. In **Config**, select a control point from the **Remote Control Point** dropdown menu. *The control point selected is the new control point*.

3.9.2 Controlling the RF Output

This section details how to control the RF output and the RF control modes. RF control modes assist users during operation—by simplifying everyday activities.

3.9.2.1. Setting the Attenuator

All amplifiers include variable attenuator which can be used during normal operation to adjust the RF output power level. Increasing the attenuation value—in dB—lowers the amplifiers gain which decreases the RF output power proportionately.

To set attenuation,

1. In **Screens Menu**, select **Setpoints**.
2. In **Setpoints**, select the **Attenuation Set Pt field**.
3. In the **Attenuation Set Pt field**, enter a numeric value in dB then press **Enter** to confirm the new value.

3.9.2.2. Automatic Level Control Mode

This section details how to use Automatic Level Control—ALC mode. ALC uses the internal variable attenuator to maintain a constant RF output power. If the output power

To set ALC,

1. In **Screens Menu**, select **Setpoints**.
2. In **Setpoints**, select the **Attenuation Set Pt field**.
3. In the **Attenuation Set Pt field**, enter 6 then press **Enter** to confirm the new value. This setting determines the range of output power compensation. A setting of 6dB provides protection for output power losses of 6dB or less. Set the attenuation higher if the expected output power loss is greater than 6dB.
4. Increase the input drive level until the amplifier reaches the RF output level you would like to maintain.
5. In **Setpoints**, select **ALC Set PT,** then enter the RF output level you would like to maintain, and then press **Enter** to confirm. *The power mode will be set to AUTO and the amplifier will maintain the RF output power.*

Caution: Adjusting the attenuation setting will disable ALC operation. In Amp Status, press the ALC button to enable ALC mode.

3.9.3 Manual RF Mode

This section details how to use manual RF mode. Manual RF uses the internal variable attenuator to set the RF output power.

To set manual RF,

1. In **Screens Menu**, select **Setpoints**.
2. In **Setpoints**, select the **Attenuation Set Pt field**.
3. In the **Attenuation Set Pt field**, enter the maximum attenuation, then press **Enter** to confirm.
4. Increase the input drive level until the amplifier reaches 40dBm or 10W RF output.
5. In **Setpoints**, select **Manual RF Set PT**, then enter an RF output level, and then press **Enter** to confirm. *The power mode will be set to MANUAL and the amplifier will automatically adjust the RF output power to the level you set.*

3.10 BUC Operation

This section is for SSPB's only. The standard SSPB uses non-inverting frequency translation with the frequency of local oscillation (F_{LO}) to convert the L-band input to the Ka-band output.

Each SSPB includes an input frequency band label which indicates the L-band input frequency range. The input frequency label will list the L-band input frequency range for each band.

Warning: Ensure the L-band input frequency range is not exceeded or damage may result. Damage due to an improper input frequency may not be covered by your product warranty.

This section provides information on SSPB operation and explains the reference frequency types.

3.10.1 The Reference Frequency

All SSPB's require a reference signal for normal operation. This reference signal is typically 10MHz unless otherwise specified at the time of order. If the F_{LO} reference fails or drifts outside of the capture range, software settings allow the operator to determine if a "BUC alarm" or a "BUC fault" will be reported by the SSPB. A reset command is required to clear the “BUC fault” condition.

The reference frequency is multiplexed with the L-Band input signal.

Caution: For multiplexed reference, the L-band input signal must be free from spurious signals which can cause poor performance. Spurious signals may also cause unexpected failures.

3.10.1.1. Multiplexed Reference

Most L-band modems now have a built-in 10 MHz reference which allows both the L-band and F_{LO} reference to be provided to the RF input connector. This is CPI’s standard configuration and is recommended for most applications. The level of the F_{LO} reference should be +5 to -5 dBm at the amplifiers input.

Caution: A multiplexer should be used rather than a combiner. If a combiner must be used, include a band pass filter the modems’ output or a 10 dB fixed attenuator to the combiner’s input.

3.10.2 Multi-band Operation

During multi-band operation the user chooses the input band. Each band translates the L-band input signal using a different F_{LO}.

Warning: CPI sells a wide variety of multi-band BUCs which operate with different input and output frequencies. Always check and use the information provided on the frequency label to avoid damaging your product.

3.10.2.1. Band Selection

The band selection setting is in the Config screen of the web interface.

To select a band,

6. In the web interface, select Config from the navigation panel.
7. In the Config screen, select the band using the **Band Select** drop down menu.

Caution: Some multi-band SSPB's can have up to three bands to choose from. Be careful and verify your band selection before applying an RF input.

4. Preventive Maintenance

This chapter provides instructions for routine maintenance. It includes procedures and test equipment for scheduled maintenance tasks and amplifier performance testing. Guidelines for protecting parts from electrostatic discharge are also included in this chapter.

Note: Improper maintenance of the amplifier may void the warranty. For additional information, see the "Warranty & Support Information" appendix.

The equipment's internal memory contains a log, which can be used to research the long-term operating conditions that the amplifier has experienced. This log can be downloaded, and emailed, which can help identify long-term trends or future potential problems.

4.1 Scheduled Preventative Maintenance

Note: Some preventive maintenance tasks require a service technician who has attended formal training program at CPI.

To function safely and efficiently, periodic maintenance is required. Maintenance is not required for internal components. Preventative maintenance tasks listed in the following tables is to be performed by both operators and service technicians respectively. Some tasks is required removing the prime power. Details are listed in the following sections.

4.2 Operator Preventive Maintenance

Warning: Operators must not remove covers which have electrical hazard warning. Only CPI trained service technician may repair or replace parts in these locations.

This section details maintenance tasks which can be performed by operators. Add these tasks to the operator's preventive maintenance schedule. Performing preventive maintenance is important to promote long operating life and minimize downtime.

Table 2. Operator Preventive Maintenance Tasks

Task	Daily	Monthly	3 Months
Log Meter Readings	X		
Perform Visual Checks		X	
Unit Cleaning		X	
Inspect Cooling Fans†			X

† Depending on the operating environment cleaning may be required more or less frequently than indicated.

4.2.1 Log Meter Readings

At a minimum interval of once a day the meter log should be downloaded and reviewed for abnormalities which indicate maintenance is required. For example, a high temperature reading may indicate the heat sink fans require cleaning. After downloading the log file it can be graphically represented in a spreadsheet program for monitoring trends.

4.2.2 Perform Visual Checks

At one-month intervals, visually inspect the equipment for damage. Preform inspections more frequently if the equipment is subject to severe environmental conditions.

To perform a visual check,

1. Verify all connectors are properly seated and have not been damaged. Contact a CPI trained service technician to replace bad connectors.
2. Inspect cables for signs of discoloration, cracks, and bad insulation. Contact a CPI trained service technician to replace broken cables.
3. Inspect all waveguide for discoloration, cracks, loose connectors, and proper sealing. Contact a CPI trained service technician to replace broken waveguide.
4. Check for defects including, but are not limited to, breakage, deterioration, fungus, excess moisture, and mounting integrity. Contact a CPI trained service technician to make any repairs.

4.2.3 Unit Cleaning

Warning: Before attempting unit cleaning, remove all sources of power. When cleaning with air, wear safety goggles and use clean, dry compressed air not exceeding 25 psi (1.75 kg/cm).

Caution: When using solvents, provide adequate ventilation and wear personal protective equipment (PPE) to avoid breathing in fumes.

Caution: When cleaning with air, wear safety goggles and use clean, dry compressed air which not exceeding 25 psi (1.75 kg/cm).

Look for signs of dirt or moisture contamination, which can cause degraded unit performance or damage. Use water, a mild detergent, and a lint free cloth to wipe away built-up debris. A small vacuum cleaner or a compressed-air blower at low pressure can also be used to clean in hard-to-reach places.

4.2.4 Inspect Cooling Fans

Note: Observation may be required more or less frequently than shown, depending on the site environment.

Periodically check unit for abnormal vibration that would indicate a fan balance issue or bearing problem. Unusual sounds or vibration should be investigated. Examination of the log files for temperature inconsistencies can be an early indication the fan needs to be replaced. Only a trained service technician can perform replacements. Contact CPI Customer Service for details.

4.3 Technician Preventive Maintenance

This section details maintenance tasks for service technician's. Add these tasks to the service technician's preventive maintenance schedule. Preventive maintenance tasks are important because they promote a long operating life and minimize downtime.

Table 3. Service Technician Preventive Maintenance Tasks

Task	3 Months	6 Months	Yearly
Perform Initial Power On	X		
Fan Replacement†			A/R
Run Performance Tests			X

† Replace fan after 50,000 hours of operation or as required.

Note: Technicians who perform maintenance tasks listed must attend CPI service training for this amplifier model.

4.3.1 Perform Initial Power On

Every three months verify the initial turn on using the information provided in *Initial Power On* section of this manual.

4.3.2 Fan Replacement

This section details when the fan should be replaced. Contact CPI customer support or your nearest service center for details.

The fan should be replaced,

- After 50,000 hours of operation
- If the fan stops working
- If the fan cannot rotate fast enough to cool the amplifier

4.3.3 Run Performance Tests

Once a year performance testing is required. Performance testing requires the service technician to measure the RF output power and gain. The results are record for future reference. If performance results change dramatically, contact CPI using the information provided in the *Customer Support* appendix of this manual.

To measure the power and gain,

1. Setup the amplifier for performance testing as shown in the *Performance Test Setup* figure.
2. Set the amplifiers attenuator to maximum.
3. Verify the signal generator is set to the minimum drive with the output drive off.
4. Set the signal generator to center of the input frequency range.
5. Turn on the output drive of the signal generator.
6. Set the RF output of the amplifier to 10W or 40dBm. To achieve the 10W output power reduce the amplifiers attenuator before increasing the RF output of the source.
7. Sweep the amplifier—no less than 12 inches away—with a radiation probe.

Caution: Measured radiation levels must be less than 1mW/cm^2 to proceed. Otherwise, shut off the amplifier and tighten all waveguide joints. Repeat this step until radiation levels are acceptable.

8. Increase the RF output level in increments of 3dB until rated output power is achieved. Perform step 7 at each increment. Sometimes RF leakage is not present at lower RF output levels. Record the gain on the record sheet.
9. Check the low, center-low, center-high, and high frequencies. Record the gain on the record sheet.

The gain can be calculated using the formula below:

Gain (dB) = Pout (dBm) – Pin (dBm)

Table 4. Power and Gain Data Record Sheet

Model: _____

Serial: _____

Rated Power: _____

	Frequency:	**Gain at Rated:**
Low		
Center-Low		
Center		
Center-High		
High		

Notes: _____

4.4 Protecting Parts from ESD

Static electricity is a familiar phenomenon; except for an occasional mild shock or annoying “static cling,” it does not seem very serious to most personnel handling integrated circuit (IC) parts or assemblies. Unfortunately, many electronic components can be damaged or destroyed by electrostatic discharge (ESD) at potentials well below a person’s range of feeling. This damage can occur before, during, or after the part is installed.

People often carry 1000 to 5000 volts of static charge and do not feel any discharge of less than 3500 to 4000 V. Components mounted on a printed circuit board face increased risk of ESD damage because each printed conductor (wire) is a path connecting several devices. A discharge to that conductor stresses several devices at once.

Passive as well as active components are susceptible, and the damage ranges from a slight degradation of a parameter to catastrophic failures, such as short circuits. In many cases, a damaged part exhibits little or no visible physical damage, even under microscopic examination.

4.4.1 ESD Precautions

ESD damage can be prevented for the most parts by following these precautions:

- Treat all electronic parts and assemblies as static sensitive.
- Do not touch leads, pins, or traces while handling parts.
- Keep parts in original containers until ready for use.
- Discharge static before handling devices by touching a grounded metallic surface such as a cabinet. For personal grounding, use a wrist strap grounded through a 1-megohm resistor.
- Do not slide static-sensitive devices over any surface.

4.4.2 Workstation Practices

Handle all sensitive parts or assemblies at static-safe workstations. A static-safe workstation provides the following features:

- A conductive tablemat grounded through a 1-megohm resistor
- A conductive wrist strap wired to a swivel connector on the mat through a 1-megohm resistor
- A common ground point at each workstation
- A work area free of non-conductors, including all common plastics, “polybags,” cardboard, cigarette packages, candy wrappers, work envelopes, synthetic mats, and ungrounded metal plates. Carpeting should not be used on floors, work surfaces, or shelving.
- Do not allow clothing contacting with components or assemblies. Sleeves should be rolled high enough to keep them away from sensitive parts. Antistatic smocks should be worn.
- Gloves, if used, should be made of cotton or antistatic materials only.
- Brushes, if needed, should have natural, not synthetic, bristles.
- If walking is necessary and wrist straps cannot be worn, use a conductive floor mat in conjunction with conductive shoe heels.
- Transport and store electrostatic-sensitive devices only in static-protective containers
- No paper or cards should be placed inside the containers. A label attached to each container should warn personnel to observe proper handling precautions.
- Transportation carts should have carrying surfaces covered by conductive mats and should have at least two conductive wheels. Verify that carts, wheels, casters, frames, and shelves are conductive. Do not transport sensitive electronic equipment on a rubber-wheeled cart being pushed by a person wearing crepe- or heavy-rubber-soled shoes; this promotes very high levels of electrostatic charge.

4.4.3 Workstation Upkeep

Perform the following checks at the static-safe workstation on a weekly basis:

- Monitor each workstation for proper grounding, safe procedures, and possible static hazards.
- Check electrical grounds and wrist-strap continuity with an ohmmeter.
- Check workstations, including materials and containers with a static meter.
- Spray a commonly available antistatic solution on a clean cotton cloth and wipe the surfaces of workbenches, hand tools, and chairs.
- Clean conductive mats with mild detergent and water or with antistatic solution. This removes dirt and wax, which can insulate the surface and render it nonconductive.

4.4.4 Packaging

Package parts properly for storage or transportation in the following manner:

Attach a static warning label on the outside of each applicable envelope and container. (A JEDEC/EIA ESDS symbol is preferred.) Pack parts for storage or transportation in antistatic packaging; pack the parts tightly to prevent motion that could generate static.

Note: The best protective enclosure is a Faraday cage, which shunts any inductive charges around the part, providing complete protection. Metal, metalized plastic and carbon-loaded plastic bags are all examples of Faraday cages. Metalized plastic has the advantage that it is semitransparent, and its contents can be seen without opening it. The often-used "pink poly" bags afford less protection.

4.5 Customer Service

Refer to the "Warranty and Support Information" appendix, for CPI Satcom contact, service, and return information.

5. Product Drawings

This section contains technical drawings and specifications to aid in the system install and operation of the equipment provided.

Table 5. Product drawings

Drawing Name	Drawing Number
Marketing Datasheet SB49KOA	MKT497
Outline drawing	01-000955-000
CIF Protocol Document	0200597800

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A. Customer Support Information

- For product support, visit www.cpii.com/support.cfm/4
- For product recycling, visit www.cpii.com/docs/library/4/recycle.pdf
- To download the CPI Mobile App, search “CPI” in the app store of your Apple or Android device.
- For the desktop version of the CPI Mobile App, visit www.satcomproducts.cpii.com

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B. Firmware Updates

For a number of reasons the software may become corrupted or lost. The firmware for all internal components is contained in a single file. Therefore, anytime the firmware is updated—all of the internal component firmware is updated.

To update firmware,

1. Verify the amplifier has been removed for service.
2. Verify the amplifier is grounded and that RF input and output ports are properly terminated.
3. Apply prime power.
4. Configure the IP settings. Refer to section the PC interfacing section if you are not sure how to do this.
5. Connect to the amplifier using a PC browsing application.
6. In **Amp Status**, select **Amp Info** from the **Screens Menu**.
7. In **Amp Info**, press **Choose File**, and then select the firmware file to be uploaded.
8. In **Amp Info**, press **Upload**. *The firmware will automatically update and the power may cycle a few times. A screen prompt will appear indicating the firmware has been updated.*
9. When the screen prompt appears, press **OK**.

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C. Web Interface Screens

This section details the amplifier screens which are used to control and monitor the amplifier. Users can access amplifier screens by clicking on them from the screens menu. The amplifier screens are displayed in the screens display.

Figure 10. Screens Menu

C.1 Amp Status

The amp status screen allows users to change the operating state, set RF unit preferences, and displays the operating parameters of the amplifier. A bar is displayed for each parameter which uses colored sections to indicate the thresholds—red for fault, yellow for alarm, and green for normal operation. The amp status screen can be displayed as bars or readings using the selection tool at the bottom of the screen.

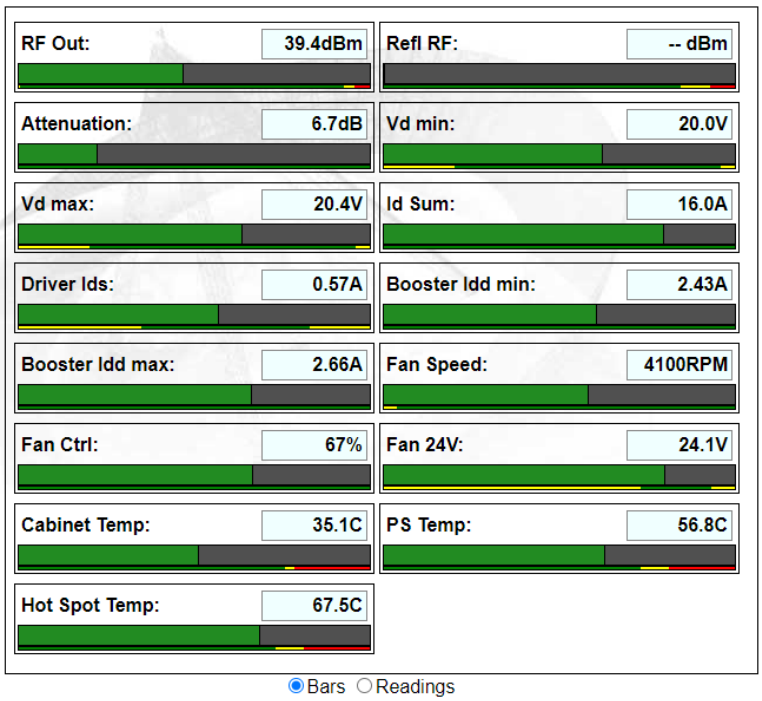


Figure 11. Amp Status Screen (Bars)

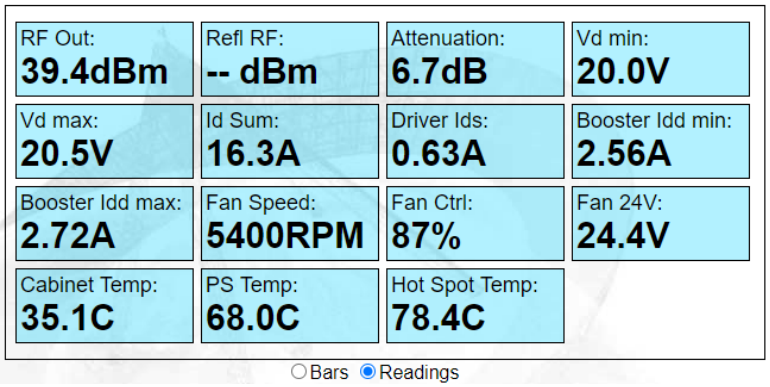


Figure 12. Amp Status Screen (Readings)

C.2 Amp Info

The amp info screen includes the amplifier type, serial number, firmware versions, and amplifier name. Users can rename the amplifier, download files to, or upload files from the amplifier.

To rename the amplifier,

- In **Amp Info**, type the new name in the **Amp Name** field, then press **Set** to confirm.

To download files saved in memory,

1. In **Amp Info**, select a file type in the **Download** dropdown menu, and then press **Download**.
2. When prompted, select a save location and save the file.

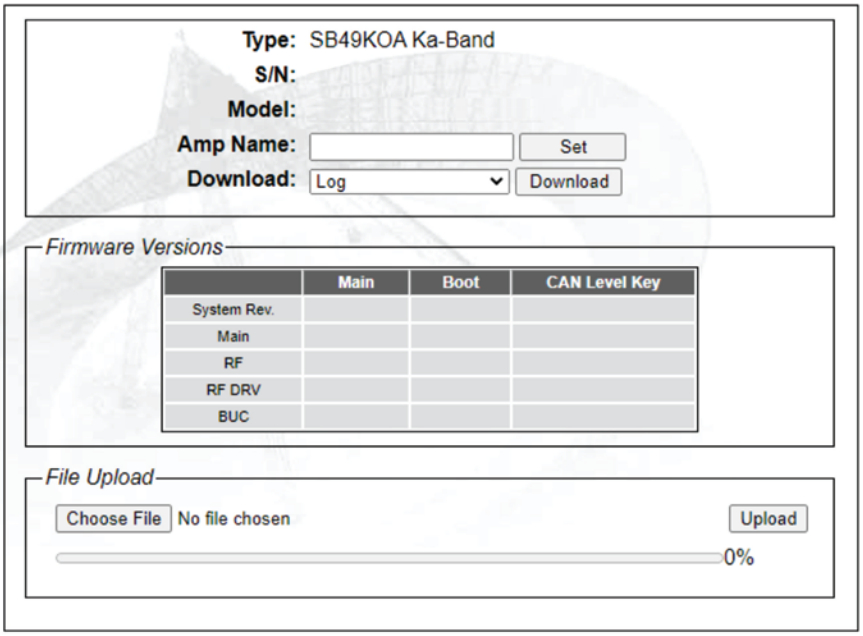


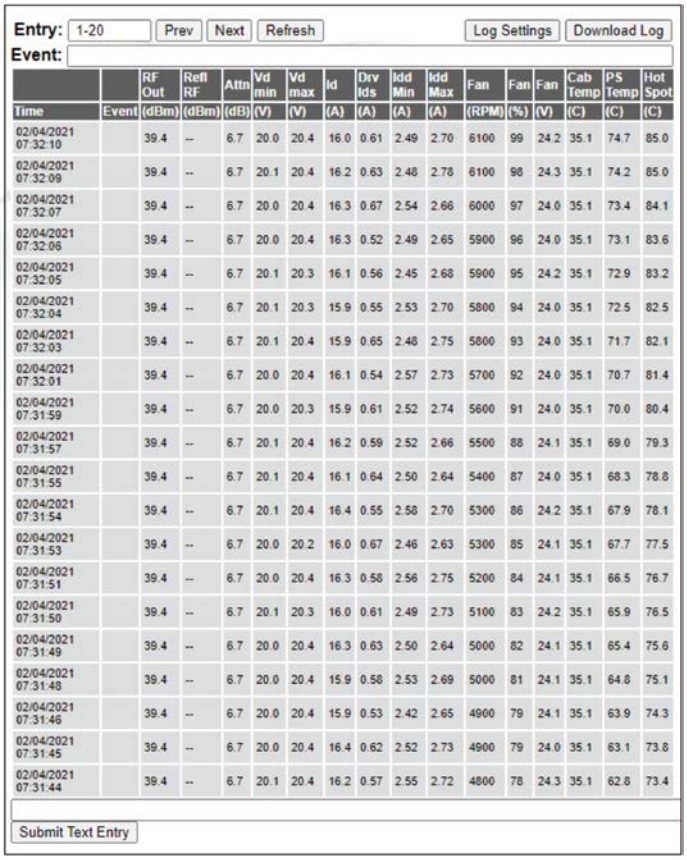
Figure 13. Amp Info Screen

C.3 Meter Log

The meter log displays twenty entries at a time—press the **Prev** or **Next** buttons to navigate entries. 6000 entries can be saved in FRAM (non-volatile memory) and the SD flash has the capacity for an additional 10,000 entries. The oldest log file will be overwritten after 16,000 log entries have been saved.

To download the meter log,

- In **Meter Log**, press **Download Log**. A complete meter log .csv file will be downloaded from the amplifier.



Time	Event	RF Out (dBm)	Refl RF (dBm)	Attn (dB)	Vd min (V)	Vd max (V)	Id (A)	Drv Ids (A)	Idd Min (A)	Idd Max (A)	Fan (RPM)	Fan (%)	Fan (V)	Cab Temp (C)	PS Temp (C)	Hot Spot (C)
02/04/2021 07:32:10		39.4	--	6.7	20.0	20.4	16.0	0.61	2.49	2.70	6100	99	24.2	35.1	74.7	85.0
02/04/2021 07:32:09		39.4	--	6.7	20.1	20.4	16.2	0.63	2.48	2.78	6100	98	24.3	35.1	74.2	85.0
02/04/2021 07:32:07		39.4	--	6.7	20.0	20.4	16.3	0.67	2.54	2.66	6000	97	24.0	35.1	73.4	84.1
02/04/2021 07:32:06		39.4	--	6.7	20.0	20.4	16.3	0.52	2.49	2.65	5900	96	24.0	35.1	73.1	83.6
02/04/2021 07:32:05		39.4	--	6.7	20.1	20.3	16.1	0.56	2.45	2.68	5900	95	24.2	35.1	72.9	83.2
02/04/2021 07:32:04		39.4	--	6.7	20.1	20.3	15.9	0.55	2.53	2.70	5800	94	24.0	35.1	72.5	82.5
02/04/2021 07:32:03		39.4	--	6.7	20.1	20.4	15.9	0.65	2.48	2.75	5800	93	24.0	35.1	71.7	82.1
02/04/2021 07:32:01		39.4	--	6.7	20.0	20.4	16.1	0.54	2.57	2.73	5700	92	24.0	35.1	70.7	81.4
02/04/2021 07:31:59		39.4	--	6.7	20.0	20.3	15.9	0.61	2.52	2.74	5600	91	24.0	35.1	70.0	80.4
02/04/2021 07:31:57		39.4	--	6.7	20.1	20.4	16.2	0.59	2.52	2.66	5500	88	24.1	35.1	69.0	79.3
02/04/2021 07:31:55		39.4	--	6.7	20.1	20.4	16.1	0.64	2.50	2.64	5400	87	24.0	35.1	68.3	78.8
02/04/2021 07:31:54		39.4	--	6.7	20.1	20.4	16.4	0.55	2.58	2.70	5300	86	24.2	35.1	67.9	78.1
02/04/2021 07:31:53		39.4	--	6.7	20.0	20.2	16.0	0.67	2.46	2.63	5300	85	24.1	35.1	67.7	77.5
02/04/2021 07:31:51		39.4	--	6.7	20.0	20.4	16.3	0.58	2.56	2.75	5200	84	24.1	35.1	66.5	76.7
02/04/2021 07:31:50		39.4	--	6.7	20.1	20.3	16.0	0.61	2.49	2.73	5100	83	24.2	35.1	65.9	76.5
02/04/2021 07:31:49		39.4	--	6.7	20.0	20.4	16.3	0.63	2.50	2.64	5000	82	24.1	35.1	65.4	75.6
02/04/2021 07:31:48		39.4	--	6.7	20.0	20.4	15.9	0.58	2.53	2.69	5000	81	24.1	35.1	64.8	75.1
02/04/2021 07:31:46		39.4	--	6.7	20.0	20.4	15.9	0.53	2.42	2.65	4900	79	24.1	35.1	63.9	74.3
02/04/2021 07:31:45		39.4	--	6.7	20.0	20.4	16.4	0.62	2.52	2.73	4900	79	24.0	35.1	63.1	73.8
02/04/2021 07:31:44		39.4	--	6.7	20.1	20.4	16.2	0.57	2.55	2.72	4800	78	24.3	35.1	62.8	73.4

Figure 14. Meter Log Screen

Special events, such as service activities, can be entered as text events in the meter log.

To enter a text event in the meter log,

1. In **Meter Log**, select the text field above the **Submit Text Entry** button, and then type the event.
2. In **Meter Log**, press the **Submit Text Entry** button.

C.3.1 Meter Log Settings

The meter log settings screen contains deltas and the automatic log entry controls. Each delta is a variable limit for the metered parameter. If the delta limit is crossed, a log entry is made.

To set a log delta,

1. In **Meter Log**, press the **Log Settings** button. *The meter log settings window will appear.*
2. In **Log Settings**, enter a new delta value in the log delta field, and then press **Enter** to confirm the change.

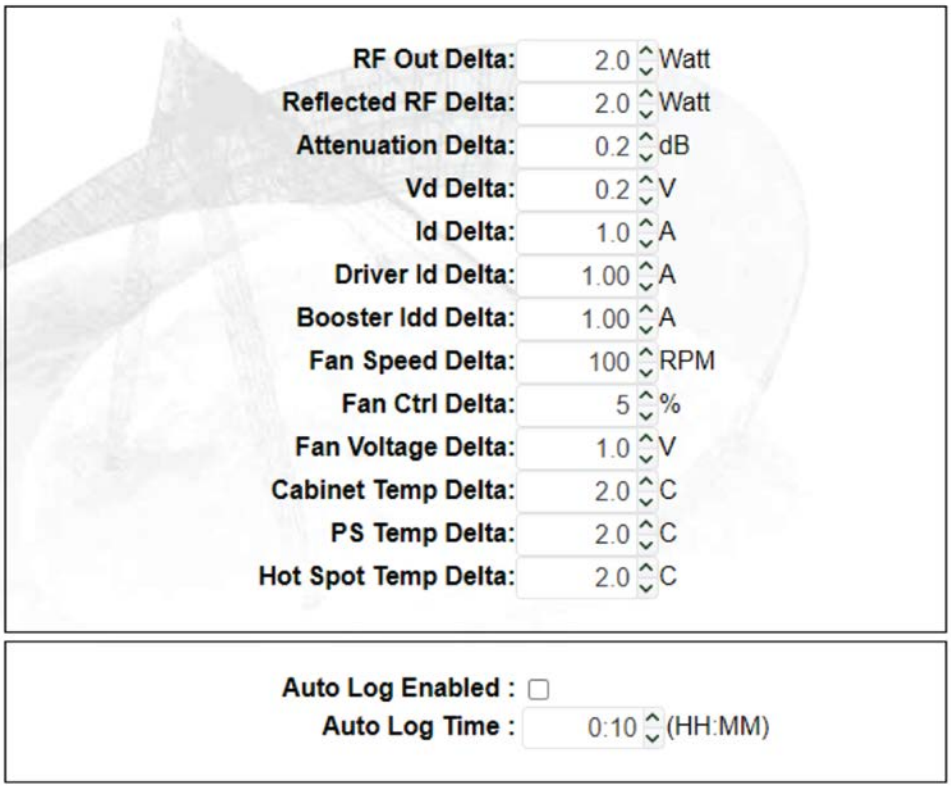


Figure 15. Meter Log Settings

The amplifier can be set to create automatic log entries at user defined time intervals.

To enable automatic log entries,

1. In **Meter Log**, press the **Log Settings** button.
2. In **Log Settings**, enter a new period in the **Auto Log Time** field, and then press **Enter**.
3. In **Log Settings**, place a checkmark in the **Auto Log Enabled** checkbox.

C.4 Setpoints

The setpoints screen lists the fault and alarm trip limits available to users. Fault and alarm trip limits protect the amplifier from damage and warn of hazardous operating conditions.

There are two ways to set a new limit,

- In **Setpoints**, enter a new value in the limit box, and then press **Enter**.
- In **Setpoints**, press the up or down arrow keys beside the limit box. The step size for dB limits is 0.1 and the step size for Watt limits is 1.

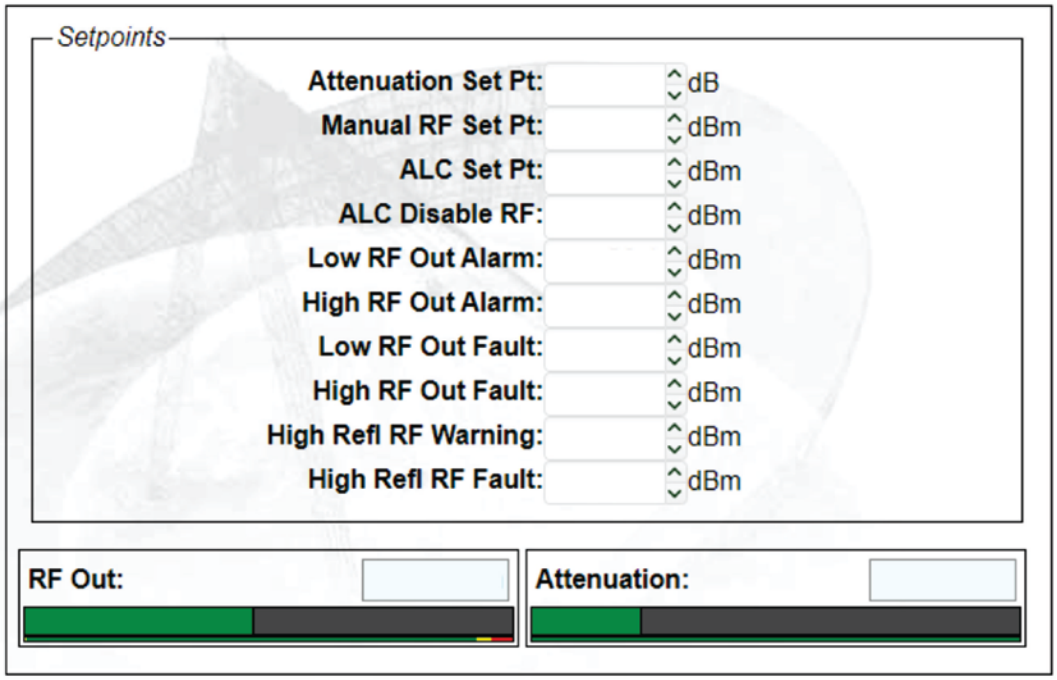


Figure 16. Setpoints Screen

C.5 Config

The config screen contains settings for the computer interface—CIF, discrete interface, and remote control point.

CIF settings,

- **CIF Protocol**—the protocol can be set to binary computer interface protocol—BCIP or ASCII computer interface protocol—ACIP. Refer to the CIF protocol document provided in the *Drawings* section of this manual for details.
- **BCIP Type**—GaNLink or B3KO Legacy. Only available when BCIP is the active CIF protocol.
- **Address**—the BCIP address range is 17–255 and the ACIP address range is 48–111.
- **RS-485 Termination**—Enables the 120 Ohm termination resistor on the RS485+/- serial receive lines.

BUC settings,

- **BUC Unlock Type**—sets the notification type when the BUC loses the reference frequency. Can be set to Alarm or Fault. Setting this field to fault will cause the amplifier to mute if the reference frequency is lost.
- **Band Select**—sets the output frequency band of the BUC.

Discrete settings,

- **Relay**—sets the event to trigger the relay on the legacy switch interface.
- **Disable Ext Mute**—disables the external mute pins on the serial interface. On the standard serial interface the pins are H, J, and K. With the Keyline mode option, the pins are J and K.

Keyline settings,

- **Keyline Enabled**—enables keyline function.
- **Keyline Polarity**—sets the keyline polarity to active high or active low.

Control point settings,

- **Control point**—sets the control point. The control point can be set to Ethernet CIF, serial CIF, web, all, SNMP, or OpenBMIP. Regardless of the current control point, the control point can always be changed via the web interface.

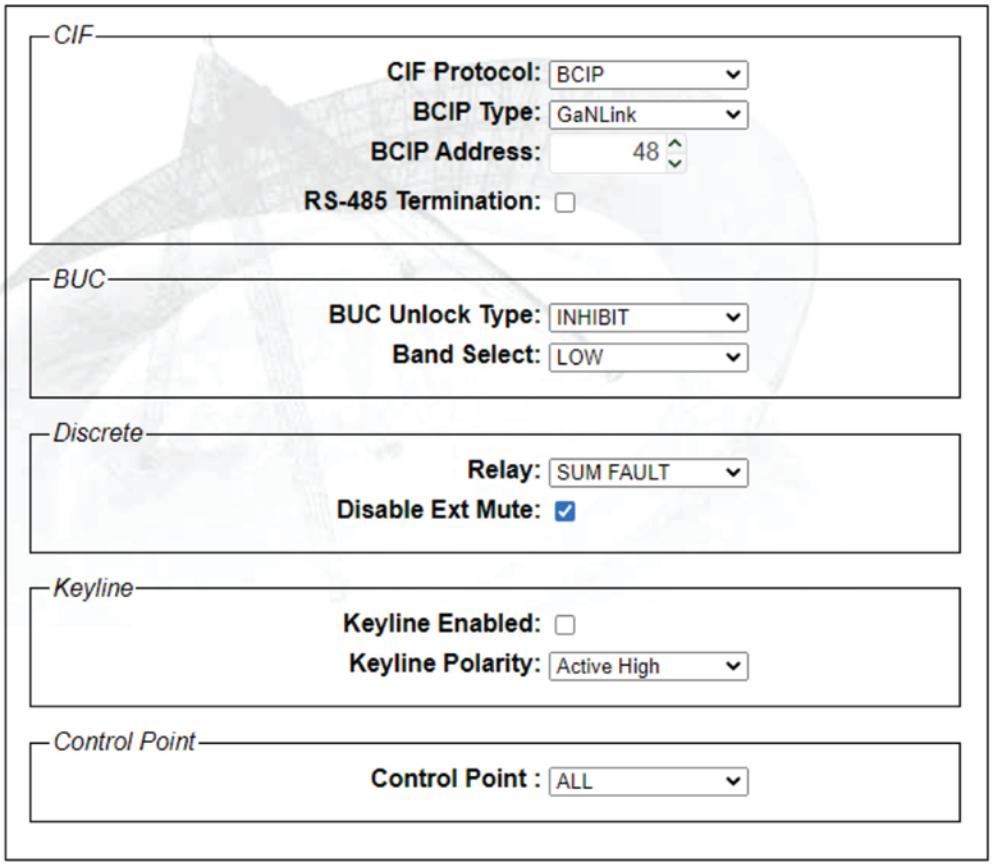


Figure 17. Config Screen (BCIP shown)

C.6 Timers

The timers screen displays the length of time the amplifier has been on and the length of time transmit.

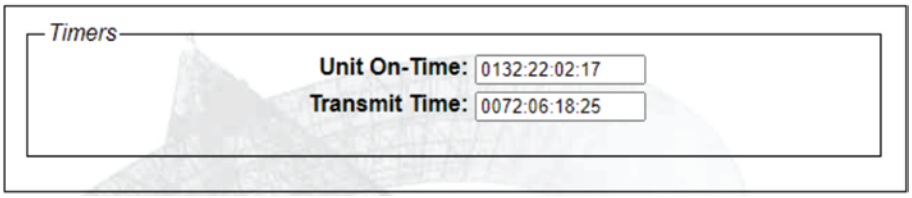


Figure 18. Timers Screen

C.7 IP Settings

The IP settings screen contains the static IP settings, dynamic host configuration protocol—DHCP setup, and the MAC address. The IP settings in use are shown in the current IP settings box.

To enable DHCP,

- In **IP Settings**, place a checkmark in the **Enable DHCP** checkbox.

To set new static IP settings,

1. In **IP Settings**, enter a new IP address in the **IP Address**, **IP Mask**, and **IP Gateway** fields.
2. In **IP Settings**, press **Set** to confirm the changes.

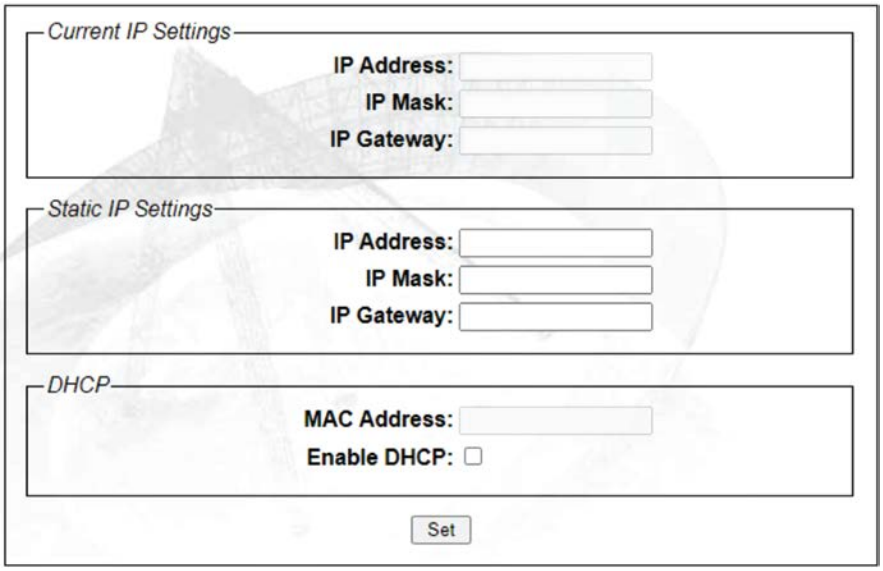


Figure 19. IP Settings Screen

C.8 SNMP

The Simple Network Management Protocol—SNMP screen is used to enable and set the communication parameters required by the SNMP network. A MIB compiler software is required to parse the Management Information Bus—MIB file so it can be used by the SNMP client.

A copy of the MIB file can be found,

- With this product manual.
- In the memory of the amplifier—download it from the Amp Info screen.

Note: Press the Apply button to confirm changes to any SNMP settings.

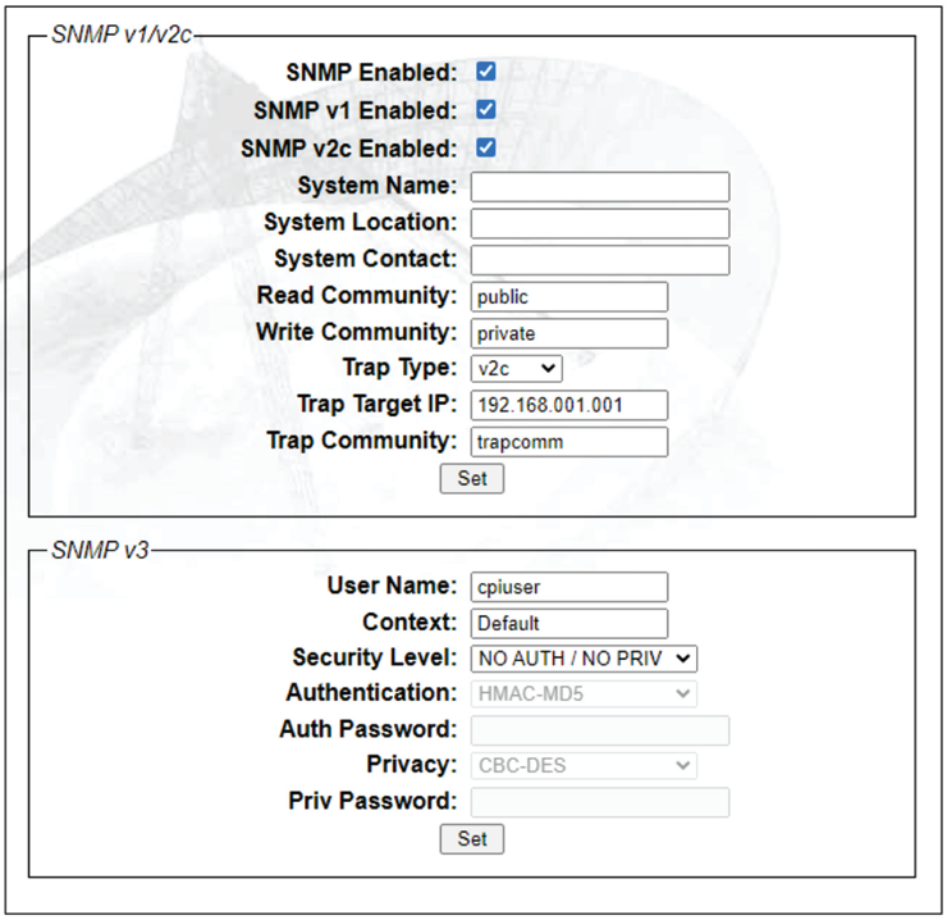


Figure 20. SNMP Screen

SNMP v1/v2c configurable settings,

- **SNMP Enabled**—allows the SNMP client to control and monitor the amplifier.

- **SNMP v1 Enabled**—sets SNMP v1 communication.
- **SNMP v2c Enabled**—sets SNMP v2c communication.
- **System Name**—text field for the name the system.
- **System Location**—text field for the location name.
- **System Contact**—text field for the system contact.
- **Read Community**—text field for the SNMP read community string. Community strings are only used with the SNMPv1 or SNMPv2c protocols.
- **Write Community**—text field for the SNMP write community string. Community strings are only used with the SNMPv1 or SNMPv2c protocols.
- **Trap Type**—set to **NONE**, **v1**, **v2c**, or **v3**. A trap is a notification generated by the amplifier. Traps notify the network monitor that a problem exists, such as a fault condition. The trap type is set per the SNMP protocol used.
- **Trap Target IP**—holds the IP address of the network monitor device.
- **Write Community**—text field for the SNMP trap community string. Community strings are only used with the SNMPv1 or SNMPv2c protocols.

SNMP v3 configurable settings,

- **User Name**—text field for the SNMPv3 user name string.
- **Context**—text field for the SNMPv3 context string.
- **Security Level**—set to **NO AUTH/NO PRIV**, **AUTH/NO PRIV**, or **AUTH/PRIV**.
- **Authentication**—set to **HMAC-MD5** or **HMAC-SHA**.
- **Auth Password**—used to set the authentication password.
- **Privacy**—set to **CBC-DES** or **CFB-AES-128**.
- **Priv Password**—used to set the privacy password.

C.9 Email

The email screen is used to send alarm or fault emails and the meter log to the specified email address. The network must support Simple Mail Transfer Protocol—SMTP to send email alerts.

To setup alarm or fault email notifications,

1. In **Email**, enter an email address in the Email text box. *Up to four email addresses can be set.*
2. In **SMTP Server**, enter the IP address of the SMTP server in the IP Address field.
3. In **SMTP Server**, enter the domain name of the SMTP server in the domain name field.
4. In **Event Trigger**, place a checkmark in the **Any Alarm** and **Any Fault** as required.
5. In **Event Trigger**, enter a value in minutes in the **Alarm Hold Off** field.
6. In **Meter Log**, place a checkmark in the **Attach Meter Log** if the meter log is required for your application.
7. In the **Email** screen, press **Submit** to confirm the email settings.
8. In the **Email** screen, press **Send Test Email**. *An email will be sent to the email address specified in the Email text box.*

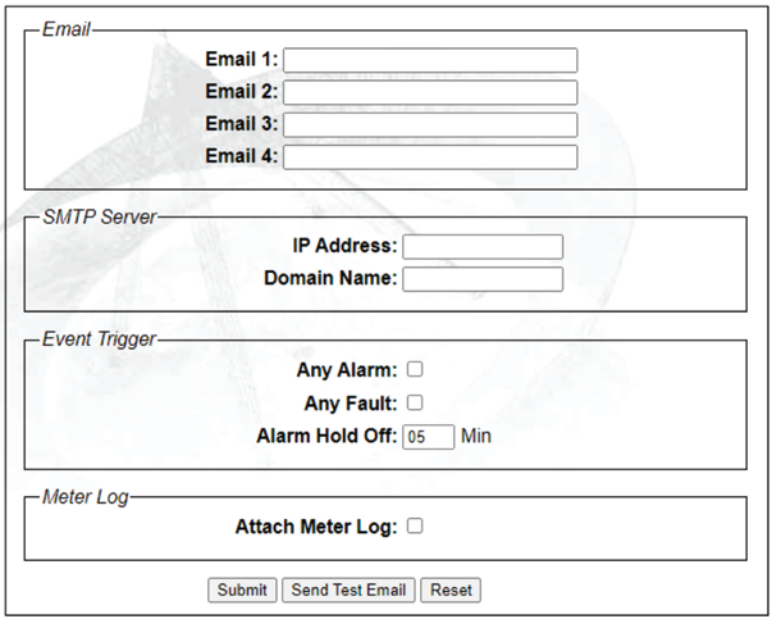


Figure 21. Email Screen

C.10 Set Login

The set login screen allows users to reset the default user name and password when accessing the amplifier using a web browser.

To change the user name and password,

1. In **Set Login**, enter the current user name in the **Old User Name** text box.
2. In **Set Login**, enter the current password in the **Old Password** text box.
3. In **Set Login**, enter a new user name in the **New User Name** text box.
4. In **Set Login**, enter a new password in the New Password text box.
5. In **Set Login**, re-enter the new password in the **Repeat New Password** text box.
6. In **Set Login**, press **Apply** to confirm your changes.

Note: Press the Reset button change both the user name and password back to cpi.

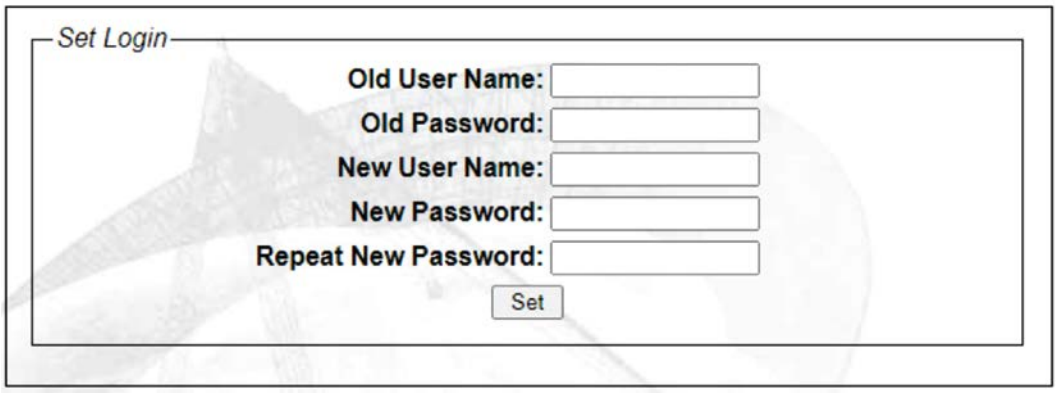


Figure 22. Set Login Screen

C.11 Clock

The clock screen is used to set the time and date of the amplifier. The time and date are used by the meter log to create event entries. Users can set the date and time manually by inputting the data or automatically by using the Network Time Protocol—NTP feature.

To manually setup the time and date,

1. In **Time**, enter the hour, minute, second, month, day, and year in their respective fields, and then click **Set** to confirm changes.
2. In **Time**, enter the coordinated universal time—UTC offset in the Offset From UTC field, and then click **Set** to apply confirm.

To setup the NTP,

1. Verify the network has an NTP server. An NTP server is required to use this feature.
2. In **NTP**, enter the IP address of the NTP server in the **NTP Server** field.
3. In **NTP**, place a checkmark in the **NTP Enabled** checkbox, and then press **Set** to confirm.

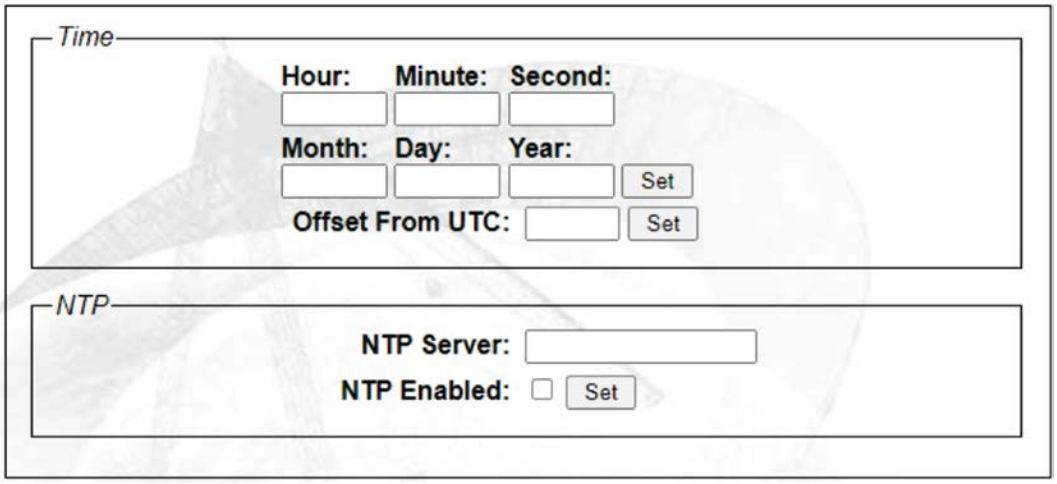


Figure 23. Clock Screen

C.12 Options

The options screen is used to set user preferences during operation, save user settings, load user settings, or load factory settings.

The confirm transmit, standby, or inhibit selection fields generate a user prompt when a checkmark is placed in the checkbox. The user prompt to confirm the operation is generated anytime a transmit, standby, or inhibit command is issued. This feature prevents unintentional operation.

When a checkmark is placed in the enable save transmit state checkbox—the amplifier will recall the last known operating state if the power is cycled.

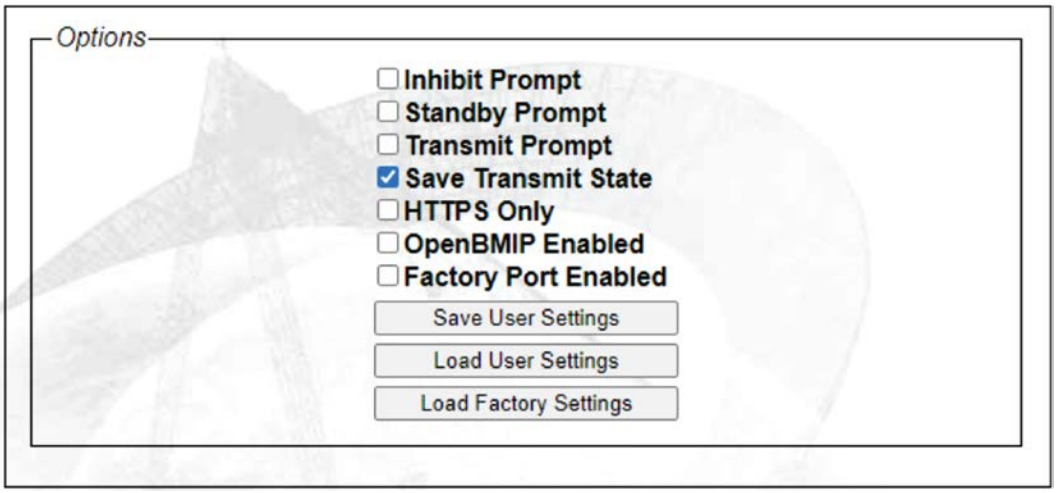


Figure 24. Options Screen

Save User Settings—saves all user settings from all screens pages in the amplifier memory.

Load User Settings—recalls the saved user settings from the amplifiers memory. The recalled user settings overwrite the current user settings.

Load Factory Settings—overwrites all settings with a factory default value to the factory default.