SBII+
Model 63

Installation and Operation Manual

'WARNING: This is **NOT** a **CONSUMER** device. It is designed for installation by **FCC Licensees** and **Qualified Installers**. You must have an **FCC license** or express consent of an FCC Licensee to operate this device. You must register Class B signal boosters (as defined in 47 CFR 90.219) online at www.fcc.gov/signal-boosters/registration. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation.

Booster default IP Address and account details "Communicating With the Booster" on page 49.

Fiber-DAS default IP Address and account details "Default Head-end Login Information" on page 64.

This is a preliminary manual. Specifications, limits, and text are subject to change without notice. The information within this manual was as complete as possible at the time of printing.
Bird Electronic Corporation is not liable for errors. Check our Web Site for updates: http://www.birdrf.com/

Instruction Book Part Number 7-9598 Rev. A

Safety Precautions

The following are general safety precautions that are not necessarily related to any specific part or procedure, and do not necessarily appear elsewhere in this publication. These precautions must be thoroughly understood and apply to all phases of operation and maintenance.

WARNING

Keep Away From Live Circuits

Operating Personnel must at all times observe general safety precautions. Do not replace components or make adjustments to the inside of the test equipment with the high voltage supply turned on. To avoid casualties, always remove power.

WARNING

Shock Hazard

Do not attempt to remove the RF transmission line while RF power is present.

WARNING

Do Not Service Or Adjust Alone

Under no circumstances should any person reach into an enclosure for the purpose of service or adjustment of equipment except in the presence of someone who is capable of rendering aid.

WARNING

Safety Earth Ground

An uninterruptible earth safety ground must be supplied from the main power source to test instruments. Grounding one conductor of a two conductor power cable is not sufficient protection. Serious injury or death can occur if this grounding is not properly supplied.

WARNING

Resuscitation

Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

WARNING

Remove Power

Observe general safety precautions. Do not open the instrument with the power applied.

Safety Symbols

WARNING

Warning notes call attention to a procedure, which if not correctly performed, could result in personal injury.

CAUTION

Caution notes call attention to a procedure, which if not correctly performed, could result in damage to the instrument.

This symbol indicates that a shock hazard exists if the precautions in the instruction manual are not followed.

The caution symbol appears on the equipment indicating there is important information in the instruction manual regarding that particular area.

This symbol indicates that the unit radiates heat and should not be touched while hot.

NOTE

Calls attention to supplemental information.

Warning Statements

The following safety warnings appear in the text where there is danger to operating and maintenance personnel and are repeated here for emphasis.

WARNING

Never attempt to connect or disconnect RF equipment from the transmission line while RF power is being applied. Leaking RF energy is a potential health hazard.

WARNING

To avoid personal injury, disconnect the power cord from the AC line before performing any maintenance.

Caution Statements

The following equipment cautions appear in the text and are repeated here for emphasis.

CAUTION

Check the electrical code for proper AC hookup prior to operation of the unit. Make sure the neutral or return hookup is only used for that purpose.

Safety Statements

USAGE

ANY USE OF THIS INSTRUMENT IN A MANNER NOT SPECIFIED BY THE MANUFACTURER MAY IMPAIR THE INSTRUMENT'S SAFETY PROTECTION.

USO

EL USO DE ESTE INSTRUMENTO DE MANERA NO ESPECIFICADA POR EL FABRICANTE, PUEDE ANULAR LA PROTECCIÓN DE SEGURIDAD DEL INSTRUMENTO.

BENUTZUNG

WIRD DAS GERÄT AUF ANDERE WEISE VERWENDET ALS VOM HERSTELLER BESCHRIEBEN, KANN DIE GERÄTESICHERHEIT BEEINTRÄCHTIGT WERDEN.

UTILISATION

TOUTE UTILISATION DE CET INSTRUMENT QUI N'EST PAS EXPLICITEMENT PRÉVUE PAR LE FABRICANT PEUT ENDOMMAGER LE DISPOSITIF DE PROTECTION DE L'INSTRUMENT.

IMPIEGO

QUALORA QUESTO STRUMENTO VENISSE UTILIZZATO IN MODO DIVERSO DA COME SPECIFICATO DAL PRODUTTORE LA PROZIONE DI SICUREZZA POTREBBE VENIRNE COMPROMESSA.

SERVICE

SERVICING INSTRUCTIONS ARE FOR USE BY SERVICE - TRAINED PERSONNEL ONLY. TO AVOID DANGEROUS ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING UNLESS QUALIFIED TO DO SO.

SERVICIO

LAS INSTRUCCIONES DE SERVICIO SON PARA USO EXCLUSIVO DEL PERSONAL DE SERVICIO CAPACITADO. PARA EVITAR EL PELIGRO DE DESCARGAS ELÉCTRICAS, NO REALICE NINGÚN SERVICIO A MENOS QUE ESTÉ CAPACITADO PARA HACERIO.

WARTUNG

ANWEISUNGEN FÜR DIE WARTUNG DES GERÄTES GELTEN NUR FÜR GESCHULTES FACHPERSONAL.

ZUR VERMEIDUNG GEFÄHRLICHE, ELEKTRISCHE SCHOCKS, SIND WARTUNGSARBEITEN AUSSCHLIEßLICH VON QUALIFIZIERTEM SERVICEPERSONAL DURCHZUFÜHREN.

ENTRENTIEN

L'EMPLOI DES INSTRUCTIONS D'ENTRETIEN DOIT ÊTRE RÉSERVÉ AU PERSONNEL FORMÉ AUX OPÉRATIONS D'ENTRETIEN. POUR PRÉVENIR UN CHOC ÉLECTRIQUE DANGEREUX, NE PAS EFFECTUER D'ENTRETIEN SI L'ON N'A PAS ÉTÉ QUALIFIÉ POUR CE FAIRE.

ASSISTENZA TECNICA

LE ISTRUZIONI RELATIVE ALL'ASSISTENZA SONO PREVISTE ESCLUSIVAMENTE PER IL PERSONALE OPPORTUNAMENTE ADDESTRATO. PER EVITARE PERICOLOSE SCOSSE ELETTRICHE NON EFFETTUARRE ALCUNA RIPARAZIONE A MENO CHE QUALIFICATI A FARLA.

For Class A or Class B Unintentional Radiators

This equipment has been tested and found to comply with the limits for a Class A or Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which the user will be required to correct the interference at his own expense.

Pour Classe-A ou Classe-B Radiateurs Involontaires

Cet équipement a été testé et jugé conforme avec les limites de la Classe-A ou Classe-B des appareils numériques, suivants à la Partie 15 des règlements de la FCC. Ces limites sont conçues pour fournir une protection raisonnable contre les interférences dangereuses lorsque l'équipement est utilisé dans un environnement commercial. Cet équipement génère, utilise et peut émettre des fréquences radio et, s'il n'est pas installé et utilisé conformément aux instructions du manuel, ceci peut causer des interférences dangereuses aux communications radio. Le fonctionnement de cet équipement dans une zone résidentielle est susceptible de causer des interférences mauvaises dans lequel l'utilisateur sera tenu pour responsable de corriger l'interférence à sa propre discrétion.

WARNING: Changes or modifications which are not expressly approved by Bird could void the user's authority to operate the equipment.

AVERTISSEMENT: Les changements ou modifications qui ne sont pas approuvés par Bird pourrait annuler l'autorité de l'utilisateur de faire fonctionner l'équipement.

ATTENTION: This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

ATTENTION: Cet appareil est conforme à la Partie 15 des règlements de la FCC. L'opération doit se conformer aux deux conditions suivantes: (1) cet appareil ne peut causer d'interférences nuisibles et (2) cet appareil doit accepter toute interférence reçue, y compris les interférences qui peuvent provoquer un fonctionnement indésirable.

About This Manual

This manual covers the operating & maintenance instructions for the following models:

63 Model SBII+ Signal Booster
63 Model SBII+ Fiber-DAS

Changes to this Manual

We have made every effort to ensure this manual is accurate. If you discover any errors, or if you have suggestions for improving this manual, please send your comments to our Solon, Ohio factory. This manual may be periodically updated. When inquiring about updates to this manual refer to the part number and revision on the title page.

Table of Contents

General Description

The Bird Signal booster II+ and Signal booster II+ fiber-optic Distributed Antenna System (SB+ Fiber DAS) are used to extend radio coverage into areas where propagation losses prevent reliable communication.

Signal Booster — The standard systems receive RF signals from a donor antenna, amplifies the power level, couples it to an antenna and re-radiates the RF signals enhancing the signal coverage area.

Fiber-DAS — The Fiber-DAS systems receive RF signals from a donor antenna at a Head-end unit. The Head-end amplifies the power level, converts the RF into light pulses, and transmits the signal over fiber-optic cables to one or more remote units. The remote units convert the light pulses back into RF signals, couples it to an antenna and re-radiates the RF signals, enhancing the signal coverage area.

No frequency translation (conversion) occurs with these devices. The two-way SBII+ signal booster and Fiber-DAS are broadband, bi-directional, dual branch (uplink and downlink) systems. The systems receive from a donor antenna and transmits signals into a DAS for downlink. For uplink the system receives signal from the service antenna (DAS) and transmits signals to a Donor antenna.

The Bird Technologies SBII+ Model 63 and Fiber-DAS, are industrial, Class-B, signal boosters designed to operate in the UHF, 700, and 800 MHz public safety band.

The SBII+ Signal Boosters are available in NFPA compliant configurations, see "NFPA Compliance" on page 26.

SBII+ Model 63 Specifications

Table 1 Specifications

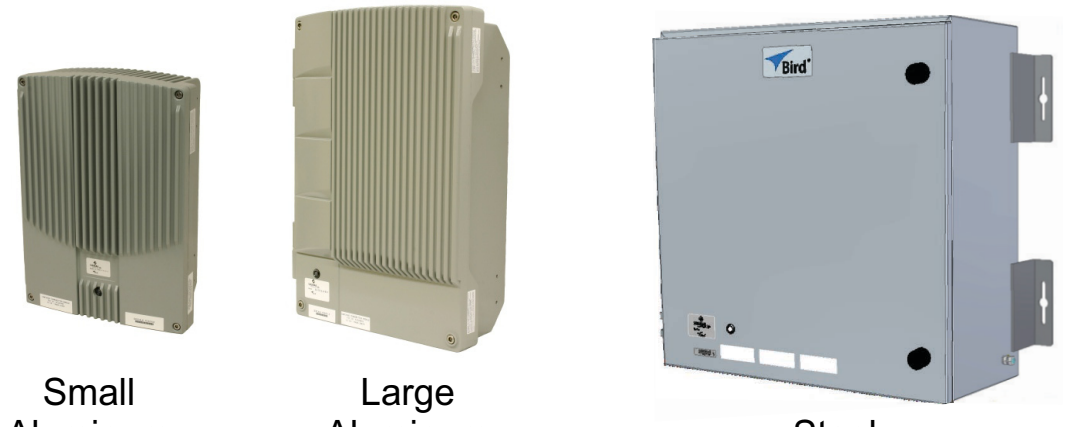
Parameter	Specification
Gain	80 dB
Gain Range (dB)	35 dB - 80 dB in 0.5 dB steps
Maximum Output Power 450 - 512 MHz 764 - 869 MHz	 +32 dBm UL/DL (composite) +33 dBm UL/DL (composite)
Maximum Input Level	-20 dBm
RF Sampler	-40 dB typ.
Operating Temperature Range	-30°C to +50°C
Nominal Impedance	50 Ohms, <1.5:1 VSWR
Input/Output Connectors	N Female
RF Sample Connectors	BNC female
UL Rated AC/DC Power Supply	100 - 240 VAC; 50 - 60 Hz, +24 VDC nominal
Enclosure	NEMA 4
Size/Weight (small clamshell enclosure) 700 or 800 Single Band	18.1” x 14” x 6.5” / 45 lbs.
Size/Weight (large clamshell enclosure) 700/800 Dual Band, UHF	24” x 17.5” x 9” / 90 lbs.
Propagation Delay	<0.5 micro-seconds
Unit Power Consumption (AC/DC)	75 W (3 Amps at 24 VDC)

Enclosures

The SBII+ Model 63 system is housed in wall mountable enclosures. There are two types of enclosures Aluminum and Steel, see Figure 1.

The small Aluminum enclosure has its status LED located on the lower center of the door, the large aluminum enclosure has a status LED located on the lower left-side of the door. The Steel enclosure has a status LED located on the lower left-side of the door.

Figure 1 SBII+ Enclosures



The enclosures are convection cooled.

Because of the SBII+ Model 63 systems modular design, the system can be customized to suit the customers specific requirements.

Standard Model Configurations

Standard Model Configurations

The SBII+ Model 63 is available in a variety of configurations as shown in Table 2 on page 4. The product model number is used to describe each configuration available.

For example:

Model number 63-70-2-A-B-1-J represents the following

- 63 = SBII+ Signal Booster
- 70 = 450 - 470 MHz Frequency Band
- 2 = Signal flow is in 2 directions (uplink and downlink)
- A = Gain of the booster is 80 dB
- B = Filter Band Width of the booster will be 0.5 MHz
- 1 = Enclosure Type is a gray NEMA 4 case
- J = Fiber-optic Head End with an RF Remote End (local RF)

Custom Model Configurations

Custom designed SBII+ Signal Boosters use the same model number formatting except that a unique 5 digit number will be inserted into the model number in place of the fields for signal direction, gain, and filter bandwidth.

As an example the model number 63-70-98765-1-J represents

- 63 = SBII+ signal booster
- 70 = 450 - 470 MHz Frequency Band
- 98765 = Custom design for signal direction, gain, and filter bandwidth.
- 1 = Enclosure Type is a gray NEMA 4 case
- J = Fiber-optic Head End with an RF Remote End (local RF)

Table 2 Model Number Breakdown

63-nnX-2-A-X-n-X (nomenclature breakdown)	
63	Product Type = Signal Booster II+
nnX	Operating Frequency Band (Filter Bandwidths Available) 70 = 450 - 470 MHz (B,D,F) 69 = 470 - 512 MHz (B,D) 82P = 763 - 805 MHz (P) 83B = 764 - 806 MHz (P)[1] 89C = 806 - 861 MHz (G,N) 89A = 806 - 869 MHz (G,N,R)[1] 82R = 763 - 861 MHz (PF,PN) 83E = 764 - 869 MHz (PF,PN,PR)[1]
2[2]	Signal Direction 2-Way, Standard, SBII+
A[2]	Gain of Booster (dB) 80
X[2]	Filter Bandwidth (MHz) B = 0.5 D = 1.0 F = 2.0 G = 3.0 N = 10 P = 12 [1]R = 18 PG = 12, 3 PN = 12, 10 [1]PR = 12, 18
n	Enclosure Type 1 = Gray NEMA 4 case 2 = Red NEMA 4 case
X	Options Blank = No options 4 = Fiber Head End, number of fiber ports (4,8,12, or 16) N = NFPA N4 = NFPA + Fiber Head End, number of fiber ports (4,8,12, or 16) R = Fiber Remote-end, 1310 Wavelength RA = Fiber Remote-end, 1270 Wavelength RB = Fiber Remote-end, 1290 Wavelength RD = Fiber Remote-end, 1330 Wavelength NR = NFPA, Fiber Remote-end, 1310 Wavelength NRB = NFPA, Fiber Remote-end, 1290 Wavelength

1 The 18 MHz models may not be authorized in your area due to recent FCC rule changes.
2 The model number of custom designed boosters replaces the three fields shown in red with a unique 5 digit number instead. As an example 63-nnX-XXXXX-n-X.

System Components

The SBII+ Model 63 system was designed to be a modular system, capable of a variety of configurations as shown in Table 2 on page 4. The system can be powered by an AC power supply assembly or a DC battery backup voltage. Because of its modular design the completed booster system can be housed in a variety of cabinet designs.

The major components that make up the system are described in the following paragraphs.

SBII+ Class B SB Module

The Class B SB Module is the heart of the SBII+ design. The Class B SB module contains, and shields, both the uplink and downlink signal amplification paths. The maximum gain for each path is 80 dB with a maximum output power of 2 Watts. Output power is limited by an Output Level Control (OLC) function so as not to exceed the 5 Watt ERP FCC specification or not to exceed the user output power limit setting (21 to 33 dBm). The customer can configure the module via an Ethernet connection and a software user interface (GUI). The GUI can be used to alter the gain of either or both signal paths, monitor system performance metrics, vary network and SNMP/SMTP notification settings.

AC Power Supply

The AC Supply is the primary source of power for the system. The AC Supply is a 100 - 240 single phase AC, 50 - 60 Hz power supply assembly, which converts the AC input to a 48 Volt DC output.

DC Power Supply

The DC supply is provided for back-up power in the event AC power is lost. If the AC Supply is lost the system will automatically switch to the DC back-up supply. See "Optional Equipment" on page 28.

Diplexers/Triplexers/Filters

Depending on the systems configuration diplexers, triplexers, or filters are used to provide isolation between the uplink and downlink paths, and are necessary to prevent oscillation. The diplexer/Triplexer/filter also insures that only RF signals in the desired operational band are amplified.

Fiber-DAS

In addition to the components mentioned above the Fiber-DAS systems include the following:

Head-end Enclosures

4-Port Splitter/Combiner — In the downlink path the 4-Port Splitter divides the RF output of the SB Module into four equal RF Signals. The outputs of the splitter are routed to the Fiber Optic Interface (FOI) Units. In the uplink path the 4-Port Combiner combines the four uplink path signals and routes the output to the SB Module.

Fiber Optic Interface (FOI) — Each FOI converts the downlink RF into fiber-optic laser output that is transmitted on fiber to the remote units. It also receives the laser light transmitted by the Remote Unit and converts it back to uplink RF signals that are then routed to the 4-Port Combiner.

Remote Gateway (RGW) — provides the web interface for all the settings of the system as well as many other functions. The Int/LAN port on the RGW is connected to the 8-Port Ethernet Switch to form the head-ends internal network. The Ext/WAN port is a “northbound” Ethernet port that allows the RGW to connect to the Internet, or a WAN/MAN type of larger network. This allows the system can be monitored and managed remotely.

8-Port Ethernet Switch — The 8-Port Ethernet Switch forms the head-ends internal network. The network allows the SB Module, FOIs, RGW, and the optional alarm panel to communicate. ENET 1 and ENET2 ports on the I/O panel allow a technician local access to the internal network without interrupting remote access via the RGW.

Remote Enclosures

Fiber Optic Remote (FOR) — Each FOR receives the laser light transmitted by the head-end and converts it back to downlink RF and routes the RF to the SB Module. In the uplink path the FOR converts uplink RF signals into fiber-optic laser output that is transmitted on the fiber to the head-end.

5-Port Ethernet Switch — The 5-Port Ethernet Switch forms the remote units internal network. The network allows the SB Module and FOR to communicate. ENET port on the I/O panel allow a technician local access to the internal network for configuration and troubleshooting.

System Examples

The Signal Flow Block Diagrams in this section show the Class B SB Module and how it interconnects with the other units within the system.

The passive filters/duplexers/triplexers provide the isolation between the uplink and downlink paths and are required to prevent oscillation. The size of the filters/duplexers/triplexers typically determine the size of the enclosure required to contain the system.

The connections between the module and the external passive filters/duplexers/triplexers are made with double shielded coaxial cable.

The filters/duplexers/triplexers ensure that only signals in the desired operational band are amplified and not those of other radio services. Circulators may be used as shown in the UHF block diagram to simplify the RF connections to the two signal paths or appropriately phased cables might also be used.

Signal Booster Systems

Single Band System — 700 or 800 MHz, "Single Band System (700 MHz or 800 MHz)" on page 7.

Single Band System — UHF, "Single Band System (UHF)" on page 8.

Dual Band System — 700 and 800 MHz, "Dual Band System (700 MHz/800 MHz)" on page 9

Fiber-DAS Systems

Head-end

Fiber-DAS Head-end Single Band System — 700 or 800 MHz, "Fiber-DAS Systems" on page 12.

Fiber-DAS Head-end Single Band System — UHF, "Fiber-DAS Head-End UHF" on page 15.

Fiber-DAS Head-end Dual Band System — 700 and 800 MHz, "Fiber-DAS Head-End Dual-Band" on page 17

Remote-end

Fiber-DAS Single Band Remote — 700 or 800 MHz, "Fiber-DAS Single-Band Remote Enclosure" on page 19.

Fiber-DAS Single Band Remote — UHF, "Fiber-DAS UHF Remote Enclosure" on page 22.

Fiber-DAS Dual Band Remote — 700 and 800 MHz, "Fiber-DAS Dual-Band Remote Enclosure" on page 24

Signal Booster Systems

Single Band System (700 MHz or 800 MHz)

Figure 2 shows the component layout of a typical Single Band system operating in the 700 MHz or 800 MHz band. Figure 3 is a block diagram of the same single band system.

Figure 2 Typical Single-Band SBII+ Booster (700 MHz or 800MHz)

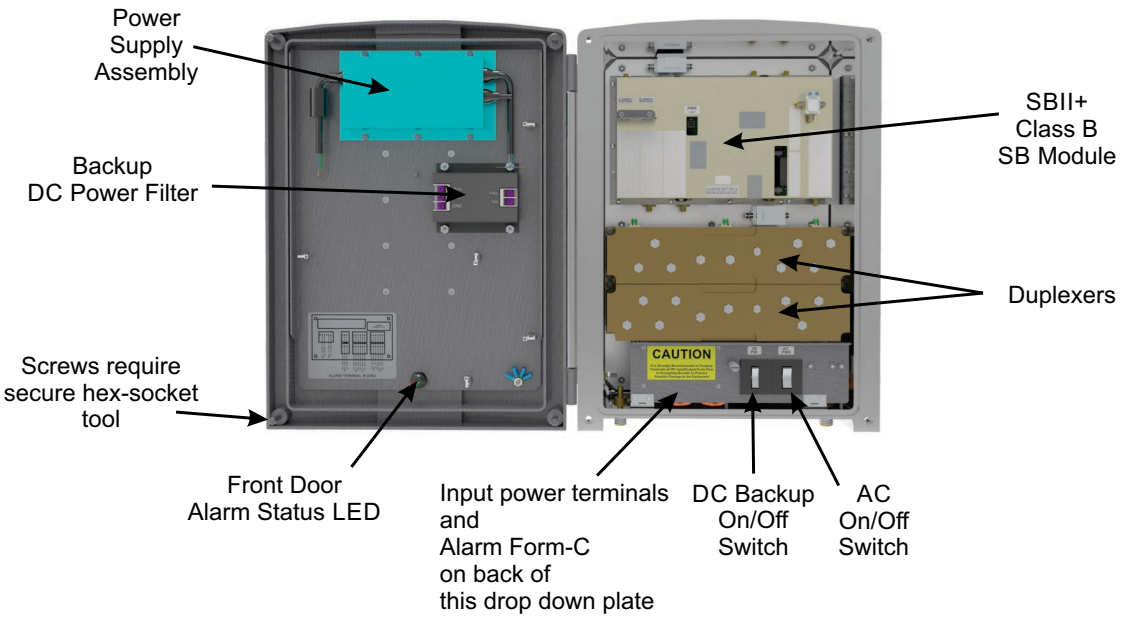
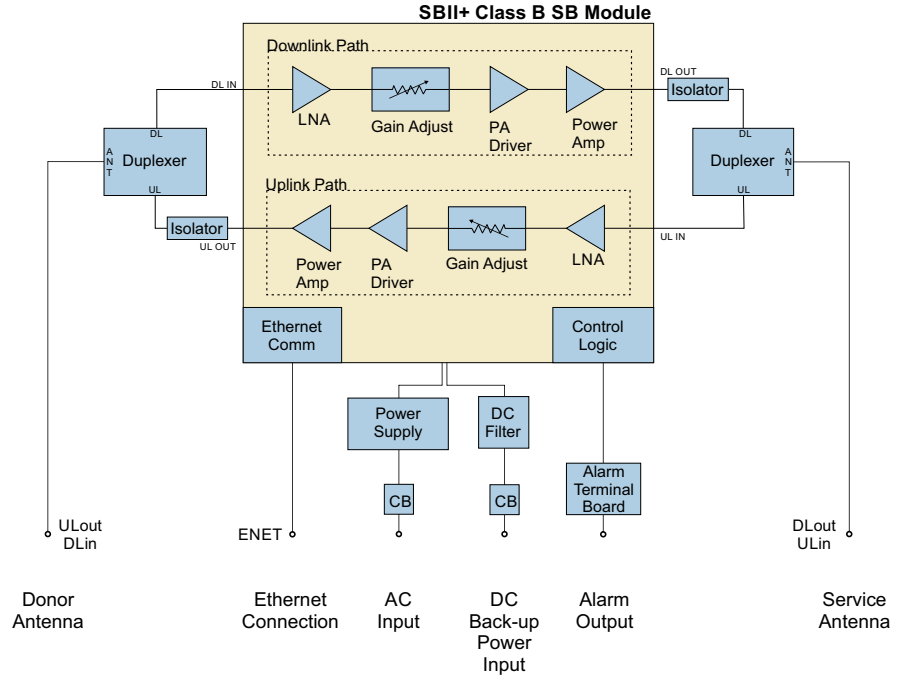


Figure 3 Signal flow block diagram of the typical Single Band 700 or 800 MHz SBII+ Booster.



Single Band System (UHF)

Figure 4 shows the component layout of a typical Single Band system operating in the UHF band.

Figure 5 is a block diagram of the same UHF single band system.

Figure 4 Typical UHF booster

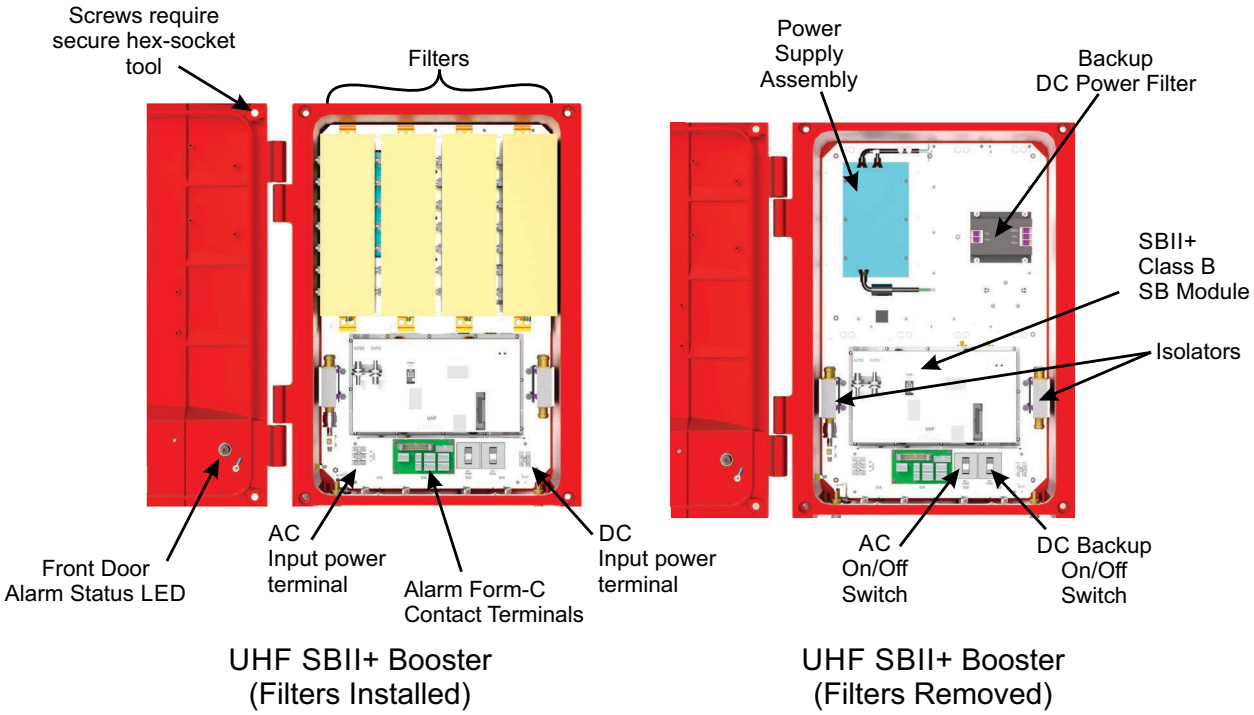
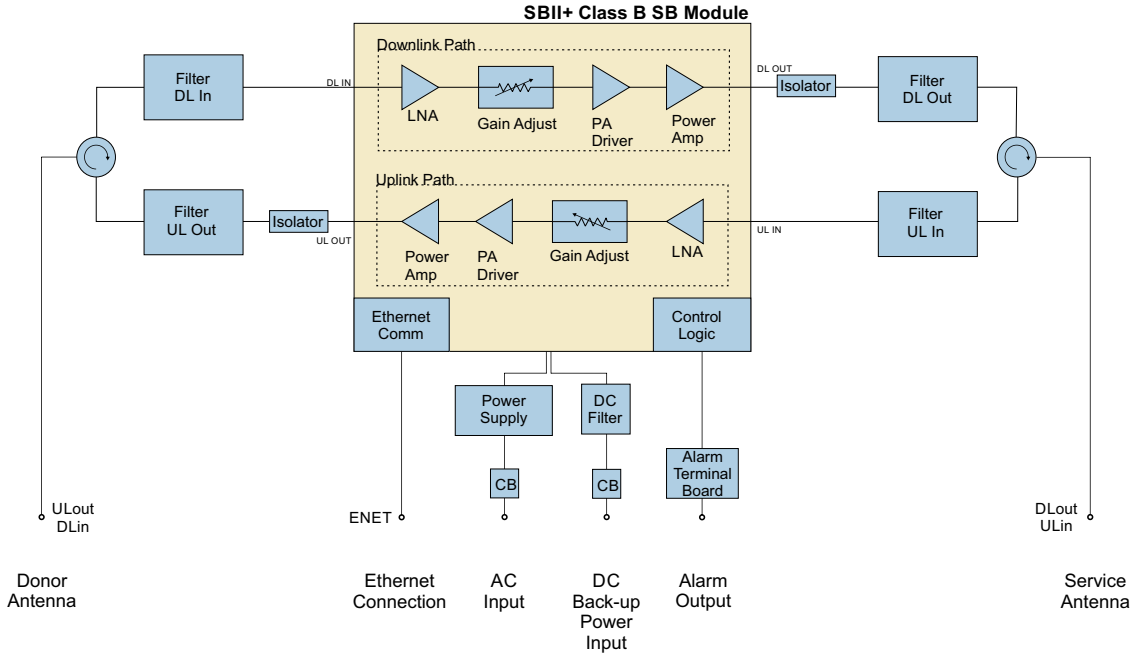


Figure 5 Signal flow block diagram of the typical UHF SBII+ Booster.



Dual Band System (700 MHz/800 MHz)

Figure 6 shows the component layout of a typical Dual Band system operating on both the 700 MHz and 800 MHz bands. Figure 7 is a block diagram of the same dual band system.

Figure 6 SBII+ Dual Band 700/800 MHz (Large Enclosure)

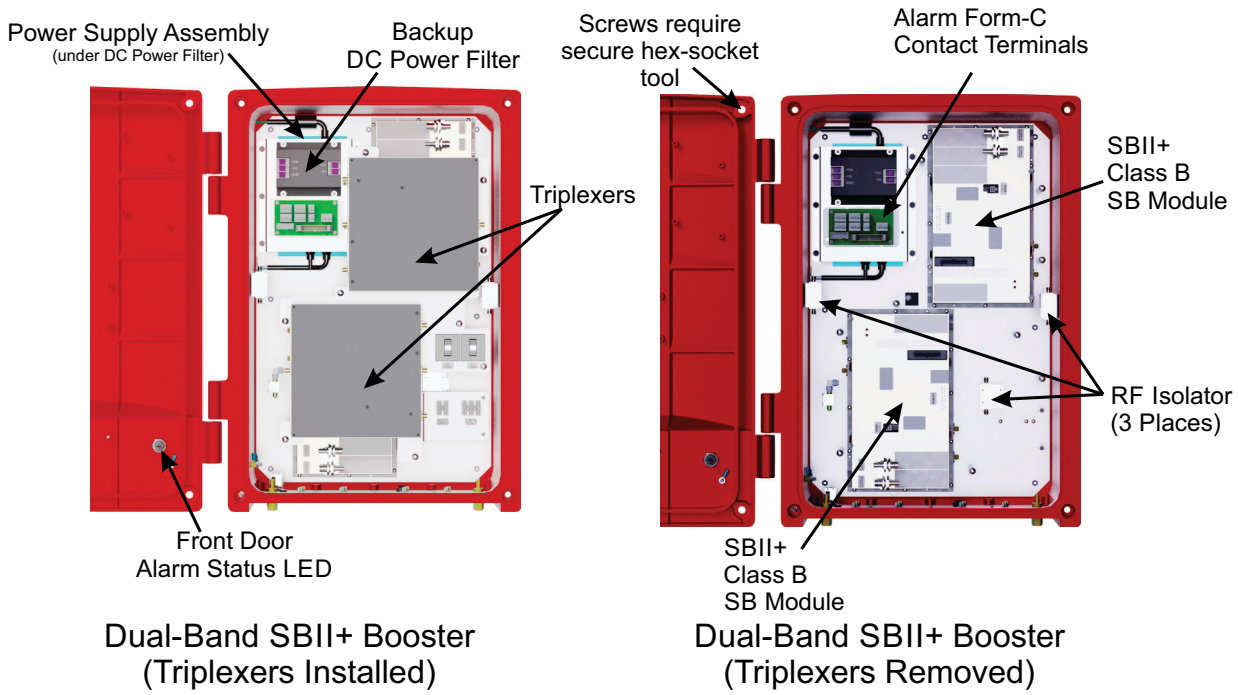
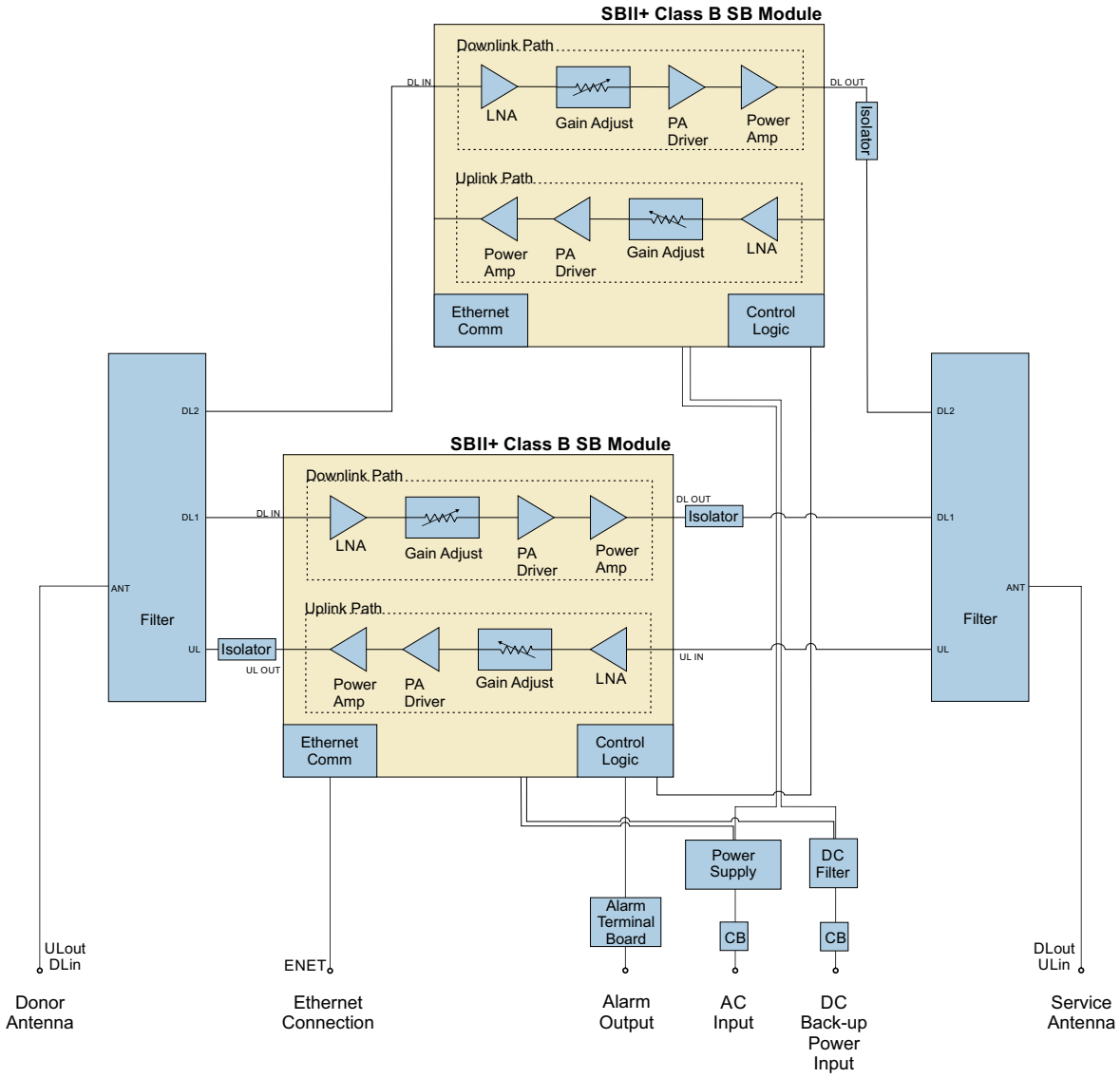


Figure 7 Signal flow block diagram of the typical Dual Band 700/800 MHz SBII+ Booster.

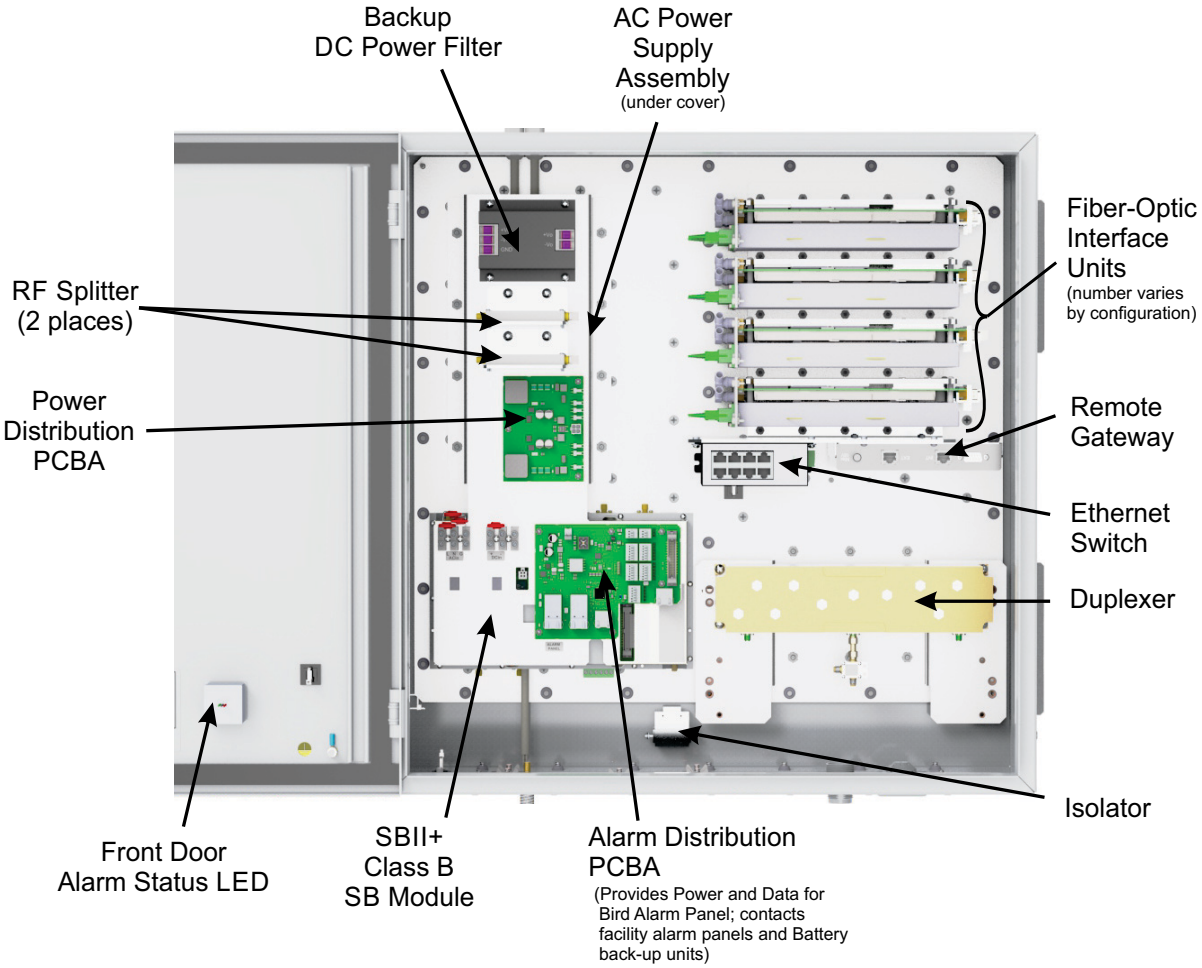


Fiber-DAS Systems

Fiber-DAS Head-End Single-Band (700 MHz or 800 MHz)

Figure 8 Shows the layout of a single band Head-end unit. The Head-End enclosure houses the equipment used to interface with the donor system and distribute the donor RF signals to as few as 4 or as many as 16 remote units.

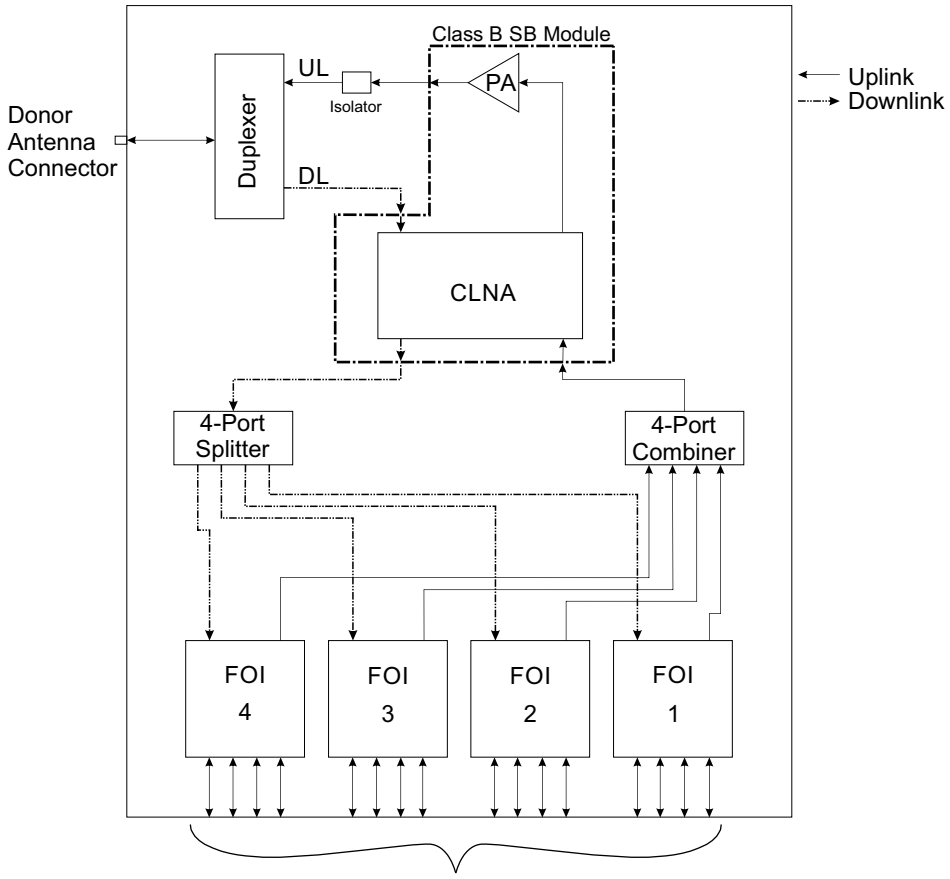
Figure 8 Single-Band Fiber-DAS Head-End



Fiber-DAS Head-End Single-Band (700 MHz or 800 MHz) RF Signal Flow

The block diagram in Figure 9 shows the RF signal flow through the Single-Band Fiber-DAS Head-End. The Head-End transmits uplink RF signals and receives downlink RF signals to/from the donor antenna.

Figure 9 Single-Band Fiber-DAS Head-End RF Signal Flow



Downlink Description

When the RF signal enters the Head-end, a duplexer provides isolation between the uplink and downlink paths. The duplexer is tuned to the head-ends operational frequencies and only passes the downlink RF frequencies for transmission to the DAS remote units.

The RF output of the duplexer is routed to the SB Module where the signal is amplified and adjusted to maintain the user configured gain. The downlink output of the SB Module is routed to a splitter where the RF is split into as many as four equal RF paths outputs (the number of output paths is determined by the equipment configuration).

The downlink RF is then converted from RF to Laser Light by the Fiber-optic Interface (FOI) units. The FOI units transmit the lightwaves along fiber optic cables to each of the remote units of the DAS, where it is converted back to RF an radiated out the service antenna.

Uplink Description

Laser Light from the DAS Remote units is received into the Head-end unit by the FOI units. The Laser Light is then converted into uplink RF, and routed to the combiner.

From the combiner the uplink RF travels to the SB Module. The SB Module amplifies and adjusts the signal to maintain the user configured gain. The output of the SB Module is routed to the duplexer.

The duplexer only passes the uplink RF frequencies for transmission via the donor antenna.

Fiber-DAS Head-End Power Distribution, Data Communications, and Alarms

Power Distribution

AC is used for the primary power source. The AC power supply assembly converts the AC input to a 48 Volt DC output. The 48 volt output is distributed to the SB Module and the Power Distribution PCB. The Power Distribution PCB in-turn provides a 17 VDC output to the Ethernet Switch, RGW, and the FOIs.

The SB Module J6 connector outputs 28 VDC to the Alarm Distribution PCBA. The Alarm Distribution PCBA supplies power over an Ethernet cable for the NFPA Alarm Panel connection.

Data Communications

The SBII+ Model 63 uses an Ethernet network for data communications, see Figure 10. The 8-Port Ethernet Switch is the core of the Ethernet Network in the Head-end, allowing the SB Module to communicate with the FOIs, the remote units, NFPA Alarm Panel, and a PC, when connected to the ENET LOCAL port on the I/O panel.

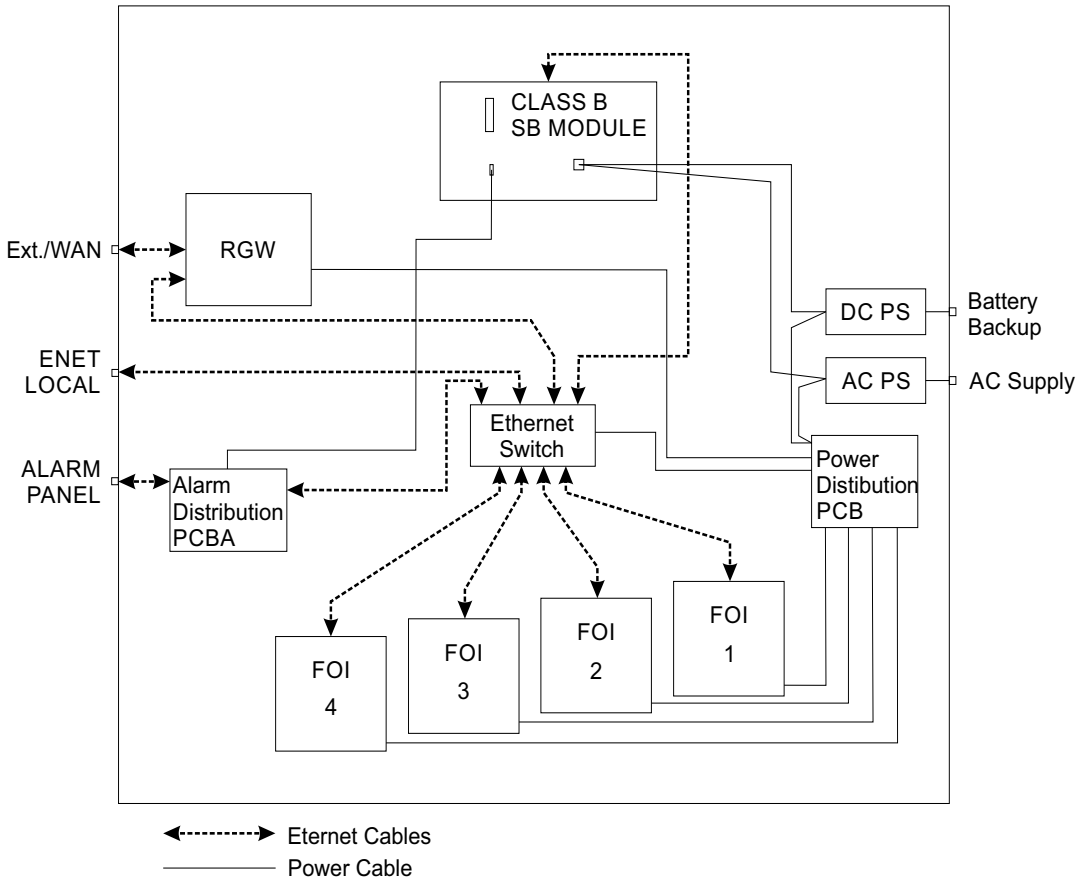
The Remote Gateway (RGW) is connected to the 8-Port Ethernet Switch providing remote access capability and a graphical User Interface for configuration and management.

Alarms

The Head-end unit is capable of reporting to fire alarm panels. The Alarm distribution PCBA may be used to interface directly with a fire alarm panel, the pinout for the connector is shown in the installation section of this manual, see Fiber-DAS Head-End Unit NFPA Alarm Connections on page 44.

An optional NFPA Alarm Panel is available, which when connected to the Alarm Panel Ethernet port on the I/O panel is capable of displaying the NFPA Alarms for the Head-end and all the connected remote units.

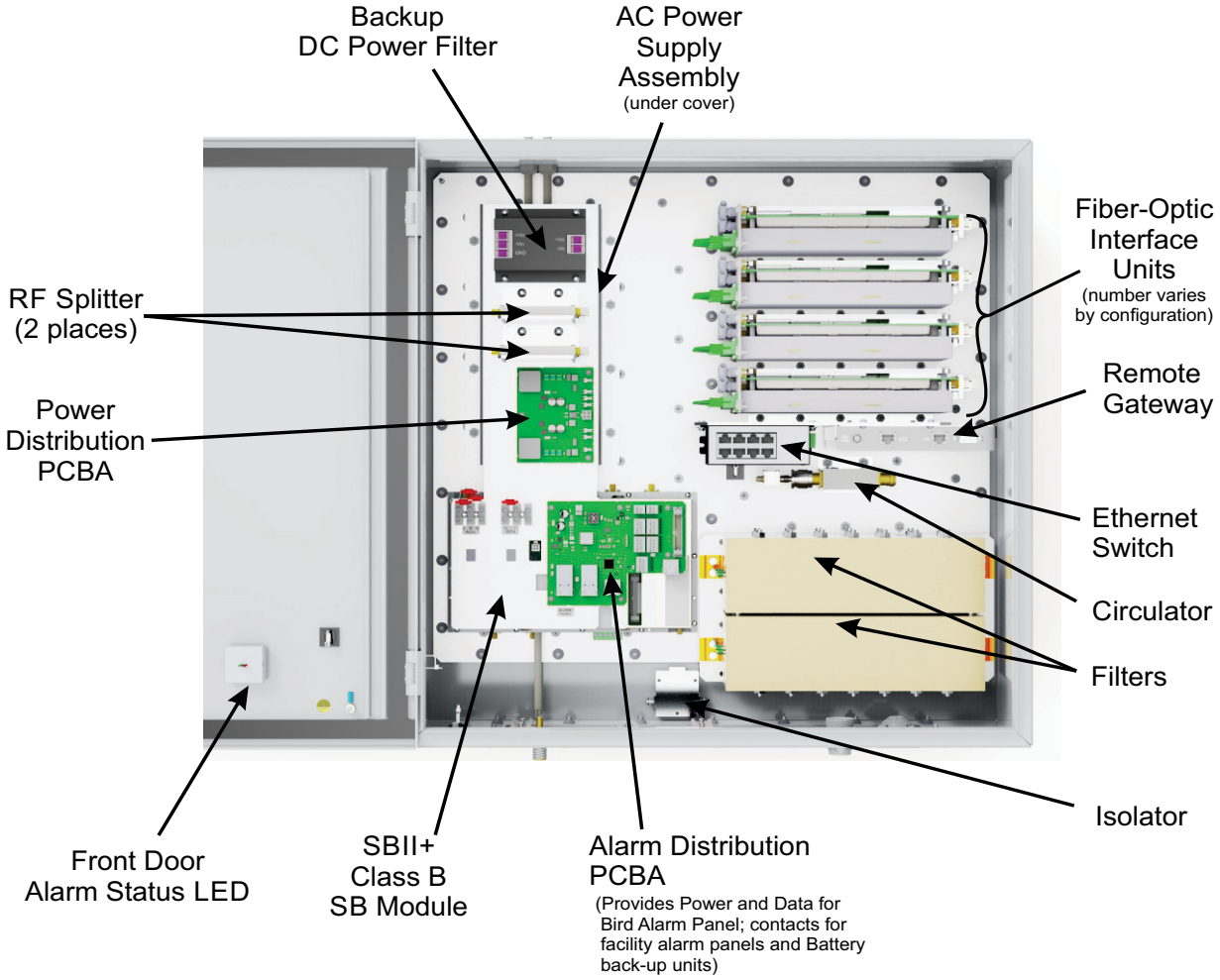
Figure 10 Single-Band Fiber-DAS Head-End Power and Communication Wiring



Fiber-DAS Head-End UHF

Figure 11 Shows the layout of a UHF Head-end unit. The Head-End enclosure houses the equipment used to interface with the donor system and distribute the donor RF signals to as few as 4 or as many as 16 remote units.

Figure 11 UHF Fiber-DAS Head-End



Fiber-DAS Head-End UHF RF Signal Flow

The block diagram in Figure 12 shows the RF signal flow through the UHF Fiber-DAS head-end. The Head-end transmits uplink RF signals and receives downlink RF signals to/from the donor antenna.

Downlink

When the RF signal enters the Head-end, a duplexer provides isolation between the uplink and downlink paths. The duplexer is tuned to the head-ends operational frequencies and only passes the downlink RF frequencies for transmission to the DAS remote units.

The RF output of the duplexer is routed to the SB Module where the signal is amplified and adjusted to maintain the user configured gain. The downlink output of the SB Module is routed to a splitter where the RF is split into as many as four equal RF paths outputs (the number of output paths is determined by the equipment configuration).

The downlink RF is then converted from RF to Laser Light by the Fiber-optic Interface (FOI) units. The FOI units transmit the lightwaves along fiber optic cables to each of the remote units of the DAS, where it is converted back to RF an radiated out the service antenna.

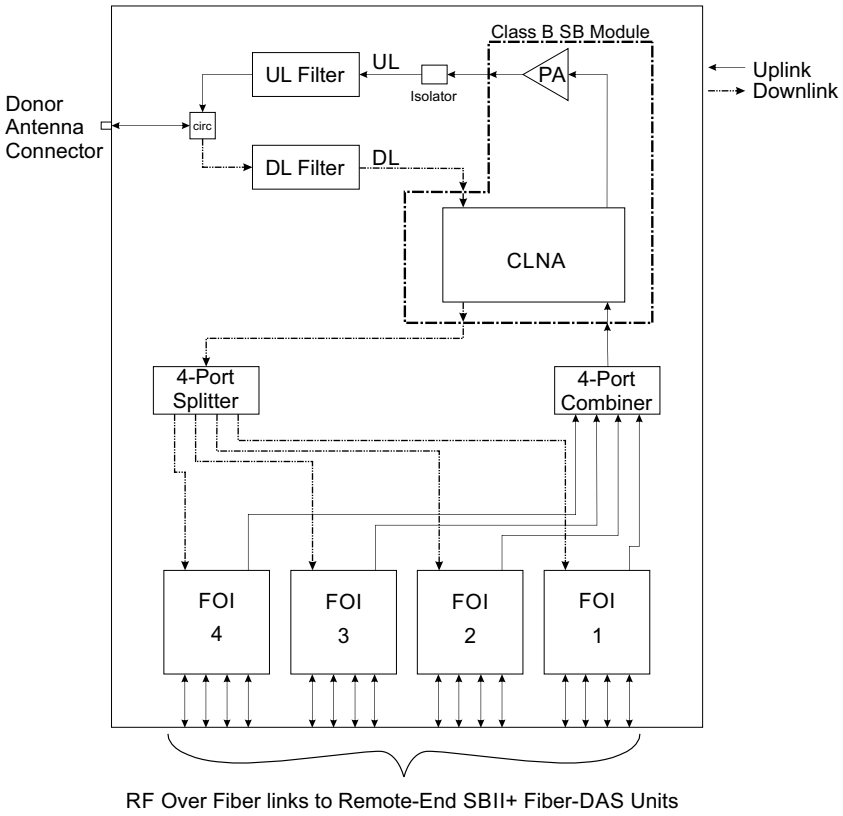
Uplink

Laser Light from the DAS Remote units is received into the Head-end unit by the FOI units. The Laser Light is then converted into uplink RF, and routed to the combiner.

From the combiner the uplink RF travels to the SB Module. The SB Module amplifies and adjusts the signal to maintain the user configured gain. The output of the SB Module is routed to the duplexer.

The duplexer only passes the uplink RF frequencies for transmission via the donor antenna.

Figure 12 UHF Fiber-DAS Head-End RF Signal Flow



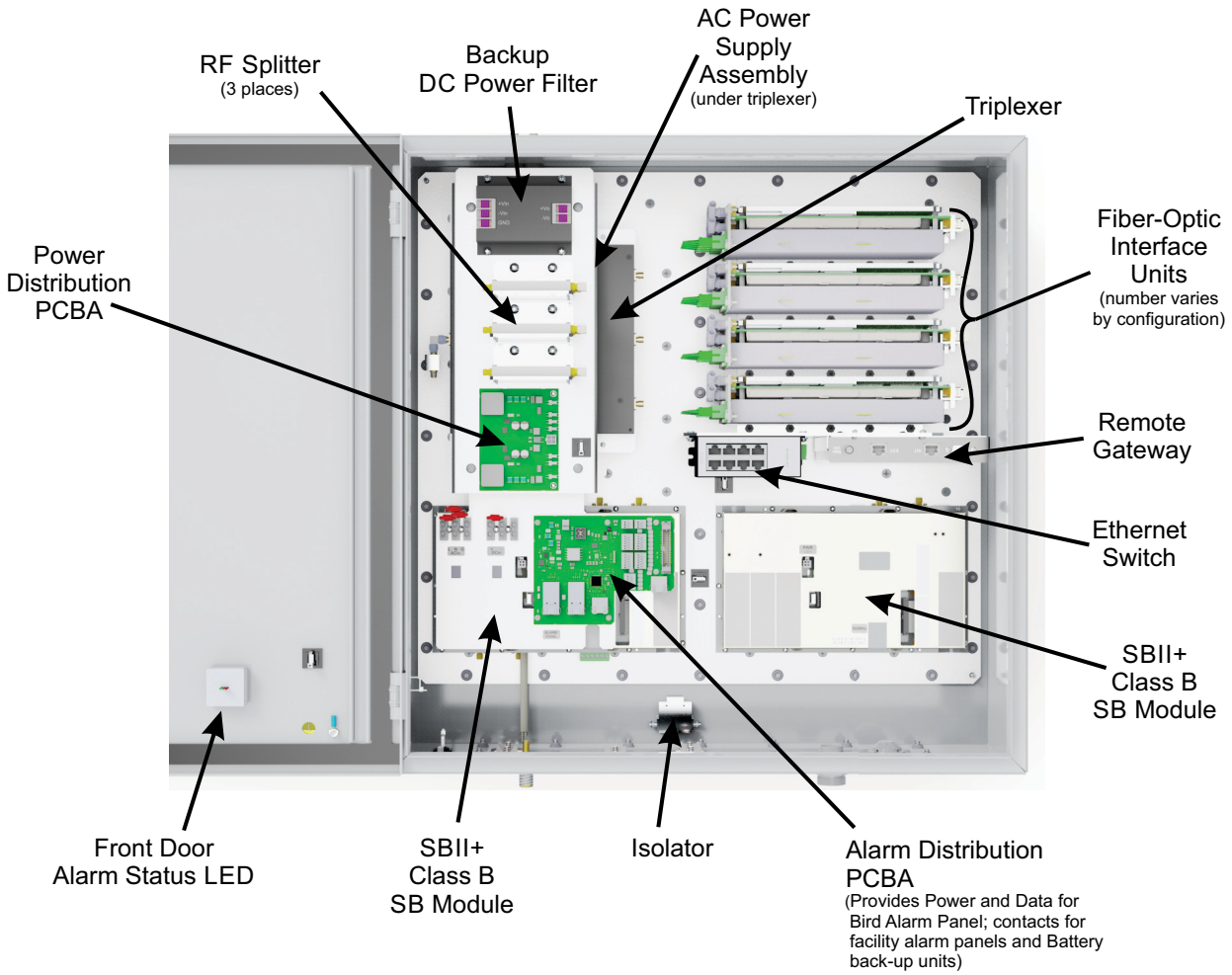
Fiber-DAS Head-End Power Distribution, Data Communications, and Alarms

See "Fiber-DAS Head-End Power Distribution, Data Communications, and Alarms" on page 14.

Fiber-DAS Head-End Dual-Band

Figure 13 Shows the layout of a UHF Head-end unit. The Head-End enclosure houses the equipment used to interface with the donor system and distribute the donor RF signals to as few as 4 or as many as 16 remote units.

Figure 13 Dual-Band Fiber-DAS Head-End



Dual Band Fiber-DAS Head-End RF Signal Flow

The block diagram in Figure 14 shows the RF signal flow through the Dual Band Fiber-DAS head-end. The Head-end transmits uplink RF signals and receives downlink RF signals to/from the donor antenna.

Downlink

When the RF signal enters the Head-end, a triplexer provides isolation between the uplink and two downlink paths. The triplexer is tuned to the head-ends operational frequencies and only passes the downlink RF frequencies for transmission to the DAS remote units.

There are two downlink RF outputs from the triplexer, they are routed to the two SB Module where the signals are amplified and adjusted to maintain the user configured gain. The output of each SB Module is routed to a splitter where the RF is split into as many as four equal RF paths outputs (the number of output paths is determined by the equipment configuration).

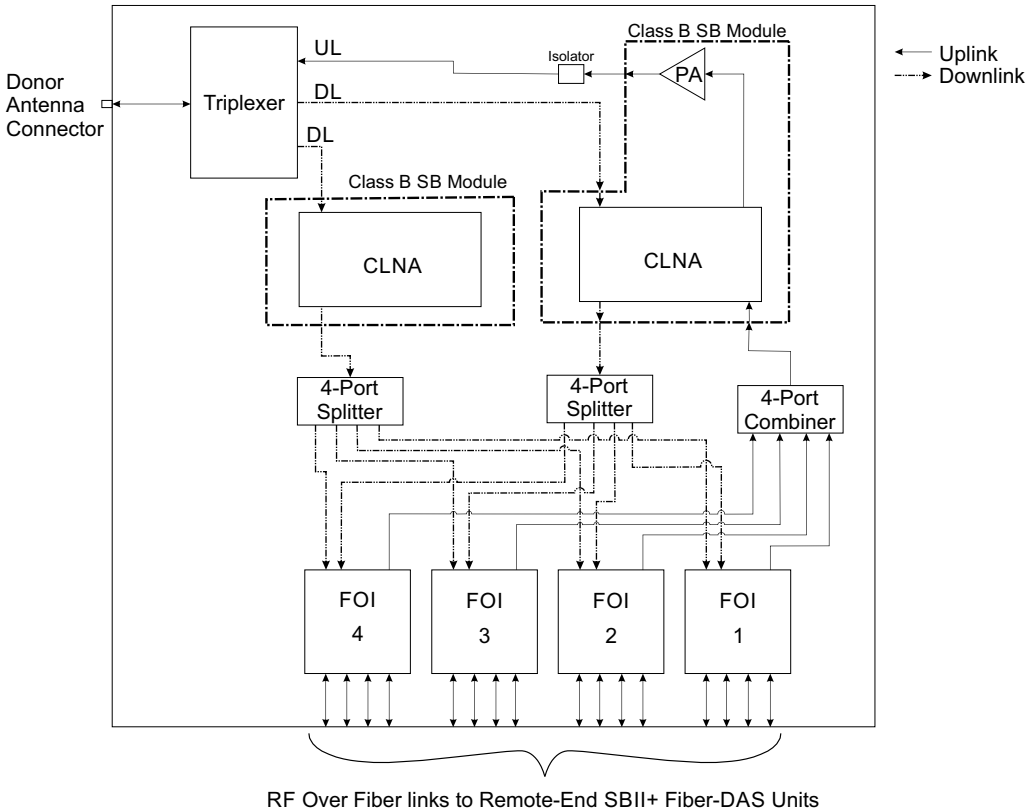
The downlink RF is then converted from RF to Laser Light by the Fiber-optic Interface (FOI) units. The FOI units transmit the lightwaves along fiber optic cables to each of the remote units of the DAS, where it is converted back to RF an radiated out the service antenna.

Uplink

Laser Light from the DAS Remote units is received into the Head-end unit by the FOI units. The Laser Light is then converted into uplink RF, and routed to the combiner.

From the combiner the uplink RF travels to the SB Module. The SB Module amplifies and adjusts the signal to maintain the user configured gain. The output of the SB Module is routed to the triplexer. The triplexer only passes the uplink RF frequencies for transmission via the donor antenna.

Figure 14 Dual Band Fiber-DAS Head-End RF Signal Flow

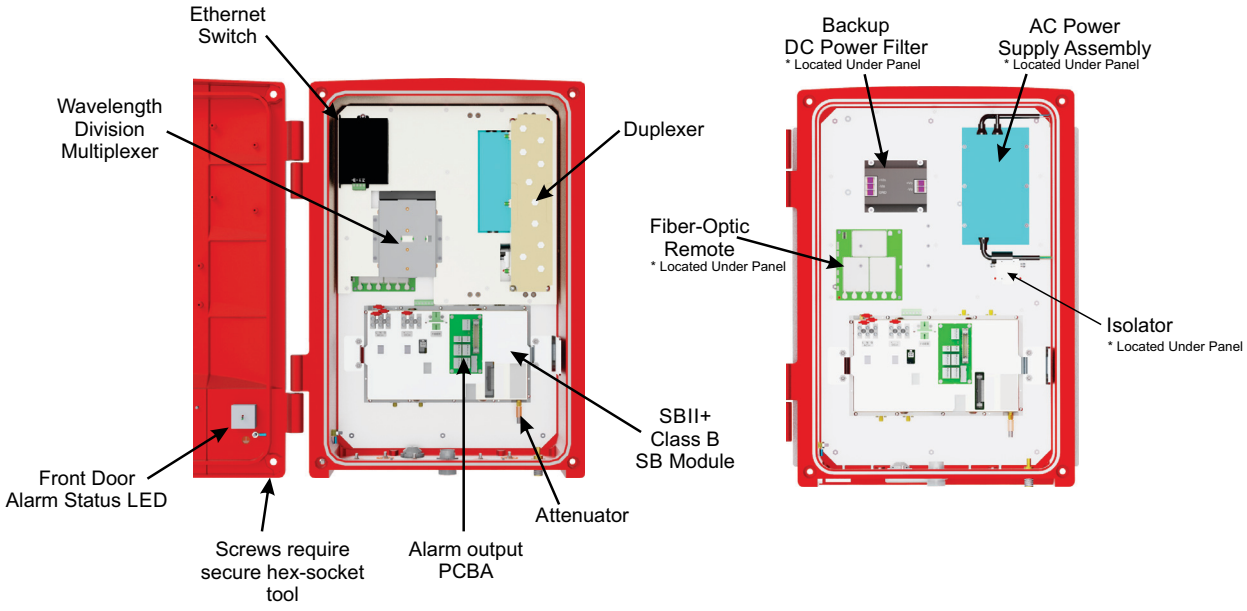


Fiber-DAS Head-End Power Distribution, Data Communications, and Alarms

See "Fiber-DAS Head-End Power Distribution, Data Communications, and Alarms" on page 14.

Fiber-DAS Single-Band Remote Enclosure

Figure 15 Single-Band Remote Enclosure



Single Band Fiber-DAS Remote (Filter and Mounting Plate Installed)

Single Band Fiber-DAS Remote (Filter and Mounting Plate Removed)

Single Band Remote Unit RF Signal Flow

The remote units transmit downlink RF signals and receive uplink RF signals to/from a service antenna. Figure 16 shows the RF signal flow block diagram for a single band remote.

Downlink

The FOI in the Head-end unit transmit lightwaves along fiber-optic cable to the remote unit. The Fiber-optic Remote (FOR) in the remote unit receives the laser light and converts it back to downlink RF and routes the RF to the SB Module.

The SB Module amplifies and adjusts the signal to maintain the user configured gain. The output of the SB Module is routed to the duplexer.

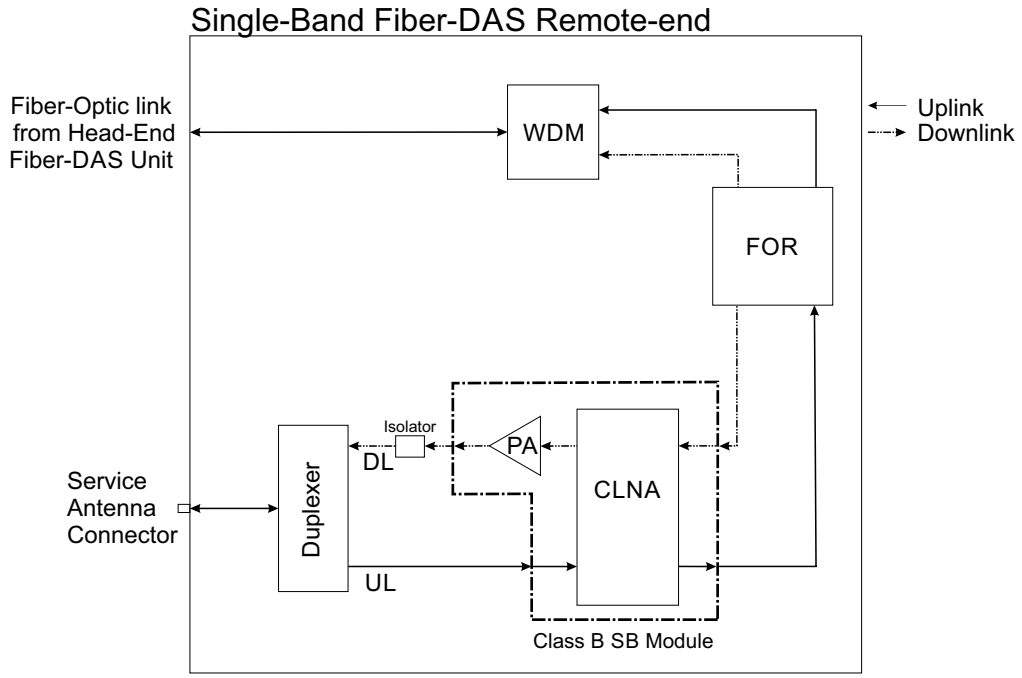
The duplexer only passes the downlink RF frequencies for transmission via the service antenna.

Uplink

When the RF signal enters the remote, the duplexer provides isolation between the uplink and downlink paths. The duplexer is tuned to the remote units operational frequencies and only passes the uplink RF frequencies for transmission to the Head-end unit.

The RF output of the duplexer is routed to the SB Module where the signal is amplified and adjusted to maintain the user configured gain. The output of the SB Module is routed to the FOR. The FOR converts uplink RF signals into fiber-optic laser output that is transmitted on the fiber to the head-end

Figure 16 Remote Single-Band RF Signal Flow



Fiber-DAS Remote Power Distribution, Data Communications, and Alarms

The wiring within the Remote unit consist of power distribution, data communications and alarm handling.

Power Distribution

AC is used for the primary power source. The AC power supply assembly converts the AC input to a 48 Volt DC output. The 48 volt output is distributed to the SB Module. The SB Module in-turn provides a 17 VDC output to the Ethernet Switch and FOR.

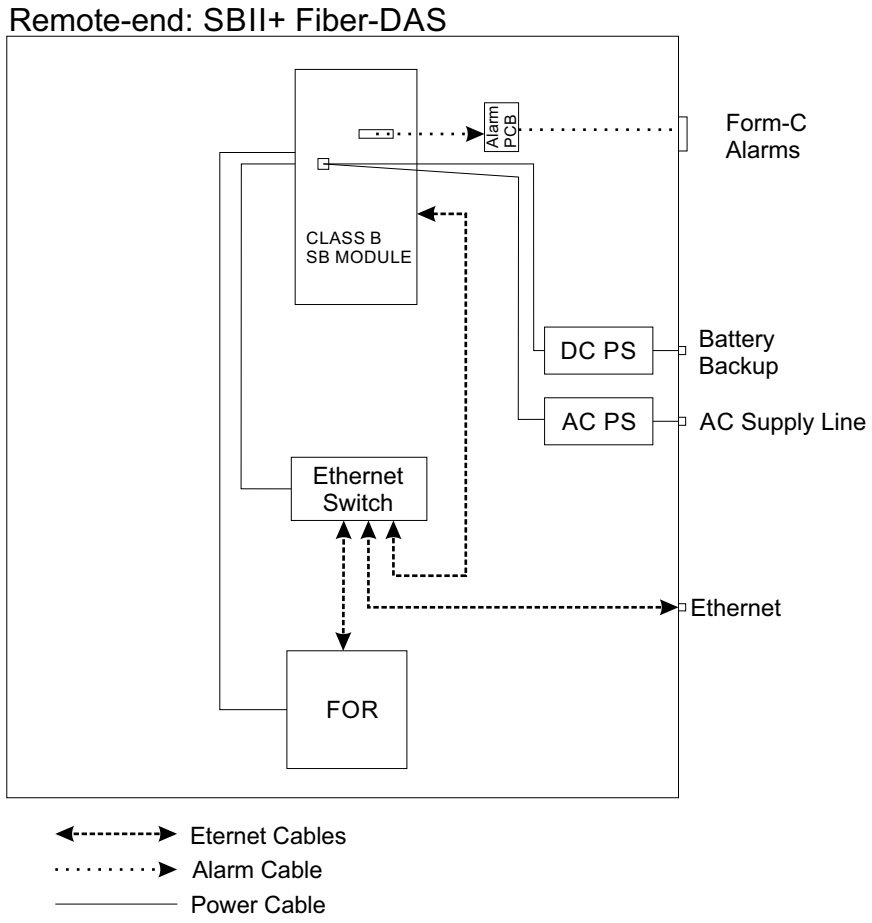
Data Communications

The SBII+ Model 63 uses an Ethernet network for data communications. The 5-Port Ethernet Switch is the core of the Ethernet Network in the remote unit, allowing the SB Module to communicate with the FOR, the Head-end unit, and a PC, when connected to the ENET port on the I/O panel.

Alarms

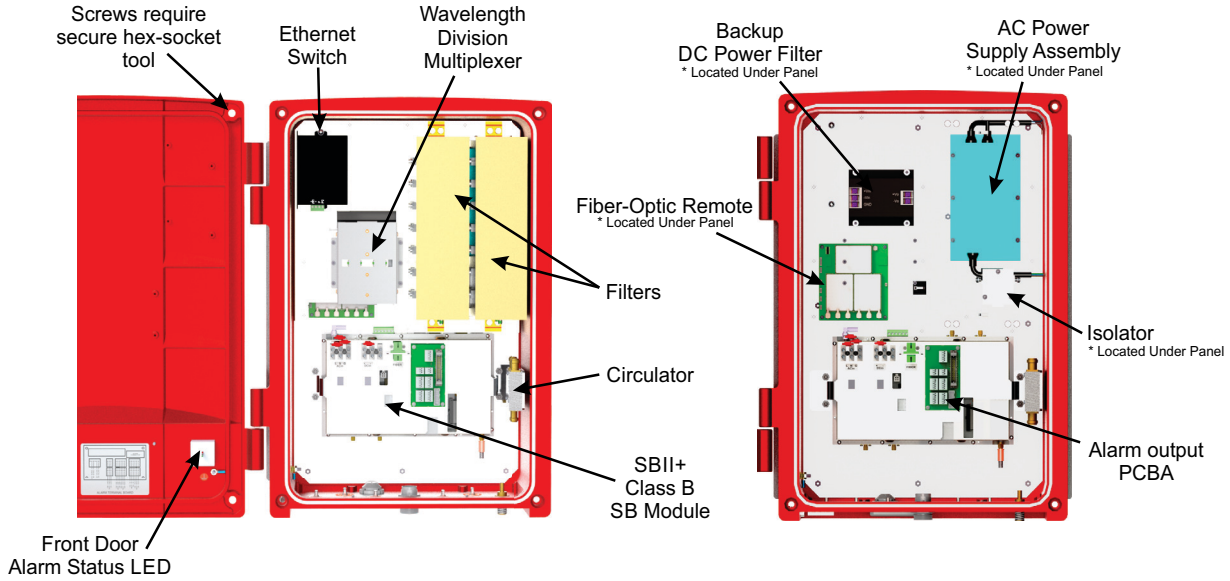
Alarms are reported over the fiber-optic connection to the Head-end unit.

Figure 17 Remote Power and Communication Wiring



Fiber-DAS UHF Remote Enclosure

Figure 18 UHF Fiber-DAS Remote



UHF Fiber-DAS Remote (Filters Installed)

UHF Fiber-DAS Remote (Filters Removed)

Fiber-DAS UHF Remote Unit RF Signal Flow

The remote units transmit downlink RF signals and receive uplink RF signals to/from a service antenna. Figure 19 shows the RF signal flow block diagram for a single band remote.

Downlink

The FOI in the Head-end unit transmit lightwaves along fiber-optic cable to the remote unit. The Fiber-optic Remote (FOR) in the remote unit receives the laser light and converts it back to downlink RF and routes the RF to the SB Module.

The SB Module amplifies and adjusts the signal to maintain the user configured gain. The output of the SB Module is routed to the duplexer.

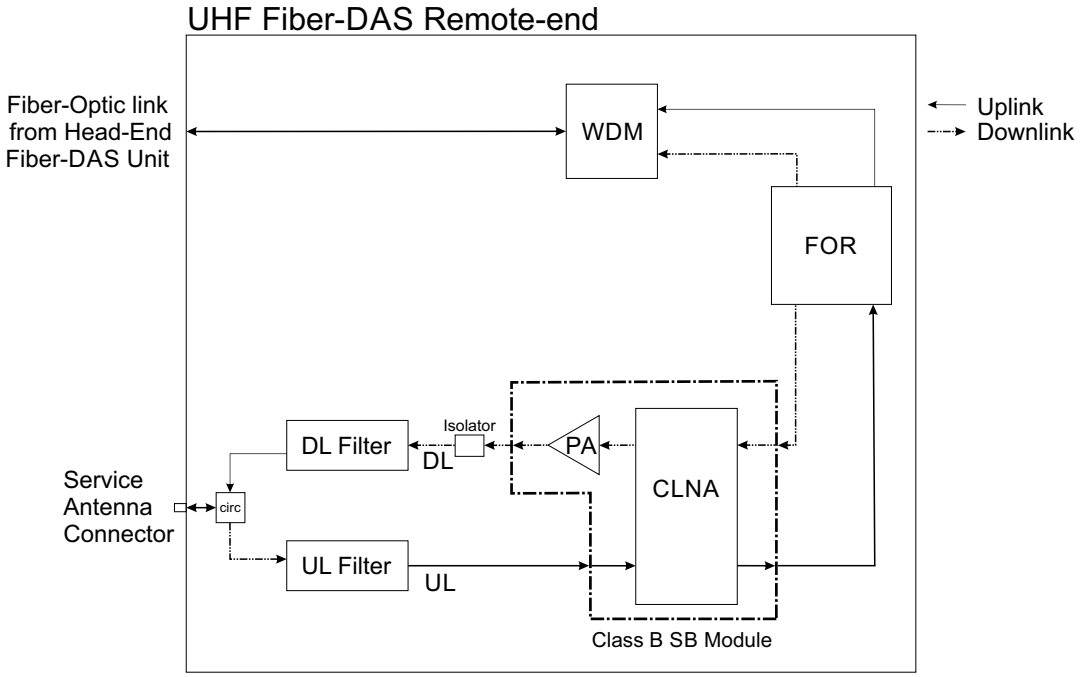
The duplexer only passes the downlink RF frequencies for transmission via the service antenna.

Uplink

When the RF signal enters the remote, the duplexer provides isolation between the uplink and downlink paths. The duplexer is tuned to the remote units operational frequencies and only passes the uplink RF frequencies for transmission to the Head-end unit.

The RF output of the duplexer is routed to the SB Module where the signal is amplified and adjusted to maintain the user configured gain. The output of the SB Module is routed to the FOR. The FOR converts uplink RF signals into fiber-optic laser output that is transmitted on the fiber to the head-end

Figure 19 Remote UHF RF Signal Flow

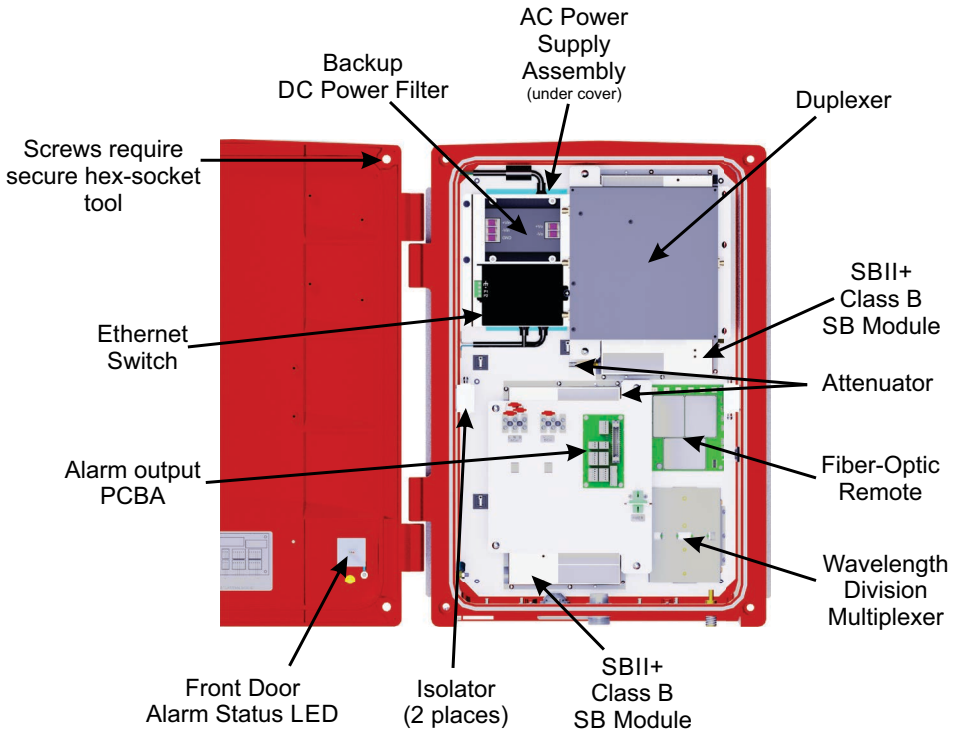


Fiber-DAS Remote Power Distribution, Data Communications, and Alarms

See "Fiber-DAS Remote Power Distribution, Data Communications, and Alarms" on page 20.

Fiber-DAS Dual-Band Remote Enclosure

Figure 20 Dual-Band Remote



Fiber-DAS Dual Band Remote Unit RF Signal Flow

The remote units transmit downlink RF signals and receive uplink RF signals to/from a service antenna. Figure 21 shows the RF signal flow block diagram for a single band remote.

Downlink

The FOI in the Head-end unit transmit lightwaves along fiber-optic cable to the remote unit. The Fiber-optic Remote (FOR) in the remote unit receives the laser light and converts it back to downlink RF and routes the RF to the SB Module.

The SB Module amplifies and adjusts the signal to maintain the user configured gain. The output of the SB Module is routed to the duplexer.

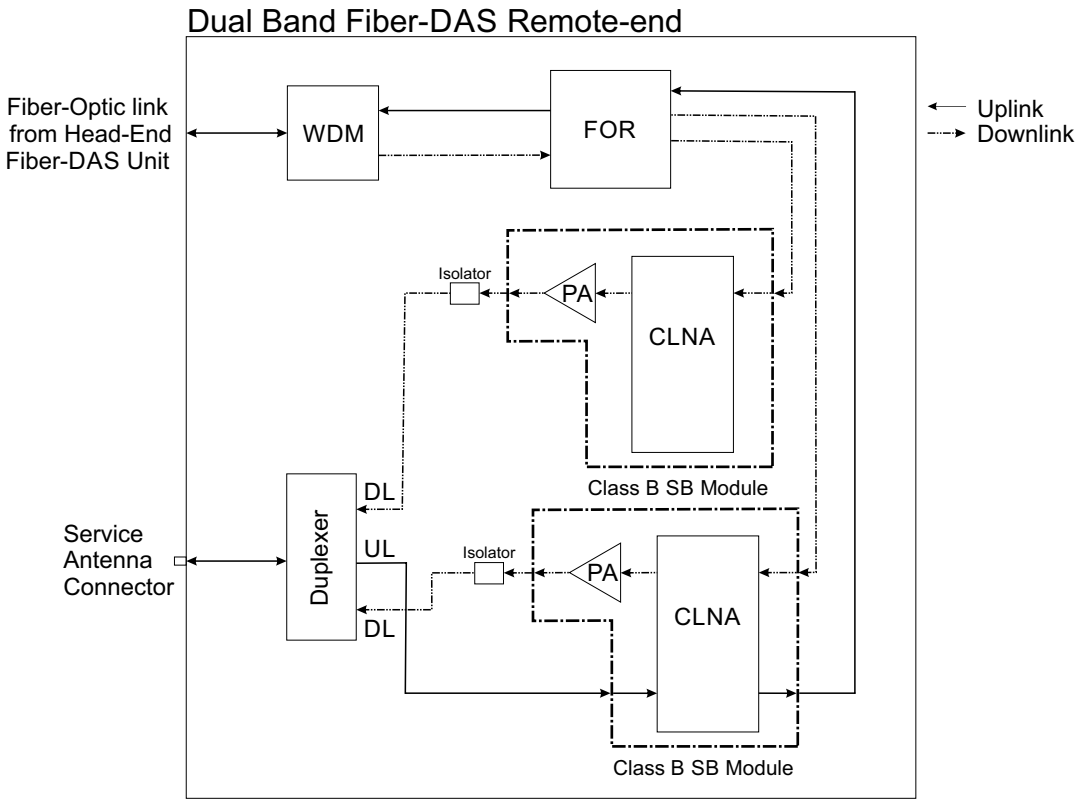
The duplexer only passes the downlink RF frequencies for transmission via the service antenna.

Uplink

When the RF signal enters the remote, the duplexer provides isolation between the uplink and downlink paths. The duplexer is tuned to the remote units operational frequencies and only passes the uplink RF frequencies for transmission to the Head-end unit.

The RF output of the duplexer is routed to the SB Module where the signal is amplified and adjusted to maintain the user configured gain. The output of the SB Module is routed to the FOR. The FOR converts uplink RF signals into fiber-optic laser output that is transmitted on the fiber to the head-end.

Figure 21 Remote Dual Band RF Signal Flow



Fiber-DAS Remote Power Distribution, Data Communications, and Alarms

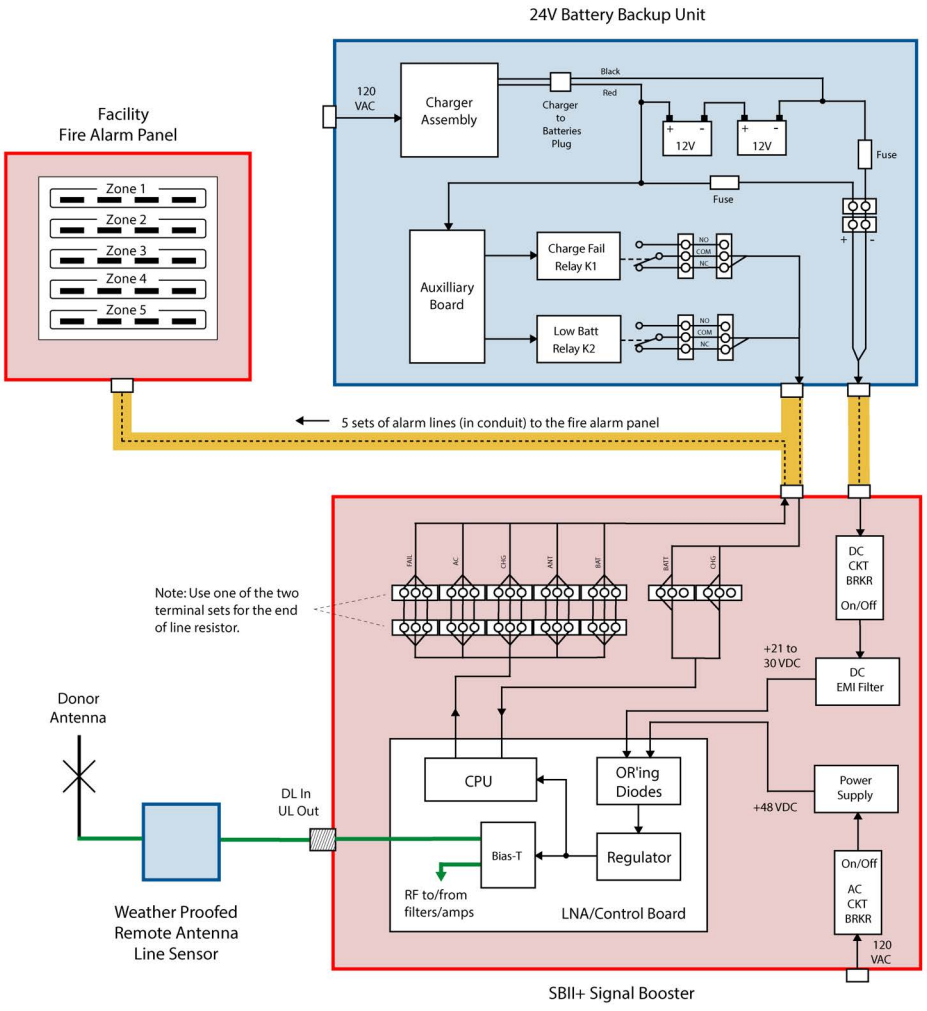
See "Fiber-DAS Remote Power Distribution, Data Communications, and Alarms" on page 20.

NFPA Compliance

The Model 63 SBII+ systems are available compliant with the national public safety in-building codes issued in the International Fire Code and by the National Fire Protection Association.

An SBII+ system is NFPA compliant when it used in conjunction with an Alarm Panel and a Battery Back Up unit. Figure 22 on page 26 shows a block diagram of an NFPA compliant SBII+ system.

Figure 22 NFPA Compliant SBII+ System Block Diagram



Battery Backup Unit

An optional battery backup unit (BBU) is available from Bird. Bird has two BBU models:

- 110 Ah Battery Backup Unit - model 6160-110-24-NR
- 220 Ah Battery Backup Unit - model 6160-220-24-NR

Detailed installation and operating instructions for the battery backup unit are included with the backup unit when it ships from the factory. See "Optional Equipment" on page 28

Alarm Panel

The NFPA compliant SBII+ system is designed to easily interface with existing fire alarm panels. Bird offers an Alarm Panel for displaying the status of the five alarms listed below, see "Optional Equipment" on page 28.

Five alarm outputs are provided by the SBII+ systems.

SB Failure — this is a summed alarm that is active when any number of fault conditions arise within the SBII+ unit such as when an over current or high temperature event occurs.

Loss of AC Power — indicates that AC power to the SBII+ unit has failed.

Low Battery Capacity — the source of this alarm is the battery backup unit and it indicates that the battery backup voltage level has dropped significantly.

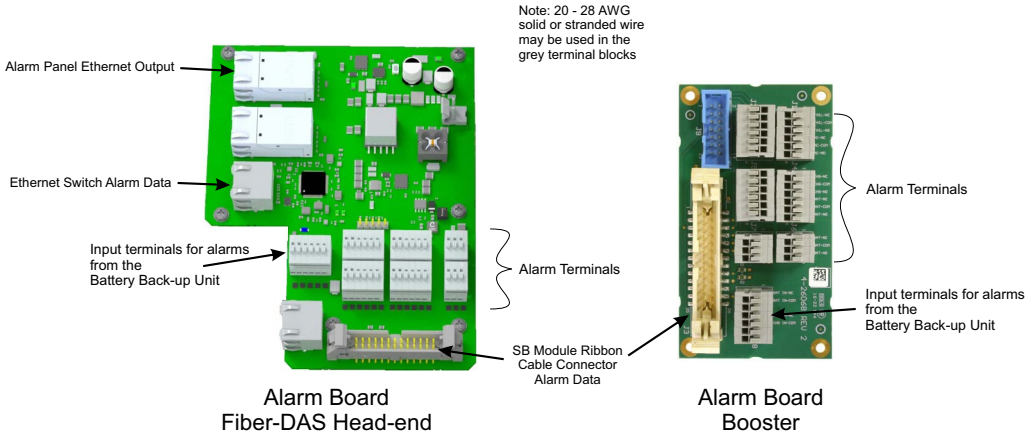
Charge Fail — the source of this alarm is the battery backup unit and it indicates failure of the battery charger. If the battery charger looses AC power this alarm will be active.

Antenna Malfunction — indicates there is a loss of RF cable integrity between the SBII+ unit and the remote antenna line sensor. In order to detect an antenna malfunction an antenna line sensor must be installed as close to the Donor antenna as possible. This sensor works with the Bias-T assembly inside the SBII+ unit to verify the continuity of the antenna line. Refer to Figure 23. The sensor is waterproofed but the connections to both the antenna and the antenna feed line should be sealed to prevent water entry. We recommend that the connections be tightly and completely wrapped with rubber splicing tape. Connect the port that is labeled “antenna” on the sensor to your donor antenna and the port that is labeled “transline” to the antenna feed line cable coming from the SBII+.

Figure 23 Remote Antenna Line Sensor

These five alarm functions are available at the terminal contacts shown in Figure 24 on page 27.

Figure 24 Alarm Board



Optional Equipment

The SBII+ signal booster is designed to be compliant with the national public safety in-building codes issued in the International Fire Code and by the National Fire Protection Association (NFPA).

Battery Back-up

The SBII+ Model 63 accomplishes NFPA compliance when used in conjunction with an appropriate battery backup unit. Bird Battery Backup Systems are designed to provide uninterruptible DC backup voltage for Bird signal boosters. The backup voltage is provided by high capacity 12 VDC lead acid batteries connected in series-parallel, which supplies the 24 VDC needed for backup operation. The units have an integrated battery charger and monitor system that maintains peak battery charge level when AC mains is present. The battery backup provides operational status indicators and alarm terminal connections for remote monitoring. When used in conjunction with a Rescueline ™ signal booster, the battery backup provides a fully NFPA compliant system solution to NFPA72, NFPA1221, or IFC.

Figure 25 Bird Battery Back-up System

The Bird Booster Battery Backup Units are available in 110 Amp-hour and 220 Amp-hour, 24 VDC Output, NFPA, Red

NFPA Alarm Panel

NFPA Alarm Panel (6150-ALM-01)

The optional Bird NFPA Alarm panel is available to monitor the SBII+ Model 63. The alarm panel connects to the SBII+ Model 63 via the Alarm Circuit board.

Figure 26 NFPA Alarm Panel

NFPA Alarm Panel (6150-ALM-02)

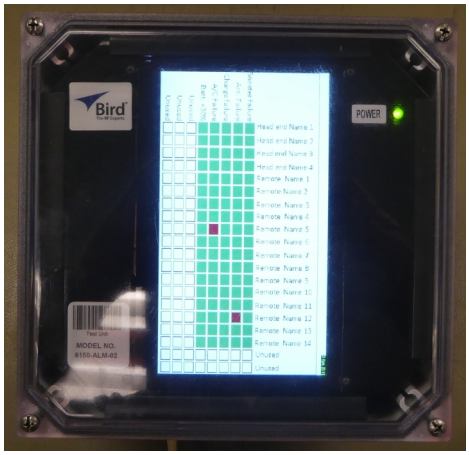
SBII+ Fiber-DAS option.

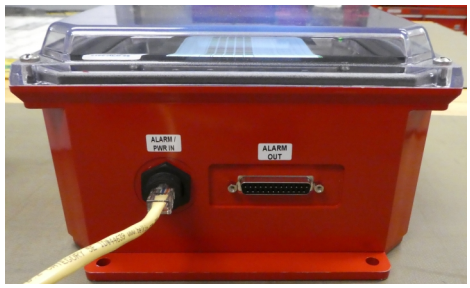
The optional Bird NFPA Alarm panel (6150-ALM-02) is used to monitor SBII+ Fiber-DAS Head-end and remote units. The alarm panel will monitor the status of the Fiber-DAS head-end unit and up to 16 remote units. See Figure 27.

The alarm panel connects to the Head-end unit via the Alarm Panel connector on the I/O panel. This is an Ethernet connection that carries data from the head-end to the alarm panel. The Ethernet cable also supplies the DC operating voltage required by the alarm panel.

The 25-pin Alarm Out connector on the Alarm Panel may be used for connection of the systems Form-C alarm contacts to the users fire alarm panel.

Figure 27 NFPA Alarm Panel



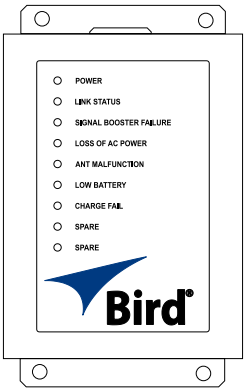


NFPA Alarm Panel (6150-ALM-03)

SBII+ standard Booster option

The optional Bird NFPA Alarm panel (6150-ALM-03) is available to monitor a SBII+ Model 63. The alarm panel connects to the SBII+ Model 63 via a standard Ethernet Cable.

Figure 28 NFPA Alarm Panel



NFPA Alarms

An NFPA compliant signal booster system is designed to easily interface to fire alarm panels. The following alarms are available for connecting to interfacing systems.

Loss of AC Power — indicates that AC power to the booster unit has failed.

Charge Fail (battery backup) — indicates failure of the battery charger. If the battery charger looses AC power this alarm will be active.

Antenna Malfunction — indicates there is a loss of RF cable integrity between the signal booster unit and the remote antenna line sensor.

Low Battery Capacity (battery backup) — indicates that the battery backup voltage level has dropped significantly.

Signal Booster (SB) Failure — this is a summed alarm that is active when any number of fault conditions arise within the booster unit such as when an over current or high temperature event occurs.

Chapter 2 Installation

The following sections discuss general considerations for installing the SBII+ Model 63. All work should be performed by qualified personal in accordance with local codes.

Unpacking and Inspection

It is important to report any visible damage to the carrier immediately. It is the customer's responsibility to file damage claims with the carrier within a short period of time after delivery (1 to 5 days). Care should be taken when removing the unit from the packing box to avoid damage to external heat-sink fins.

1. Carefully inspect shipping container for signs of damage.
   - If the shipping container is damaged, do not unpack the unit. Immediately notify the shipping carrier and Bird Technologies.
   - If the shipping container is not damaged, unpack the unit. Save shipping materials for repackaging.
2. Inspect unit for visual signs of damage.

NOTE

If there is damage, immediately notify the shipping carrier and Bird Technologies.

Location

The layout of the signal distribution system will be the prime factor in determining the mounting location of the booster. However, safety and serviceability are also key considerations. The unit should be located where it cannot be tampered with by the general public, yet is easily accessible to service personnel. Also consider the weight of the unit and the possibility for injury if the unit should become detached from its mounting surfaces for any reason.

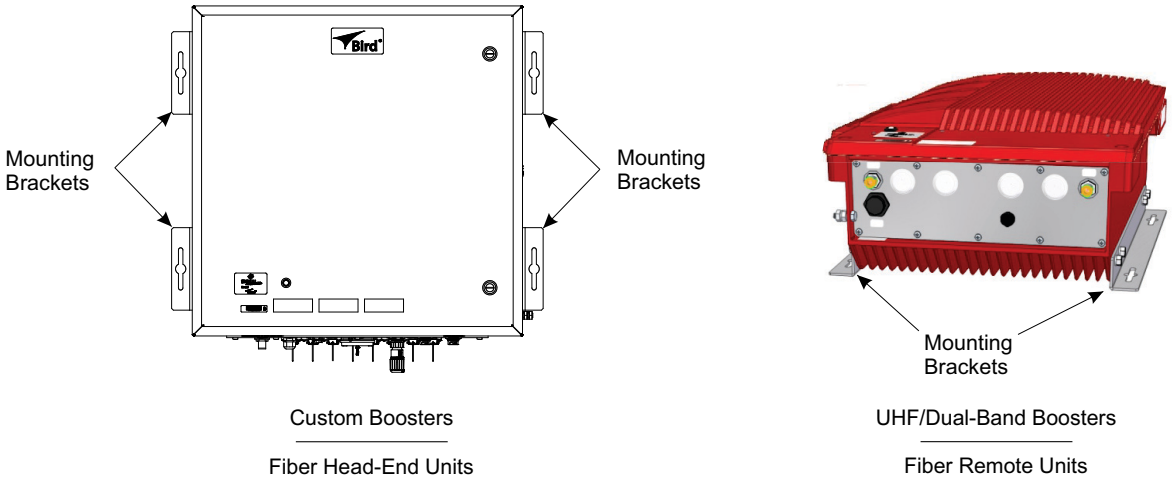
Although signal boosters can operate for years without being attended to, the unit will need to be accessed by service personnel with troubleshooting equipment, such as a digital multimeter and spectrum analyzer or a laptop computer from time to time. The location of the power source will also have a bearing on the mounting location. SBII+ uses external heat sinks and needs to be mounted where there can be an unobstructed air flow over the heat sinks fins. The SBII+ cabinet will stay warm during normal operation so in the interest of equipment longevity, avoid locations that carry hot exhaust air or are continually hot.

Mounting

Fiber-DAS Head-End, Remote and Large Enclosure Booster Mounting

Figure 29 shows mounting hole layout for the large Steel and Aluminum enclosures. Mount the cabinet using 3/8" (10 mm) diameter steel bolts (not supplied). We recommend flat washers on both ends and a lock washer under the nut. Nut and bolt mounting is preferred to the use of lag bolts. Use backer blocks where necessary to spread the force over a larger surface area. In areas of known seismic activity, additional devices such as tether lines may be necessary. The mounting hole dimensions for the large enclosure unit mounting brackets are shown in Figure 31.

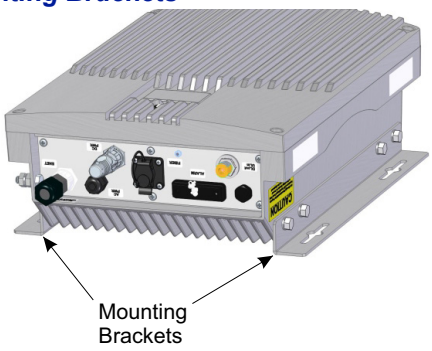
Figure 29 Large Units with Mounting Brackets



Small Enclosure Booster Mounting

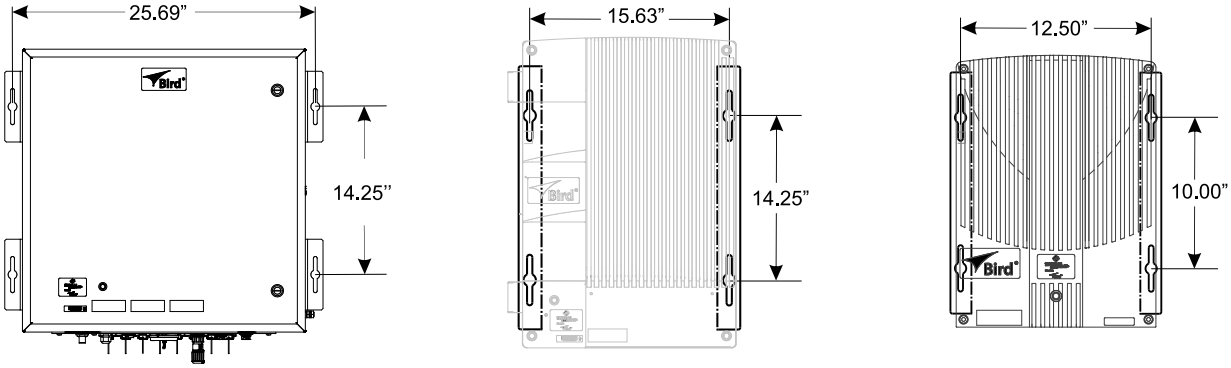
Figure 30 shows the mounting brackets on the small booster enclosure. Brackets are attached to the sides of the enclosure and the unit is then mounted to the wall using steel bolts up to 5/16” (8mm) diameter (not supplied). We recommend flat washers and a lock washer under the head of the bolt. Nut and bolt mounting is preferred to the use of lag bolts whenever possible. Use backer blocks where necessary to spread the force over a larger surface area. In areas of known seismic activity, additional devices such as tether lines may be necessary. The mounting hole dimensions of the mounting brackets are shown in Figure 31.

Figure 30 Small Units with Mounting Brackets



Single-Band (700/800) Boosters

Figure 31 Dimensions for Bolt Pattern



Large
Steel Enclosure

Large
Aluminum Enclosure

Small
Aluminum Enclosure

Because mounting locations and structure types where these devices will be located are varied, we recommend consulting local building inspectors, engineering consultants or architects for advice on how to properly mount objects of this type, size and weight in your particular situation. It is the customer’s responsibility to make sure these devices are mounted safely and in compliance with local building codes.

Cable Connections

All cable connections to the SBII+ units are made at the I/O panel at the bottom of the unit. Antenna connections are made to type N connectors on the I/O panel. All other connections are made using conduit connected at cable entry points on the I/O panel and cable connections are made inside the enclosure.

All cabling connections to the booster should be made and checked for correctness prior to powering up the system.

AC Power Requirements

Signal Booster II+ is designed to be hard-wired to 100 - 240 single phase AC at 50 - 60 Hz. The power supply assembly used in the SB II+ is auto ranging so there is no voltage select switch (110 or 240) on the supply assembly. Bring the AC line into the cabinet through a conduit opening on the bottom of the enclosure.

- Use conduit for running the AC wiring into the SB II+
- #14 gauge or larger conductors.
- AC feed line should have an independent circuit breaker (a 15 Amp breaker is recommended).

Screw terminals are provided inside the enclosure for AC line connection.

Backup DC Power Requirements

SB II+ may be run on a DC power source that can supply 20 to 27 volts DC (24 VDC nominal).

Bring the DC line into the cabinet through a conduit opening on the bottom of the enclosure.

- Use conduit for running the DC wiring into the SB II+
- #14 gauge or larger conductors.

The power system in SB II+ automatically switches to this backup DC voltage when the AC supply fails for any reason including a power outage or intentional disconnection.

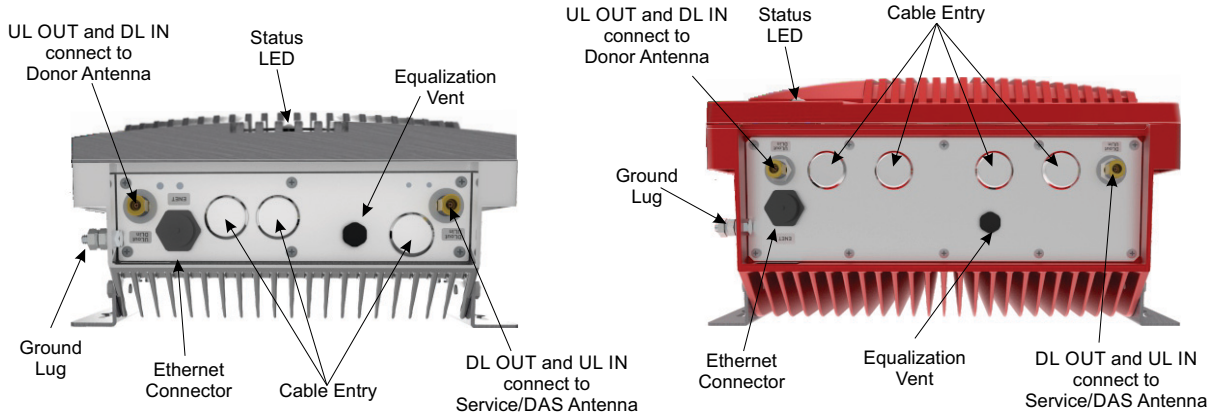
DC backup is not required normal operation of the booster on the AC line, DC is only used in the event AC power fails. A DC backup is required for a system to be NFPA compliant, see "NFPA Compliance" on page 26.

Booster Cable I/O Panel

The Boosters have two Type N RF connectors on the I/O panel. One RF connector for a Donor antenna and the second connector for a service antenna. Cable connections for AC power, DC backup power, and Alarm reporting are made through conduit connected at the cable entry points on the I/O panel.

The I/O panel for the two sizes of enclosures used for Boosters are shown in Figure 32. Notice that the small enclosure has three conduit entry ports and the large enclosure has four.

Figure 32 Bottom View, Booster Enclosures.



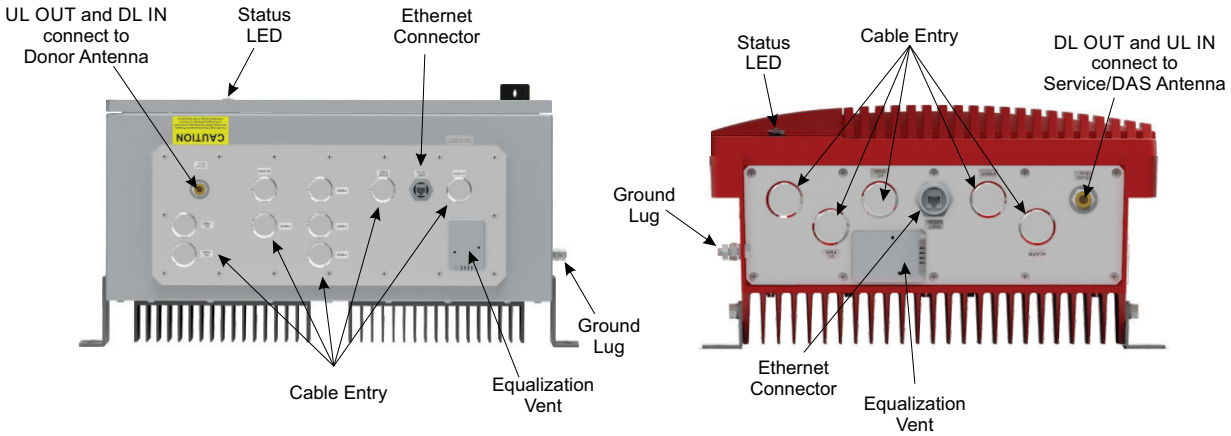
Small Booster Enclosure

Large Booster Enclosure

Fiber DAS Cable I/O Panel

The Fiber units have one Type N RF connectors on the I/O panel. The head-end units have a RF connector for a Donor antenna and the remote units have a RF connector for a service antenna. A fiber-optic link connects the head-end to the remote units. Cable connections for AC power, DC backup power, Fiber-optic cables, Ethernet, and Alarm reporting are made through conduit connected at the cable entry points on the I/O panel. Examples of the Fiber Head-end and Remote enclosures are shown in Figure 33.

Figure 33 Bottom View, Fiber Enclosures



Fiber Head-end Enclosure

Fiber Remote-end Enclosure

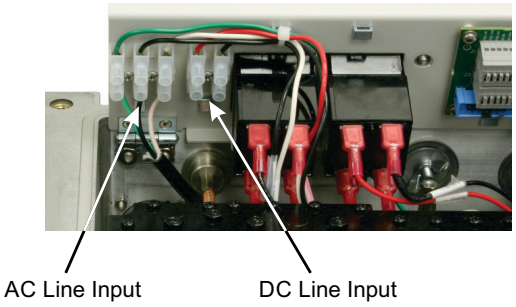
Booster Power Connections

Terminals are used in all units for AC and DC power inputs.

Single Band 700 or 800 MHz, Small Enclosure units

For the small clamshell style enclosure, a terminal strip is located behind the flip-up panel and to the right of the On/Off switches. See Figure 34.

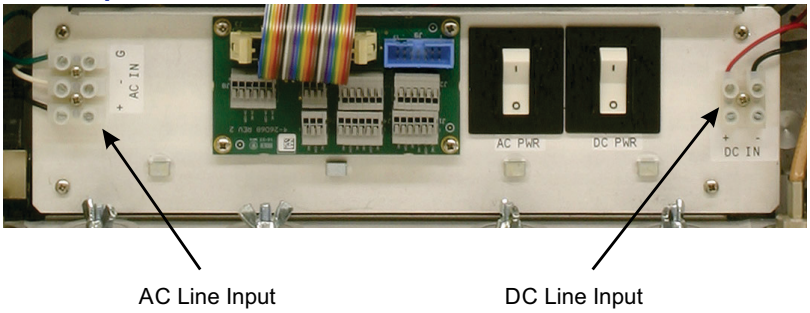
Figure 34 Small Enclosure, Input Power Connections



UHF, Large Enclosure units

For the UHF large clamshell style enclosure, the AC line terminal is located to the left of the Form-C contact terminals. The DC input terminal is located on the right side. See Figure 35.

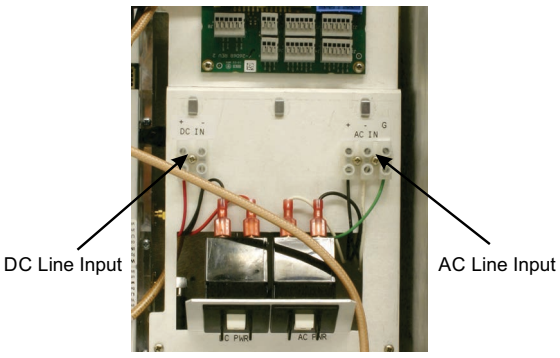
Figure 35 UHF, Power Input Connections



700/800 MHz Dual Band Large Enclosures

For the 700/800 MHz Dual Band large enclosure, the AC line and DC terminal strips located above the circuit breakers in the bottom right of the enclosure. See Figure 36.

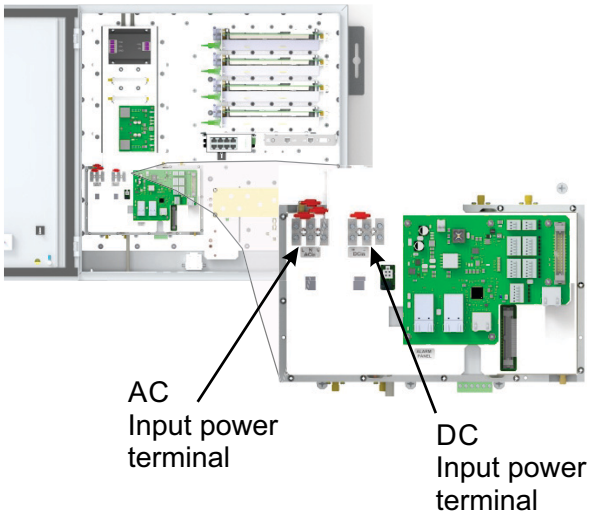
Figure 36 Dual Band 700/800 MHz, Power Input Connections



Fiber-DAS Power Connections

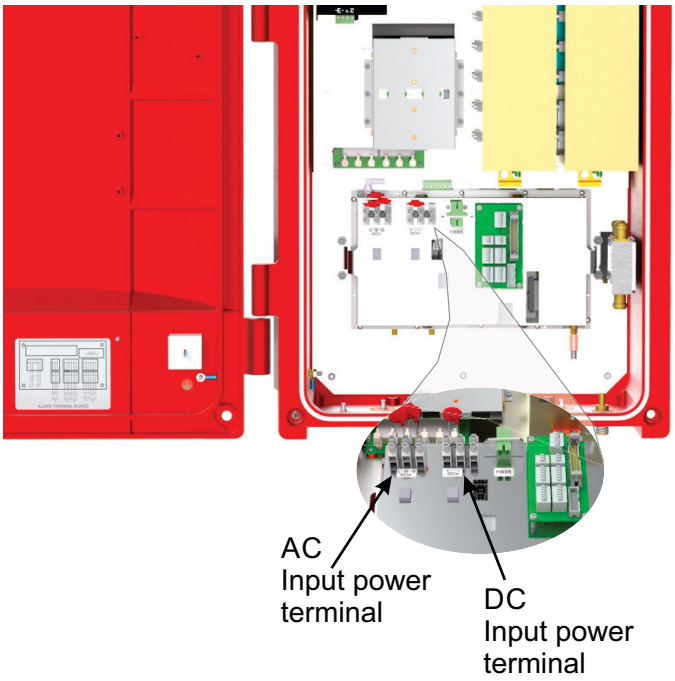
All Fiber-DAS Head-end units have the AC and DC input terminals located on a panel in the bottom left portion of the enclosure, see Figure 37.

Figure 37 Fiber-DAS Head-End Power Connection



All Fiber-DAS Remote units have the AC and DC input terminals located on the left end of a panel in the bottom portion of the enclosure, see Figure 38.

Figure 38 Fiber-DAS Remote Power Connection



Fiber-Optic Cable Connection

SBII+ Model 63 FOIs use wave-length division multiplexing (WDM) featuring the following:

- Single mode fiber
- Angled connectors
- Up to 15 dB optical loss

This interface is designed to work with SC-APC connectors (angled physical connector) and single mode fibers only. All connectors used in SBII+ Model 63 equipment are SC-APC type. It is important that all connectors (i.e. patches) between the Head-end and the Remote Units be angled, otherwise reflections could result, causing signal quality problems through the system. All connection points in the fiber must either be fusion spliced or equipped with APC connectors.

NOTE

UPC connectors anywhere in the fiber path will cause degradation in the performance of the equipment.

The Ethernet communication between the Head-end and the Remote Units takes place on two sub-carriers in the FOI where the Ethernet signals are superimposed on the RF signals. The Ethernet sub-carriers are on frequencies not used by the RF traffic so they do not cause any system performance degradation.

The fiber connection has a keyed slot SC-APC connection. Care must be taken to ensure the fiber is installed correctly. It is possible to force the connection so that the fiber is installed at a 180 degree rotation causing performance issues.

Figure 39 shows the location of the fiber-optic cable connectors in a head-end unit. Fiber optic cables are routed through the cable entry openings in the bottom of the enclosure then connected to one of the connectors on an FOI.

NOTE

A full 16-port system is shown in Figure 39, the number of FOIs and available fiber-optic connectors will vary by Fiber-DAS model.

One fiber-optic cable is used for each remote unit in the Fiber-DAS, Figure 40 shows the typical pattern for connecting a remote unit's fiber-optic cable to the head-end units FOIs.

Figure 39 Head-End FOI Fiber Connections

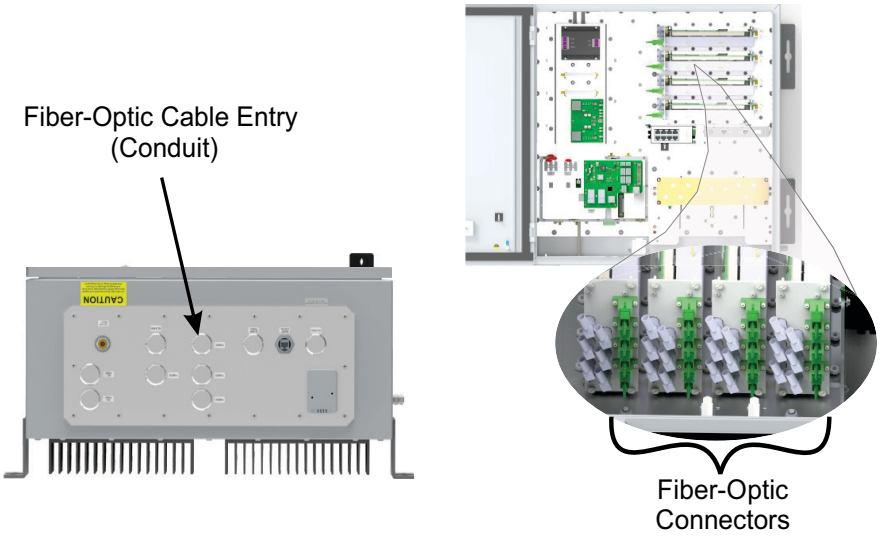


Figure 40 Fiber-Optic Head-End to Remote Unit Connections

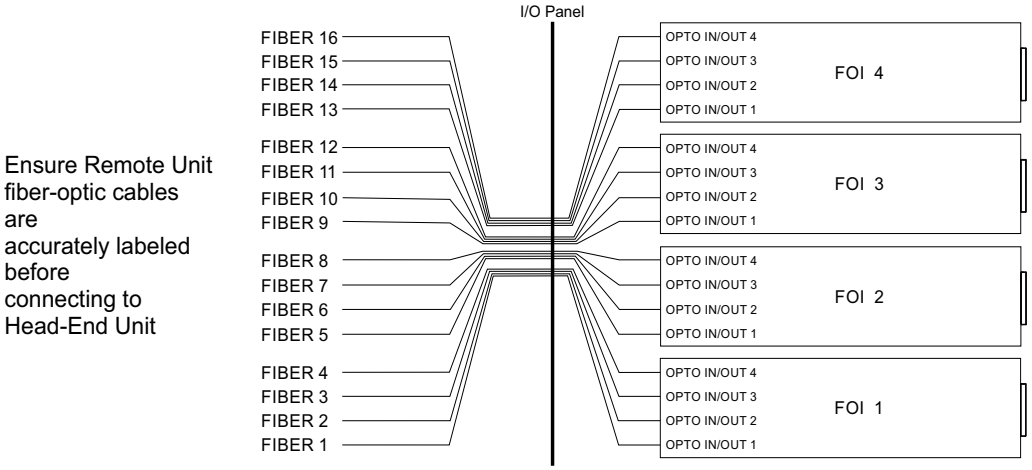
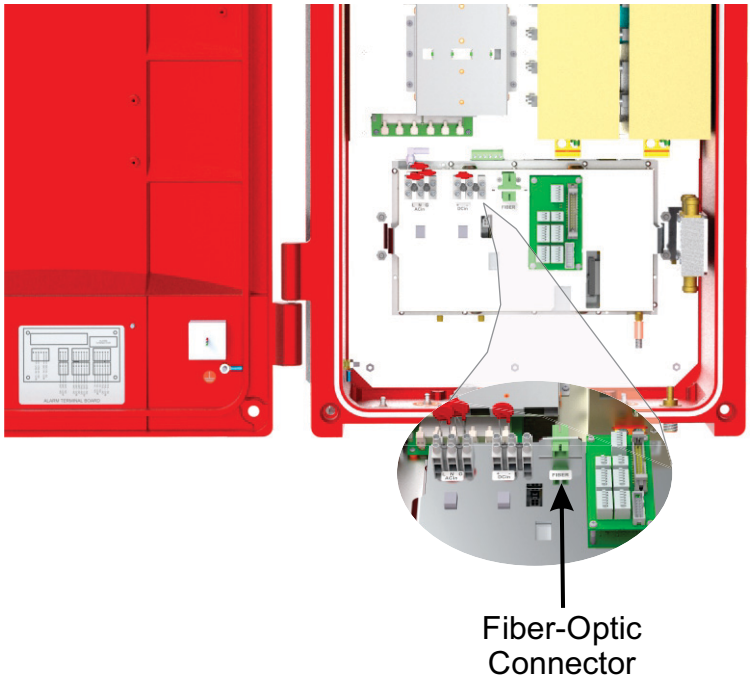


Figure 41 shows the location of the fiber-optic cable connector in a remote unit. The Fiber-optic cable is routed through the cable entry opening in the bottom of the enclosure then connected to the connector.

Figure 41 Remote Fiber Connections



RF Connections

N(F) bulkhead connector(s) are located on the I/O panel on the bottom of the enclosure for connection to the signal distribution system. All RF cabling connections to the booster should be checked for correctness prior to powering up the system.

Be sure that the correct branch of the distribution system is connected to its corresponding Uplink/Downlink connector or the system will not work properly. Using high-quality connectors with gold center pins is advised. Flexible jumper cables made of high-quality coax are also acceptable for connecting to rigid cable sections.

CAUTION

The maximum RF input power level for the SBII+ is -20 dBm.
Stronger input signals will cause the unit to exceed it's IM specifications.
Static Input signals stronger than -10 dBm may physically damage the unit.

Pre-RF Connection Tests

Antenna isolation between the uplink and downlink branches should be measured before connecting the signal booster to the antenna system. This step is necessary to insure that no conditions exist that could possibly damage the signal booster and should not be skipped for even the most thoroughly designed system.

NOTE

The booster is factory preset to 50 dB gain and should only be reset to a higher value after determining the safe maximum gain based on antenna isolation.

Test Equipment

The following equipment is required in order to perform the pre-installation measurements.

- Signal generator for the frequencies of interest capable of a -20 dBm output level. Modulation is not necessary.
- Spectrum analyzer that covers the frequencies of interest and is capable of observing signal levels down to -100 dBm or better.
- Double shielded coaxial test cables made from RG142, RG55 or RG223 coaxial cable.

Antenna Isolation

Just like the feedback squeal that can occur when the microphone and speaker get too close to each other in a public address system, a signal booster can start to self oscillate. This can occur when the isolation between the input antenna or signal source and the output distribution system does not exceed the signal boosters gain by at least 15 dB. Oscillation will reduce the effectiveness of the system and may possibly damage the power amplifier stages.

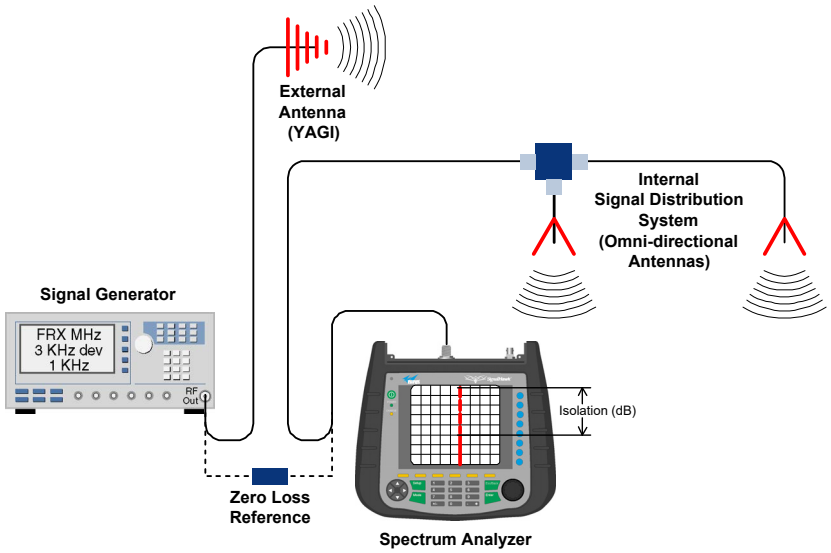
In general, if one or both antenna ports are connected to sections of radiating coaxial cable (lossy cable) the isolation will be more than adequate because of the high coupling loss values that are encountered with this type of cable. When a network of antennas are used for the input and output, this problem is much more likely. Isolation values are relatively easy to measure with a spectrum analyzer and signal generator.

Procedure for Measuring Antenna Isolation

1. Set the signal generator for a -20 dBm output level at the center frequency of one of the signal boosters passbands.
2. Set the spectrum analyzer for the same center frequency and a sweep width equal to or just slightly greater than the passband chosen in step one.
3. Connect the test leads of the signal generator and the spectrum analyzer together using a female barrel connector, see Figure 42. Observe the signal on the analyzer and adjust the input attenuator of the spectrum analyzer for a signal level that just reaches the -20 dBm level at the top of the graticule.

4. Referring to Figure 42, connect the generator test lead to one side of the signal distribution system (external antenna) and the spectrum analyzer lead to the other (internal distribution system) and observe the signal level. The difference between this observed level and -20 dBm is the isolation between the sections. If the signal is too weak to observe, the spectrum analyzer's bandwidth may have to be narrowed and its input attenuation reduced. Record the isolation value for future reference. **The isolation value measured should exceed the signal boosters gain figure by at least 15 dB.**

Figure 42 Test Equipment Setup



5. Repeat step 4 again with the signal generator set at the passband edges in order to see if the isolation is remaining relatively constant over the complete width of the passband.
6. Repeat the isolation measurements if necessary at other system passbands to determine the overall minimum isolation value for the system. Physical modification of the antenna system maybe required in order to reach an acceptable minimum value.

WARNING

RF Exposure

FCC RF exposure compliance requirements: a separation distance of at least 32.5 cm (for UHF), 23 cm (for 700 MHz PS), 27 cm (for 800 MHz PS), or 22 cm (for 800 MHz CRMS) must be maintained between the Donor antenna of this equipment and all persons. To comply with FCC RF exposure compliance requirements, a separation distance of at least 32.5 cm (for UHF), 20 cm (for 700 MHz PS), 21 cm (for 800 MHz PS), or 27 cm (for 800 MHz CRMS) must be maintained between the DAS antenna of this equipment and all persons. This equipment must not be co-located or operating in conjunction with any other antenna or transmitter.

IC RF exposure compliance requirements: a separation distance of at least 39.4 cm (for UHF), 30.5 cm (for 700 MHz), 36.1 cm (for 800 MHz) must be maintained between the Donor and DAS antennas of this equipment and all persons.

WARNING

Exposition RF

Pour conformer aux exigences d'exposition de FCC RF, une distance de séparation d'au moins 32.5 cm (pour UHF), 23 cm (pour 700 MHz PS), 27 cm (pour 800 MHz PS), or 22 cm (pour 800 MHz CRMS) doit être maintenue entre les Donor antenne de cet équipement et toutes les personnes.
Pour conformer aux exigences d'exposition de FCC RF, une distance de séparation d'au moins 32.5 cm (UHF), 20 cm (pour 700 MHz PS), 21 cm (pour 800 MHz PS), or 27 cm (pour 800 MHz CRMS) doit être maintenue entre les DAS antenne de cet équipement et toutes les personnes. Cet équipement ne doit pas être co-localisé ou exploités en conjonction avec toute autre antenne ou transmetteur.
Pour conformer aux exigences d'exposition de IC RF, une distance de séparation d'au moins 39.4 cm (pour UHF), 30.5 cm (pour 700 MHz), 36.1 cm (pour 800 MHz) doit être maintenue entre les Donor et DAS antennes de cet équipement et toutes les personnes.

Alarm Connections

Booster and Fiber-DAS Remote Unit NFPA Alarm Connections

Alarm Form-C relay contacts are located on the Alarm Form-C terminal circuit board as shown in Figure 43.

700 or 800 MHz Single Band Boosters — The alarm board is located on the back of the flip-up panel, see Figure 2 on page 7.

UHF Boosters — The alarm board is mounted to the shelf next to the conduit entry holes, see Figure 4 on page 8.

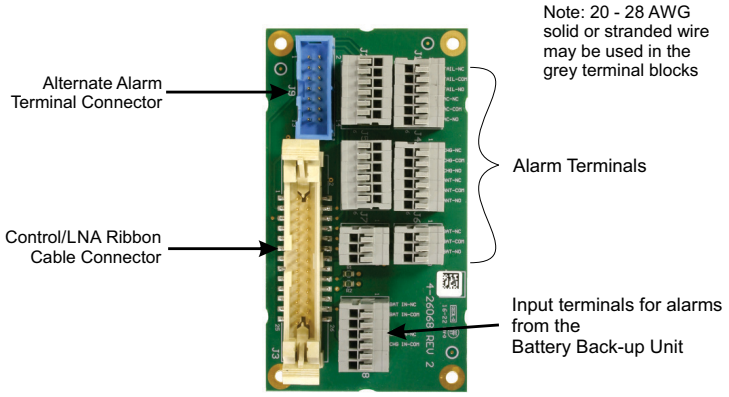
Dual Band 700 and 800 MHz Boosters — the alarm board is mounted on a panel on the right side of the enclosure, see Figure 6 on page 9.

Fiber-DAS Remote Units — the alarm board is mounted adjacent to the input power connectors, see Figure 38 on page 37.

These push-on style terminals are intended for connection to the customer's supervisory and data acquisition system. Both normally open and normally closed contacts are available for each of the five alarm functions.

A terminal identification sticker is attached to the inside of the front door, see Figure 44 on page 43 for view of sticker. The terminals provide a common access point to the alarm signal relay contacts.

Figure 43 Alarm Board



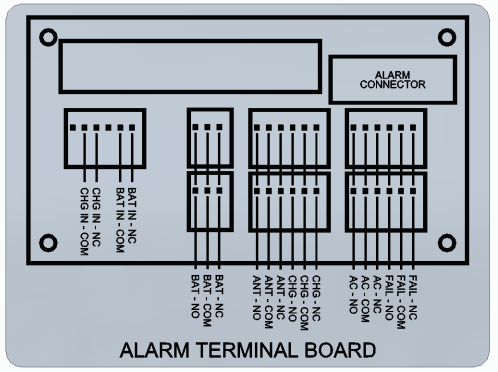
The normal condition for the SBII+ is power applied, no alarms occurring, and the booster operating as usual with the front door status LED colored green. Under these normal conditions there will be continuity between the Com and NC alarm contacts and no continuity between the COM and NO alarm contacts. When an alarm condition occurs the status LED on the front door will turn red and the appropriate form-C contacts will change state. When alarming there will be continuity between the COM and NO alarm contacts and no continuity between the COM and NC alarm contacts.

The alarm terminals are push-on type for ease of connection. Route the alarm wires through one of the access holes in the bottom of the cabinet, strip about 3/16” of insulation from the end of each wire and insert into the appropriate terminal. To remove a wire push down on the tab and pull out the wire. Use #20 to #28 gauge insulated wire for alarm connections.

NOTE

In the unlikely event that all operating voltage to the booster is lost the Form-C alarm contacts may present in an undefined state.

Figure 44 Alarm Terminal Identification



Available alarm functions include;

All five of the alarms use “supervising” alarm circuits. A supervised circuit includes technology that will detect open or shorted circuits regardless of the alarm status. This is accomplished by using EOL (end-of-line) resistors at the alarm terminal strip in the signal booster cabinet. The value of the EOL resistors is a function of the alarm panel so you should consult the manual for the alarm panel when you are determining the resistor value.

Fiber-DAS Head-End Unit NFPA Alarm Connections

The Head-end units have two alarm output options, one output option is an RJ-45 output exclusively for the Bird Alarm Panel, the second option is individual normally open/normally closed outputs for each NFPA alarm.

Bird Alarm Panel — The Alarm Panel connects to the signal booster using a standard Ethernet cable with RJ-45 connectors. The Ethernet cable provides operating voltage for the Alarm Panel and carries the booster status. Alarm Panels provide immediate feedback on the status of the NFPA alarms for the systems. See "NFPA Alarm Panel" on page 29.

Facility Panel — Individual outputs for each NPFA alarm, each individual output is available as normally open or normally closed. These outputs are provided for connecting the NFPA alarms to an existing facility alarm panel. See Figure 46 on page 45 for a connection diagram of Facility Panel and SBII+ Alarm Board.

Monitored NFPA Alarms

The booster monitors the five alarms required for NFPA compliance including:

- Signal Booster Failure
- Loss of AC Power
- Antenna Malfunction
- Low Battery Condition
- Charger Failure

Figure 45 I/O Panel Alarm Outputs

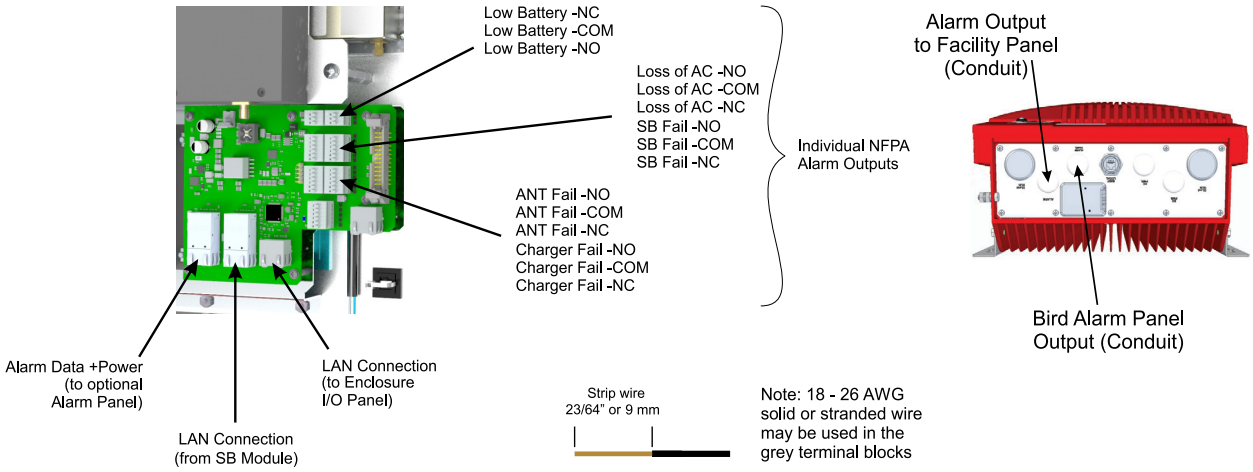
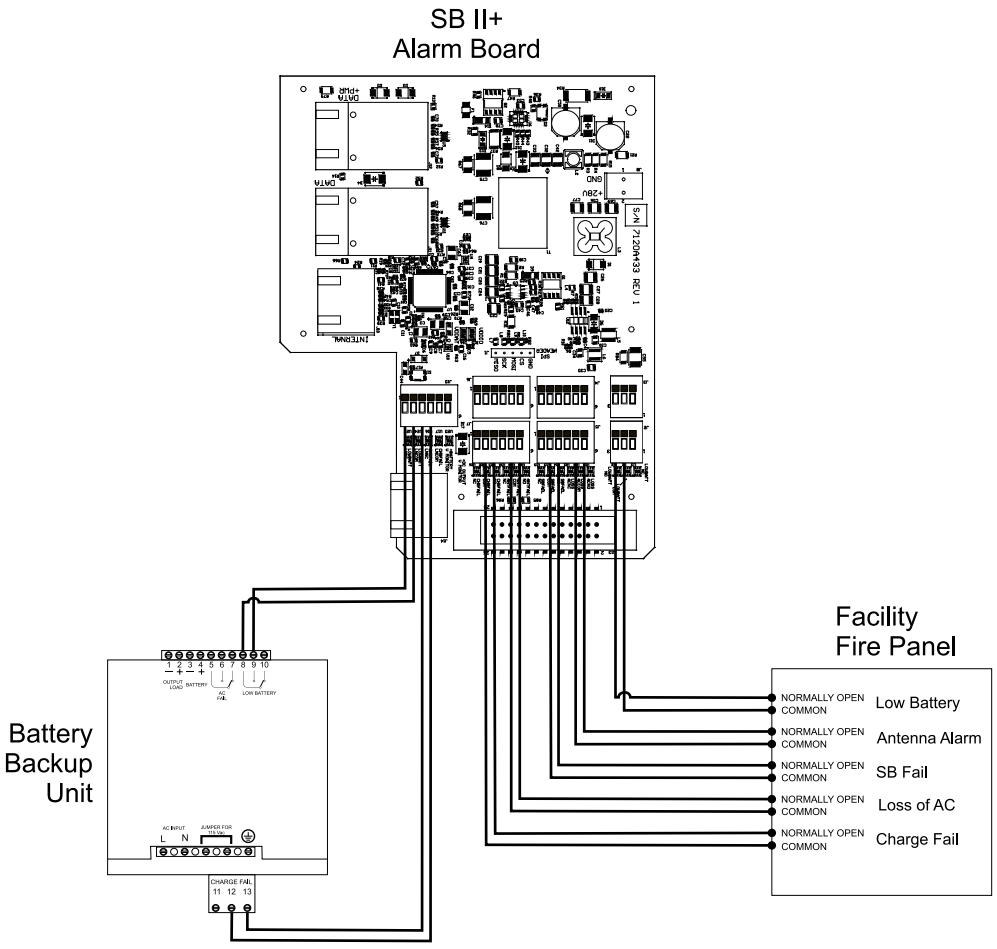


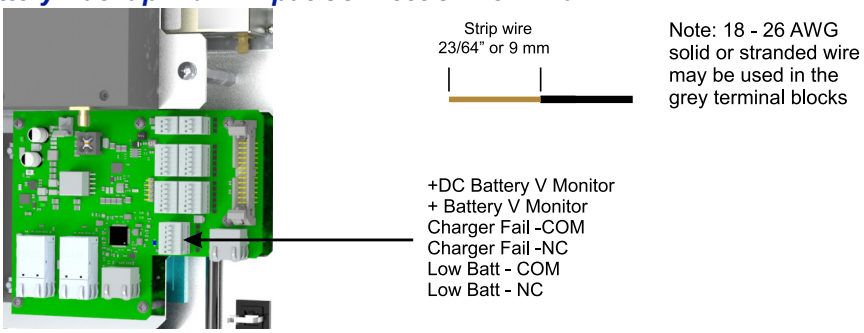
Figure 46 Battery Backup and Facility Fire Panel Integration



Battery Back-up Alarm Input connections

In addition to the DC back-up voltages, the battery back-up provides outputs for the low battery and charger failure NFPA alarms. The wiring for the Battery Back-up alarms should be routed through conduit with the DC power supply wiring. See Figure 47 for terminal location. See Figure 46 on page 45 for a connection diagram of Battery Back-up and SBII+ Alarm Board.

Figure 47 Battery Backup Alarm Input Connection Terminal



The RF ports on the SBII+ should be terminated before energizing the booster. If an RF port is not connected to an antenna then the port should be connected to a 50 Ohm load whenever operating power is applied to the booster.

Power is applied to the booster by turning on the AC and DC power switches. The status LED located on the front door of the unit will illuminate indicating that operational power is being applied.

Booster User Interface — The booster user interface is a web based interface allowing the user to configure the SB Module. In the boosters the only configuration is within the SB Module. See "Booster User Interface" on page 49.

Fiber-DAS User Interface Description — Fiber-DAS user interface is a web based interface allowing the user to configure the fiber-optic components and the SB Module. See "Fiber-DAS User Interface" on page 63.

Status LED

The status LED is located on the front cover of the unit, it is a tri-color indicator (red, yellow, green). Each color represents a different status as shown in Table 3.

Table 3 Status LED

Color	*Status*
Red	System has a critical error.
Yellow	System has an error. Warning: performance may be impaired. Example: OLC is active
Green	System is operating normally

Operational Problems

Even in the most carefully designed signal distribution systems, unpredictable situations can arise which can cause problems. A few of the more common causes are:

a. Unintended signals entering the system. Primarily caused by radios operating on channels that are within the operational bandwidth of the booster. Sometimes this will be a transient problem caused by mobile units when they transmit while in close proximity to your system.

b. Hand-held and mobile units that approach much closer than expected to one of the antennas in the signal distribution system.

c. Unexpected signal propagation anomalies. Building geometry can cause signal ducting and other phenomena that cause signal levels that are much stronger (or lower) than expected.

d. Lower than estimated signal attenuation can cause signals to be unusually strong. Higher losses can also occur giving weaker signals than desired.

e. Excessive Signal Booster gain. In systems that have an existing booster, it is sometimes assumed that an identical unit should be installed when expanding the system to provide extended coverage. In many cases a booster with far less gain than the first is required. Users should consult with the Bird Applications Engineering group whenever expanding an existing signal booster system for extended coverage.

f. Improper installation/application of signal splitters or directional couplers in the signal distribution system. This is usually the cause of too low a signal level but deserves mentioning here. Signal splitting needs to be done with constant impedance signal splitters so that the proper power splitting ratios and VSWR are maintained. Using tee connectors by themselves is inviting trouble. Directional couplers must be connected with regard to their directionality and coupling levels or improper system signal levels may result. Users should consult with the Bird Applications Engineering group whenever considering the expansion of an existing signal distribution system for extended coverage.

Input Signal Levels

Signals that exceed the maximum input rating of the booster may either damage the booster or cause it to generate intermodulation products that exceed the maximum allowed by the FCC or other regulatory agencies. The addition of PA Protection and OLC (Output Level Control) in the design of the booster helps prevent these ill effects.

PA Protection

PA Protection will temporarily reduce the boosters gain to the lowest amount possible and at the same time dial-in the maximum attenuation possible. This will help protect the PA from damage. RF signals will still pass through the booster however they will be considerably reduced in amplitude compared to normal operation. PA Protection will turn on automatically whenever the input level to the PA amplifier is to high. The booster will keep applying PA Protection until 1 minute after the fault condition clears. Both the uplink and downlink branches have PA Protection which operates independently of the other branch.

OLC

The boosters OLC circuitry will automatically activate whenever the maximum desired output power level of the booster is reached. The maximum output power level is user selectable between 21 and 33 dBm. When OLC is active it will reduce the incoming signals by an amount necessary to keep the output power from exceeding the user specified maximum output power level value. The maximum amount of OLC attenuation that the booster can apply is 30 dB. If all the available OLC is used and the input signals continue to increase in amplitude then the output power of the booster will rise until PA protection is activated as described in the paragraph above. The 30 dB range of OLC attenuation is more than adequate for most real life situations.

One undesirable side effect of OLC is that the signal level of all signals being passed by the branch will be reduced when the OLC circuitry is active. This means that the performance of the branch is actually decreased for other passband signals as long as OLC is active.

OLC has been designed to handle short term or transient overdrive signals only. Under normal operation some small amount of OLC might be applied on an occasional basis depending on the RF environment the booster is operating in. However, if excessive amounts of OLC are applied or the OLC is being applied often then the user should consider remedial action. Choices include reducing the gain of the booster and/or redesigning the antenna system.

Increase Isolation or Decrease Gain

As mentioned earlier in the manual in the section titled "Pre-RF Connection Tests" on page 40, the isolation between the uplink and downlink signal paths must be 15 dB greater than the signal boosters gain setting. Modification of the signal distribution system is required to increase isolation between the uplink and downlink paths. This can sometimes require significant changes that may or may not be practical from a cost or logistical standpoint. Gain reduction may be the practical or only alternative that is available to the user. Fortunately this is easy to accomplish with the SBII+ Signal Booster using the ”RF Configuration Submenu”. The gain of each branch in the system is independently adjustable from 35 to 80 dB.

See the Booster "RF Configuration Submenu" on page 53.

See the Fiber-DAS "SB Module RF Configuration Screen" on page 90.

Communicating With the Booster

The booster is configured using the web based graphical user interface (GUI). The bottom panel ENET connector on the booster provides for 10/100 BASE-T Ethernet connection using the TCP-IP protocol. This connector allows access to a web-based interface for interacting with the booster.

The SBII+ Model 63 Booster system is shipped with a default IP address and a default Login and Password.

Default IP Address: 192.168.1.100 Default Subnet: 255.255.255.0

Login: admin Password: admin

The are two methods of connecting to the booster:

- A direct connection from your laptop computer to the booster. A direct connection (at the installation site) should be the first time to establish a connection to the booster using the fixed IP mentioned above.
- Network Connection. Once the initial communications are established the IP address in the booster can be changed to permit a networked connection (from a remote site such as a remote office).

Direct Connection

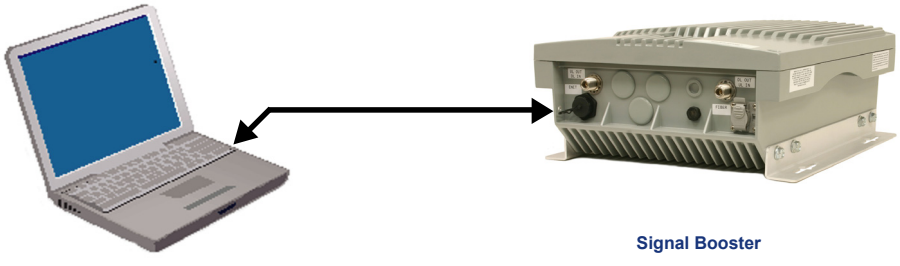
Your initial connection to the booster system should be a direct connection using an Ethernet cable as shown in Figure 48. The signal booster supports Auto-MDIX so a cross-over or straight-through cable can be used to make the connection.

Required Equipment

To perform a direct connection to the booster the following items are required.

- Cat-5 Cable
- Laptop Computer with a network interface card installed. The laptop computer should be running a windows based operating system with at least version 7.

Figure 48 Direct Ethernet Connection



Procedure

To connect your laptop computer to the ENET port and access the web page interface, perform the following steps;

1. Connect your laptop's network port to the ENET connector on the boosters bottom panel using a standard CAT-5 cable (cross-over or straight-through).
2. Insure that your laptop's IP address is compatible with the default address of the signal booster system. This may require changes be made to the Ethernet adaptor address on your laptop. Your laptop's IP address will need to be set to "192.168.1.2" along with a subnet mask of "255.255.255.0".
3. Launch your web browser software on the laptop.

4. In your web browsers address box type-in the address of the booster “http://192.168.1.100” (factory default) and press the ENTER key. The web page interface to the booster should appear in your laptop’s browser window.

Networked Connection

Before attempting a networked connection to the signal booster system consult with your IT support personnel for information concerning the correct IP address to use and any additional connectivity issues such as firewall settings.

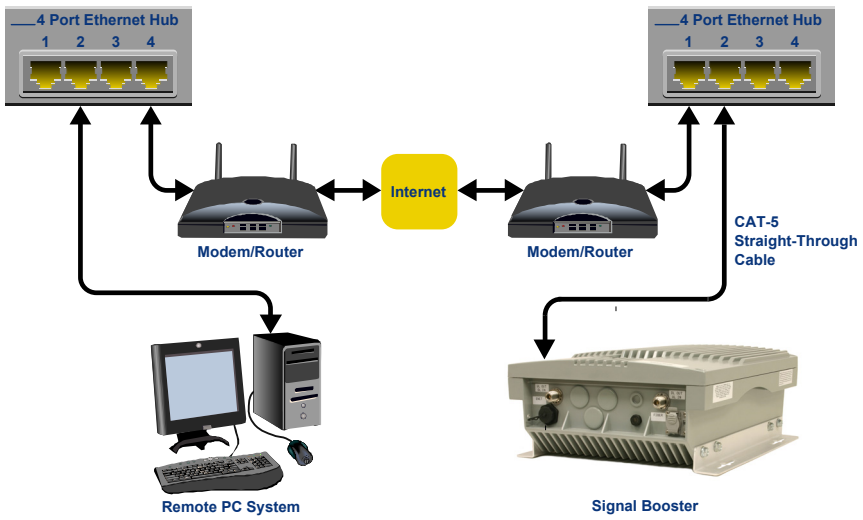
Once you have the correct IP address you will need to direct connect to the booster system as discussed in the earlier section of this appendix and reconfigure the booster ENET port with this new address. You can then connect the signal booster system using a CAT-5 (cross-over or straight-through) cable to the networked environment and interface to it from a remote computer. Figure 49 shows the proper way to interconnect the equipment for a networked connection.

Required Equipment

To perform a direct connection to the booster the following items are required.

- Cat-5 cable for connection to the network.
- Temporary use of a laptop computer with a network interface card installed and a Cat-5 cable. These temporary items are used to adjust the boosters network settings.

Figure 49 Network Ethernet Connection



Procedure

Before a networked connection can be established, the boosters ENET Port must be changed to an IP address that’s compatible with your network. If you are unsure how to determine this address check with your IT support personnel. To connect the boosters ENET port to a networked environment and access the web page interface, perform the following steps;

1. Change the boosters ENET port IP address. To do this, direct connect your laptop to the booster as discussed in "Direct Connection" on page 49.
2. Once you have established a direct connection to the booster go to the Admin page and log in. You must be logged in to the booster in order to make any kind of changes to it’s configurations.
3. Go to the Network Configuration page and enter the new configuration values provided by your network administrator for;
    a. IP Address
    b. Subnet Mask
    c. Gateway Address

4. Enter labels for Hostname and Server.
5. Click the “Save” button to store the new values in the boosters memory.
6. Click the “Restart Network” button to initiate the use of the new values. At this time your laptop will stop communicating with the booster because your laptop should no longer be set to the communicate with active network configuration values.
7. Disconnect your laptop and use the Cat-5 cable to connect the booster to the network.
8. Verify that the booster can now be accessed from the remote PC.

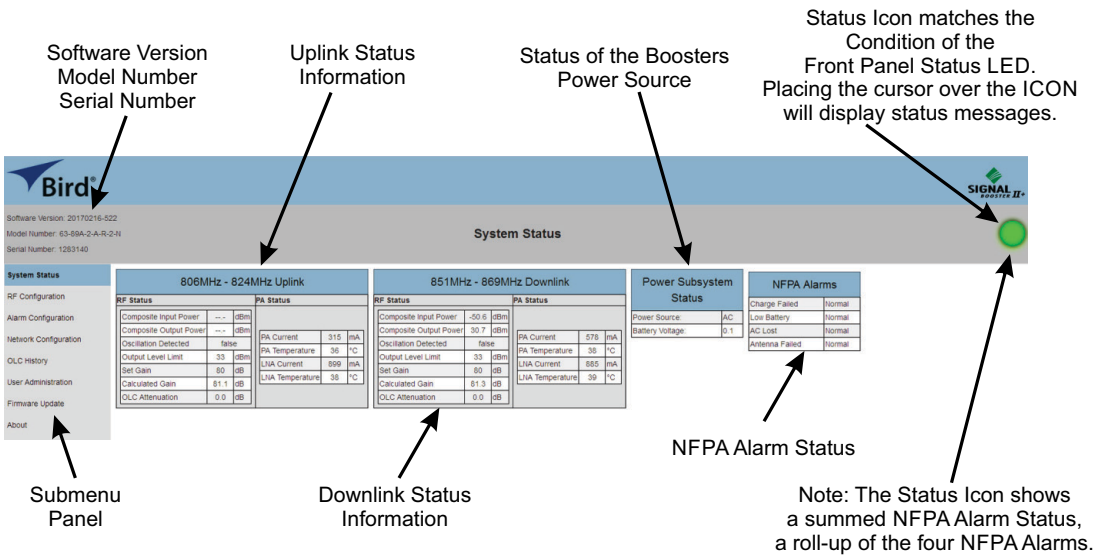
System Status Submenu

Once connected to the signal booster a system summary screen will be displayed as shown Figure 50. This screen shows the overall operational status of the booster. There are no user interactions available on this page. It is designed to provide the big picture of what the booster is doing and the values displayed on this screen are updated in real time.

The top banner of this submenu screen shows the current software version, model number, and serial number of the booster.

The front door status LED is shown as a status icon on the right of the banner and will be updated in real time. If the GUI cursor is placed on the status icon a message bubble will appear describing the meaning of the status indication. This can be particularly helpful during warning (yellow) and alarm (red) conditions. This message bubble feature is also available for most of the boxes shown on the menu pages and can be a useful tool for the user when learning the software features of the product.

Figure 50 System Status Submenu



On the left-hand side of the page is a panel containing the major submenus available to the user including System Status, RF Configuration, Alarm Configuration, Network Configuration, OLC History, User Administration, and Firmware Update. Place your cursor over a particular submenu heading and left click to make a selection. Each major submenu page contains a group of related functions and each is discussed in detail in later sections of this manual.

The center of the System Status submenu screen is divided into graphical boxes. Identical boxes for each uplink and downlink branch and a smaller box for power subsystem status and NFPA alarms. The uplink and downlink boxes have their passband displayed on the top border of the box. Both RF Status values and Power Amplifier Status values are displayed in a column format. The values displayed are updated in real time. The example shown in Figure 50 is for a dual band booster which has 3 passbands, one uplink passband and two downlink passbands.

The Power Subsystem Status reports on the current power source operating the booster, either AC or Battery Backup. In addition, the battery backup voltage level being supplied to the booster is displayed.

The NFPA alarm status box is displayed whenever the NFPA option is installed in the booster and the NFPA alarm function is activated in the Alarm Configuration, (discussed in a later section of this manual). The NFPA alarm status box shows four of the five alarms associated with NFPA compliance. The fifth alarm is overall signal booster status which is indicated by the status icon in the upper right corner of the screen.

RF Status

The RF status items list is identical for both uplink and downlink passbands. A description of each of the 7 status items is listed below.

Composite Input Power — The composite input power of the link's passband. The composite input power is not directly measured, but is calculated based on the output power. This is why both input and output composite power values start and stop displaying at the same time. The input power must be greater than -70 dBm in order to show up as a value on the system status screen otherwise the display will show "--.-" instead of a value.

CAUTION

The maximum input power level to the booster in order to maintain specifications is -20 dBm.
To prevent damage to the booster the maximum input power level should not exceed -10 dBm.

Composite Output Power — The composite output power of the link's passband. The output power must be greater than +10 dBm in order to show up as a value on the system status screen otherwise the display will show "--.-" instead of a value.

Oscillation Detected — This is an indication that oscillation has been detected. The displayed value will change from false (the normal state) into true. The boosters response to an oscillation detection can be configured by the user via the RF Configuration submenu.

Output Level Limit — The desired output power level of the booster. This is user selectable via the RF Configuration submenu. The selectable range is from 21 to 33 dBm in 0.5 dBm increments.

Set Gain — The desired gain of the booster as determined by the user. This is user selectable via the RF Configuration submenu (referred to as maximum gain). The selectable range is 35 to 80 dB in 0.5 dB increments.

Calculated Gain — This is a calculated value. Defined as the (user selectable) Set Gain value minus the current amount of OLC attenuation.

OLC Attenuation — This is the amount of attenuation the OLC is providing. Ideally there should be little or no OLC applied. OLC (output level control) is meant to reduce gain for transient episodes of very strong signals. However, when OLC is active, gain is reduced for all signals being passed by that link's passband and that reduction may compromise communications for weaker signals in the passband. If a large amount of OLC is applied more than occasionally, it is advised that the gain of that branch be reduced or re-orient the antenna for better isolation.

PA Status

The items for PA Status are identical for both the uplink and downlink passbands. A description of each of the 4 status items is listed below.

PA Current — The amount of current the power amplifier is drawing.

PA Temp — Temperature of the power amplifier in degrees Celsius.

LNA Current — The amount of current the LNA is drawing.

LNA Temperature — Temperature of the LNA in degrees Celsius.

Power Subsystems Status

This area of the screen provides a convenient summary of the operating voltage currently powering the booster as well as the value of the backup voltage being applied.

The power source for the booster is normally the AC supply line and AC will be displayed in the Power Source item box as shown in the example in Figure 50 on page 51. When the AC supply is interrupted the booster will switch over to the battery source for continued uninterrupted operation. The item box will change to battery and will become backlit to draw the attention of the user. The battery connected box located on the Alarm Configuration screen should be checked if the user has battery backup voltage applied to the booster.

If the battery connected box is checked on the Alarm Configuration page the booster will provide warning and alarm notifications based on the value of the battery voltage. When the battery voltage is low a warning or alarm state will occur. Likewise, when the battery voltage is high a warning or alarm state will occur.

NFPA Alarms

This area shows the current status of 4 of the 5 NFPA alarms including Charge Failed, Low Battery, AC Lost, and Antenna Failed. A detailed description of each of these alarm events is provided in a later section of this manual titled “NFPA Compliance”. In order for the NFPA alarm status items to appear on the System Status screen they must first be enabled on the Alarm Configuration screen by checking the box for Enable NFPA Alarms. In addition, each of the four individual alarms must further be enabled by placing a check mark in the appropriate box. The fifth NFPA alarm which is a booster summed alarm is represented by the Status icon in the upper right corner of the display.

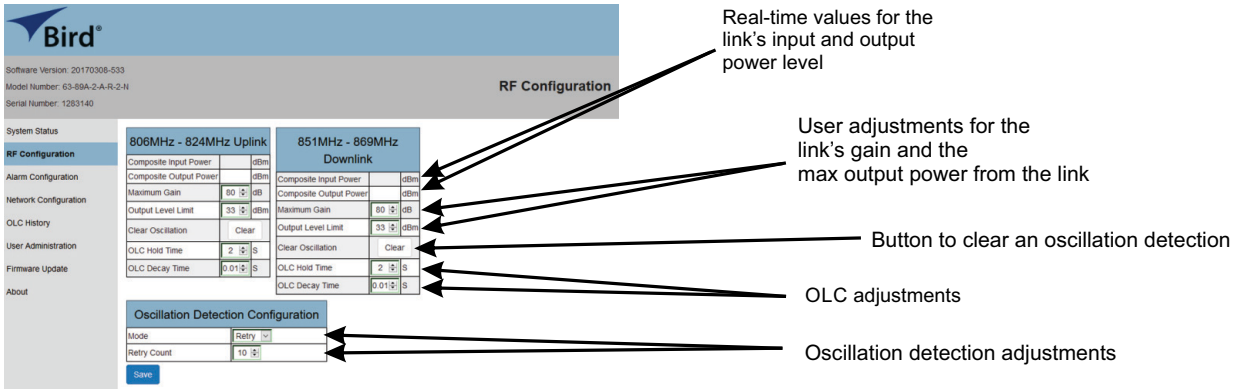
RF Configuration Submenu

The RF Configuration submenu screen is shown in Figure 51 and allows the user to configure the RF operating characteristics of the booster. If the user is not properly logged into the booster a link to the login page will be provided and no information will be displayed.

Similar to the system status screen this screen is broken into identical graphical boxes, one each for uplink branches and one each for downlink branches. The user is allowed to adjust the maximum gain of each link and the desired power output level from each link. The maximum gain is adjustable from 35 to 80 dB in 0.5 dB increments which is an adjustment range of 45 dB. The output power level is adjustable from 21 to 33 dBm in 0.5 dB increments which is an adjustment range of 12 dB.

Buttons are provided to clear an oscillation detection. Oscillation detection is a safe mode the booster will place itself into if a severe feedback problem is detected.

Figure 51 RF Configuration Submenu



On the right side of the RF Configuration submenu screen underneath the Status icon there is a check box for turning on advanced configuration items which are OLC adjustments for Hold Time and Decay Time. OLC Hold Time is adjustable from 2 to 5 seconds (in 0.1 second increments) and determines the amount of time that OLC will be applied (once it is activated by a strong transient input signal). OLC decay begins after the user specified hold time is expired. Decay Time can be adjusted between 0.01 to 1 second (in 0.01 second increments). Decay time will determine how long it takes for the applied OLC to fade from on to off.

NOTE

The OLC hold and decay time should normally be kept at a very low value. Increasing them will increase how long it takes the booster to initialize after a power interruption.

Oscillation detection can be characterized using the two entry fields that are shown below the graphical boxes for the uplink and downlink branches. Changes to the behavior of the oscillation detection feature will be applied equally to both uplink and downlink passbands. This feature shuts off the output signals from the booster for both the uplink and downlink branches whenever an oscillation condition is detected. Oscillation detection occurs whenever port to port isolation falls down to 25 dB or less. For normal operation the port to port isolation needs to be at least 15 dB greater than the gain of the booster.

Oscillation detection can operate 3 ways including Ignore, Retry, and Halt. Select the desired mode of operation from the drop down choices. Left click on the desired choice and the selected mode will now appear in the box next to the item label. In the example shown in Figure 51 the Retry mode is selected as the desired mode of operation.

In the Ignore mode the booster will ignore oscillation events. In the Halt mode the booster shuts off the output signals in both the uplink and downlink directions. The halted condition persists until the user selects the Clear Oscillation button and then presses the Save button. In the Retry mode the booster will halt for a short period of time then retry normal operation to see if the condition has cleared itself. The number of times a retry will be attempted is determined by the Oscillation Retry Count value which is user selectable. After the specified number of retry's have occurred, and if the booster is still experiencing an oscillation condition, then the booster will enter the Halt mode where it turns off and stays off until there is user intervention to correct the condition causing oscillation.

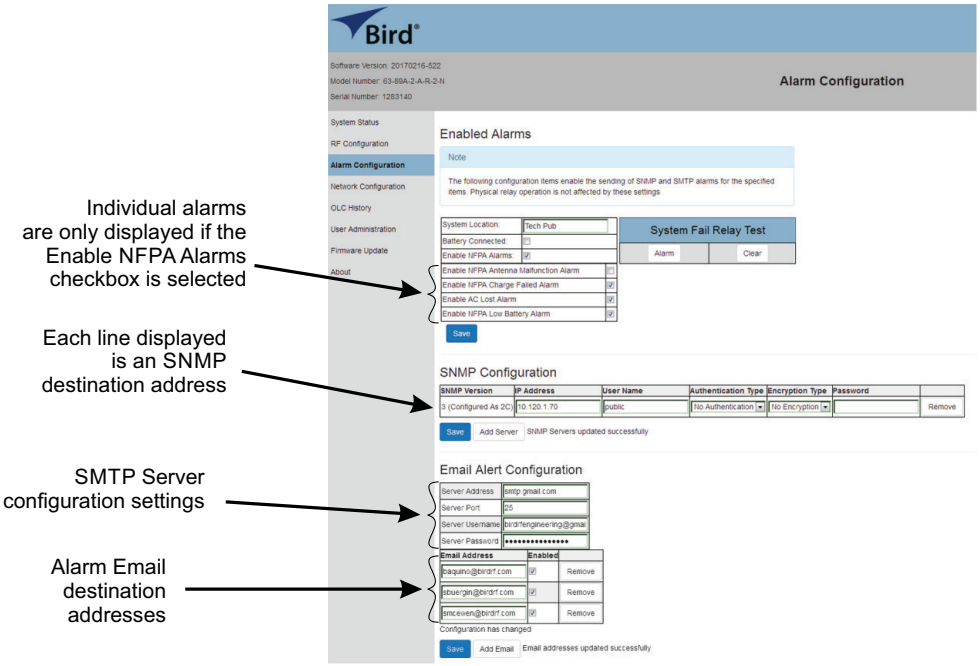
NOTE

Button selections or user changes made to drop down menu's or value counters will NOT become active until the user clicks on the SAVE button.

Alarm Configuration Submenu

The Alarm Configuration submenu screen is shown in Figure 52 and allows the user to configure the alarm operating characteristics of the booster. The screen is broken into distinct areas based on alarm related functions. These areas include Enabled Alarms, SNMP Configuration, and Email Alert Configuration. All the areas displayed on this screen allow user interaction.

Figure 52 Alarm Configuration Submenu



Enabled Alarms

The first three items in this area of the screen include System Location, Battery Connected, and Enable NFPA Alarms. The System Location feature allows the user to assign a site name to the booster. The site name will be used in SNMP and SMTP notifications sent out by the Booster. this feature is particularly useful when the signal booster is in an area or territory along with other operational boosters.

The Battery connected and Enable NFPA Alarms boxes will allow the booster to send SNMP and SMTP alarms as well as provide GUI alarm indications (red backlit boxes) for the specified items. Physical Form-C relay operation is not affected by the setting of these two boxes.

If a battery backup voltage source is connected to the booster and the booster is setup in a non-NFPA manner then the user should place a check mark in the battery is connected box. When this box is checked the booster will annunciate alarms based on a measurement of the backup battery voltage being applied. Please note that if there is not a battery backup connected to the booster and the AC source is disabled, then on air signals will not pass through the booster in either branch.

When the Enable NFPA Alarm box is checked then the NFPA alarm group list shown in Figure 52 will appear on the Alarm Configuration screen. The list includes Antenna Malfunction, Charge Fail, AC Lost, and Low Battery. Placing a check mark in these four boxes will allow the booster to send SNMP and SMTP notifications as well as provide GUI alarm indications (red backlit boxes) for the checked item. Physical Form-C relay operation is not affected by the setting of these four boxes.

In order to insure correct NFPA operation the booster must be physically setup to be NFPA compliant. NFPA compliance is discussed in detail in a later section of this manual. In order to be NFPA compliant the booster must have the required NFPA hardware (Bias-T and Antenna line sensor) installed and the booster must be connected to an NFPA capable battery backup unit. These hardware enhancements to the communications system will allow the booster to support the NFPA alarm functionality correctly.

NOTE

Recommended NFPA capable battery backup units include the Bird models 6160-110-24-NR and the 6160-220-24-NR battery backups.

In the case of the NFPA low battery alarm a possible confusion can occur if the battery connected box is checked at the same time the NFPA low battery function is checked. When the battery connected box is checked the signal booster is instructed to monitor the backup voltage level and generate alarms if the voltage drops below a threshold value (22.4 VDC). This event will not change the state of the NFPA Low Battery form-c contacts. The NFPA Low Battery form-c contacts can only change state when instructed to do so by the battery backup unit.

NOTE

Button selections or user changes made to drop down menu's or value counters will NOT become active until the user clicks on the SAVE button.

System Fail Relay Test

These two buttons are provided to easily test the summed alarm output relay. When the System Fail Relay Test button is pressed the booster will be forced into a summed alarm state and the system fail Form-C relay contacts will change state and the front door Status LED will turn red. When the Clear System Fail Relay Test button is pressed, the forced enable of the system fail relay will be removed. It takes several seconds for these button presses to become effective after they are pressed. These buttons have no effect if the booster is already in an alarmed state. That is, the Clear button will NOT clear real alarms, it will only clear forced alarms which are used for testing purposes. If the user initiates a relay test the booster will automatically clear it after about 5 minutes. This prevents the booster from being left accidently in a test mode. Also, at system reboot a forced failure mode alarm will automatically be removed. If the cursor is placed over the status icon (shown on the upper right of the GUI Interface) while the booster is performing a relay test then a message bubble will appear notifying the user that the unit is in a forced alarm condition.

SNMP Configuration

Simple Network Management Protocol (SNMP) is an Internet-standard protocol for managing devices on IP networks. The SNMP feature is designed to provide reliable internet notification of an alarm occurrence or a change in operational status in the booster. In order to configure the booster to send SNMP messages (called traps) to a destination device, such as your computer, the following values need to be entered into the booster; the IP address of the destination computer, User name, Authentication type, Encryption type, and Password. To enter these values into the booster click on the ADD SERVER button shown on the Alarm Configuration screen. Each time the button is selected an entry row will be created. Users can add as many SNMP Manager configurations as needed. An example of the SNMP configuration table is shown in Figure 52.

Destination IP addresses that are entered into the SNMP configuration table should be the IP addresses of the computers that you want the traps to be sent to. These destination computers must have SNMP manager software installed and running properly in order to receive the messages. SNMP manager software installation into the destination computers is the customers responsibility. Consult with your IT specialist for assistance.

When using authentication and/or encryption (SNMP version 3) the User Name is the name of the person to receive the trap. If not (SNMP version 2C), this will be the community name of the trap receiver. Authentication type is used to verify that the person receiving the trap is the person the trap is intended for. Authentication type choices are NONE, MD5, or SHA, with SHA being the strongest encryption type. This setting needs to reflect what the SNMP Manager computer is configured to receive.

The Encryption type is used to protect the contents of the message from unauthorized receivers. Encryption type choices are NONE, DES, or AES, with AES being the strongest supported encryption type. If Authentication is none then Encryption must be none. If the Authentication and Encryption are none then the message is compatible with SNMP version 2C. The Encryption setting needs to reflect what the SNMP Manager computer is configured to receive.

The Password is a string used to encrypt and authenticate the user. It is only used when authentication and/or encryption types are enabled (SNMP version 3). This setting needs to reflect what the SNMP Manager computer is configured to receive. The password should be eight characters long.

The System location is a user defined string which will be returned with every trap that is generated and can assist the user in identifying which unit is sending the trap message. This value is added into a box at the top of the Alarms Configuration screen and is labeled System Location.

NOTE

Whenever values in the SNMP Configuration table are changed you must click on the SAVE button to initiate the changes.

Initial SNMP Setup

When the booster is installed the SNMP feature should be setup for proper communications. There are several steps required for proper setup of the SNMP feature as discussed below.

1. Connect a laptop directly to the booster. The booster is shipped from the factory setup for static IP addressing and with a default IP address of "192.168.1.100". The factory default subnet mask is "255.255.252.0". Change the factory default IP address of the booster to one provided by your IT department.
2. Use the Network Configuration submenu to setup the DHCP as either active or inactive. When DHCP is inactive the booster will be using a static IP and the user must enter values for IP address, netmask, and gateway. Make sure you consult with your IT department regarding setting DCHP active or inactive.

NOTE

DCHP is activated by placing a check mark into the box labeled Configure Automatically and then saving the change and restarting the network.

3. Use the SNMP Configuration table to enter the destination device addresses. These are addresses where the SNMP feature will send trap messages whenever a qualifying event takes place.
4. Setup the SNMP format using the SNMP Configuration table. Items that need to be configured include User Name, Authentication Type, Encryption Type, and Password. Consult with your IT specialist for assistance.
5. Load the SNMP manager software into the destination computer and configure the manager so that it will be able to receive the SNMP traps.
6. Download MIB files from the Bird Technologies website (www.birdrf.com) and load the MIB files into your SNMP manager software. The MIB files allow the SNMP manager software to sort out the trap messages into an understandable message format.

NOTE

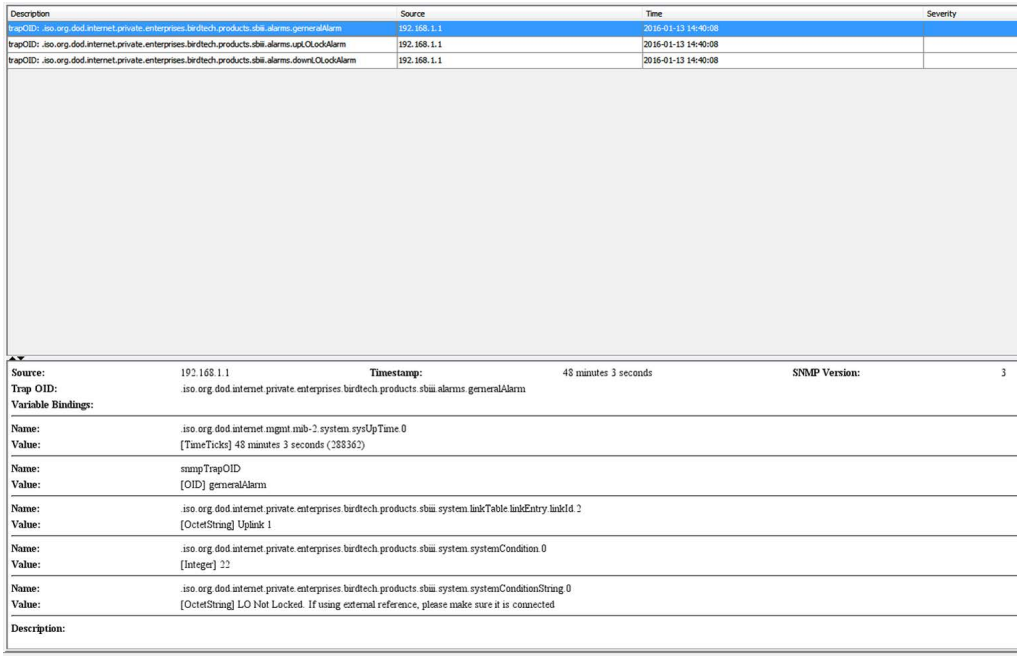
The SBII+ booster will occasionally send SNMP status updates regardless of a status change taking place. An example would be "System operating normally".

SNMP Manager Example

SNMP manager software is designed to provide a GUI style interface for the user so that traps sent from the booster can be received and displayed for viewing. SNMP manager software can also be used to determine what actions are taken when a trap is received, such as distribute to groups of users, archive, ignore, etc. The SNMP manager software chosen and used by the customer is up to the customers discretion and as such may not exactly match the example shown in this discussion. SNMP manager software packages will need to be properly configured in order to successfully receive messages from the booster. Refer to the SNMP configuration setup discussed earlier in this manual and ask your IT specialists for assistance.

When a qualifying event occurs in the booster a trap is formulated and sent to the destination computer. A typical trap is shown in Figure 53. In the example shown the trap messages are shown at the top of the screen display. Three trap messages have been received by this manager from a signal booster. In this particular SNMP manager software package if a trap message is selected the details of that message are displayed in the lower portion of the screen. The details show the raw message as it was received by the manager while the upper box shows the message after it has been interpreted by the MIB files.

Figure 53 SNMP manager



Email Alert Configuration (SMTP)

The SMTP feature allows the SBII+ Signal Booster to send status change and alarm notification email messages to user specified recipients. The body of the email message will contain a date/time stamp, status notification, and a description. For example;

2017-01-20 18:47:35 Error Antenna Malfunction

An SMTP server is used to resolve the email address of a recipient to a proper location on the internet. The SBII+ does not have a resident SMTP server so it has to be told by the user which server is going to send the message. This can be a server on your corporate network or it can be a server outside your network as long as the SBII+ is configured to know how to access resources external to your network. If you are using an SMTP server that is external to your network then the gateway in the SBII+ needs to be set properly. Network settings are adjusted using the Network Configuration Submenu discussed in a later section of this manual.

Configuring the SMTP Server

To configure the SMTP server perform the following in a step-by-step fashion.

1. Make sure you are properly logged onto the SBII+.
2. Go to the Alarm Configuration submenu and scroll down to the Email Alert Configuration area at the bottom of the screen.
3. Enter information into the following fields;

Server Address — his is the address of the SMTP server that is going to be used to send the emails over the internet. If you are using an SMTP server name rather than an IP address (i.e. smtp.gmail.com), you MUST have the “Name Server” value on the Network Configuration Submenu filled in correctly.

Server Port — his is the port that is used to connect to the SMPT server.

Server Username — The username used to log on the server.

Server Password — The password associated with the Username.

NOTE

The SMTP Server chosen for use must support TLS. Consult with your IT department personnel before assigning the server address.

4. Enter the address that email messages will be sent to. If more than one address is desired then click on the “Add Email” button.
5. Click on the SAVE button.

NOTE

Whenever values in the SMTP Configuration table are changed you must click on the SAVE button to initiate the changes.

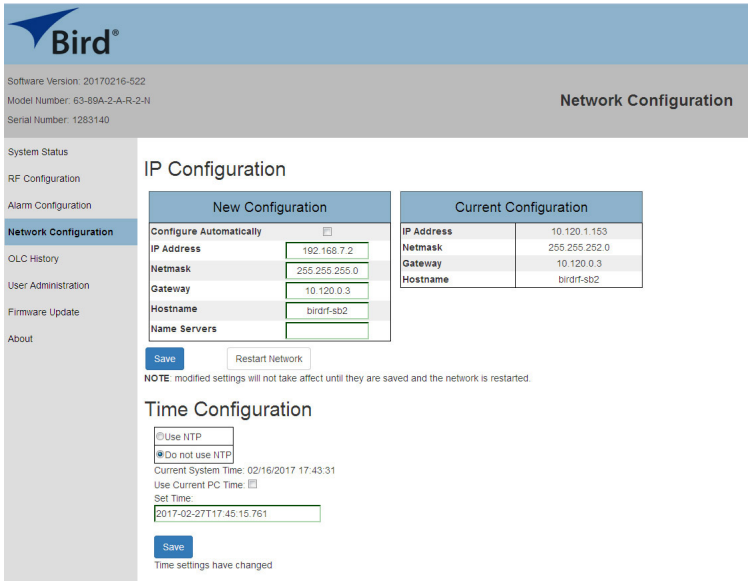
NOTE

The SBII+ booster will occasionally send SMTP status updates regardless of a status change taking place. An example would be “System operating normally”.

Network Configuration Submenu

the Network Configuration submenu screen is broken into two major areas including IP Configuration and Time Configuration. IP Configuration is further divided into the current configuration and the new configuration. The current configuration fields show what the network setting are for the SBII+ right now. The new configuration fields give the user the ability to change the settings. Time configuration shows what the SBII+ currently thinks the time is and offers methods to change the time if desired.

Figure 54 Network Configuration



IP Configuration

Under the Current Configuration fields the values for the boosters IP Address, Netmask, Gateway and Hostname are displayed. Refer to Figure 54. None of these are user interactive because they display the boosters current network settings.

The New Configuration fields are all interactive and allow the user to change the current network configuration. The configure automatically check box will permit the selection of either static or dynamic configuring. In static configuring the user is responsible for setting each network parameter manually and in dynamic configuring the network decides what the settings are. The SBII+ ships from the factory in the static mode and should normally be operated that way. If dynamic configuring is going to be used instead make sure you consult with your IT personnel before turning on configure automatically. Enabling dynamic configuring is accomplished by placing a check mark in the box next to the label “Configure Automatically”. Click the Save button then the restart network button to initiate the change. To disable dynamic configuring uncheck the box then click the save button and then restart the network.

NOTE

To avoid possibly writing incomplete network settings, whenever the save button is pressed wait until a message appears at the bottom of the screen stating “Settings Have Been Saved” before pressing the restart network button.

Dynamic configuring is known as the Dynamic Host Control Protocol (DHCP) and is a standardized networking protocol used on IP networks for dynamically distributing network configuration parameters, such as IP addresses for interfaces and services. With DHCP, computers request IP addresses and networking parameters automatically from a DHCP server, reducing the need for a network administrator or a user to configure these settings manually.

When static configuring is being used and parameters need to be changed the user must enter the values for IP address, Netmask, Gateway, and Hostname manually into the appropriate fields in the new configuration boxes. The Name Servers field is the DNS Server. Consult with your IT personnel before making changes to the boosters network configuration to ensure you are making changes that are compatible with your particular network.

NOTE

Whenever values in the Network Configuration are changed you must click on the SAVE button and then the RESTART NETWORK button to initiate the changes.

Time Configuration

The SBII+ does not have an internal means of determining the current time so it must be synchronized to the correct time by an outside source. Three methods are available, either by synchronizing to a PC that is connected to the booster, via the internet by synchronizing with an NTP server, or by manually entering the date and time. The Time Configuration area of the Network Configuration submenu shows what the booster thinks the current time is and allows the user to choose which method is used to synchronize the time. Once the time is set the booster will keep track of it accurately so long as the booster has operating voltage applied to it. The time will need to be set whenever the booster is powered up.

To set the time using an NTP server select the radio button USE NTP as shown in Figure 54. When the USE NTP radio button is selected synchronization is accomplished by visiting an NTP server to retrieve the correct time. The NTP servers IP address must be entered into the displayed box and your current offset from GMT must be selected from the drop down choices. When the Do Not Use NTP radio button is highlighted the NTP address and GMT offset fields are removed from the screen.

When the Do Not Use NTP radio button is selected synchronization can be accomplished by connecting a PC to the booster. Make sure the Use Current PC Time box is checked then press the Save button. This will then set the boosters time to match the PC’s time.

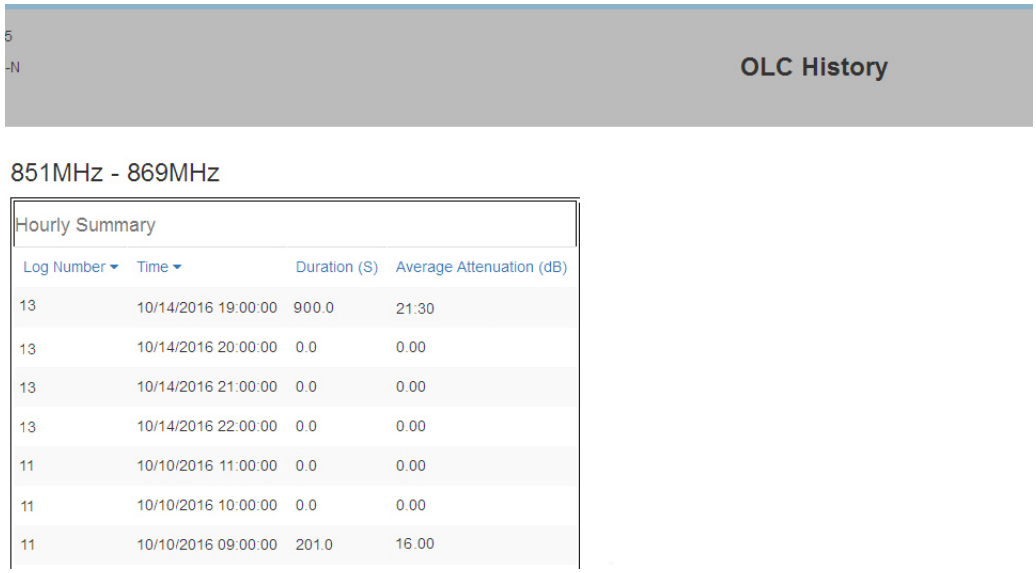
To set the time manually uncheck the box labeled Use Current System Time and an entry field will appear. The current time can be entered into this entry field manually. Use the date/time format that will appear when the entry field opens. Simply change the values in the entry field to the desired values and click on the SAVE button to reset the boosters date/time. The Current System Time should now match the value in the Set Time entry field.

OLC History Submenu

The OLC History feature provides a convenient log of OLC activity taking place in the booster for each uplink and downlink branch. To access the log click on the OLC History submenu button which appears on the right side of any displayed screen. The OLC History log for each downlink and uplink branch of the booster will appear. The downlink branch is listed first then the uplink branch.

Figure 55 shows a sample portion of a typical downlink branch log. The hourly summary is shown for explanation purposes. Each vertical row in the log represents a log entry and 1 hour of sampling time. Each log entry records the Log Number, Time, Duration, and Average Attenuation. The logged data is stored in non-volatile memory and will not be erased when the unit is powered down. This archived information will permit the creation of a user signal-profile to facilitate optimum system configuration and performance. It also allows you to see if there are transient episodes of strong signals perhaps desensing other channels being amplified by the booster.

Figure 55 OLC History



The booster must run for at least 1 hour after initial power up in order to generate at least one log entry or the user will not be able to call up the log for display.

The Log Number is a numerical value which increments each time the booster powers up. Because the boosters internal clock might not be set to wall clock time after powering up the Log Number is used as a way to differentiate power cycles. For instance the example log shown in Figure 55 shows the booster was turned on October 10th long enough to successfully record three log entries (Log Number 11). Once again the booster was turned on for testing on October 14th at least long enough to record four log entries (Log Number 13). The lack of Log Number 12 says that the booster was turned on at some point but not long enough (at least 1 hour) to record even a single log entry.

The Time entry in the OLC History log represents the time the record was stored. The time entry represents what time the booster thought it was and might not be accurate. By default the log entries are displayed with the most recent entry at the top of the log. Clicking on the arrow will sort the log in the opposite direction. The Duration column represents the amount of time within the 1 hour logging period that the booster applied OLC to the branch. The duration value is expressed in seconds so the value may be any number between 0 and 3600. A value of 0.0 means that no OLC was applied to the branch during the one hour logging period and 3600 would mean that OLC was constantly applied for one hour. In the example shown in Figure 55 most log entries show a duration of 0.0 which is normal.

The Average Attenuation is a value expressed in dB's which is the average value of the attenuation while the OLC was active. The time that the OLC was not active is not included in the Average Attenuation value. For example, if the OLC was engaged for 10 seconds at 20 dB the Duration column would read 10 seconds and the Average Attenuation column would read 20 dB.

The OLC log has a download feature which allows the OLC History data to be exported to other software packages as a text file. To export the OLC data press the DOWNLOAD button that appears in the upper right of the display screen. A popup window will present. The default choice for export is Notepad but the user can specify other choices if desired.

User Administration Submenu

The User Administration submenu allows password protected access to the booster. The boxes on this page are interactive. To make changes click inside the box and a cursor will appear. When first visited the user is queried for a User Password. The default user password is “admin”.

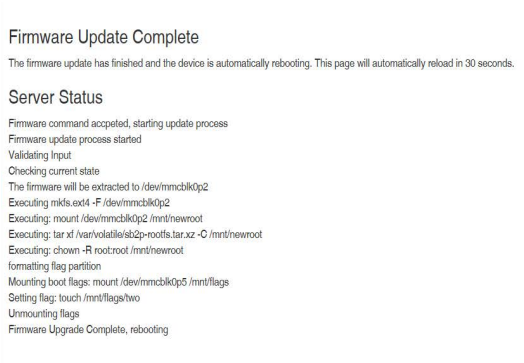
The change password prompt will appear immediately after the user logs in successfully. It is not necessary to change the password. However, if the user decides to change the boosters password then enter the new password in the appropriate entry field and the confirm entry field. Click on the UPDATE PASSWORD button. It is important to write down the new password for safekeeping.

Firmware Update Submenu

The Firmware Update submenu is used to update already existing firmware running on the SBII+. The user must be logged onto the booster in order to perform updates. To update the firmware perform the following procedure in a step-by-step fashion.

1. Check and record the current software version of the booster. It appears on the System Status screen in the upper left corner.
2. Update files are typically sent to users via an email message from Bird. Save firmware update files to a convenient location in you computer. It is important to know where the firmware update file has been stored in your computer. Go to the Firmware Update screen and then click on the BROWSE button.
3. Select the firmware update file. The correct file should be provided by the factory or your Bird representative. Note that after the file is selected the file name will appear next to the browse button.
4. Click on the SUBMIT button.
5. A percent readout will be displayed and represents the amount of the file that has been uploaded. Once it reaches 100% there will be a pause for about 20 seconds.
6. After the pause a list of status messages will appear. Wait until there is a message that notifies you that the update is complete and the system is rebooting. Refer to the example shown in Figure 56.
7. Wait until the system reboots itself. Verify the update is successfully accomplished by viewing the software version number that appears on the upper left of the System Status submenu screen. It should be a different number than the one that was recorded in step 1 above.

Figure 56 Firmware Update Complete Message.



SBII+ Model 63 Software Configuration Process

Prior to making any changes to the RF Configuration (Gain and Attenuation settings). The DAS calculator should be used to determine the expected settings for each of the RF chains in uplink and downlink.

The typical process for configuring the SBII+ Model 63 software is outlined in the following steps:

1. Install the Head-end, Remote Units and fiber-optic cable runs as detailed in "Installation" on page 31.
2. Apply power to the Head-end unit and connect a laptop to the Local ENET connector and login. See Connection Process and "Default Head-end Login Information" on page 64.
3. Configure the RGW. See "RGW Configuration" on page 65.
4. Add the Head-end SB Module and FOI(s) to the DAS System configuration. See "Manage DAS System Configuration" on page 70.
5. Rename components if required to accurately document configuration. See "Naming Components" on page 73.
6. Connect one Remote Unit's Fiber-optic cable to a Head-end fiber port.

Detailed documentation of remote locations, names, and fiber ports should be maintained to ease configuration and aid in any follow on maintenance.

7. Add the Remote Unit SB Module and FOR to the DAS System configuration. See "Manage DAS System Configuration" on page 70.
8. Repeat step 6 and 7 for all remaining Remote Units.
9. Rename components if required to accurately document configuration. See "Naming Components" on page 73.
10. Configure the uplink and downlink RF paths. See "RF Configuration" on page 75.

Configuration Preparations

Before beginning the following system documentation should be readily available:

- The system layout and block schematic
- Maximum output power for each service
- Fiber losses should be documented before hand so a comparison may be made with actual system performance
- DAS calculator sheets showing the expected settings for each of the RF chains in uplink and downlink.
- Information about Ethernet connection if the system should be monitored by remote. How to connect it to the Internet for remote viewing.

Necessary tools

The tools necessary to commission the system includes:

- One laptop for changing the system settings, checking any alarms and status. Most any Operating system may be used, only a web browser is used to interface with the SBII+ Model 63.
- Spectrum analyzer to measure the uplink. The system relies on test tone measurements in the uplink and therefore it is important to have equipment to measure them.

Software

- A graphical based web browser for displaying configuration pages
- DAS Calculator requires Microsoft Excel or compatible spreadsheet software

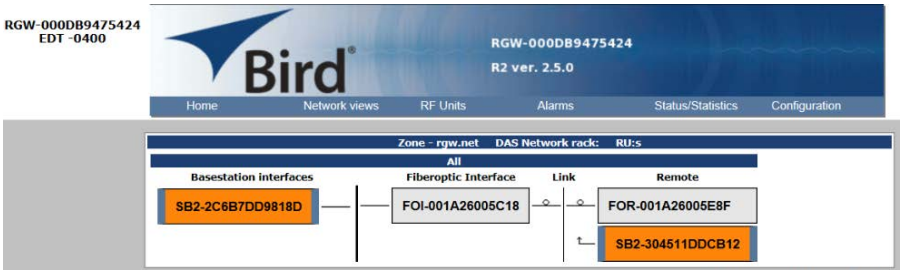
SBII+ Model 63 Fiber-DAS Graphical User Interface

The graphical User Interface (GUI) for the SBII+ Model 63 is accessed via the Local ENET port on the Head-end unit's I/O panel. The GUI is accessed using a standard web browser such as Edge, Firefox or Chrome (Internet Explorer is not recommended).

Connecting to the GUI allows access to the head-end unit and any remote units connected by fiber-optic cable. The GUI allows the user to configure the following units:

- Head-end Unit
  - ✓ RGW
  - ✓ FOI
  - ✓ SB Module
- Remote Units
  - ✓ FOR
  - ✓ SB Module

Figure 57 Graphical User Interface



Default Head-end Login Information

The SBII+ Model 63 Fiber DAS system is shipped with a default IP address and a default Login and Password.

- Default IP Address: 192.168.13.1
- Default Login: extended
- Default Password: admin

The SB Modules in the Head-end and Remote Units have password protected configuration menus. See "SB Module default login" on page 85 for the password information for the SB Modules. To access the SB Module you must login through the Head-end unit.

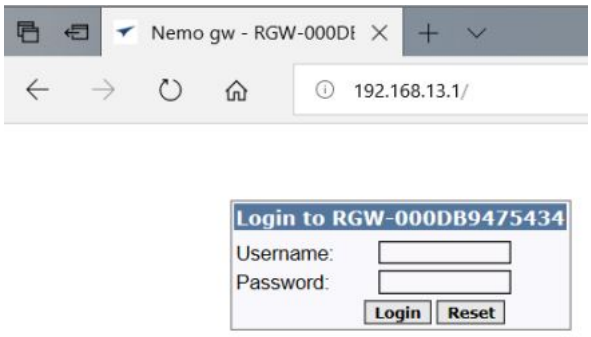
Connection Process

NOTE

When connecting to the Head-end, the laptop may be set to use DHCP, the RGW within the Head-end unit will assign an IP Address to the laptop.

1. Apply power to the Head-end unit.
2. Connect computer to the Head-end unit with an Ethernet cable via the ENET LOCAL connector on the unit's I/O panel.
3. Open web browser on the computer.
4. Type the SBII+ Model 63 IP Address into the browser address bar. See "Default Head-end Login Information" on page 64.
5. Login to the GUI. See Figure 58 on page 65.

Figure 58 RGW Login page



RGW Configuration

The RGW provides the web interface for the system settings allows the system can be monitored and managed remotely. The Ext/WAN port is a "northbound" Ethernet port that allows the RGW to connect to the Internet, or a WAN/MAN type of larger network.

RGW Naming

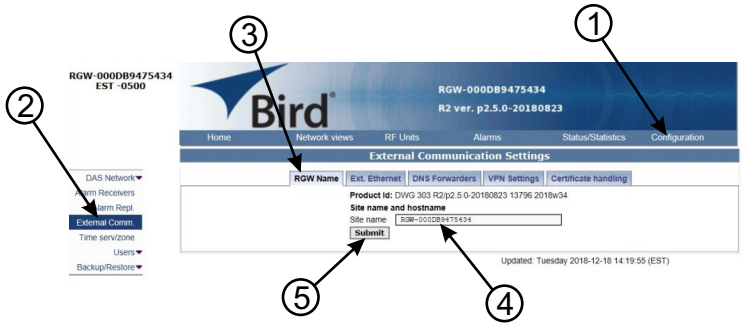
1. Select **Configuration** in top right corner, see Figure 59.
2. Select **External Comm** in left menu.
3. Select **RGW Name** tab in top menu.
4. Enter site name:
   a. You may use any combination of alphanumeric characters and the special character of dash "-". Do not use any other special characters or space.
   - ✓ 0 through 9
   - ✓ a through z
   - ✓ A through Z
   - ✓ -
   - ✓ Limit of 56 characters

   b. Use a site name that is descriptive enough to distinguish the RGW from other sites. Generic names may delay troubleshooting efforts.
5. Click **Submit**.

NOTE

After the new host name is entered, the unit must be restarted. This is the only change that requires a restart.

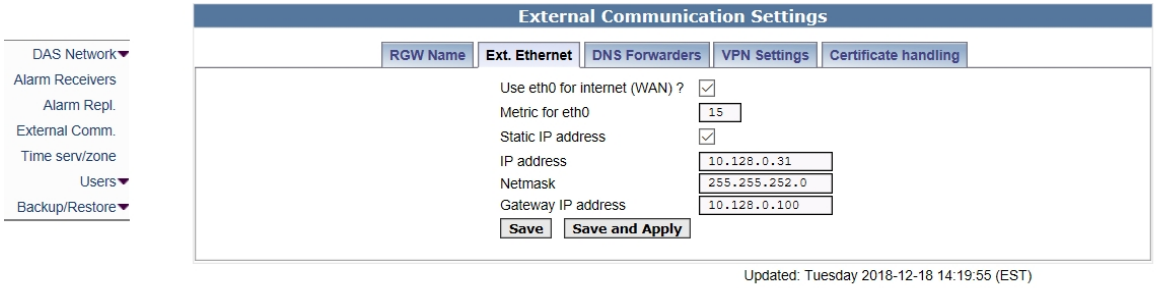
Figure 59 RGW Site Name



EXT Ethernet

In order for the RGW to be able to communicate outward, the Ext Ethernet connection has to be programmed. Consult with your Internet service provider or IT department for the IP address, Netmask and Gateway IP address settings.

Figure 60 RGW External Communications

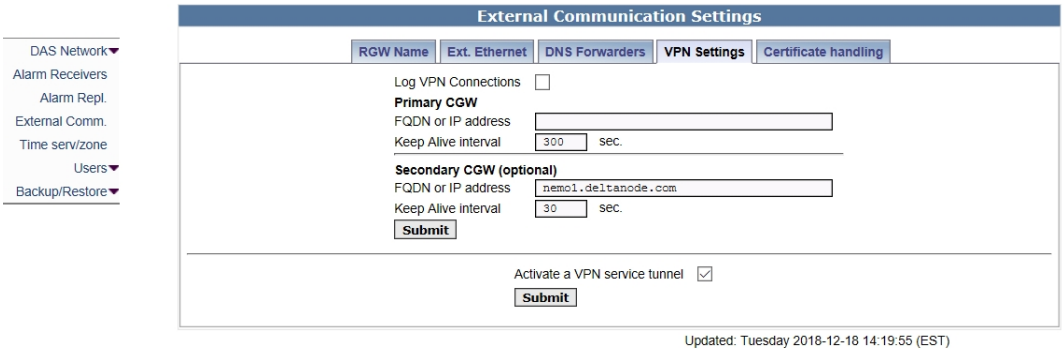


VPN Settings

On occasions, the RGW will be set up behind a firewall. To be able to access the RGW from external locations the Primary RGW settings will need to be configured to allow access. Consult with your IT department for these parameters.

Bird Technologies offers monitoring services. When these services are contracted, enter the Bird parameters in the Secondary RGW settings so that system alarms are correctly forwarded to the Bird NOC.

Figure 61 RGW VPN Settings

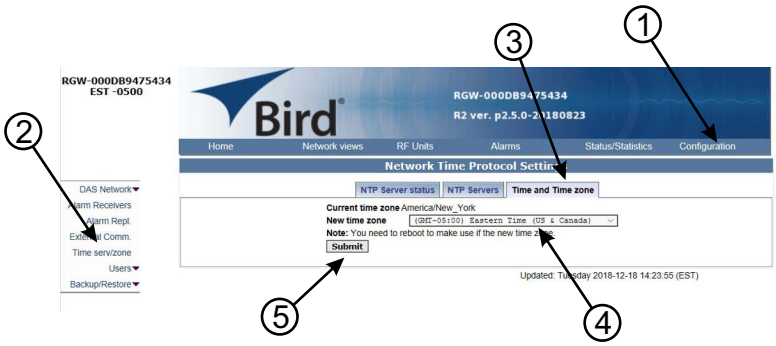


Time Zone

To ensure that alarms are correctly labeled with the local time the time zone for the RGW will need to be set.

1. Select **Configuration**. See Figure 62.
2. Click **Time serv/zone**.
3. Select the **Time and Time zone** Tab.
4. Select the local time zone from the drop-down menu.
5. Click **Submit**.

Figure 62 RGW Time Zone Settings



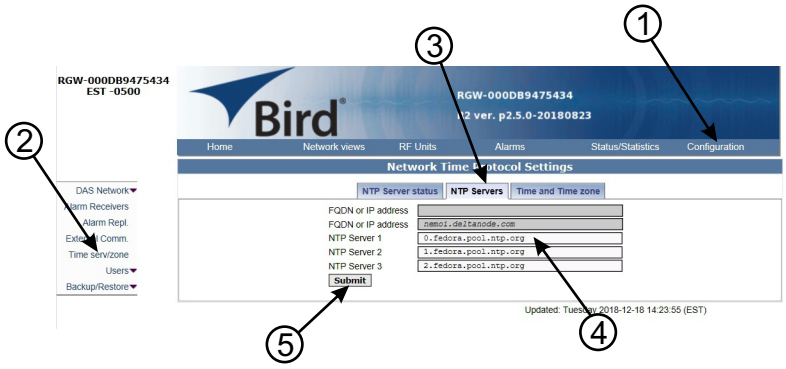
NTP Servers

NTP servers provide accurate clocks for the RGW. Utilizing multiple sources prevents clock issues as a result of one server becoming corrupt or dropping out of contact. The RGW is compatible with NTP version 4 servers. The NTP settings in the image below are the default for fedora servers.

1. Select **Configuration**.
2. Click **Time serv/zone**.
3. Select the **NTP Servers** Tab.
4. Enter the NTP Server information. The FQDN settings are reserved for deployments utilizing the CGW.
5. Click **Submit**.

If no Internet access is available, the RGW will create its own clock to give the sub-nodes of the system a valid NTP service.

Figure 63 NTP Server Settings



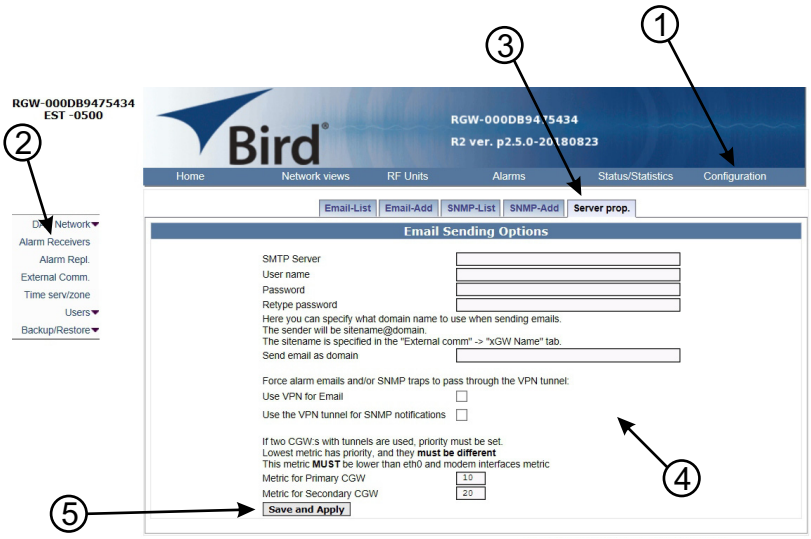
Email Server

The RGW is capable of emailing alarms directly to select email addresses. Access the set up function via Configuration, Alarm Receivers and Server Prop.

Consult with your IT department for configuration settings.

1. Select **Configuration**.
2. Click **Alarm Receivers**.
3. Select the **Server Prop.** Tab.
4. Enter the Email Server information. Consult with your IT department for configuration settings.
5. Click **Save and Apply**.

Figure 64 Email Server Settings



Manage DAS System Configuration

Each of the RF/optical components withing the Head-end and remote units must be added as nodes within the SBII+ Model 63 GUI.

The Head-end unit contains the following RF/optical components:

- SB Module
- FOI (1 or more)

Each Remote Unit contains the following RF/optical components:

- SB Module
- FOR

SBII+ Model 63 Network View

All the components that are part of the current SBII+ Model 63 configuration may be viewed by selecting **All** from the **Network Views** menu. The Head-end SB Module is displayed on the left side, the Head-end FOIs are displayed in the center, while each Remote Unit FOR and SB Module are displayed on the right side.

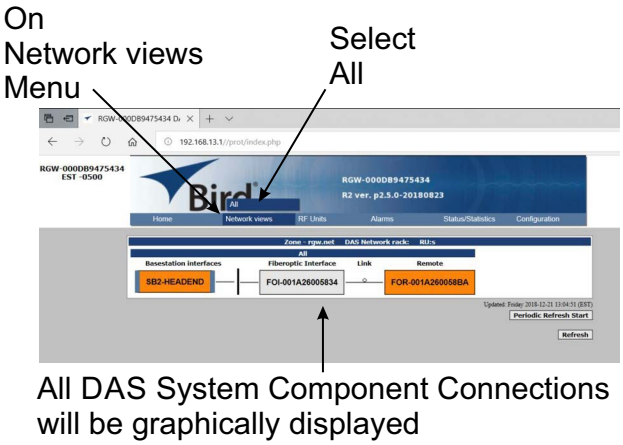
To add components to the configuration see the following paragraphs:

- "Add SB Module to DAS Configuration" on page 70.
- "Add FOI to DAS Configuration" on page 71.
- "Add FOR to DAS Configuration" on page 71.

To remove components from the configuration see the following paragraph:

- "Removing Components from the DAS Configuration" on page 72

Figure 65 Fiber DAS Graphical Network View



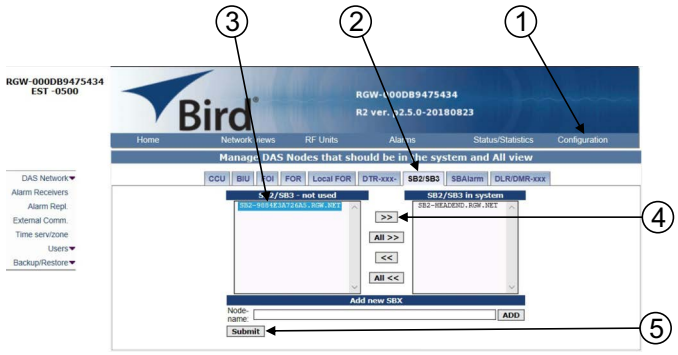
Add SB Module to DAS Configuration

Perform the following steps to SB Module to the configuration:

1. Click on Configuration Menu, see Figure 66 on page 71.
2. Click on the SB2/SB3 tab.
3. Select units to add to the configuration in the “SB2/SB3 - not used” column.
4. Click the Add Button (>>) to add the selected units into the system.

5. Click Submit to Save the changes to the configuration.

Figure 66 Adding SB Modules to the DAS Configuration

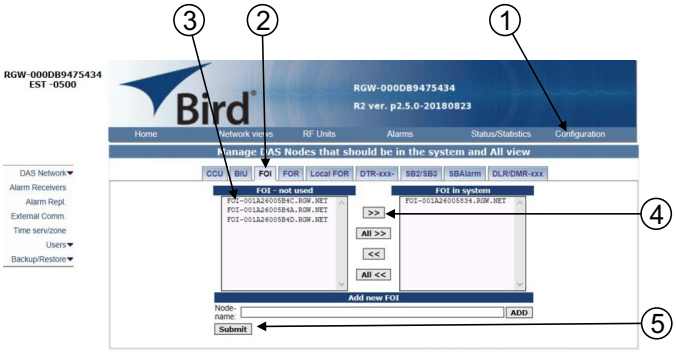


Add FOI to DAS Configuration

Perform the following steps to add FOI to the configuration:

1. Click on Configuration Menu, see Figure 67 on page 71.
2. Click on the FOI tab.
3. Select units to add to the configuration in the “FOI - not used” column.
4. Click the Add Button (>>) to add the selected units into the system.
5. Click Submit to Save the changes to the configuration.

Figure 67 Adding FOI modules to the DAS Configuration

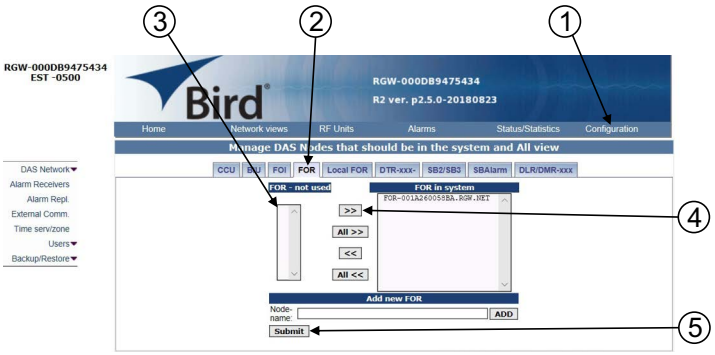


Add FOR to DAS Configuration

Perform the following steps to add FOR to the configuration:

1. Click on Configuration Menu, see Figure 68 on page 72.
2. Click on the FOR tab.
3. Select units to add to the configuration in the “FOR - not used” column.
4. Click the Add Button (>>) to add the selected units into the system.
5. Click Submit to Save the changes to the configuration.

Figure 68 Adding FOR modules to the DAS Configuration

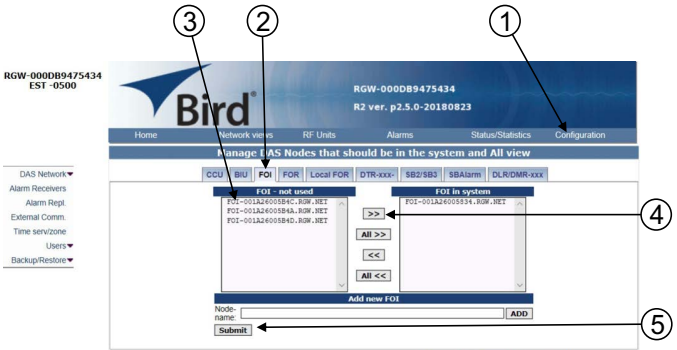


Removing Components from the DAS Configuration

Perform the following steps to remove a component from the configuration:

1. Click on Configuration Menu, see Figure 69 on page 72.
2. Click on the appropriate unit tab.
3. Select units to remove from the configuration in the “in System” column.
4. Click the Remove Button (<<) to remove the selected unit(s) from the system.
5. Click Submit to Save the changes to the configuration.

Figure 69 Removing Components from the DAS Configuration



Naming Components

Proper naming of individual components in the DAS is critical to troubleshooting. A recommendation is to start all component names with their function such as "BIU", "FOI" or "FOR". For example: "BIU-850Sector1".

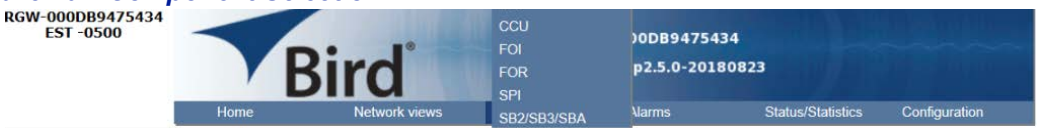
You may use any combination of alphanumeric characters and the special character of dash "-". Do not use any other special characters or space.

- 0 through 9
- a through z
- A through Z
- -

Component names are limited to 56 characters.

1. Select the component to be named from the Configuration menu.

Figure 70 Component Selection

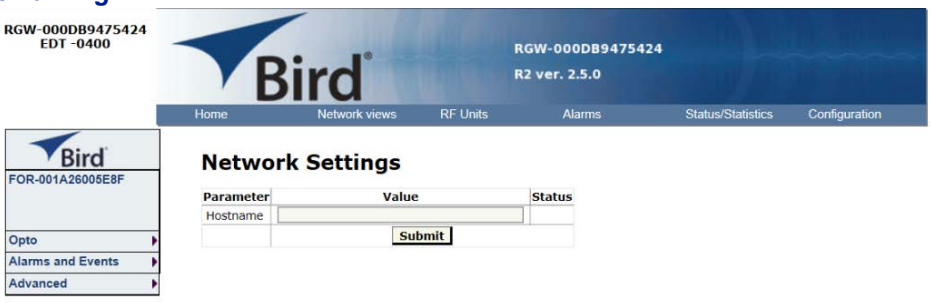


2. Go to Advanced>Netw Setup

Figure 71 FOI Welcome Screen

3. Enter the new card name in the Host Name field. See Figure 72.
4. Select submit.

Figure 72 Unit Naming

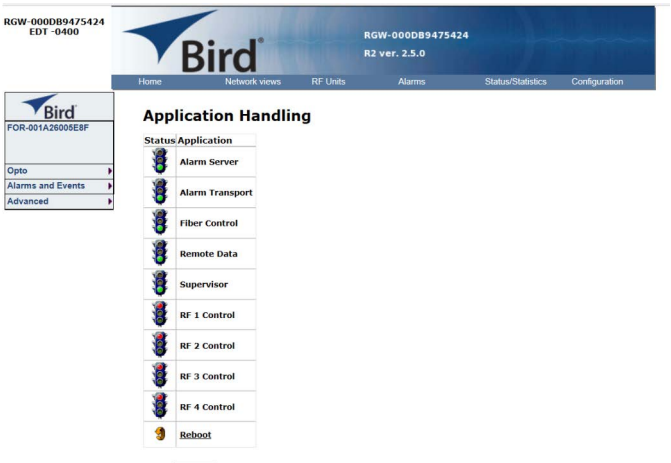


5. Go to Advanced > Appl restart.
6. Select the Reboot icon at the bottom of the menu. See Figure 73.
7. Select "YES- Restart Process"

NOTE

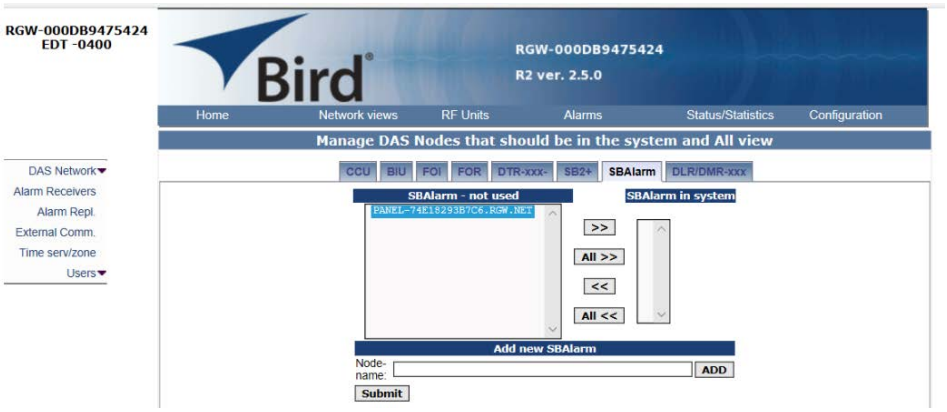
After rebooting, it can take up to 5 minutes before the unit shows up in the GUI.

Figure 73 Naming Reboot



8. After all the units have been renamed, go to the Configuration menu and select the correct card type.
9. Highlight all the cards in the right column that had name changes and then select “<<“. Select “Submit” This will remove the old names from the DAS Configuration.
10. Highlight all the cards in the left column with the new names and then select “>>”. Select “Submit”. This will move the new card names into the DAS configuration.

Figure 74 Submit Newly Named Units

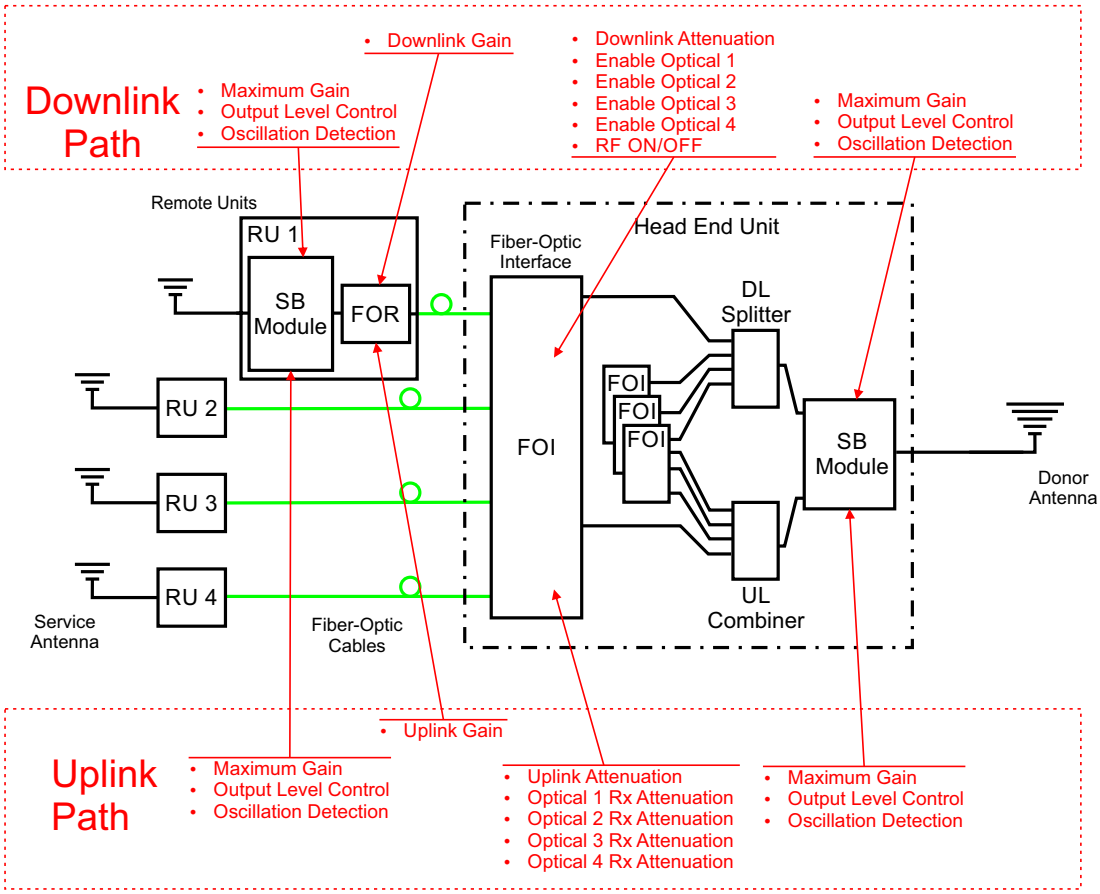


Select Network Views > All to confirm that all cards are now part of the configuration.

RF Configuration

As shown in Figure 75, there are multiple units that may require adjustment when initially configuring the SBII+ Model 63.

Figure 75 RF Adjustment Points in RF Paths

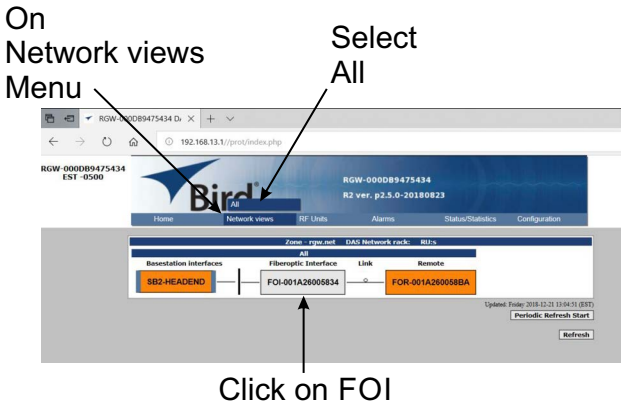


Head-End FOI RF Configuration

To access the FOI perform one of the following:

- Select All on the Network views menu, then click on the appropriate FOI in the graphical display. See Figure 76.
- Click on the RF Units menu, hover over the FOI, then select the appropriate FOI from those displayed.

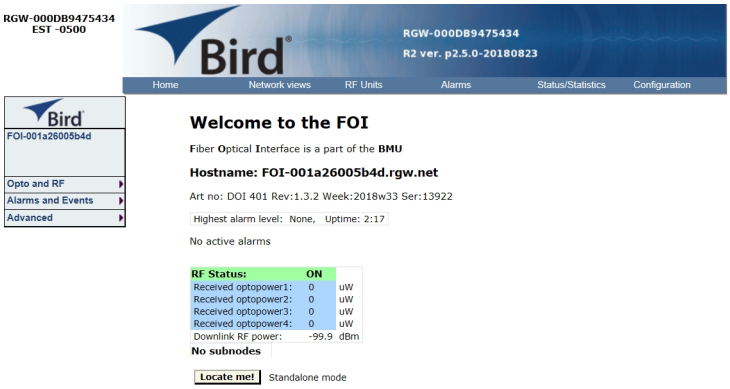
Figure 76 FOI Selection



FOI Welcome Screen

The initial screen (Figure 77 on page 76) for the FOI provides basic information such as name, serial number, part number and active alarms.

Figure 77 FOI Welcome Screen



Enable FOI Optical Ports and Enable RF Power (Laser)

NOTE

Once the fiber is connected and verified perform the following steps to enable the FOI(s).

1. Hover the mouse cursor over the Opto and RF menu, then select RF Config from the menu. See Figure 78.
2. Turn FOI RF power on.
   RF ON set to yes turns on the laser. RF ON set to No turns off laser.

NOTE

Setting to "No" will disconnect connectivity to the remote(s)

3. Enable Optical Ports.
   Only enable the optical ports that are being used. Otherwise, the system will alarm with low optical levels on the unused ports.

Figure 78 FOI Opto and Attenuator Settings

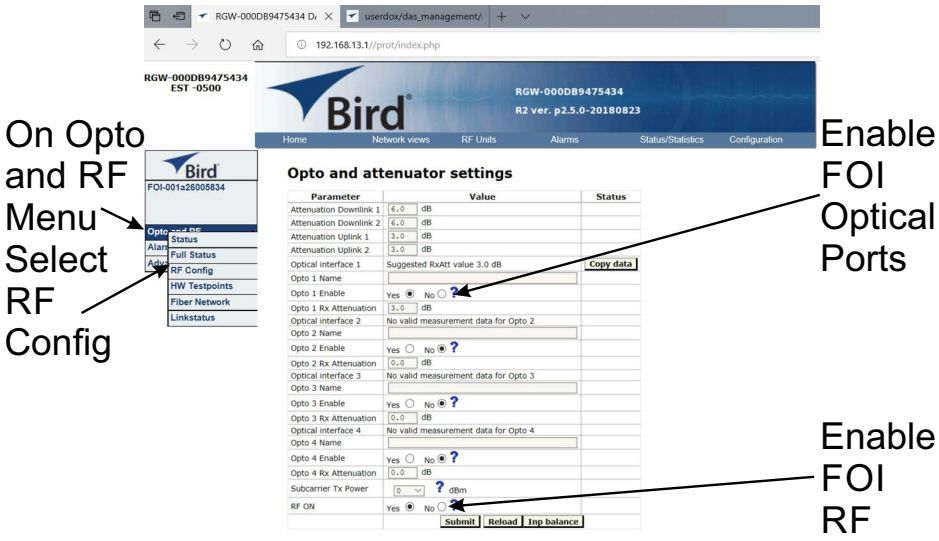
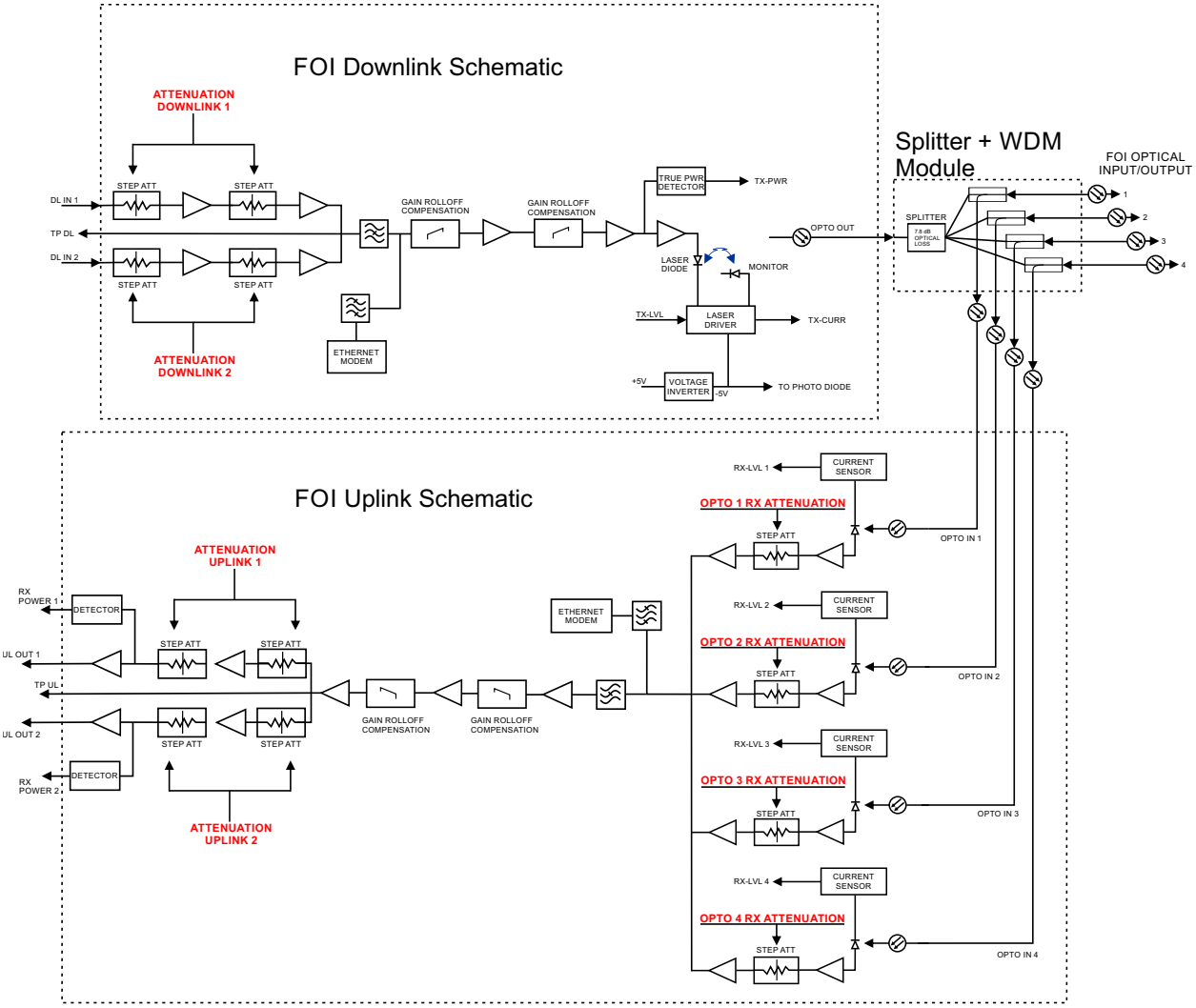
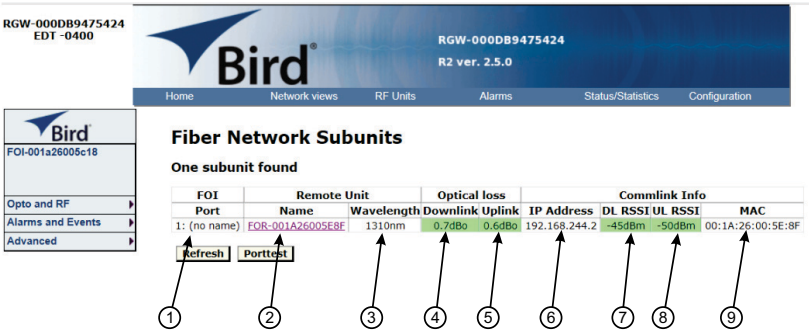


Figure 79 FOI Opto and Attenuator Settings



FOI Fiber Network Subunits

Figure 80 FOI Fiber Network Subunits

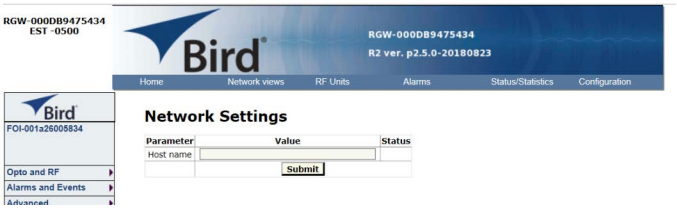


Item	Description
1	Name of FOI port the remote is connected
2	Name of the remote FOR, clicking the remote link will open the Remote Unit page.
3	Optical wavelength of the transmit laser in the FOI card.
4	Subcarrier optical loss between the FOI and FOR in the downlink path.
5	Subcarrier optical loss between the FOR and FOI in the uplink path.
6	Network IP address of the FOI card.
7	Subcarrier power to the modem in the downlink path of the FOR - Range should be -30 to -60. If the level is too high or too low communication and other system problems may occur.
8	Subcarrier power to the modem in the uplink path of the FOI - Range should be -30 to -60. If the level is too high or too low communication and other system problems may occur.
9	MAC address of the FOI card

FOI Network Setup

This page allows for entry of the Host Name.

Figure 81 FOI Network Settings

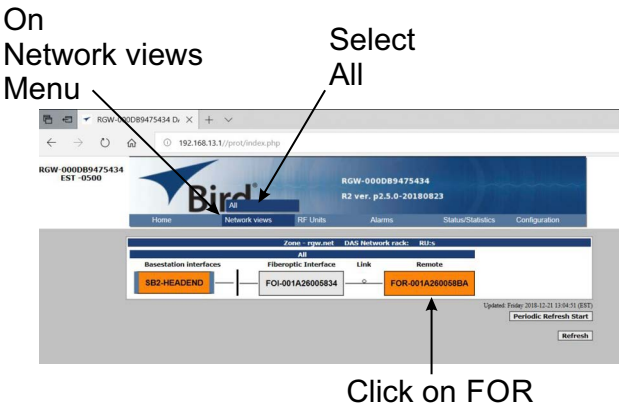


Remote Unit FOR RF Configuration

To access the FOR perform one of the following:

- Select All on the Network views menu, then click on the appropriate FOR in the graphical display. See Figure 82.
- Click on the RF Units menu, hover over the FOR, then select the appropriate FOR from those displayed.
- FORs may also be selected from the FOI welcome screen, as the subunit of the FOI it is optically connected to.

Figure 82 FOR Selection

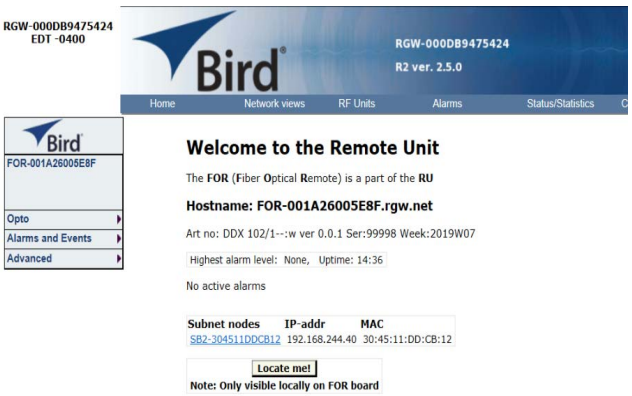


The initial screen for the FOR provides basic information such as name, serial number, part number and active alarms.

NOTE

When fiber is initially connected to the Head-end I/O panel, it could take up to 30 minutes for the FOI to assign an IP address to the FOR. See section for "Moving Remotes to Different FOI Port" on page 84 for details on how to speed up the IP assignment.

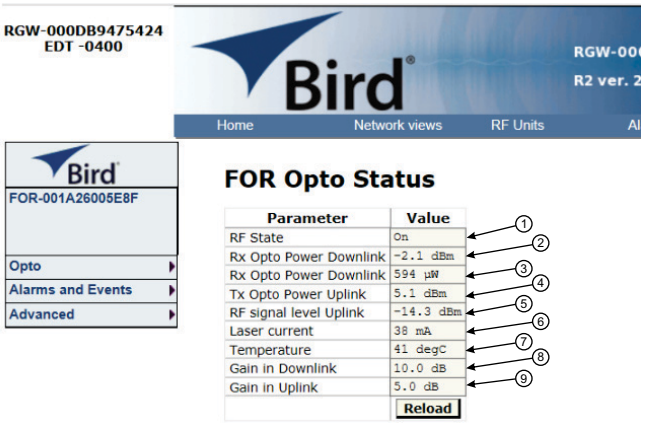
Figure 83 FOR Welcome Screen



FOR Configuration

FOR Opto Status

Figure 84 FOR Opto Status



Item	Description
1	**RF State indicates whether RF is On or Off.**
2	**Optical power received from the FOI. See item 1 in Figure 85 for measurement location.**
3	**Optical power received from the FOI. See item 1 in Figure 85 for measurement location.**
4	**Calculated uplink signal being transmitted to the FOI. See item 3 in Figure 86 for measurement location.**
5	**Uplink signal being fed into the FOR uplink laser circuit. See item 2 in Figure 86 for measurement location.**
6	**Laser current for the Remote Unit FOR. Should be less than 50mA.**
7	**Temperature of the Remote Unit FOR board.**
8	**Total gain of the FOR in the downlink.**
9	**Total gain of the FOR in the uplink path.**

Figure 85 FOR Downlink Schematic

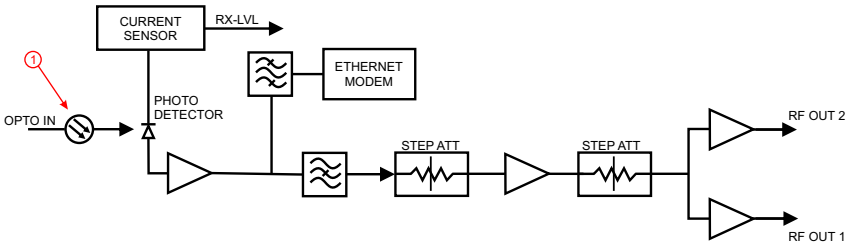
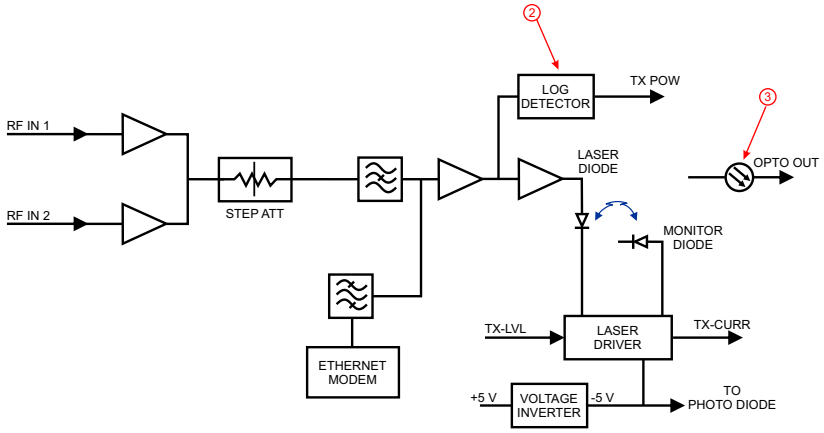
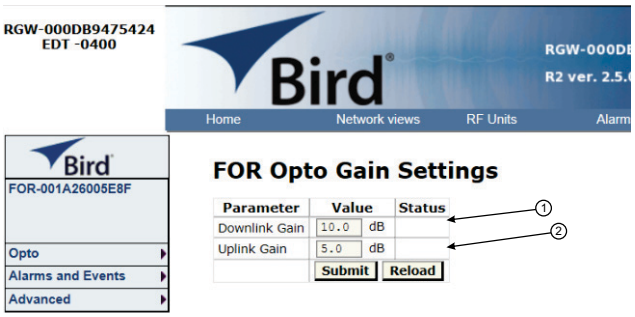


Figure 86 FOR Uplink Schematic



FOR Opto Gain and Attenuation Settings

Figure 87 FOR Opto Gain Settings

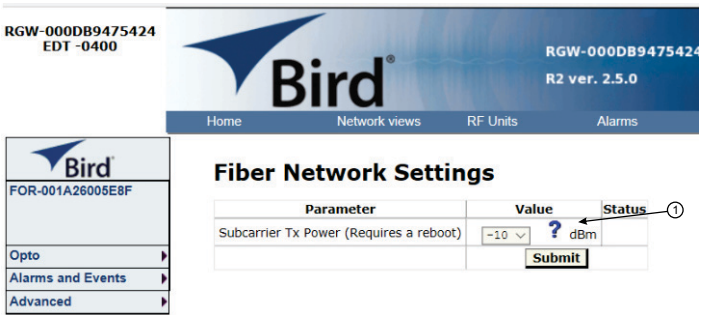


Item	Description
1	**FOR gain in the downlink path. Range is typically from -20 to +20. FOR downlink path has inherent/raw gain of +20dB (FM to 2600MHz).** • A setting of +20 indicates no attenuation so FOR will have +20dB gain (+20dB gain minus 0dB attenuation). • A setting of +10 will have 10 of attenuation so this stage will have 10dBm of gain (+20dB gain minus 10dB of attenuation). • A setting of 0 will have 20dB of attenuation so this stage will have unity gain (+20dB gain minus 20dB of attenuation). • A setting of -10 will have 30dB of attenuation so this stage will have 10dB of loss (+20dB gain minus 30dB of attenuation). • A setting of -20 will have 40dB of attenuation so this stage will have 20dB of loss (+20dB gain minus 40dB of attenuation).
2	**FOR gain in the uplink path. Range is typically from 0 to +20dBm (FM to 2600MHz).** • A setting of +20 will have full gain of +20dBm. • A setting of +10 will have +10dB gain. • A setting of 0 will have no gain. • Factory default should be used unless high loss in fiber. Note that changes in Gain uplink will require changes in the FOR UL ALC level.

FOR Fiber Network Settings

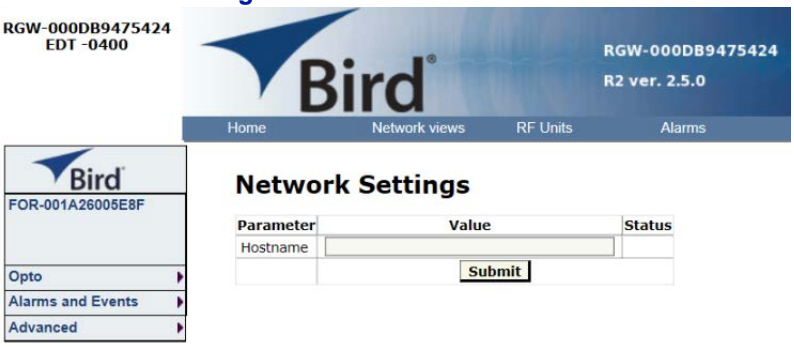
This page allows the adjustment of the subcarrier TX Power setting.

Figure 88 FOR Network Settings



Item	Description
1	**Subcarrier Tx Power is used for the communications and control signaling of the DAS. Default setting is -10. The value may need to be changed in situations where fiber loss is near the maximum and communications issues arise. Unnecessarily increasing the subcarrier TX power may affect RF performance of the DAS.**

Figure 89 More FOR Network Settings



FOR Application Handling

The application handling page allows for software reset and rebooting functions.

NOTE

Only the Reboot command should be used by the technician. All other functions should only be used under supervision of Bird engineering as they may cause data corruption if not initiated properly.

Figure 90 FOR Application Handling

Moving Remotes to Different FOI Port

All DAS components are assigned IP addresses by the RGW. The FOR in the Remote is the assigned an IP address as a subunit of the FOI to which it is connected. When the Remote is moved to a different FOI one of several actions must take place:

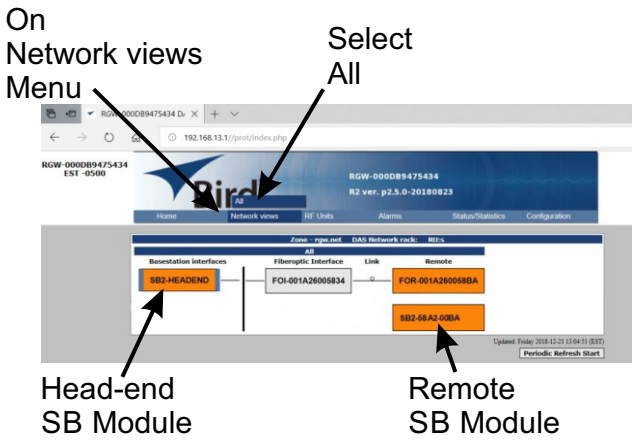
1. The lease on the Remote IP address must be given time to expire. This could take up to 30 minutes. Once the current IP lease expires, the new FOI will then assign the correct IP address to the Remote.
2. Manually power cycle the Remote. During the reboot process, the Remote will release the old IP address and have the correct IP address assigned by the new FOI.
3. Communications to the remote can only occur when the remote has the correct IP address. Before moving the fiber, access the FOR via the GUI. In the advanced settings, reboot the FOR. As soon as the reboot has been initiated, quickly move the head end fiber to the new FOI port. When the Remote finishes the rebooting process, the new FOI will assign the correct IP address.

SB Module RF Configuration

To access the SB Module perform one of the following:

- Select All on the Network views menu, then click on the appropriate SB Module in the graphical display. See Figure 91.
- Click on the RF Units menu, hover over the SB2/SB3/SBA menu, then select the appropriate SB Module from those displayed.

Figure 91 SB Module Selection



This section applies to both the Head-end SB Module and the Remote Units SB Module.

In addition to RF Configuration, each SB Module has the following configuration items:

Alarm Configuration — The NFPA alarms must be configured in each SB Module, this consists of enabling individual NFPA alarms. See "SB Module Alarm Configuration Submenu" on page 92.

Network Configuration — Network configuration is set to DHCP at the factory and must not be changed. See "SB Module Network Configuration Submenu" on page 94.

SB Module default login

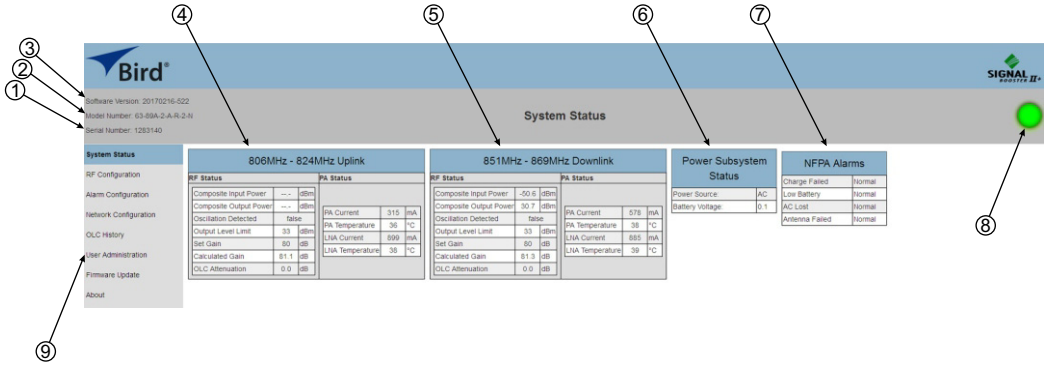
The SB Module configuration is password protected, the SB Module will request a password when any of the configuration menus are selected.

- Login: **admin**
- Default password: **admin**

SB Module System Status Screen

After accessing the SB Module the System Status screen will be displayed as shown Figure 92. This screen shows the overall operational status of the SB Module.

Figure 92 System Status Screen



Item	Title	Description
1	Serial Number	Displays the serial number of the SBII+ Model 63.
2	Model Number	Displays the model number of the SBII+ Model 63.
3	Software version	Display the software version SB Module firmware.
4	Uplink Status	The Uplink passband is displayed on the top border of the Status block. Uplink status consists of the following: • RF Status, see "RF Status" on page 88. • Power Amplifier (PA) Status, see "PA Status" on page 88. The values displayed are updated in real time.
5	Downlink Status	The Downlink passband is displayed on the top border of the Status block. Downlink status consists of the following: • RF Status, see "RF Status" on page 88. • Power Amplifier (PA) Status, see "PA Status" on page 88. The values displayed are updated in real time.
6	Power Subsystem Status	Power Source value identifies the units current power source, either AC or Battery Backup. Battery Voltage value displays the actual voltage level being supplied to the unit by the battery backup unit. See "Power Subsystems Status" on page 89.

Item	Title	Description
7	NFPA alarm status box	Displayed whenever the NFPA option is installed, and the NFPA alarm function is activated on the "SB Module Alarm Configuration Submenu" on page 92. The NFPA alarm status box shows four of the five alarms associated with NFPA compliance. See "NFPA Alarms" on page 89. The fifth alarm is overall signal booster status which is indicated by the Status Icon (8).
8	Status Icon	Overall signal booster status, this indicator and the front door Status LED indicate the overall status of the SB Module and will be updated in real time. If the GUI cursor is placed on the status icon a message bubble will appear describing the meaning of the status indication. This can be particularly helpful during warning (yellow) and alarm (red) conditions.
9	Menu Screens	List of the menus available to the user including: • System Status, see page 86 • RF Configuration, see page 90 • Alarm Configuration, see page 92 • Network Configuration, see page 94 • OLC History, see page 95 • User Administration, see page 96 • Firmware Update, see page 97

Uplink and Downlink Status Blocks

RF Status

The RF status items list is identical for both uplink and downlink passbands. A description of each of the 7 status items is listed below.

Composite Input Power — The composite input power of the link's passband. The composite input power is not directly measured, but is calculated based on the output power. This is why both input and output composite power values start and stop displaying at the same time. The input power must be greater than -70 dBm in order to show up as a value on the system status screen otherwise the display will show "--.-" instead of a value.

CAUTION

Maximum input power level should not exceed -10 dBm, booster damage may result.
The maximum input power level to the booster, to maintain specifications, is -20 dBm.

Composite Output Power — The composite output power of the link's passband. The output power must be greater than +10 dBm in order to show up as a value on the system status screen otherwise the display will show "--.-" instead of a value.

Oscillation Detected — This is an indication that oscillation has been detected. The displayed value will change from false (the normal state) to true. The boosters response to an oscillation detection can be configured by the user via the SB Module RF Configuration Screen.

Output Level Limit — The desired output power level of the booster. This is user selectable via the RF Configuration submenu. The selectable range is from 21 to 33 dBm in 0.5 dBm increments.

Set Gain — The desired gain of the booster as determined by the user. This is user selectable via the RF Configuration submenu (referred to as maximum gain). The selectable range is 35 to 80 dB in 0.5 dB increments.

Calculated Gain — This is a calculated value. Defined as the (user selectable) Set Gain value minus the current amount of OLC attenuation.

OLC Attenuation — This is the amount of attenuation the OLC is providing. Ideally there should be little or no OLC applied. OLC (output level control) is meant to reduce gain for transient episodes of very strong signals. However, when OLC is active, gain is reduced for all signals being passed by that link's passband and that reduction may compromise communications for weaker signals in the passband. If a large amount of OLC is applied more than occasionally, it is advised that the gain of that branch be reduced or re-orient the antenna for better isolation.

PA Status

The items for PA Status are identical for both the uplink and downlink passbands. A description of each of the four status items is listed below.

PA Current — The amount of current the power amplifier is drawing.

PA Temp — Temperature of the power amplifier in degrees Celsius.

LNA Current — The amount of current the LNA is drawing.

LNA Temperature — Temperature of the LNA in degrees Celsius.

Power Subsystems Status

This area of the screen provides a convenient summary of the operating voltage currently powering the booster as well as the value of the backup voltage being applied. if a battery backup is connected to the SBII+ Model 63, the battery connected check box located on the Alarm Configuration screen should be checked.

Power Source — The power source for the booster is normally the AC supply line and AC will be displayed in the Power Source text box as shown in the example in Figure 92 on page 86. When the AC supply is interrupted the booster will switch over to the battery source for continued uninterrupted operation. The Power Source text box will change to battery and will become backlit to draw the attention of the user.

Battery Voltage — The voltage applied to the SBII+ Model 63 system is displayed in the Battery Voltage text box. If the battery connected box is checked on the Alarm Configuration page the booster will provide warning and alarm notifications based on the value of the battery voltage. When the battery voltage is low a warning or alarm state will occur. Likewise, when the battery voltage is high a warning or alarm state will occur.

NFPA Alarms

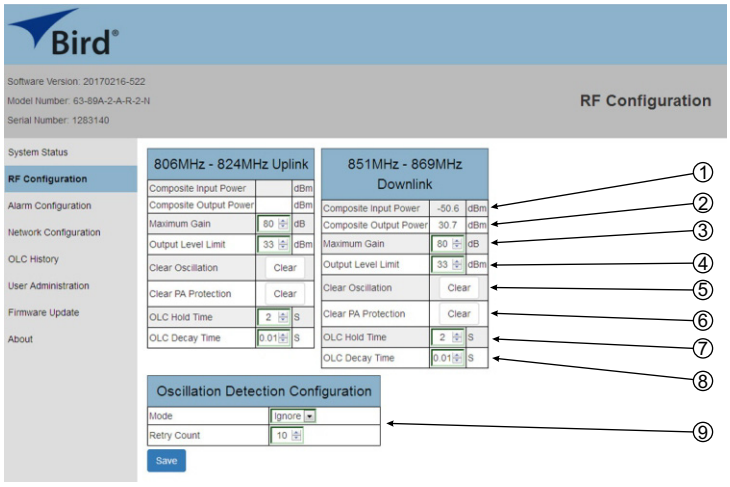
This area shows the current status of the following NFPA alarms: Charge Failed, Low Battery, AC Lost, and Antenna Failed. In order for the NFPA alarm status items to appear on the System Status screen they must first be enabled on the Alarm Configuration screen by checking the box for Enable NFPA Alarms. In addition, each of the four individual alarms must further be enabled by placing a check mark in the appropriate box.

A detailed description of each of these alarm events is provided in "Optional Equipment" on page 28. The fifth NFPA alarm which is a booster summed alarm is represented by the Status icon in the upper right corner of the display.

SB Module RF Configuration Screen

The SB Module RF Configuration screen is shown in Figure 93 and allows the user to configure the RF operating characteristics of the booster. If the user is not properly logged into the booster a link to the login page will be provided and no information will be displayed.

Figure 93 SB Module RF Configuration Screen



NOTE

Button selections or user changes made to drop down menu's or value counters will NOT become active until the user clicks on the SAVE button.

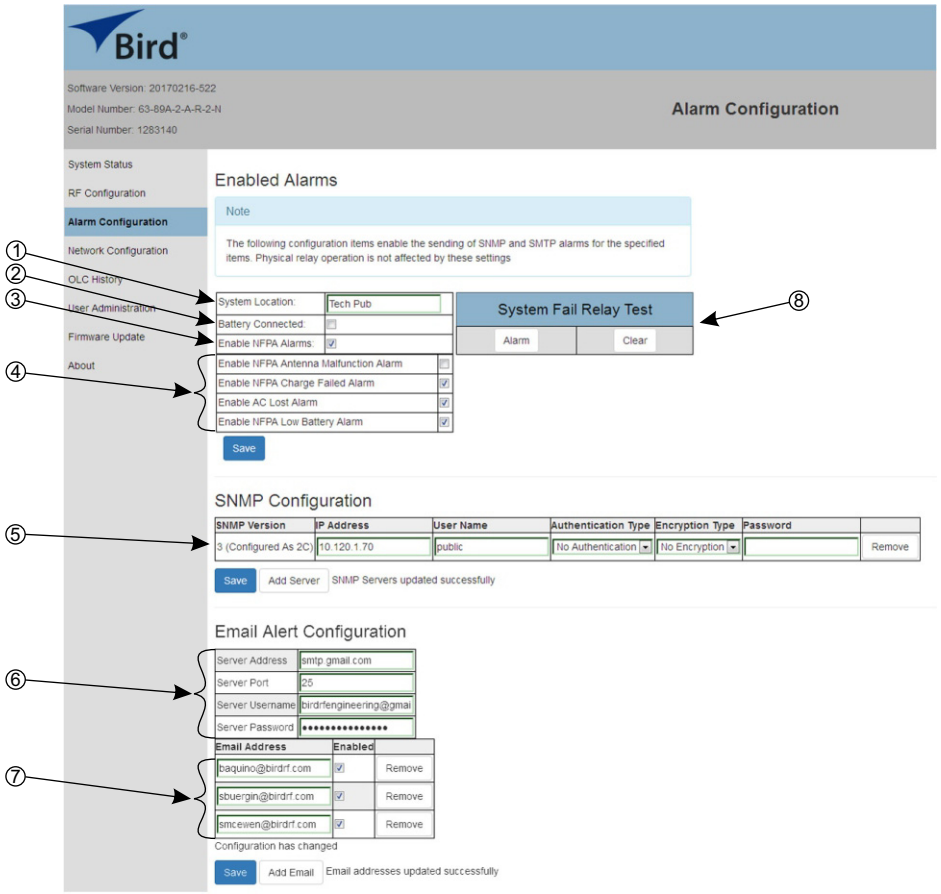
Item	Title	Description
1	Composite Input Power	Real-time values for the link's input power level.
2	Composite Output Power	Real-time values for the link's output power level.
3	Maximum Gain	The maximum gain is adjustable from 40 to 80 dB in 0.5 dB increments.
4	Output Level Limit	The output power level is adjustable from 21 to 33 dBm in 0.5 dB increments
5	Clear Oscillations	Button is provided to clear an oscillation detection. Oscillation detection is a safe mode the booster will place itself into if a severe problem is detected.
6	Clear PA Protection	Button is provided to clear PA protection. PA protection isa safe modes the booster will place itself into if a severe problem is detected.
7	OLC Hold Time	OLC Hold Time is adjustable from 2 to 5 seconds (in 0.1 second increments) and determines the amount of time that OLC will be applied (once it is activated by a strong transient input signal).

Item	Title	Description
8	OLC Decay Time	OLC decay begins after the user specified hold time is expired. Decay Time can be adjusted between 0.01 to 1 second (in 0.01 second increments). Decay time will determine how long it takes for the applied OLC to fade from on to off. **Note:** *The OLC decay time should normally be kept at a very low value. Increasing the OLC decay time will also increase how long it takes the booster to initialize after a power interruption.*
9	Oscillation Detection Configuration	Oscillation detection can be characterized using the two entry fields that are shown below the graphical boxes for the uplink and downlink branches. Changes to the behavior of the oscillation detection feature will be applied equally to both uplink and downlink passbands. This feature shuts off the output signals from the booster for both the uplink and downlink branches whenever an oscillation condition is detected. Oscillation detection occurs whenever port to port isolation falls down to 25 dB or less. For normal operation the port to port isolation needs to be at least 15 dB greater than the gain of the booster. Oscillation detection can operate 3 ways including Ignore, Retry, and Halt. Select the desired mode of operation from the drop down choices. Left click on the desired choice and the selected mode will now appear in the box next to the item label. In the Ignore mode the booster will ignore oscillation events. In the Halt mode the booster shuts off the output signals in both the uplink and downlink directions. The halted condition persists until the user selects the Clear Oscillation button and then presses the Save button. In the Retry mode the booster will halt for a short period of time then retry normal operation to see if the condition has cleared itself. The number of times a retry will be attempted is determined by the Oscillation Retry Count value which is user selectable. After the specified number of retry's have occurred, and if the booster is still experiencing an oscillation condition, then the booster will enter the Halt mode where it turns off and stays off until there is user intervention to correct the condition causing oscillation.

SB Module Alarm Configuration Submenu

The Alarm Configuration submenu screen is shown in Figure 94 and allows the user to configure the alarm operating characteristics of the SB Module. The screen is broken into distinct areas based on alarm related functions. These areas include Enabled Alarms, SNMP Configuration, and Email Alert Configuration. All the areas displayed on this screen allow user interaction.

Figure 94 SB Module Alarm Configuration Screen



Changes will NOT become active until the user clicks on the SAVE button

Item	Title	Description
1	System Location	The System Location Identifies the location of the SB Module. The System Location will be used in SNMP and SMTP notifications sent out by the SB Module. Th System Location should be very descriptive indicating whether located in the Head-end or one of the remote units.

Item	Title	Description
2	Battery Connected	The Battery connected option will allow the booster to send SNMP and SMTP alarms as well as provide GUI alarm indications (red backlit boxes) for the specified items. **Note:** *Physical Form-C relay operation is not affected by the setting of these two boxes.* If a battery backup voltage source is connected to the booster and the booster is setup in a non-NFPA manner then the user should place a check mark in the battery is connected box. When this box is checked the booster will annunciate alarms based on a measurement of the backup battery voltage being applied. **Note:** *if there is not a battery backup connected to the booster and the AC source is disabled, then on air signals will not pass through the SB Module.*
3	Enable NFPA Alarms	The Enable NFPA Alarms option will allow the booster to send SNMP and SMTP alarms as well as provide GUI alarm indications (red backlit boxes) for the specified items. **Note:** *Physical Form-C relay operation is not affected by the setting of these two boxes.* When the Enable NFPA Alarm box is checked then the NFPA alarm group list (item4) will appear on the Alarm Configuration screen. In order to insure correct NFPA operation the booster must be physically setup to be NFPA compliant. NFPA compliance is discussed in detail in a later section of this manual. In order to be NFPA compliant the booster must have the required NFPA hardware (Bias-T and Antenna line sensor) installed and the booster must be connected to an NFPA capable battery backup unit. These hardware enhancements to the communications system will allow the booster to support the NFPA alarm functionality correctly. Note; Recommended NFPA capable battery backup units include the Bird models 6160-110-24-NR and the 6160-220-24-NR battery backups.
4	Enable Individual NFPA Alarms	When the Enable NFPA Alarm box (item3) is checked then the individual NFPA alarms are displayed. The list includes Antenna Malfunction, Charge Fail, AC Lost, and Low Battery. Placing a check mark in these four boxes will allow the booster to send SNMP and SMTP notifications as well as provide GUI alarm indications (red backlit boxes) for the checked item. **Note:** *Physical Form-C relay operation is not affected by the setting of these four boxes.*
5	SNMP Configuration	NOT USED. See "Email Server" on page 68
6	SMTP Email Alert Configuration	NOT USED. See "Email Server" on page 68
7	Email Addresses	NOT USED. See "Email Server" on page 68

Item	Title	Description
8	System Fail Relay Test	These two buttons are provided to easily test the summed alarm output relay. When pressed, the Alarm the SB Module will be forced into a summed alarm state and the system fail Form-C relay contacts will change state and the front door Status LED will turn red. When pressed, the Clear button resets the forced enable of the system fail relay. It takes several seconds for these button presses to take effect. If the user initiates a relay test the booster will automatically clear it after about 5 minutes. This prevents the booster from being left accidentally in a test mode. Also, a system reboot will automatically clear a forced failure mode alarm. These buttons have no effect if the SB Module is already in an alarmed state. That is, the Clear button will NOT clear real alarms, it will only clear forced alarms which are used for testing purposes. If the cursor is placed over the status icon (shown on the upper right of the GUI Interface) while the booster is performing a relay test then a message bubble will appear notifying the user that the unit is in a forced alarm condition.

SB Module Network Configuration Submenu

No changes should be made to the Network Configuration submenu, unit must remain in DHCP mode.

CAUTION

Changes to the SB Module's network configuration will cause the RGW to lose connection with the SB Module.
This will cause a loss of communication with the SB Module.

OLC History Submenu

The OLC History feature provides a convenient log of OLC activity taking place in the booster for each uplink and downlink branch. To access the log click on the OLC History submenu button which appears on the right side of any displayed screen. The OLC History log for each downlink and uplink branch of the booster will appear. The downlink branch is listed first then the uplink branch.

Figure 95 OLC History Log

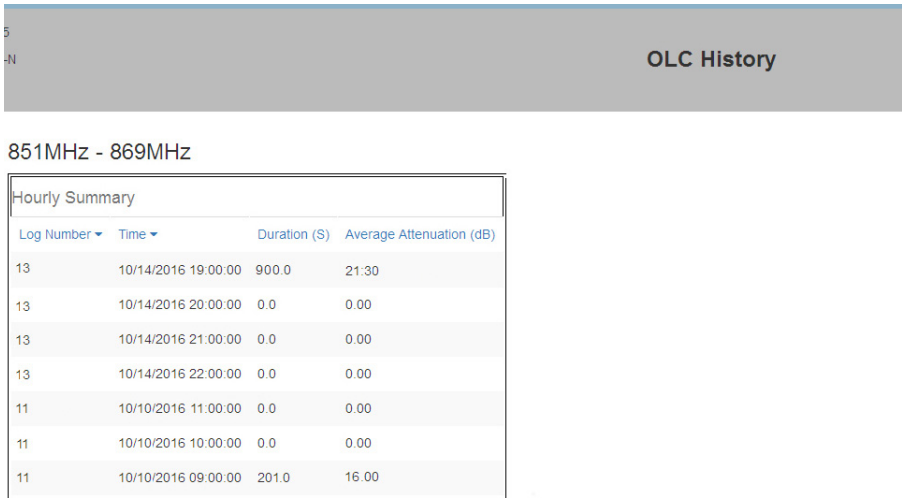


Figure 95 shows a sample portion of a typical downlink branch log. The hourly summary is shown for explanation purposes. Each vertical row in the log represents a log entry and 1 hour of sampling time. Each log entry records the Log Number, Time, Duration, and Average Attenuation. The logged data is stored in non-volatile memory and will not be erased when the unit is powered down. This archived information will permit the creation of a user signal-profile to facilitate optimum system configuration and performance. It also allows you to see if there are transient episodes of strong signals perhaps desensing other channels being amplified by the booster.

The booster must run for at least 1 hour after initial power up in order to generate at least one log entry or the user will not be able to call up the log for display.

The Log Number is a numerical value which increments each time the booster powers up. Because the boosters internal clock might not be set to wall clock time after powering up the Log Number is used as a way to differentiate power cycles. For instance the example log shown in figure 17 shows the booster was turned on October 10th long enough to successfully record three log entries (Log Number 11). Once again the booster was turned on for testing on October 14th at least long enough to record four log entries (Log Number 13). The lack of Log Number 12 says that the booster was turned on at some point but not long enough (at least 1 hour) to record even a single log entry.

The Time entry in the OLC History log represents the time the record was stored. The time entry represents what time the booster thought it was and might not be accurate. By default the log entries are displayed with the most recent entry at the top of the log. Clicking on the arrow will sort the log in the opposite direction. The Duration column represents the amount of time within the 1 hour logging period that the booster applied OLC to the branch. The duration value is expressed in seconds so the value may be any number between 0 and 3600. A value of 0.0 means that no OLC was applied to the branch during the one hour logging period and 3600 would mean that OLC was constantly applied for one hour. In the example shown in figure 17 most log entries show a duration of 0.0 which is normal.

The Average Attenuation is a value expressed in dB's which is the average value of the attenuation while the OLC was active. The time that the OLC was not active is not included in the Average Attenuation value. For example, if the OLC was engaged for 10 seconds at 20 dB the Duration column would read 10 seconds and the Average Attenuation column would read 20 dB.

The OLC log has a download feature which allows the OLC History data to be exported to other software packages as a text file. To export the OLC data press the DOWNLOAD button that appears in the upper right of the display screen. A popup window will present. The default choice for export is Notepad but the user can specify other choices if desired.

User Administration Submenu

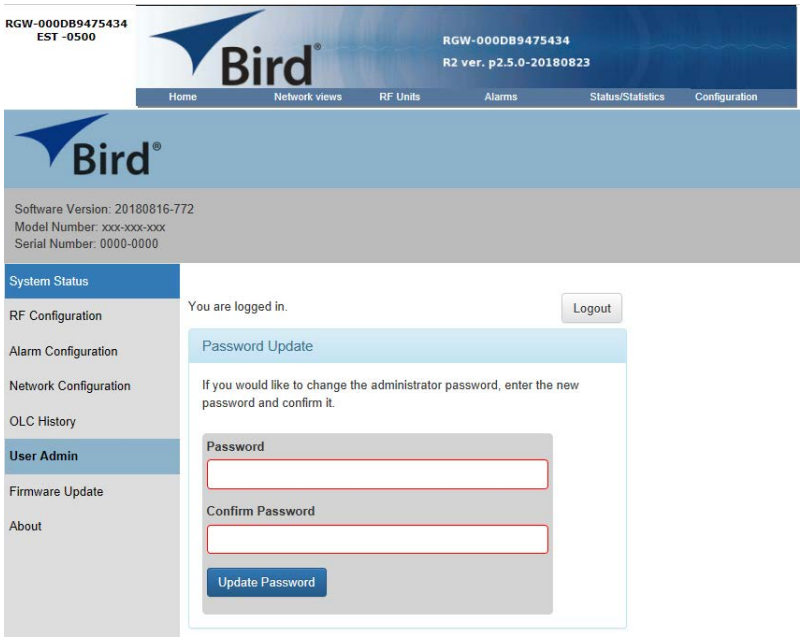
Changing the password on this page will ONLY change the password for the SB Module. This will not effect the login or password to access the Head-end unit.

The User Administration screen allows password protected access to the booster. The boxes on this page are interactive. To make changes click inside the box and a cursor will appear. When first visited the user is queried for a User Password. The default user password is “admin.”

The change password prompt will appear immediately after the user logs in successfully. It is not necessary to change the password. However, if the user decides to change the boosters password then enter the new password in the appropriate entry field and the confirm entry field.

Click on the UPDATE PASSWORD button. It is important to write down the new password for safekeeping.

Figure 96 User Admin Screen



Firmware Update Submenu

The Firmware Update submenu is used to update already existing firmware running on the SB Module. The user must be logged onto the SB Module in order to perform updates. See "SBII+ Firmware Updates" on page 98 for complete procedures.

Figure 97 SB Module Firmware Update

Routine Maintenance

SBII+ Model 63 systems manufactured by Bird Technologies can perform for years with little maintenance and repair. However, if the amplifiers are subjected to excessively high signal levels, power surges or lightning strikes, failures may occur. The following procedures may be followed for detecting a malfunctioning unit or as part of a periodic maintenance program.

1. The heatsink areas should be cleared of dust and debris.
2. Inspect the unit to see that the front door Status LED is lit (remove any dust or debris that may obscure the LED). This will verify that operating power is flowing properly. Check all hardware for tightness.
3. Compare system performance to initial performance levels measured when the system was first installed. Or measure the gain at any convenient frequency in the working frequency band (both uplink and downlink directions) to verify that the performance is still within specifications.

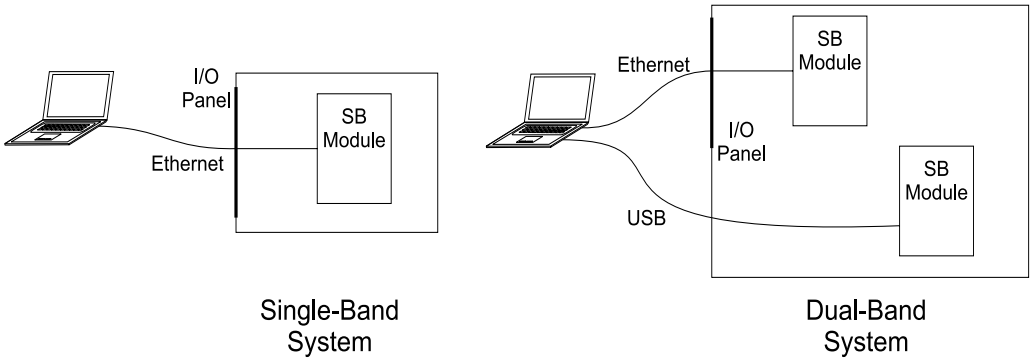
SBII+ Firmware Updates

Connecting to the SB Module via the Ethernet port on the I/O panel is the method used for operational configuration of SBII+ systems. This method is also used for most firmware updates, the only exception is dual-band systems, as shown in Figure 98, dual-band system require a USB connection to update the firmware on the second SB Module.

Single-band systems — Since single-band systems contain only one SB Module in the chassis, an Ethernet connection is the preferred method for updating the SB Module's firmware.

Dual-band systems — Dual-band systems contain two SB Modules within the chassis. Only one of the SB modules can be updated using an Ethernet connection. A USB connection must be used to update the SB Module not connected to the I/O panel Ethernet port.

Figure 98 SB Module Connections for Firmware Updates



The advantage of the Ethernet connection is the chassis need not be opened to accomplish a firmware update. On dual-band systems the chassis must be opened to access the USB port on the second SB Module.

Firmware Update Process

Obtain Updated Firmware File

NOTE

If you are going to use a USB connection to perform the firmware update, USB drivers for the SB Module should be obtained from Bird in addition to the firmware file.

1. Contact Bird for Firmware updates.
2. Save firmware update files to a USB drive or convenient location on the computer used to update the SBII+ system.

Connect Laptop to SBII+ SB Module

Connect to the SB Module using either an Ethernet or USB connection.

- "Ethernet Connection - Boosters" on page 99
- "Ethernet Connection - Fiber-DAS" on page 100
- "USB Connection" on page 102

NOTE

The Firmware update is accomplished using a web browser on the PC. Use either Edge, Firefox, or Chrome on the PC, Internet Explorer will not work properly.

Ethernet Connection - Boosters

The SBII+ Model 63 Booster system is shipped with a default IP address and a default Login and Password.

Default IP Address: 192.168.1.100

Default Subnet: 255.255.255.0

Login: admin Password: admin

NOTE

This procedure assumes the SBII+'s IP address is set to the default value, if the IP address has been changed, substitute the actual IP address for the address shown in this procedure.

To connect your laptop computer to the ENET port and access the web page interface, perform the following steps:

1. Apply power to the SBII+ system using the AC supply cable, if power is not already applied.
2. Ensure that your laptop's IP address is compatible with the default address of the signal booster system. This may require changes be made to the Ethernet adapter address on your laptop. Your laptop's IP address will need to be set to "192.168.1.2" along with a subnet mask of "255.255.255.0". See Direct Connection in "Communicating With the Booster" on page 49.
3. Connect your laptop's Ethernet (RJ-45) port to the ENET port on the booster's bottom panel using a standard CAT-5 cable (cross-over or straight-through).
4. Launch your web browser software on the laptop.
5. In your web browsers address box, type in the address of the booster, **192.168.1.100** (factory default), and press the ENTER key.
6. Once Web User Interface for the booster is displayed go to "Update Firmware" on page 103.

Ethernet Connection - Fiber-DAS

The SBII+ Model 63 Fiber-DAS system is shipped with a default IP address and a default Login and Password.

- Default IP Address: 192.168.13.1
- Default Login: extended
- Default Password: admin

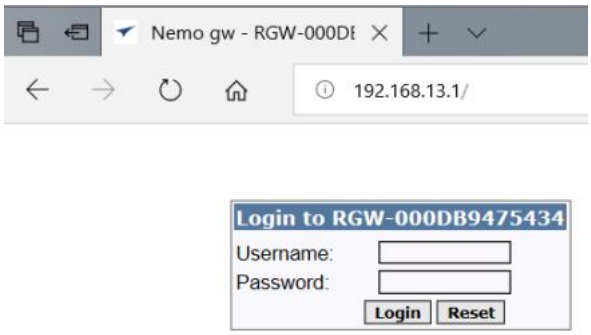
NOTE

This procedure assumes the SBII+'s IP address is set to the default value, if the IP address has been changed, substitute the actual IP address for the address shown in this procedure.

To connect your laptop computer to the ENET port and access the web page interface, perform the following steps:

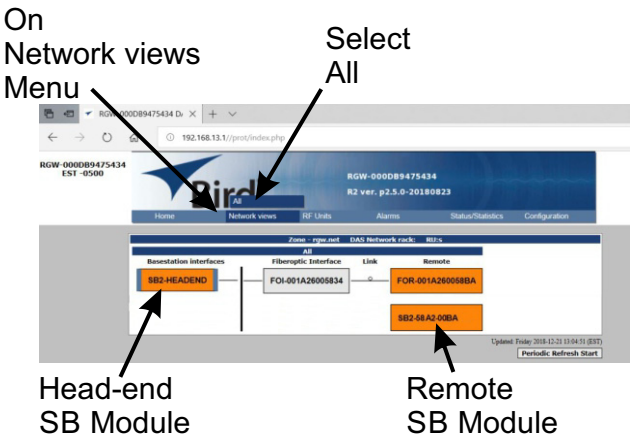
1. Apply power to the SBII+ system using the AC supply cable, if power is not already applied.
2. Ensure that your laptop's IP address is set to DHCP.
3. Connect your laptop's Ethernet (RJ-45) port to the ENET port on the booster's bottom panel using a standard CAT-5 cable (cross-over or straight-through).
4. Launch your web browser software on the laptop.
5. In your web browsers address box, type in the address of the booster, **192.168.13.1** (factory default), and press the ENTER key.
6. Login to the GUI. See Figure 99 on page 100.

Figure 99 RGW Login page



7. To access the SB Module perform one of the following:
   - Select All on the Network views menu, then click on the appropriate SB Module in the graphical display. See Figure 100.
   - Click on the RF Units menu, hover over the SB2/SB3/SBA menu, then select the appropriate SB Module from those displayed.

Figure 100 SB Module Selection



8. Once Web User Interface for the SB Module is displayed go to "Update Firmware" on page 103.

USB Connection

NOTE

If unable to perform a firmware update using the USB, use an Ethernet cable to connect a laptop to the Ethernet port on the SB Module and follow the Ethernet version of this procedure..

A USB cable with a mini USB connector on one end and a USB A connector on the other is required for this procedure.

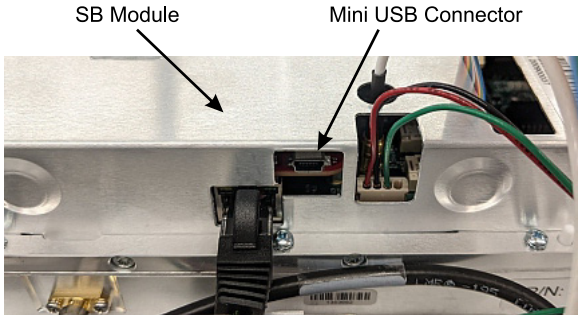
NOTE

Drivers for the SB Module should be obtained from Bird prior to performing this procedure.

The PC provides power to the SB module via the USB cable, AC power does not need to be supplied to the SBII+ to complete a firmware update if a USB connection is used.

1. Open the SBII+ chassis.
2. Connect a USB cable from the Laptop to the SB Module's USB connector. See Figure 101 on page 102.

Figure 101 SB Module Mini USB Connector



3. Wait for the USB driver for the SBII+ module to automatically install.
   If the driver does not automatically install perform step a.
   a. Install the correct SB2 plus USB driver (this only needs to be done if the drivers do not automatically install, and only needs to be done one time).

      If you are running a 32-bit version of Windows, install the SB2Plus_USB_Driver.

      If you are running a 64-bit version of Windows, install the SB2Plus_USB_Driver_D64 driver.
4. Once the driver is installed, an Ethernet interface in windows will be displayed: "Linux USB Ethernet/RNDIS Gadget"
5. Change the laptop's network settings for the "Linux USB Ethernet/RNDIS Gadget" interface to:

   IP: 192.168.7.1

   Subnet: 255.255.255.0

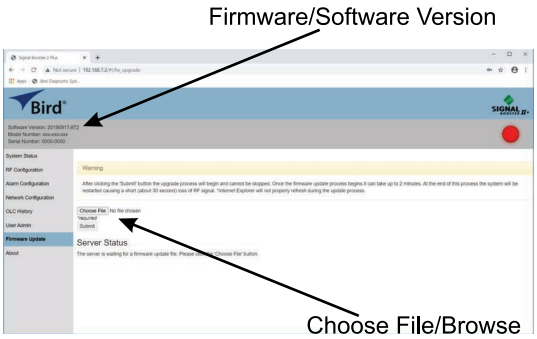
   For instructions on how to change a PC's IP address, see Direct Connection in "Communicating With the Booster" on page 49
6. Open web browser.
7. In your web browsers address box, type in the address of the booster, **192.168.7.2**, and press the ENTER key.
8. Once Web User Interface for the booster is displayed go to "Update Firmware" on page 103.

Update Firmware

Once a connection to the SBII+ by either Ethernet or USB is established and the Web User Interface is displayed, perform the following firmware update procedure.

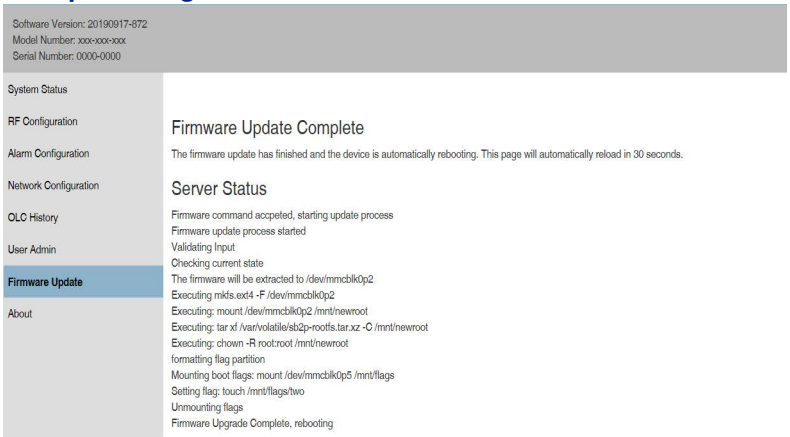
1. Check and record the current software version of the booster. Located in the upper left corner of the UI screen. See Figure 102.

Figure 102 Web UI System Status Screen



2. Click on the Firmware Update menu option.
3. Login in to the SB Module, the SB Module will request a password when any of the configuration menus are selected.
   - Login: **admin**
   - Default password: **admin**
4. On the Firmware Update Screen, click on the Choose File/Browse button. See Figure 102.
5. Select the firmware update file (sb2plus.swu). The correct file should be provided by the factory or your Bird representative. Note that after the file is selected the file name will appear next to the browse button.
6. Click on the SUBMIT button.
   a. A percent readout will be displayed and represents the amount of the file that has been uploaded. Once it reaches 100% there will be a pause for about 20 seconds.
   b. After the pause a list of status messages will appear. Wait until there is a message that notifies you that the update is complete, and the system is rebooting. See Figure 103.

Figure 103 Firmware Update Log



7. Wait until the system reboots itself.

8. Verify the update is successfully accomplished by viewing the software version number that appears on the upper left of the System Status submenu screen. It should be a different number than the one that was recorded in step 1 above.

NOTE

Dual-Band systems contain two SB Modules, revised firmware should be installed on both modules in these systems.

SBII+ Factory Reset Utility

A factory reset utility is available to reset the SB Module's network settings or admin password to the factory defaults. The factory reset utility is available, upon request, from Bird.

To perform the reset, physical access to the Mini USB connector on the SB Module inside the chassis is required.

A USB cable with a mini USB connector on one end and a USB A connector on the other is required for this procedure.

To reset the password, network settings, or both do the following:

NOTE

Drivers for the SB Module should be obtained from Bird prior to performing this procedure.

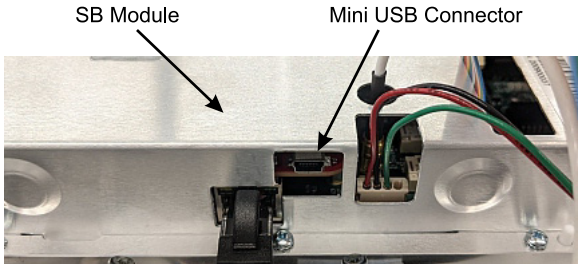
The PC provides power to the SB module via the USB cable, AC power does not need to be supplied to the SBII+ to complete a factory reset.

1. Store the factory reset utility on the laptop.
2. Open the SBII+ chassis.
3. Connect a USB cable from the laptop to the SB Module's mini USB connector. See Figure 104 on page 105.

NOTE

For dual-band systems, find the SB Module with Ethernet cable connected, plug the mini USB connector into this SB Module for the reset.

Figure 104 SB Module Mini USB Connector



4. Wait for the USB driver for the SBII+ module to automatically install.
   If the driver does not automatically install perform step a.
   a. Install the correct SB2 plus USB driver (this only needs to be done if the drivers do not automatically install, and only needs to be done one time).

      If you are running a 32-bit version of Windows, install the SB2Plus_USB_Driver.

      If you are running a 64-bit version of Windows, install the SB2Plus_USB_Driver_D64 driver.
5. Once the driver is installed, an Ethernet interface in windows will be displayed: "Linux USB Ethernet/RNDIS Gadget"
6. Change the laptop's network settings for the "Linux USB Ethernet/RNDIS Gadget" interface to:

   IP: 192.168.7.1

   Subnet: 255.255.255.0

   For instructions on how to change a PC's IP address, see Direct Connection in "Communicating With the Booster" on page 49.
7. Open laptop's web browser.
8. In your web browsers address box, type in the address of the booster, **192.168.7.2**, and press the ENTER key.
9. Navigate on the laptop to the SBII+ factory reset utility, once the Web User Interface for the booster is displayed.

10. Double click on the Factory Reset.exe.
11. Select the appropriate boxes to reset the required resource. You can reset the Network Settings, Password, or both. See Figure 105.

Figure 105 SBII+ Factory Reset Utility Dialog Box

12. Click the 'Run' button. A log will display progress of the reset process.
    a. If there are any problems, please copy log and send it to Bird Technical Support.
13. After successful reset, disconnect USB cable from SB Module's mini USB connector.
14. Secure the Chassis lid.
    a. Torque Allen screws on small aluminum enclosure units (700/800 Mhz, single-band)
       9 ft-lbs
    a. Torque Allen screws on large aluminum enclosure units (UHF/ Dual-band)
       16 ft-lbs

Customer Service

Any maintenance or service procedure beyond the scope of those in this chapter should be referred to a qualified service center.

If the unit needs to be returned for any reason, request an Return Material Authorization (RMA) through the Bird Technologies website. All instruments returned must be shipped prepaid and to the attention of the RMA number.

Bird Service Center
30303 Aurora Road
Cleveland (Solon), Ohio 44139-2794
Fax: (440) 248-5426
E-mail: *bsc@birdrf.com*

For the location of the Sales Office nearest you, visit our Web site at:

http://www.birdrf.com