**Instruction Manual**

# Innovator, CU0TD-1/CU0RD-1, 5 Watt - CU4TD/CU4RD, 2500 Watt

## UHF, ATSC Transmitter/ Regenerative Translator w/ Adaptive Modulator

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# Table of Contents

## *Introduction*

### Manual Overview

This manual contains the description of the Innovator CU0TD-1/CU0RD-1 – CU4TD/CU4RD Transmitter/Regenerative Translator and the circuit descriptions of the boards, which make up the system. The manual also describes the installation, setup and alignment procedures for the system. **Appendix A** of this manual contains the system level drawings for the Innovator CU0TD-1/CU0RD-1 – CU4TD/CU4RD ATSC Transmitter/Regenerative Translator System that was purchased. **NOTES:** If your system contains dual exciters with a remote interface panel and Exciter control panel, information and drawings on the system and panels are contained in the separate remote interface panel instruction manual. Information on the optional K-Tech Receiver or Signal Converter, if part of your system, is contained in the separate manufacturers supplied manuals.

### UBS-Axcera Numbering System Explanation

The UBS-Axcera numbering system is explained as follows. The following example is for a CU0TC-3 Transmitter system.

C – CX Series
U – UHF Frequency Band
0 or X - Number of external Power Amplifier drawers
T - Transmitter, L - Echo cancelling repeater, R - Regenerative translator
C - COFDM (DVB-T/H/T2), I - ISDB-T, D - ATSC, No letter or blank means analog.
-3 = 50W or (861 devices), -2 = 30W or (861 devices with smaller power supply), -1 = 3W or 5W depending on the modulation. -4 = 888A. For ATSC there is also a -5 at 150W output but it is the same as the -4.

The following example is for a power amplifier drawer CUBP888A-4.

```
 1 | 2 | 3 | 4 |  5  | - | 6 | - |  7  |
 C   U   B   P  888A  -   4
```

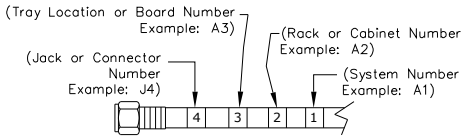
| Position | Chars | Description |
|---|---|---|
| 1 | 1 | Transmitter Line (C=CX, 6=6X, H=HX) |
| 2 | 1 or 2 | Frequency Band (U=UHF, HV=HB VHF, LV=LB VHF, etc.) |
| 3 | 1 | Version (ex. A-line, B-line, etc. - typically matches transmitter model version) |
| 4 | 1 | Use (E=Exciter/Driver, P=PA) |
| 5 | up to 4 | Transistor number (might need to abbreviate) |
| 6 | 1 or 2 | Number of transistors in final output stage |
| 7 | up to 4 | Additional field to include other important info (ex. distinguish bet single or N+1 supplies, or other things not covered in the number |

**CUBP888A-4:** Line **C**, Frequency **UHF**, Version **B**, Use **PA**, Transistor Number **888A**, number of transistors in final output stage **4**.

**Assembly Designators**

UBS-Axcera has assigned assembly numbers, Ax designations such as A1, where x=1,2,3…etc, to all assemblies, modules, and boards in the system. These designations are referenced in the text of this manual and shown on the block diagram and interconnect drawings provided in Appendix A.

The cables that connect between the boards within a drawer or assembly and that connect between the drawers, racks and cabinets are labeled using markers. Figure 1 is an example of a marked cable. There may be as few as two or as many as four Markers on any one cable. These markers are read starting farthest from the connector. If there are four Markers, the marker farthest from the connector is the system number such as system 1 or translator 2. The next or the farthest Marker is the rack or cabinet "A" number on an interconnect cable or the board "A" number when the cable is within a drawer. The next number on an interconnect cable is the Drawer location or Board "A" number. The marker closest to the connector is the jack or connector "J" number on an interconnect cable or the jack or connector "J" number on the board when the cable is within a drawer.




*Marker Identification Drawing*

**Safety**

The Innovator CU0TD-1/CU0RD-1 – CU4TD/CU4RD ATSC Transmitter/Regenerative Translator systems manufactured by UBS-Axcera are designed to be easy to use and repair while providing protection from electrical and mechanical hazards. Please review the following warnings and familiarize yourself with the operation and servicing procedures before working on the system.

**Hazardous Accessibility** – UBS-Axcera has made attempts to provide appropriate connectors, wiring and shields to minimize hazardous accessibility.

**Circuit Breakers and Wiring** – All circuit breakers and wire are UL and CE certified and are rated for maximum operating conditions.

**Single Point Breaker or Disconnect** - The customer should provide a single point breaker or disconnect at the breaker box for the main AC input connection to the transmitter.

**Transmitter Ratings** - The transmitter ratings are provided in the text of this manual along with voltage and current values for the equipment.

**Protective Earthing Terminal** – A main protective earthing terminal is provided for equipment required to have protective earthing.

**Read All safety Instructions** – All of the safety instructions should be read and understood before operating this equipment.

**Retain Manuals** – The manuals for the system should be retained at the system site for future reference. UBS-Axcera provides two manuals for this purpose; one manual can be left at the office while the other can be kept at the site.

**Heed all Notes, Warnings, and Cautions** – All of the notes, warnings, and cautions listed in this safety section and throughout the manual must be followed.

**Follow Operating Instructions** – All of the operating and use instructions for the system should be followed.

**Cleaning** – Unplug or otherwise disconnect all power from the equipment before cleaning. Do not use liquid or aerosol cleaners. Use only a damp cloth for cleaning.

**Ventilation** – Openings in the cabinet and module front panels are provided for ventilation. To ensure the reliable operation of the system, and to protect the unit from overheating, these openings must not be blocked.

**Servicing** – Do not attempt to service this product yourself until becoming familiar with the equipment. If in doubt, refer all servicing questions to qualified UBS-Axcera service personnel.

**Replacement Parts** – When replacement parts are used, be sure that the parts have the same functional and performance characteristics as the original part. Unauthorized substitutions may result in fire, electric shock, or other hazards. Please contact the UBS-Axcera Technical Service Department if you have any questions regarding service or replacement parts.

**Contact Information**

The UBS-Axcera Field Service Department can be contacted by PHONE at **724-873-8100** or by FAX at **724-873-8105**.

Before calling UBS-Axcera, please be prepared to supply the UBS-Axcera technician with answers to the following questions. This will save time and help ensure the most direct resolution to the problem.

1. What are your Name and the Call Letters for the station?
2. What are the model number and type of system?
3. Is the system digital or analog?
4. How long has the system been on the air? (Approximately when was the system installed?)
5. What are the symptoms being exhibited by the system? Include the current front panel LCD readings and what the status LED is indicating on the front panel of the drawer. If possible, include the LCD readings before the problem occurred.

**Return Material Procedure**

To insure the efficient handling of equipment or components that have been returned for repair, UBS-Axcera requests that each returned item be accompanied by a Return Material Authorization Number (RMA#). The RMA# can be obtained from any UBS-Axcera Field Service Engineer by contacting the UBS-Axcera Field Service Department at 724-873-8100 or by Fax at 724-873-8105. This procedure applies to all items sent to the Field Service Department regardless of whether the item was originally manufactured by UBS-Axcera.

When equipment is sent to the field on loan, the RMA# is included with the unit. The RMA# is intended to be used when the unit is returned to UBS-Axcera. In addition, all shipping material should be retained for the return of the unit to UBS-Axcera.

Replacement assemblies are also sent with the RMA# to allow for the proper routing of the exchanged hardware. Failure to close out this type of RMA# will normally result in the customer being invoiced for the value of the loaner item or the exchanged assembly.

When shipping an item to UBS-Axcera, please include the RMA# on the packing list and on the shipping container. The packing slip should also include contact information and a brief description of why the unit is being returned.
Please forward all RMA items to:

**UBS-Axcera**
**103 Freedom Drive**
**P.O. Box 525**
**Lawrence, PA 15055-0525 USA**

For more information concerning this procedure, call the UBS-Axcera Field Service Department at 724-873-8100.

UBS-Axcera can also be contacted through e-mail at **info@UBS-Axcera.com** and on the Web at **www.UBS-Axcera.com.**

**Limited One Year Warranty for UBS-Axcera Products**

UBS-Axcera warrants each new product that it has manufactured and sold against defects in material and workmanship under normal use and service for a period of one (1) year from the date of shipment from UBS-Axcera's plant, when operated in accordance with UBS-Axcera's operating instructions. This warranty shall not apply to tubes, fuses, batteries, bulbs or LEDs.

Warranties are valid only when and if (a) UBS-Axcera receives prompt written notice of breach within the period of warranty, (b) the defective product is properly packed and returned by the buyer (transportation and insurance prepaid), and (c) UBS-Axcera determines, in its sole judgment, that the product is defective and not subject to any misuse, neglect, improper installation, negligence, accident, or (unless authorized in writing by UBS-Axcera) repair or alteration. UBS-Axcera's exclusive liability for any personal and/or property damage (including direct, consequential, or incidental) caused by the breach of any or all warranties, shall be limited to the following: (a) repairing or replacing (in UBS-Axcera's sole discretion) any defective parts free of charge (F.O.B. UBS-Axcera's plant) and/or (b) crediting (in UBS-Axcera's sole discretion) all or a portion of the purchase price to the buyer.

Equipment furnished by UBS-Axcera, but not bearing its trade name, shall bear no warranties other than the special hours-of-use or other warranties extended by or enforceable against the manufacturer at the time of delivery to the buyer.

**NO WARRANTIES, WHETHER STATUTORY, EXPRESSED, OR IMPLIED, AND NO WARRANTIES OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR FREEDOM FROM INFRINGEMENT, OR THE LIKE, OTHER THAN AS SPECIFIED IN PATENT LIABILITY ARTICLES, AND IN THIS ARTICLE, SHALL APPLY TO THE EQUIPMENT FURNISHED HEREUNDER.**

## ☞ WARNING!!!

**⩤ HIGH VOLTAGE ⩥**

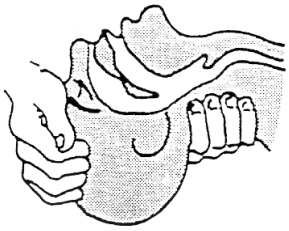
**DO NOT ATTEMPT TO REPAIR OR TROUBLESHOOT THIS EQUIPMENT UNLESS YOU ARE FAMILIAR WITH ITS OPERATION AND EXPERIENCED IN SERVICING HIGH VOLTAGE EQUIPMENT. LETHAL VOLTAGES ARE PRESENT WHEN POWER IS APPLIED TO THIS SYSTEM. IF POSSIBLE, TURN OFF POWER BEFORE MAKING ADJUSTMENTS TO THE SYSTEM.**

**★ RADIO FREQUENCY RADIATION HAZARD ★**

**MICROWAVE, RF AMPLIFIERS AND TUBES GENERATE HAZARDOUS RF RADIATION THAT CAN CAUSE SEVERE INJURY INCLUDING CATARACTS, WHICH CAN RESULT IN BLINDNESS. SOME CARDIAC PACEMAKERS MAY BE AFFECTED BY THE RF ENERGY EMITTED BY RF AND MICROWAVE AMPLIFIERS. NEVER OPERATE THE TRANSMITTER SYSTEM WITHOUT A PROPERLY MATCHED RF ENERGY ABSORBING LOAD OR THE ANTENNA ATTACHED. KEEP PERSONNEL AWAY FROM OPEN WAVEGUIDES AND ANTENNAS. NEVER LOOK INTO AN OPEN WAVEGUIDE OR ANTENNA. MONITOR ALL PARTS OF THE RF SYSTEM FOR RADIATION LEAKAGE AT REGULAR INTERVALS.**

## EMERGENCY FIRST AID INSTRUCTIONS

Personnel engaged in the installation, operation, or maintenance of this equipment are urged to become familiar with the following rules both in theory and practice. It is the duty of all operating personnel to be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.


### RESCUE BREATHING

1. Find out if the person is breathing.

You must find out if the person has stopped breathing. If you think he is not breathing, place him flat on his back. Put your ear close to his mouth and look at his chest. If he is breathing you can feel the air on your cheek. You can see his chest move up and down. If you do not feel the air or see the chest move, he is not breathing.

2. If he is not breathing, open the airway by tilting his head backwards.

Lift up his neck with one hand and push down on his forehead with the other. This opens the airway. Sometimes doing this will let the person breathe again by himself.

3. If he is still not breathing, begin rescue breathing.

-Keep his head tilted backward. Pinch nose shut.
-Put your mouth tightly over his mouth.
-Blow into his mouth once every five seconds
**-DO NOT STOP** rescue breathing until help arrives.

LOOSEN CLOTHING - KEEP WARM

Do this when the victim is breathing by himself or help is available. Keep him as quiet as possible and from becoming chilled. Otherwise treat him for shock.

### BURNS

**SKIN REDDENED:** Apply ice cold water to burned area to prevent burn from going deeper into skin tissue. Cover area with a clean sheet or cloth to keep away air. Consult a physician.

**SKIN BLISTERED OR FLESH CHARRED:** Apply ice cold water to burned area to prevent burn from going deeper into skin tissue. Cover area with clean sheet or cloth to keep away air. Treat victim for shock and take to hospital.

**EXTENSIVE BURN - SKIN BROKEN:** Cover area with clean sheet or cloth to keep away air. Treat victim for shock and take to hospital.

# dBm, dBw, dBmV, dBμV, & VOLTAGE EXPRESSED IN WATTS

**50 Ohm System**

| WATTS | PREFIX | dBm | dBw | dBmV | dBμV | VOLTAGE |
|---|---|---|---|---|---|---|
| 1,000,000,000,000 | 1 TERAWATT | +150 | +120 | | | |
| 100,000,000,000 | 100 GIGAWATTS | +140 | +110 | | | |
| 10,000,000,000 | 10 GIGAWATTS | +130 | +100 | | | |
| 1,000,000,000 | 1 GIGAWATT | +120 | + 99 | | | |
| 100,000,000 | 100 MEGAWATTS | +110 | + 80 | | | |
| 10,000,000 | 10 MEGAWATTS | +100 | + 70 | | | |
| 1,000,000 | 1 MEGAWATT | + 90 | + 60 | | | |
| 100,000 | 100 KILOWATTS | + 80 | + 50 | | | |
| 10,000 | 10 KILOWATTS | + 70 | + 40 | | | |
| 1,000 | 1 KILOWATT | + 60 | + 30 | | | |
| 100 | 1 HECTROWATT | + 50 | + 20 | | | |
| 50 | | + 47 | + 17 | | | |
| 20 | | + 43 | + 13 | | | |
| 10 | 1 DECAWATT | + 40 | + 10 | | | |
| 1 | 1 WATT | + 30 | 0 | + 77 | +137 | 7.07V |
| 0.1 | 1 DECIWATT | + 20 | - 10 | + 67 | +127 | 2.24V |
| 0.01 | 1 CENTIWATT | + 10 | - 20 | + 57 | +117 | 0.707V |
| 0.001 | 1 MILLIWATT | 0 | - 30 | + 47 | +107 | 224mV |
| 0.0001 | 100 MICROWATTS | - 10 | - 40 | | | |
| 0.00001 | 10 MICROWATTS | - 20 | - 50 | | | |
| 0.000001 | 1 MICROWATT | - 30 | - 60 | | | |
| 0.0000001 | 100 NANOWATTS | - 40 | - 70 | | | |
| 0.00000001 | 10 NANOWATTS | - 50 | - 80 | | | |
| 0.000000001 | 1 NANOWATT | - 60 | - 90 | | | |
| 0.0000000001 | 100 PICOWATTS | - 70 | -100 | | | |
| 0.00000000001 | 10 PICOWATTS | - 80 | -110 | | | |
| 0.000000000001 | 1 PICOWATT | - 90 | -120 | | | |

## TEMPERATURE CONVERSION

**°F = 32 + [(9/5) °C]**

**°C = [(5/9) (°F - 32)]**

## USEFUL CONVERSION FACTORS

| TO CONVERT FROM | TO | MULTIPLY BY |
|---|---|---|
| mile (US statute) | kilometer (km) | 1.609347 |
| inch (in) | millimeter (mm) | 25.4 |
| inch (in) | centimeter (cm) | 2.54 |
| inch (in) | meter (m) | 0.0254 |
| foot (ft) | meter (m) | 0.3048 |
| yard (yd) | meter (m) | 0.9144 |
| mile per hour (mph) | kilometer per hour(km/hr) | 1.60934 |
| mile per hour (mph) | meter per second (m/s) | 0.44704 |
| pound (lb) | kilogram (kg) | 0.4535924 |
| gallon (gal) U.S. liquid | liter | 3.7854118 |
| (One U.S. gallon equals 0.8327 Canadian gallon) | | |
| fluid ounce (fl oz) | milliliters (ml) | 29.57353 |
| British Thermal Unit | watt (W) | 0.2930711 per hour (Btu/hr) |
| horsepower (hp) | watt (W) | 746 |

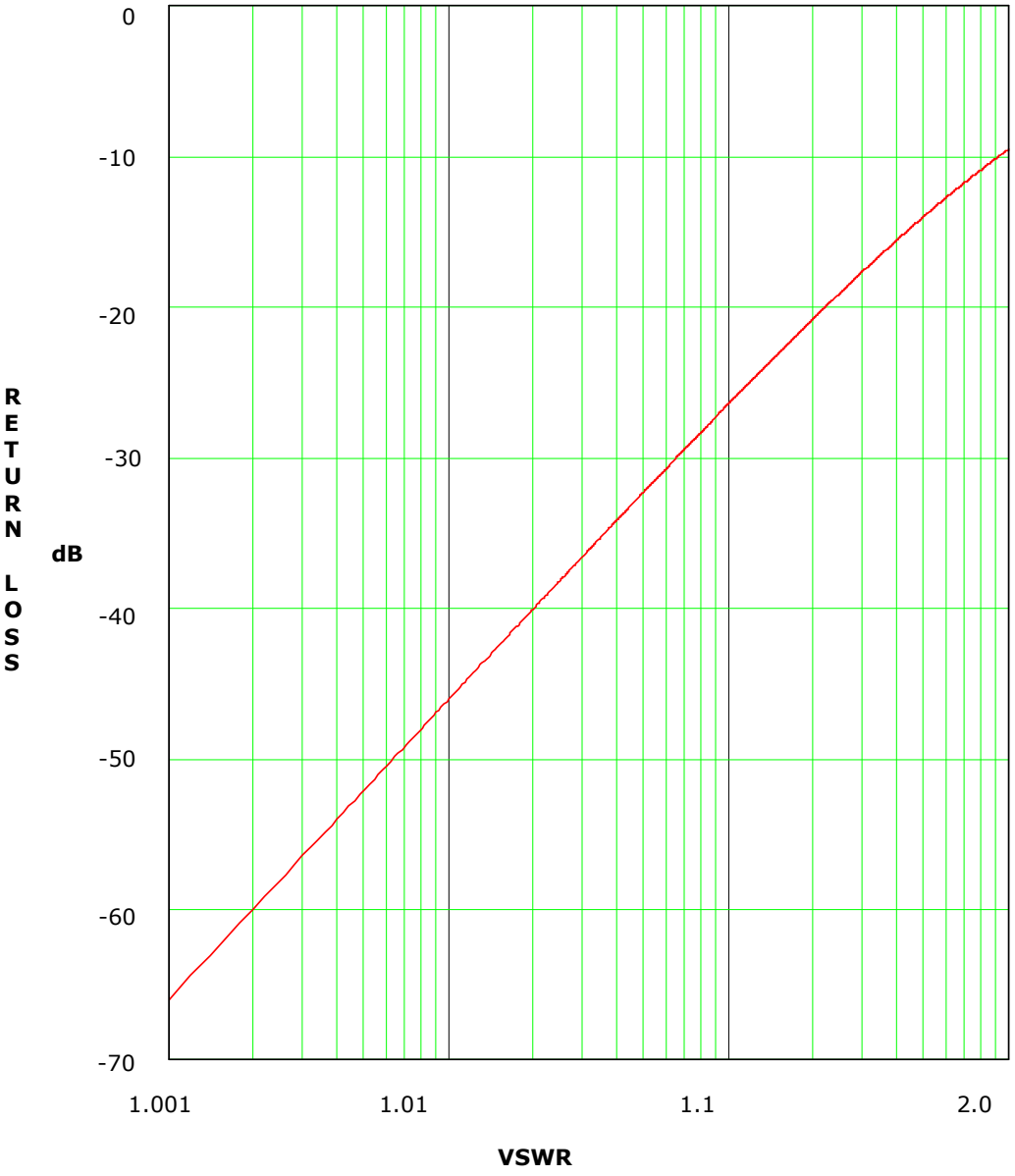
## NOMENCLATURE OF FREQUENCY BANDS

| FREQUENCY RANGE | DESIGNATION |
|---|---|
| 3 to 30 kHz | VLF - Very Low Frequency |
| 30 to 300 kHz | LF - Low Frequency |
| 300 to 3000 kHz | MF - Medium Frequency |
| 3 to 30 MHz | HF - High Frequency |
| 30 to 300 MHz | VHF - Very High Frequency |
| 300 to 3000 MHz | UHF - Ultrahigh Frequency |
| 3 to 30 GHz | SHF - Superhigh Frequency |
| 30 to 300 GHz | EHF - Extremely High Frequency |

## LETTER DESIGNATIONS FOR UPPER FREQUENCY BANDS

| LETTER | FREQ. BAND |
|---|---|
| L | 1000 - 2000 MHz |
| S | 2000 - 4000 MHz |
| C | 4000 - 8000 MHz |
| X | 8000 - 12000 MHz |
| Ku | 12 - 18 GHz |
| K | 18 - 27 GHz |
| Ka | 27 - 40 GHz |
| V | 40 - 75 GHz |
| W | 75 - 110 GHz |

**RETURN LOSS VS. VSWR**



## ABBREVIATIONS/ACRONYMS

**AC:** Alternating Current

**AFC:** Automatic Frequency Control

**ALC:** Automatic Level Control

**AM:** Amplitude Modulation

**AGC:** Automatic Gain Control

**ATSC:** Advanced Television Systems Committee (Digital)

**AWG:** American Wire Gauge

**B/D:** Block Diagram

**BER:** Bit Error Rate

**BW:** Bandwidth

**COFDM:** Coded Orthogonal Frequency Division Multiplexing modulation scheme.

**CUBP888A-4:** Line **C**, Frequency **UHF**, Version **B**, Use **PA**, Transistor Number **888A**, number of transistors in final output stage **4**.

**DC:** Direct Current

**D/A:** Digital to Analog

**DSP:** Digital Signal Processing

**DTV:** Digital Television

**dB:** Decibel

**dBm:** Decibel referenced to 1 milliwatt

**dBmV:** Decibel referenced to 1 millivolt

**dBW:** Decibel referenced to 1 watt

**FEC:** Forward Error Correction

**FM:** Frequency Modulation

**FPGA:** Field Programmable Gate Array

**Hz:** Hertz

**I/C:** Interconnect

**ICPM:** Incidental Carrier Phase Modulation

**I/P:** Input

**IF:** Intermediate Frequency

**LED:** Light emitting diode

**LSB:** Lower Sideband

**LDMOS:** Lateral Diffused Metal Oxide Semiconductor Field Effect Transistor

**MPEG:** Motion Pictures Expert Group

**NTSC:** National Television Systems Committee (Analog)

**O/P:** Output

**PLL:** Phase Locked Loop

**PCB:** Printed Circuit Board

**QAM:** Quadrature Amplitude Modulation

**RD:** Regenerative Translator, Digital

**SMPTE:** Society of Motion Picture and Television Engineers

**TD:** Transmitter, Digital

**VSB:** Vestigial Side Band

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***System Description***

**Product Architecture**

The Innovator CX Series Systems can be configured as DTV Transmitters (i.e CU3TD) or Regenerative Translators (i.e CU3RD). The DTV Transmitter (TD) takes an ASI input and converts it to an On-Channel DTV RF output signal. The Regenerative Translator (RD) accepts an On-Channel RF signal (-79 to –8 dBm) and converts it to an On-Channel DTV RF output signal. If an optional preamp is present in the system, it is connected to the output of the receive antenna and amplifies the weak signal approximately 20 dB.

In single drawer systems (CU0TD/RD-1 through CU0TD/RD-5), the CX drawer is configured as a transmitter/repeater with an output power level of 5, 30, 50, 100 or 150 Watts ATSC. In multi drawer systems, the CX drawer is configured as an exciter/driver used to drive additional power amplifier drawers; a single amplifier drawer can operate at 250, 400 or 750 Watts ATSC; two amplifier drawers can operate at 1400 Watts ATSC; three amplifier drawers can operate at 2100 Watts ATSC; and four amplifier drawers can operate at 2500 Watts ATSC.

The Innovator CX Series system provides Adaptive Linear and Non-linear correction capability for the transmission path as well as internal test sources that are used during initial system installation. If your system contains the Optional Internal GPS Kit, the output of the GPS Antenna connects to the J5 TNC connector on the rear panel of the CX drawer. This kit supplies 10 MHz and 1 PPS references for use in the CX drawer.

**CX Drawers**

The CX drawer contains the (A12) 8VSB ATSC Digital Modulator (1316294), the (A15) Downconverter (1316715) and the (A16) Capture Board (1316716). The drawer also contains the (A6) the Amplifier Assembly, (A7) Output Detector Board (1312207), (A8) the Innovator CX Control Board (1312543), (A10) the +28V/+32V/+42V/+48VDC Power Supply and (A9) the +5V, ±12V Power Supply. To make the system a regenerative translator, the RD kit (1310182) supplies the (A1) 8 VSB Demodulator Board (1308275) for the drawer.

The type of (A6) Amplifier Assembly used in the drawer changes as the output power of the system changes. The Amplifier Assembly (1316313) is used in CU0TD/RD-1 systems, the Amplifier Assembly (1312566) is used in CU0TD/RD-2 systems, the Amplifier Assembly (1316636) is used in the CU0TD/RD-3 systems and the Amplifier Assembly (1316035) is used in CU0TD/RD-4 and CU0TD/RD-5 systems.

The (A10) Power Supply Assembly also changes as the output power of the system changes. A +48V/300W Power Supply is used in CU0TD/RD-1 systems, a +28V/300W Power Supply is used in CU0TD/RD-2 Systems, a +48V/1100W Power Supply is used in CU0TD/RD-3 systems and a +48V/1100W Power Supply is used in CU0TD/RD-4 and CU0TD/RD-5 systems.

When configured as an ATSC Transmitter (TD), the ASI "A" input at (J1) connects directly to the input jack (J30 or ASI IN1), and the ASI "B" input at (J2) connects directly to the input jack (J31 or ASI IN2), on the (A12) 8VSB Modulator Board. The 8VSB Modulator Board automatically selects the ASI "A" or "B" input depending on which input is present.

When configured to operate as a Regenerative Translator (RD), the DTV ON Channel RF Input at (J1 or J5), (-8 to -79 dBm) connects to the Tuner Input Jack on (A1) the 8 VSB Demodulator Board (1308275) supplied with the (RD) kit. The 8 VSB Demodulator Board converts the DTV input to a SMPTE-310 output at (J13), which is connected to the input jack on the (A12) 8VSB Modulator Board. The output of the 8 VSB modulator board at the RF output jack X-502 connects to J1 on the (A6) amplifier assembly.

The 8VSB Modulator Board converts the ASI or SMPTE-310M input to a digital RF TV channel frequency in the range of 470-860 MHz.

The RF on channel signal is fed to J1 on the amplifier assembly that connects to the ALC Board, Innovator CX Series (1315006), which is used to control the drive power to the RF amplifier chain in the CU0TD/RD-1, CU0TD/RD-2, CU0TD/RD-3, CU0TD/RD-4 and CU0TD/RD-5 Transmitter/Translators.

In a CU0TD/RD-1 system, the RF is connected to the (A6) Amplifier Assembly (1316313) that is made up of (A6-A1) the 1W UHF Amplifier Board (1310282) and (A6-A2) the BLF881 Single Stage Amplifier Board (1314882). The assembly has approximately 35 dB of gain. The amplified output at approximately +37 dBm connects to the (A7) Output Detector Board (1312207) which provides forward (2V=100%) and reflected (2V=25%) power samples to the CU Control Board (1312543) for metering and monitoring purposes.

In a CU0TD/RD-2 system, the RF is connected to the (A6) Amplifier Assembly (1312566) that is made up of (A6-A1) the 2 Stage UHF Amplifier Board (1308784) and (A6-A2) the RF Module Pallet w/Philips transistors (1300116). The assembly has approximately 36 dB of gain. The amplified output at approximately +38 dBm connects to the (A7) Output Detector Board (1312207) which provides forward (2V=100%) and reflected (2V=25%) power samples to the CU Control Board (1312543) for metering and monitoring purposes.

In a CU0TD/RD-3 system, the RF is connected to the (A6) Amplifier Assembly (1316636) that is made up of (A6-A1) 1W UHF Amplifier Module (1310282), the (A6-A2) single Stage UHF Amplifier Board (1314882) and (A6-A3) the RF Module Pallet w/Philips transistors (1316084). The amplified output connects to the (A7) Output Detector Board (1312207) which provides forward (2V=100%) and reflected (2V=25%) power samples to the CU Control Board (1312543) for metering and monitoring purposes.

An output power sample is also supplied to the front panel sample jack J15, which is a 50 Ohm BNC type. The typical sample value in a CU0TD/RD-3 is approximately 60dB down from the output power level of the drawer.

The RF output is cabled to J9 the "N" connector RF output jack on the rear panel of the drawer. In CU0TD/RD-1, CU0TD/RD-2, CU0TD/RD-3, CU0TD/RD-4 and CU0TD/RD-5 systems the output connects to a digital mask filter, low pass filter and then the antenna for your system. In CU1TD/RD-1, CU1TD/RD-2, and CU1TD/RD-3 systems, the RF output, from the driver drawer, is connected to J1 on the rear panel of the amplifier drawer. The RF is cabled to J1 on the Amplifier Heatsink Assembly in the amplifier drawer. In CU2TD/RD and higher power systems the RF is connected to a splitter and then to the inputs of the amplifier drawers. In systems with vertically mounted amplifier drawers, the RF output connects to the High Power Amplifier Assembly RF Input located on the rear panel of the assembly.

**Amplifier Drawers**

The CU1TD/RD-1 ATSC system is made up of a CX driver drawer and a 250 Watt ATSC amplifier drawer. The driver drawer connects to the 250 Watt amplifier drawer and supplies the needed drive level to produce the 250 Watts output of the system.

The control and operating parameters of the 250 Watt amplifier drawer are displayed on the LCD Screen on the driver drawer. In the 250 Watt amplifier drawer, the RF input signal is at J1 on the rear panel of the drawer that is cabled to J1 on the amplifier pallet. In a standard 250 Watt amplifier drawer, a single +42VDC power supply provides the operating voltages, through the current metering board, to the amplifier pallet.

In a N+1 250 Watt amplifier drawer, two +42VDC power supplies are diode "ored" and provide the operating voltages, through the current metering board, to the amplifier pallet. If one power supply should malfunction, the other power supply will maintain the necessary voltage to provide the 250 Watts output. The amplified output of the pallet, which has approximately 15 dB gain, is connected to J2 the 7/16" (1.1cm) Din RF output jack of the drawer. An output detector board supplies a forward and a reflected power sample to the amplifier control board for metering and monitoring purposes.

The standard CU1TD/RD-2 ATSC system is made up of a CX driver drawer and a 400 Watt amplifier drawer. The driver drawer output connects to the 400 Watt amplifier drawer and supplies the needed drive level to produce the 400 Watts output of the system. The control and operating parameters of the 400 Watt amplifier drawer are displayed on the LCD Screen on the driver drawer. In the 400 Watt amplifier drawer, the input RF signal at J1, located on the rear panel of the drawer, is fed to J1 on the Splitter Board, which supplies two outputs, one to each 888 amplifier pallet. Each amplifier pallet has approximately 14 dB gain. The amplified outputs of the pallets are combined in the 2 Way combiner board whose output is at J1. The RF is connected to J2 the 7/16" (1.1cm) Din RF output jack located on the rear panel of the drawer. The 2 way combiner board supplies a forward and a reflected power sample to the amplifier control board for metering and monitoring purposes. In a 400 Watt amplifier drawer, the typical sample value at J6, a 50Ω BNC jack located on the front panel of the drawer, is approximately 65dB down from the output power level of the drawer.

The CU1TD/RD-1 ATSC system w/two dual 888 pallets is made up of a CU0TD/RD-2 drawer and a 500 Watt Amplifier Drawer w/two dual 888 pallets. The CU0TD/RD-1 is used as a driver that connects to the external Amplifier drawer and supplies the needed drive level to produce the 500 Watts output of the system. The control and operating parameters of the 500 Watt Amplifier Drawer are displayed on the LCD Screen on the CU0TD/RD-1 drawer. In the CU1TD/RD-1, the input RF signal at J1 located on the rear panel of the drawer, is fed to J1 on the 2 Way Splitter Board which supplies two outputs; one to each 888A amplifier pallet. Each amplifier pallet has approximately 17 dB gain. The amplified outputs of the pallets are combined in the 2 Way combiner board whose output is at J1. The RF is connected to J2 the 7/16" (1.1cm) Din RF output jack located on the rear panel of the drawer. The 2 way combiner board supplies a forward and a reflected power sample to the amplifier control board for metering and monitoring purposes. In a CU500, the typical sample value at J6, a 50Ω BNC jack located on the front panel of the drawer, is approximately 65dB down from the output power level of the drawer.

The CU1TD/RD-3, 750 Watt ATSC system is made up of a CX driver drawer and a 750 Watt amplifier drawer. The output of the driver drawer connects to the amplifier drawer and supplies the needed drive level to produce the 750 Watts output of the system. The control and operating parameters of the amplifier drawer are displayed on the LCD Screen on the driver drawer. In the amplifier drawer the input RF signal at J1, located on the rear panel of the drawer, is fed to J1 on the 4 Way Splitter Board, which supplies four outputs, one to each 888A amplifier pallet. Each amplifier pallet has approximately 15 dB gain. The amplified outputs of the pallets are combined in the 4 Way combiner board whose output is at J1.

The RF is connected to J2 the 7/16" (1.1cm) Din RF output jack located on the rear panel of the drawer. The 4 way combiner board supplies a forward and a reflected power sample to the amplifier control board for metering and monitoring purposes. The typical sample value at J6, a 50Ω BNC jack located on the front panel of the drawer, is approximately 65dB down from the output power level of the drawer.

In higher power systems, multiple amplifier drawers are used along with splitters and combiners to produce the desired output. A System Metering Board (1312666) provides forward, reflected, over-temperature and other parameters to the exciter/driver drawer from the external power amplifier chain.

The CU2TD/RD is made up of a driver drawer, a two way splitter, two amplifier drawers and a two way combiner with a reject load. The reject load provides isolation protection of the operating power amplifier if the other amplifier fails. One–half the power of the operating amplifier drawer connected to the combiner will be dissipated by the reject load with the other half of the power going to the output filters and the antenna.

The CU3TD/RD is made up of a driver drawer, a three way splitter, three amplifier drawers and a three way combiner with reject load.

The CU4TD/RD is made up of a driver drawer, a four way splitter, four amplifier drawers and a four way combiner with reject load. The reject loads in the multi-amplifier systems have thermal switches connected to them which monitor the temperature of the load and provide the over-temperature fault, if it occurs, through the system metering board to the exciter/driver drawer.

The On Channel RF output of the amplifier drawer either connects directly to the digital mask filter and low pass filter and then to the antenna in single amplifier systems or to a combiner, the digital mask filter, low pass filter, output coupler and finally to the antenna in multiple amplifier systems. The output coupler provides a forward and a reflected power sample to the system metering board which detects the samples and supplies the forward and reflected power levels to the exciter/driver drawer for use in the metering circuits.

**Pre-Filter Sample (Non-Linear Distortion)**

The pre-filter sample from the pre-filter coupler connects to (J3), the RF input 1 jack, located on the rear panel of the driver drawer. This sample connects to the modulator board where it is used in the correction system.

**Post-Filter Sample (Linear Distortion)**

The post-filter sample from the post-filter coupler connects to (J4), the RF input 2 jack, located on the rear panel of the driver drawer. This sample connects to the modulator board where it is used in the correction system.

**IMPORTANT NOTES:**

RF feedback sample lines must not be disturbed when adaptive pre-correction is enabled. If a sample line is removed, the appropriate pre-correction mode must first be disabled and only re-enabled after the feedback signal is re-connected. RF feedback sample #1 is feedback for the non-linear pre-corrector system and sample #2 is used for the linear pre-corrector system.

The adaptive pre-correction systems are likely to be significantly affected if the sense port is moved to another coupler port with a different level or if a sample level is changed significantly (a few dB). If the linear pre-corrector system is exposed to this scenario it may generate a notable ripple in the output that may translate into an increase (or decrease) of the measured RMS level. Should this situation occur, the only way to restore proper operation is to reset the linear corrector using the controller's 'Set To Neutral' command or the web interface's 'Reset Current Curve To Factory' command and allow the pre-corrector system to start over again.

The On Channel RF output of the amplifier drawer either connects directly to the low pass filter and digital mask filter and then to the antenna in single amplifier systems or to a combiner, pre-filter coupler, low pass filter, the digital mask filter, post-filter output coupler and finally to the antenna in multiple amplifier systems. The post-filter output coupler provides a forward and a reflected power sample to the system metering board which detects the samples and supplies the forward and reflected power levels to the exciter/driver drawer for use in the metering circuits.

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***Unpacking, Installation and Maintenance***

**Unpacking**

UBS-Axcera certifies that upon leaving our facility all equipment was undamaged and in proper working order. It is imperative that all packages be inspected immediately upon arrival to verify that no damage occurred in transit to the site.

Inspect all packages for exterior damage and make note of any dents, broken seals, or other indications of improper handling. Carefully open each package and inspect the contents for damage.

Verify that all materials are enclosed as listed on the packing slip. Report any shortages to UBS-Axcera. In the event any in transit damage is discovered, report it to the carrier. UBS-Axcera is not responsible for damage caused by the carrier.

If the equipment is not going to be installed immediately, return all items to their original packaging for safe storage. Save all packing material for future use. If equipment is ever removed from the site, the original packaging will ensure its safe transport.

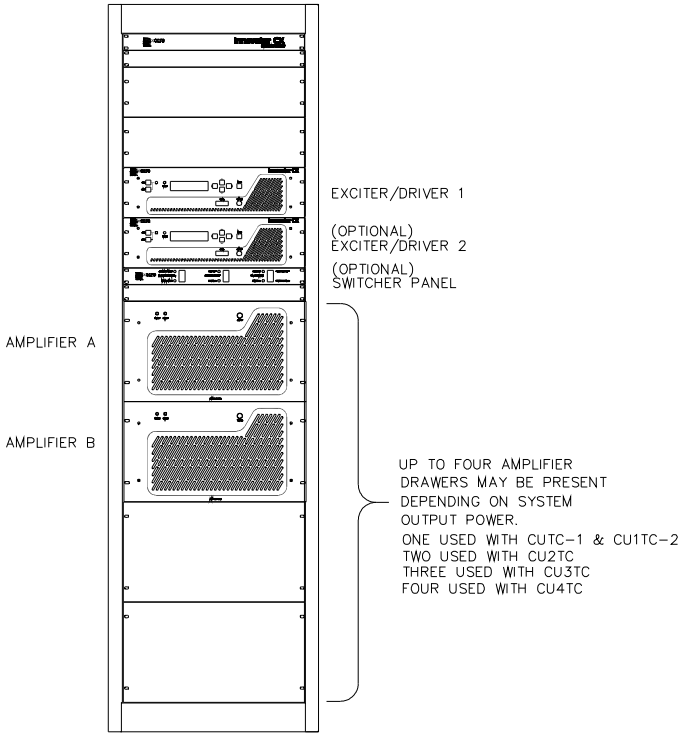


***Figure 1: CU2TD Front View - Typical Racking Plan***

**Installation**

The Innovator CX Series transmitters are designed for simple installation. Expensive test equipment is not required for installation and set up and to keep a system operational. An information decal, with Voltage Range, Current Range, Manufacturer, Model and ratings is attached to the rear panel of the stand alone drawer or if mounted in a cabinet, to the top of the frame above the door facing the rear of the cabinet. Prior to installing the product, review the following items. Check that they been installed, tested and/or inspected.

- Building Structure
- Electrical Systems
- Heating and Air Conditioning
- Receive Antenna or Satellite Dish and input cabling
- Optional ASI to S310 Converter, if needed
- Transmit Antenna and output transmission line

The Innovator CX Series systems are 17" (43.2cm) wide standard rack mountable drawers. They are sometimes supplied with side mounted Drawer Slides for ease of installation and removal.
The CU0TD/RD-1, CU0TD/RD-2, CU0TD/RD-3, CU0TD/RD-4 & CU0TD/RD-5 systems are 3 RU, 5.25" (13.3cm), high. The CU1TD/RD-1, CU1TD/RD-2 & CU1TD/RD-3 systems are 9 RU, 15.75" (40cm) high, which is 3 RU, 5.25" (13.3cm) for the driver drawer and 6 RU, 10.5" (26.7cm) for the amplifier drawer. The CU2TD/RD systems are 15 RU, 26.25" (66.7cm) high, which is 3 RU, 5.25" (13.3cm) for the driver drawer and 12 RU, 21" (53.4cm) for the two amplifier drawers. The CU3TD/RD systems are 21 RU, 36.75" (93.3cm) high, which is 3 RU, 5.25" (13.3cm) for the driver drawer and 18 RU, 31.5" (80cm) for the three amplifier drawers. The CU4TD/RD systems are 27 RU, 47.25" (120cm) high, which is 3 RU, 5.25" (13.3cm) for the driver drawer and 24 RU, 42" (106.7cm) for the four amplifier drawers. Note: Theses systems include the horizontally mounted amplifier drawers.

For systems which include the vertically mounted high power amplifier drawers, 14 RU, 24.5" (62.23cm) is required for the amplifier assembly which includes splitter and combiner assemblies as well as an amplifier shelf, which can accommodate 1 to 4 amplifier drawers. An additional 4RU, 7" (17.78cm) is required for the blower system and up to 2RU, 3.5" (8.9cm) is required for the DC power supply shelves.

**NOTE:** The Optional Dual Exciter/driver System requires an additional 4 RU, 7" (17.78cm) for mounting into the cabinet; 3 RU, 5.25" (13.3cm) for the second Exciter/Driver drawer and an additional 1 RU, 1.75" (4.43cm) for the Exciter Switcher panel.

Also needed for FCC compliance operation is an ATSC filter on the broadcast channel that connects to the output of the CU0TD/RD thru CU4TD/RD systems. Space must be provided for the ATSC filter, and in some systems, for the circulator, splitter, combiner, reject load, and low pass filter whose dimensions will vary depending on manufacturer and channel. Refer to the vendor supplied information included with your ATSC filter and low pass filter for specific dimensions. Make sure that the space provided for the CX Series equipment is sufficient and includes the circulator, splitters, combiner, reject load and external filters.

Check that any additional equipment, which is included in the system that extends above or to the side of the mounting rack, has sufficient clearance space. Refer to the custom racking plan for the system, if prepared, for detailed information.

**Drawer Slide Installation**

If the system is pre-mounted in a cabinet skip this section.

Locate the drawer slide-rails included in the installation material for your system. Refer to Figure 2 and the manufacturers instructions, included with the drawer slide-rails, for the cabinet mounting instructions of the drawer slide-rails.

Install the left drawer slid-rail into the left side of the cabinet (as viewed from the rear). Allow 3 RU, 5.25" (13.3cm) of space between the drawers for a CU0TD/RD-1, CU0TD/RD-2, CU0TD/RD-3, CU0TD/RD-4 & CU0TD/RD-5 systems. In high power systems, allow a space of 3 RU, 5.25" (13.3cm) for the driver drawer and 6 RU, 10.5" (26.7cm) for each of the amplifier drawers.

Space must also be provided for the splitter, combiner, ATSC filter and low pass filter, if present, whose dimensions will vary depending on the manufacturer and the output channel. Secure the left drawer slide-rail by connecting it to the front and rear mounting bars using No. 10 screws and the bar nuts that have been provided.
Install the drawer slide-rail on the right side of the cabinet (as viewed from the rear) making sure that it is aligned with the drawer slide-rail on the left side. Secure the slide-rail by connecting it to the front and rear mounting bars using No. 10 screws and the bar nuts that have been provided. Repeat this process for any other drawers if purchased. With both slide-rails in place, slide the drawer or drawers into the cabinet.

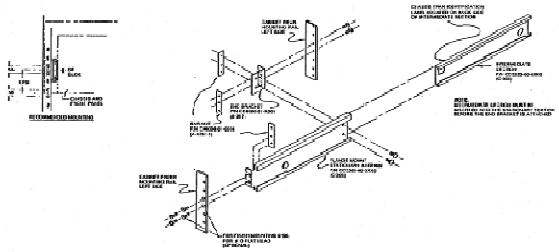

***Figure 2: Cabinet Slides***

**AC Input Connections**

***Single Amplifier Drawer Systems***

The CU0TD/RD-1, CU0TD/RD-2 and CU0TD/RD-3 single drawer systems will operate with an input voltage of 85-253VAC. The CU0TD/RD-4 single drawer systems operate on 185-253VAC. The customer should provide a single point disconnect for the main AC input connection to the transmitter. Check that the AC switch, located on the rear of the drawer above the AC power jack, is OFF. Connect the AC power cord supplied with the drawer from J6 on the rear of the drawer to the AC source. If your system has the optional ASI to S310 Converter, check that it is connected to the AC source.

If your system contains an optional preamp check that the 24VDC power supply is connected to the preamp and an AC source.

### *Multi Amplifier Drawer Systems*

If your system is a CU1TD/RD-1, CU1TD/RD-2 or CU1TD/RD-3, it also contains one amplifier drawer. In CU2TD/RD and higher power systems, multiple amplifier drawers are included. Each amplifier drawer is configured for 230 VAC operation only. Check that the ON/OFF circuit breaker in the CU1TD/RD-1 amplifier drawer, or circuit breakers in N+1 amplifier drawers, CU1TD/RD-2 or CU1TD/RD-3, located on the rear panel on either side of the AC power jack, are OFF. Connect the AC power cord supplied with the drawer from J10 on the rear of the drawer to the 230 VAC source. Refer to Table 1 for the typical voltage and current requirements for CX Systems.

### *AC Distribution Box*

If the system is mounted in a rack, an AC distribution box wired to a quad receptacle box is used to connect the AC to the individual drawers. The AC distribution box is mounted on the upper right side of the rack accessed through the back of the rack.

The main AC input for a C1TD-1 transmitter is, 195-253VAC, at least 10Amps, 50/60Hz. The customer should provide a single point disconnect for the main AC input that connects to the transmitter.

The AC input lines connect inside the AC distribution box by first removing the two screws that hold the cover plate to the front of the AC distribution box. Then connect the three wire main AC input to the input lugs, L1 to L1, L2 to L2 and Ground to Ground.

The power amplifier drawer and the quad receptacle box connect through AC power cords directly to the AC distribution box. The AC power to the optional receiver drawer and the exciter/driver drawer are connected through AC power cords that plug into the quad receptacle box.

### *AC Distribution Panel*

If the system is mounted in a cabinet, an AC distribution panel is supplied to connect the AC to the individual drawers. The AC distribution panel is mounted facing the rear of the cabinet and accessed through the back of the cabinet.

The main AC input for a CU2TD transmitter is, 195-253VAC, at least 30Amps, 50/60Hz. The customer should provide a single point disconnect for the main AC input that connects to the transmitter.

The AC input lines connect to the AC distribution panel by first removing the four #8 screws that hold the cover plate to the front of the AC distribution panel. Then connect the three wire main AC input to the input lugs located at the top left of the AC distribution panel, L1 to L1, L2 to L2 and Ground to the Ground lug on the left.

The AC distribution panel in a CU2TD has three circuit breakers that distribute the AC to the individual drawers, which are the Exciter and the two power amplifier drawers. The circuit breakers, which are accessed through the rear door of the cabinet, supply the AC though AC line cords, that connect to the AC input jacks mounted on the rear panels of the drawers. CB1 is a 30 Amp circuit breaker which supplies the AC to the (A2), top, Power Amplifier A drawer. CB2 is a 30 Amp circuit breaker which supplies the AC to the (A3), bottom, Power Amplifier B drawer. CB3 is a 10 Amp circuit breaker which supplies the AC to the (A1) Exciter/Driver drawer. A maximum of four 30 Amp circuit breakers for four amplifier drawers and two 10 Amp circuit breakers for two Exciter/Driver drawers can be installed in the AC Distribution Panel.

***Power Requirements***

***Table 1: CX Series Digital Systems Typical AC Input and Current Requirements***

| System | O/P Power | Power Consumption | Voltage | Current |
|---|---|---|---|---|
| CU0TD/RD-1 | 10 Watts | 180 Watts | 115 VAC | 1.6 Amps to the Cabinet |
| | | | 230 VAC | .8 Amps to the Cabinet |
| CU0TD/RD-2 | 30 Watts | 300 Watts | 115 VAC | 2.7 Amps to the Cabinet |
| | | | 230 VAC | 1.4 Amps to the Cabinet |
| CU0TD/RD-3 | 50 Watts | 475 Watts | 115 VAC | 4.2 Amps to the Cabinet |
| | | | 230 VAC | 2.1 Amps to the Cabinet |
| CU0TD/RD-4 | 100 Watts | 780 Watts | 230 VAC | 3.4 Amps to the Cabinet |
| CU0TD/RD-5 | 150 Watts | 1000 Watts | 230 VAC | 4.3 Amps to the Cabinet |
| CU1TD/RD-1 | 250 Watts | 1700 Watts | 230 VAC | 7.4 Amps to the Cabinet |
| CU1TD/RD-2 | 400 Watts | 2400 Watts | 230 VAC | 10.4 Amps to the Cabinet |
| CU1TD/RD-3 | 750 Watts | 4600 Watts | 230 VAC | 20 Amps to the Cabinet |
| CU2TD/RD | 1400 Watts | 8700 Watts | 230 VAC | 37.8 Amps to the Cabinet |
| CU3TD/RD | 2100 Watts | 11880 Watts | 230 VAC | 51.7 Amps to the Cabinet |
| CU4TD/RD | 2500 Watts | 14800 Watts | 230 VAC | 64.4 Amps to the Cabinet |

**NOTE:** All values are approximate.

**CX Exciter/Driver Input and Output Connections**

The CX drawer (CU0TD/RD-1 thru CU0TD/RD-5 system as well as the CU2TD/RD-1 system and higher) rear panel includes a number of input, output and serial connectors that require the user to connect cables to when installing the drawer.

When configured as an RD system, the drawer accepts an On Channel RF signal. When configured as a TD system, the drawer accepts an ASI or SMPTE 310M input. In each case, the drawer outputs a digital On Channel RF signal.

When the system had been configured as a complete rack/cabinet mounted transmitter system, cables have been installed in the rack/cabinet and hang loosely near the rear panel of the CX drawer when it is pushed all the way into the cabinet. Each cable has been labeled to simplify installation. Please refer to Figure 6 and Table 3 for the locations and information on the CX drawer rear panel connectors.

If your system contains the Optional Internal GPS Kit, the output of the GPS Antenna connects to the J5 TNC connector on the rear panel of the CX drawer.

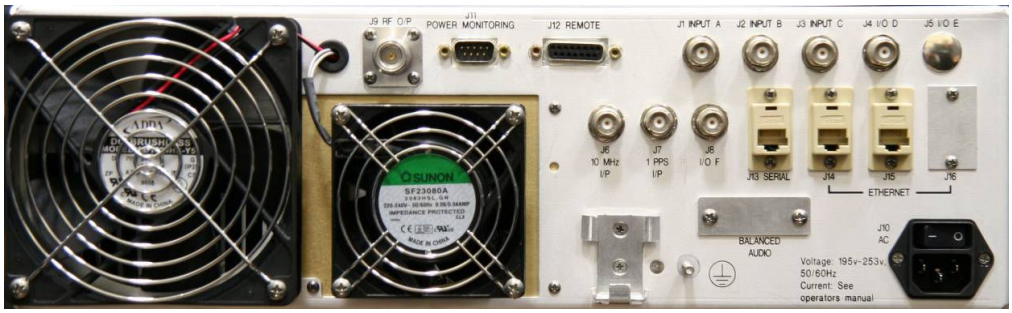


***Figure 3: CX Exciter/Driver Rear Panel***

| Port | Type | Function | Impedance |
|---|---|---|---|
| J1 | BNC | Input A: On Channel RF Input (RD) –78 to –8 dBm or ASI Input or SMPTE-310M Input | 50 Ohms |
| J2 | BNC | Input B: ASI Input or SMPTE-310M Input | 50 Ohms |
| J3 | BNC | Input C: RF Sense-1 Input from pre-filter coupler See notes 5 & 6 | 50 Ohms |
| J4 | BNC | Input D: RF Sense-2 Input from post-filter coupler. See notes 5 & 6 | 50 Ohms |
| J5 | BNC | I/O E: On Channel RF Input (RD) | 75 Ohms |
| J6 | BNC | 10 MHz Input: Optional External 10 MHz Reference Input | 50 Ohms |
| J7 | BNC | 1 PPS Input: Optional External 1 PPS Reference Input | 50 Ohms |
| J9 | N | RF Output: On Channel RF Output | 50 Ohms |
| J10 | IEC | AC Input: AC input connection to 85-264VAC Source and On/Off circuit breaker | N/A |
| J11 | 9 Pos Male D | Power Monitoring: Provides communication with System Metering board, which generates forward and reflected power samples for system metering and ALC loop control. Also provides an interlock for the Reject Loads through the System Metering board. If not used (in systems with no external amplifier) a jumper from J11-6 to J11-9 needs to be in place. Refer to Table 3 or information on the connections. | N/A |
| J12 | 15 Pos Female D | Remote: Provides communication with Remote Interface Module (A27). Used for CX Exciter remote control and status indications. Refer to Table 4. | N/A |
| J13 | RJ-45 | Serial: Provides communication to System and to external amplifier drawers, if present. | N/A |
| J14 | RJ-45 | Ethernet: Optional Ethernet connection. May not be present in your drawer. | N/A |
| J15 Front Panel | BNC | RF Sample: Output Sample from Output Detector Board. The sample level at J15 is approximately 60dB down from the output power level of the drawer. | 50 Ohms |
| J16 Front Panel | 9 Pos Female D | Serial: Used to load equalizer taps into the modulator. | N/A |

***Table 2: CX Drawer Connectors***

**NOTES:**

**1)** If your transmitter (TD) system contains an Optional ASI to S310 Converter, connect the ASI output of the STL to the ASI in jack on the rear panel of the converter. Connect the SMPTE-310 Output from the SMPTE 310 Out jack on the rear panel of the converter module to the input jack J1 on the rear panel of the CU0TD/RD-1 thru CU0TD/RD-5 drawer or the driver drawer for the CU1TD/RD-1 and higher power systems.

**2)** If your transmitter (TD) system contains an Optional K-Tech receiver, connect the RF from the receive antenna or one output of the splitter to the input jack J1 on the rear panel of the K-Tech receiver. Connect the SMPTE 310 Out jack J2 on the rear panel of the K-Tech receiver to the input jack J5 on the rear panel of the CU0TD/RD-1 thru CU0TD/RD-5 or the driver for the CU1TD/RD-1 and higher power systems.

**3)** If the system contains the optional K-Tech back up system, the K-Tech receiver is bypassed by using the second output of the splitter that connects to J1 on the rear panel of the CU0TD/RD-1 thru CU0TD/RD-5 or the driver drawer and connecting a jumper from J4 to J5, after removing the cable from the K-Tech receiver, on the rear panel of the CU0TD/RD-1 thru CU0TD/RD-5 or the driver drawer. This configuration uses the 8VSB demodulator board in the CU0TD/RD-1 thru CU0TD/RD-5 or the driver drawer to produce the SEMTE-310 signal.

**4)** If the system contains an optional preamp it connects to the output of the receive antenna and to J1 on the rear panel of the CU0TD/RD-1 thru CU0TD/RD-5 drawer.

**5)** RF feedback sample lines must not be disturbed when adaptive pre-correction is enabled. If a sample line is removed, the appropriate pre-correction mode must first be disabled and only re-enabled after the feedback signal is re-connected. RF feedback sample #1 is feedback for the non-linear pre-corrector system and sample #2 is used for the linear pre-corrector system.

**6)** The adaptive pre-correction systems are likely to be significantly affected if the sense port is moved to another coupler port with a different level or if a sample level is changed significantly (a few dB). If the linear pre-corrector system is exposed to this scenario it may generate a notable ripple in the output that may translate into an increase (or decrease) of the measured RMS level. Should this situation occur, the only way to restore proper operation is to reset the linear corrector using the controller's 'Set To Neutral' command or the web interface's 'Reset Current Curve To Factory' command and allow the pre-corrector system to start over again.

### *CX Driver/Exciter Input Connections*

Connect the On Channel RF Input (RD) –78 to –8 dBm signal, or the ASI Input or the SMPTE-310 Input to the 50Ω BNC input jack (J1 or J5) located on the rear panel of CX drawer.

If used, connect the external 10 MHz reference input to the 50Ω BNC 10 MHz input jack (J6) located on the rear panel of the CX drawer.

If used, connect the external 1 PPS reference input to the 50Ω BNC 1 PPS input jack (J7) located on the rear panel of the CX drawer.

If used, connect the external forward power sample from the pre-filter coupler to the 50Ω BNC Input C jack (J3) located on the rear panel of the CX drawer.

If used, connect the external forward power sample from the post-filter coupler to the 50Ω BNC Input D jack (J4) located on the rear panel of the CX drawer.

If your system contains the Optional Internal GLONASS or GPS Kit, the output of the GPS Antenna connects to the (J5) TNC connector on the rear panel of the CX drawer. This kit supplies 10 MHz and 1 PPS references for use in the CX drawer.

In Translator (RD) systems there is a SMPTE-310 loop-thru from the output of the Demodulator Board at J4, mounted on the rear panel of the transmitter or driver drawer, to the input to the Modulator Board at J5, mounted on the rear panel of the transmitter or driver drawer. There is a jumper installed from J4 to J5. To feed SMPTE-310 directly to the Modulator Board, remove the jumper and insert SMPTE-310 into J5. This is only used in Translator (RD) systems not Transmitter (TD) systems.

### *CX Driver/Exciter Output Connections*

The digital RF On-Channel output of the CX drawer is the (J9) 50Ω "N" connector RF output jack located on the CX drawer rear panel.

### *CX Driver/Exciter Single Drawer Output Connections*

In CU0TD/RD-1 thru CU0TD/RD-5 systems, the output of the CX drawer at J9 connects to the low pass, digital mask filter and then to the antenna for your system.

### *CX Driver/Exciter Multi Drawer Output Connections*

In CU1TD/RD-1 and higher power systems, the output of the CX drawer at J9 is connected to J1 the 50 Ohm "N" connector RF input jack located on the rear panel of the amplifier drawer or to a splitter in multiple amplifier systems.

In CU1TD/RD-1, CU1TD/RD-2 or CU1TD/RD-3 systems, check that the system power metering interface cable is connected from J11 the 9 position "D" connector located on the rear panel of the driver drawer to J4 the 9 position "D" connector located on the rear panel of the amplifier drawer. This cable provides the control, status and operating parameters of the amplifier drawer to the driver drawer.

In CU2TD/RD and higher power systems the output of the driver drawer is split and connected to J1 the "N" type connector RF input jack on the amplifier drawers. Check that the system power metering interface cable is connected from J11 the 9 position "D" connector located on the rear panel of the driver drawer to J9 the 9 position "D" connector located on the System Metering Board. Also check that the serial connection is cabled from the RJ-45 connector J13 on the driver drawer to the RJ-45 connector J1 on the system metering board. The system metering board provides serial RJ-45 connections at J2 and J5 that are cabled to the RJ-45 serial port J5 on the rear panel of the amplifier drawers. These cables provide the control, status and operating parameters of the amplifier drawers to the driver drawer through the System Metering Board.

***Power Monitoring Connections to J11***

In systems with one or more external amplifiers, J11 is used to communicate the output forward and reflected metering voltages back to the driver. J11 is connected directly to the external amplifier when there is only one external amplifier and is connected through the system metering module when multiple external amplifiers are used.

In multiple external amplifier systems there are thermal switches mounted on the output combiner reject loads. The reject load interlock is connected to thermal switches and is used to shut down the system if the reject load overheats. In systems with no external amplifier, the only connection used is the Reject Load Interlock, which must be connected to Supply Return using a jumper from J11-6 to J11-9.

| J11 Pin | Function |
|---|---|
| 1 | +12VDC |
| 2 | System Forward Power |
| 3 | System Reflected Power |
| 4 | System Aural Power |
| 5 | Remote Spare Input |
| 6 | Reject Load Interlock. (If not used, in systems with no external amplifier, must be jumpered to J11-9) |
| 7 | System Serial + |
| 8 | System Serial - |
| 9 | Supply Return (If Reject Load Interlock is not used, in systems with no external amplifier, must be jumpered to J11-6) |

***Table 3: Power Monitoring Connector J11***

***Remote Connections to J12***

The remote connections for the Innovator CX Series system are made to the Remote 15 Pos Female "D" connector Jack J12 located on the rear panel of the drawer.

**NOTE:** In dual exciter systems, remote connections are made to the rear panels of the two drivers.

***Table 4: Remote Connector J12***

| Remote Signal Name | Pin Designation | Signal Type | Description |
|---|---|---|---|
| System Operate | J12-1 | Discrete Open Collector Input - A pull down to ground on this line indicates that the System is to be placed into the operate mode. Not Available in dual exciter systems. (Low = Activate : Floating = No Change) | Command |
| System Standby | J12-2 | Discrete Open Collector Input - A pull down to ground on this line indicates that the System is to be placed into the standby mode. Not Available in dual exciter systems. (Low = Activate : Floating = No Change) | Command |

| Remote Signal Name | Pin Designation | Signal Type | Description |
|---|---|---|---|
| Power Raise | J12-3 | Discrete Open Collector Input - A pull down to ground on this line indicates that the Power of the System is to be Raised. (Low = Activate : Floating = No Change) | Command |
| Power Lower | J12-4 | Discrete Open Collector Input - A pull down to ground on this line indicates that the Power of the System is to be Lowered. (Low = Activate : Floating = No Change) | Command |
| System Interlock | J12-5 | Discrete Open Collector Input - A pull down to ground on this line indicates that the Interlock is present. Normally jumpered to J12-15. (Low = OK : Floating = Fault) | |
| Set to Modulation Type (system specific and may not be available) | J12-6 | Discrete Open Collector Input. - Sets the Modulation type of the system. (Low = Analog : Floating = Digital) | Command |
| Set Channel (Set Up 1 or Set Up 2) - (system specific and may not be available) | J12-7 | Discrete Open Collector Input. – Selects one of two possible Channel Setups of the system. (Low = Set Up 2, CH 2 : Floating = Set Up 1, CH 1) **NOTE:** The Set Up 1 & Set Up 2 settings are displayed and changed in the Upconverter Set Up Menus. | Command |
| Ground | J12-8 | Ground. | |
| System Forward Power Level | J12-9 | Analog Output - 0 to 4.0 V. - This is a buffered loop through of the calibrated "System Forward Power". Indicates the System Forward power. Scale factor is 100 % = 2.0V. | Metering |
| System Aural Power Level | J12-10 | Analog Output - 0 to 4.0 V. - This is a buffered loop through of the calibrated "System Aural Power". Indicates the System Aural power. Scale factor is 100 % = 2.0V. **(Not used in Digital)** | Metering |
| System Reflected Power Level | J12-11 | Analog Output - 0 to 4.0 V. - This is a buffered loop through of the calibrated "System Reflected Power". Indicates the System Reflected power. Scale factor is 25 % = 2.0V. | Metering |
| Report Input Status | J12-12 | Discrete Open Collector Output. - Indicates if input to system is Normal or Not. (Low = OK : Floating = Fault) | Status |
| Report Fault Status | J12-13 | Discrete Open Collector Output. - Indicates if system is Operating | Status |

| Remote Signal Name | Pin Designation | Signal Type | Description |
|---|---|---|---|
| | | Normally or has a Fault. Not available in dual exciter systems. (Low = OK : Floating = Fault) | |
| Report Operate Status | J12-14 | Discrete Open Collector Output. – Indicates whether system is in Operate or Standby. Not available in dual exciter systems. (Low = Operate : Floating = Standby) | Status |
| Ground | J12-15 | Ground. Not Available in dual exciter systems. Normally jumpered to J12-5. | |

**HPA Input and Output Connections**

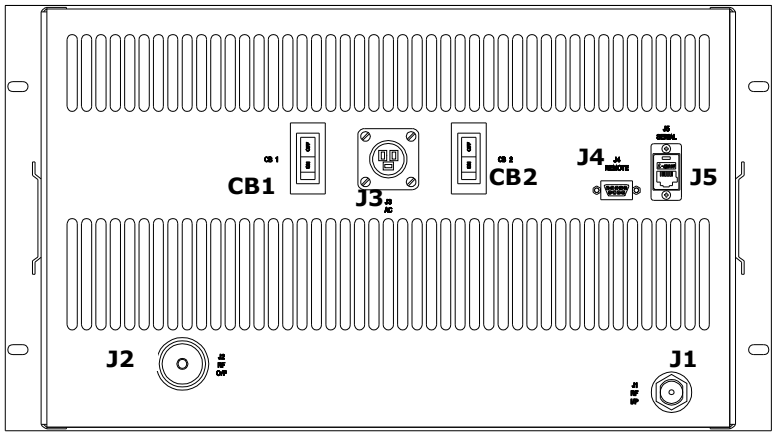


***Figure 4: Amplifier Rear Panel Connectors***

**NOTE:** Some amplifier drawers only have a CB1 circuit breaker.

| Port | Type | Function | Impedance |
|---|---|---|---|
| J1 | N | RF Input: On Channel RF from CX driver drawer | 50Ω |
| J2 | 7/16" (1.1cm) Din | RF Output: On Channel RF Output | 50Ω |
| J3 | IEC | AC Input: AC input connection to 230VAC Source | N/A |
| J4 | 9 Pos D | Remote: Amplifier Control Interface (Connects to J11 on the exciter/driver drawer) | N/A |
| J5 | RJ-45 | Serial data | N/A |
| J8 Front Panel | BNC | RF Sample: Output Sample from Combiner thru Control Board. In a CU500, the sample level is approximately 70dB down from the output power level of the drawer. | 50Ω |

***Table 5: Amplifier Connectors***

***HPA Output Connections***

The amplifier drawer digital RF On-Channel output is at the (J12) 50Ω "7/16" (1.1cm) DIN RF output jack, located on the rear panel of the drawer. The RF output jack is connected to the low pass filter, digital mask filter, then to the antenna for your system in single amplifier systems.

In multiple amplifier drawer systems, the outputs of each drawer is connected to a combiner and then the low pass filter, digital mask filter, output coupler and finally to the antenna for your system.

The output coupler provides a forward and a reflected power sample that are cabled to the System Metering Board at J8 reflected and J3 forward. Also connected to the system metering board at J10-6 & 9, is the output of the over-temperature switch mounted to the reject load that is used as the reject interlock by the system. The samples and interlock are fed through J9 on the system metering board to J11 on the driver drawer. This completes the connections of the system.

**Connecting your Transmitter to a TCP/IP Network**

To connect your transmitter to a TCP/IP Network you must set up the IP address, subnet mask, and gateway values of both the Ethernet controller and the modulator. DHCP is not available for the Ethernet controller but it can be turned on for the modulator controller. However, both devices should use static IP addressing so that these values remain constant after a power cycle. Refer to Figure 54.1.13 on Page 103 for setting up the Ethernet controller and see Figure 31 on Page 67 for setting up the modulator Network parameters.

If the transmitter system is pre-wired at the factory and includes a router, the router's WAN port should be the connection point to the network. The user must configure the router's WAN port for access to the network.

***Note: All other devices (Remote Interface panel and CX Exciters) connected to the router have been configured with a static IP address. The operator can access the other devices though the router, but the IP addresses must not be changed. Changing the static IP addresses could prevent communication between the devices and render the transmitter inoperative.***

Contact your local IT administrator for the proper TCP/IP address subnet mask and gateway settings of your network.

**Maintenance**

The Innovator CX Transmitters are designed with components that require little or no periodic maintenance, except for the routine cleaning of air intakes, fans and module front panels as well as the periodic check of general tightness of hardware.

It is recommended that periodically (the time interval depends on the amount of movement the cabinet receives) all mounting hardware, holding drawer slides, shelving and mounting plates inside the cabinet are checked for tightness. All screws and bolts that are accessible should be tightened initially when the transmitter is received and periodically thereafter if the transmitter is moved by vehicle. All coaxial connectors, hard-line connections and hardware holding combiners, splitters, or any other mounted items should be checked and tightened.

The amount of time between cleanings of the drawers and cabinets depends on the conditions within the transmitter room. While the electronics have been designed to function even if covered with dust, a heavy buildup of dust, dirt, or insects will affect the cooling of the components. This could lead to a thermal shutdown or the premature failure of the affected drawer. When the front panels of the drawers become dust covered, the drawer should be pulled out and any accumulated foreign material should be removed.

**NOTE:** To remove a drawer from the cabinet, the input and output cables must be removed from the rear (and/or front) of the transmitter before the drawer can be pulled out completely from the cabinet.

A vacuum cleaner, utilizing a small, wand-type attachment, is an excellent way to suction out any dirt from the drawer and cabinet. Alcohol and other cleaning agents should not be used unless you are certain that the solvents will not damage components or the silk-screened markings on the drawers and boards. Water-based cleaners can be used, but do not saturate the components. The fans and heatsinks should be cleaned of all dust or dirt to permit the free flow of air for cooling purposes.

It is recommended that the operating parameters of the transmitter be recorded from the LEDs and the LCD system metering on the front panel of the drawer at least once a month to be used for comparison purposes in case of a failure. It is suggested that this data be retained in a rugged folder or envelope and stored near the transmitter.

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***8VSB ATSC Modulator Board***

The Modulator design is based on the Advanced Universal Modulator board, customized to comply with ATSC standards A/53, A/54 A/64, A/110 and A/153.

The modulator converts an MPEG-2 transport stream to an 8-VSB modulated RF signal. Using a new direct digital conversion process, the modulator is able to provide an RF output that covers a standard frequency range of 470 MHz to 1 GHz with superior shoulders and MER. Optionally, the modulator can be configured with an IF frequency range of 30 MHz to 100 MHz or a RF frequency range of 30 MHz to 1 GHz.

The modulator supports ATSC features such as 8-VSB modulation, ATSC M/H processing, MFN network mode and SFN network modes with Distributed Transmission.

The modulator comes equipped with Adaptive Non-linear and Linear Digital Pre-correction that provide compensation for the non-linear distortions produced by a High Power Amplifier and the group delay introduced by an output filter. The Adaptive Pre-correction support continuous or single run adaptation, provides MER, Peak to Average Ratio, Upper Shoulder, Lower Shoulder and Group Delay measurements and allows the user to store curves on the modulator. The modulator also features Manual Non-linear and Linear Digital Pre-correction.

The modulator Controller functions are performed by an embedded controller, based on the PowerPC™ (IBM) processor. The Controller provides all external communication interfaces as well as internal board and peripheral controls. CLI, Web GUI, SNMP and Machine-to-Machine interfaces are all supported. Full remote management and control as well as remote firmware and software upgrades are provided.

**Control and Communication**

The modulator can be controlled and monitored locally (on-site), or remotely from a Network Management System (NMS).

***Control and Communication Interfaces***

There are two interface ports provided for control and communication:

- Ethernet Port (RJ-45) – used for local control with a laptop PC and remote access through a LAN. Web GUI, SNMP and CLI (Telnet and HyperTerminal) protocols are supported.
- USB Port (Type B) – used for local control, initial setup, status information and troubleshooting with a laptop PC. A Command Line Interface (CLI) is the supported protocol.

***SNMP***

The modulator SNMP interface provides the means for remote management of the modulator and to accept alarm traps. The notification options can be configured on a per-alarm basis. The user may decide to mask certain alarms, increase/decrease integration time to declare an alarm, etc. Alarm and event logs are available via the SNMP interface and are stored in Non Volatile Memory.

***Web GUI***

The modulator hosts an internal web interface (Web GUI) accessible through its Ethernet port. The Web GUI is an intuitive interface allowing the user to access the current modulator status and configure the operational parameters of the system. The Web interface uses a simple hierarchical menu structure which provides access to all modulator parameters.

For a detailed description of the Web GUI interface refer to Web GUI Interface.

***CLI***

The CLI allows the user to access the current modulator status and configure the operational parameters of the system. The CLI uses a simple hierarchical menu structure which provides access to all modulator parameters.

For a detailed description of the CLI interface refer to CLI (Command Line Interface).

***Local Access***

The modulator can be controlled and monitored locally (on site) through the Ethernet Port and/or the USB port with a laptop PC.

The Ethernet port provides access to the Web GUI and CLI through Telnet. The USB port provides access to the CLI, which allows the operator to perform initial setup/troubleshooting when network connectivity is not available or desired.

***Remote Access***

The Network Management System (NMS) operator can control and monitor the modulator remotely through the Ethernet port and LAN using the Web GUI and/or SNMP interfaces.

To facilitate the remote control of several modulators, each modulator may be individually named (16 characters). This "name" is available on the control interfaces.

**Network Parameters**

The network parameters need to be configured properly to communicate with the modulator on an IP network. This is required to access the Web GUI, SNMP or the CLI on Telnet, as well as for upgrading the main software components.

If the default network settings are known and want to be changed, the user can do so with the Web GUI – see Figure 31 for details.

**Transport Stream Inputs**

***DVB-ASI Inputs***

The DVB-ASI inputs accept an MPEG-2 transport stream according to DVB recommendations. Both 188 and 204 byte transport packets are supported.

Automatic switching provides near seamless switching to a secondary transport stream if the primary transport steam source fails.

***SMPTE 310M Inputs***

The SMPTE 310M input accept a MPEG-2 transport stream.

***Note: The SMPTE 310M inputs are an optional feature of the ATSC modulator.***

**Modulator Operating Modes**

The modulator operating modes are Normal and CW. In Normal mode, the modulator generates a complete ATSC (8-VSB) waveform. In CW mode, the modulator generates a narrow-band frequency tone.

**ATSC M/H Mode**

The modulator can be configured to process incoming M/H packets created by an M/H pre-processors.

**Network Modes**

The modulator can be configured for MFN or SFN network operation.

**RF Output**

The RF output covers a frequency range of 470 MHz to 860 MHz in 1 Hz steps.

**Windowing (Window Enabled)**

The windowing function is a raised cosine window that reduces the modulation sidebands of the COFDM spectrum. It may be enabled or disabled.

**Internal Frequency Reference**

The modulator is equipped with an internal reference frequency that has a stability of ± 0.05ppm, suitable for MFN Mode. Where higher accuracies are required, an external 10 MHz reference signal must be applied to the 10 MHz external reference input.

**Manual Digital Linear and Non-linear Pre-correctors**

The modulator is equipped with digital linear and non-linear pre-correctors (pre-distorters) that can significantly improve the performance of a transmitter. The Pre-corrector function can be switched on and off from the Web GUI or CLI.

The Non-linear pre-corrector compensates for power amplifier non-linearity and is able to provide a separate adjustment for the low and high frequency shoulders of the wide channel spectrum. Additionally the non-linearity corrector may serve as peak limiter in order to control peak to average power ratios. The Linear pre-corrector compensates for the group delay created by an output filter.

The input-gain of the Pre-corrector can also be used to adjust the power-level of a transmitter.

| | |
|---|---|
| **CAUTION!**  | Adjusting the input-gain of the Pre-corrector and thereby the power-level of the transmitter must be carried out with the utmost care, since higher than normal levels may cause damage to the transmitter. |

The construction of the Pre-corrector curve is aided by a software application that provides a graphical user interface to the Pre-corrector curve. Combined with a spectrum analyzer on the transmitter output, a repetitive process can be carried out to optimize the pre-corrector curve to the actual transmitter.

In addition to being a highly effective tool for creating pre-correction curves, the UBS-Axcera Corrector GUI has extensive features for storing and retrieving pre-correction curves to and from the PC storage medium (for example hard disk drive). The UBS-Axcera Corrector GUI also allows storing and retrieving up to ten linear and non-linear curve presets to and from the modulator.

The Manual for the **Digital Pre-Corrector GUI Software** describes in detail the operation of the Pre-corrector.

**Adaptive Non-linear and Linear Digital Pre-correction**

The modulator is equipped with Adaptive Non-linear and Linear Digital Pre-correction that provides compensation for the non-linear distortions produced by a high power amplifier and the group delay introduced by an output filter.

High power amplifier and band pass filter feedback (reference) signals are downconverted to 25 MHz IF before the "adaptation process" or "cycle" begins.

The "adaptation process", or "cycle", includes set-up of the capturing cycle, the capturing of data, signal measurements, the calculation of NLP/LP coefficients and the transfer of coefficients and signal measurement to the modulator board.

Once the capturing cycle is set up, the downconverted HPA or BPF reference signal is sampled by an ADC and stored in a local memory buffer for the processor to read upon completion of the data capturing process.

The processor compares the captured data to the ideal waveform curves (stored on the capture card) and calculates NLP or LP coefficients. The coefficients are then transferred to the modulator board for control of the back-end Non-linear or Linear Digital Pre-corrector. A number of signal measurements, including MER, Peak to Average Ratio, Upper Shoulder, Lower Shoulder and Group Delay are also transferred to the modulator board and are displayed by the modulator interfaces (Web GUI, CLI).

## Web GUI Interface

### *Introduction*

The modulator parameters can be reviewed or changed using the Web GUI interface. The Web GUI is an intuitive interface allowing the user to access the current modulator status and set up the operational parameters. The Web GUI interface uses a simple hierarchical menu structure which provides access to the modulator parameters though a series of pull down menus.

The modulator needs to be assigned an IP address in order to access the Web GUI. The modulator is shipped from the factory with a default IP address, but the user will need to configure the IP address of each unit for local network access. The IP address can be accessed and modified from the front panel or CLI.

### *Login*

- Open a Web browser window (Internet Explorer, Firefox, etc.) and enter the modulator IP address. For example: http://172.20.30.210/.
- The first menu page is the login page.
- The User Name field must be kept blank, while the default password for normal access is "admin"

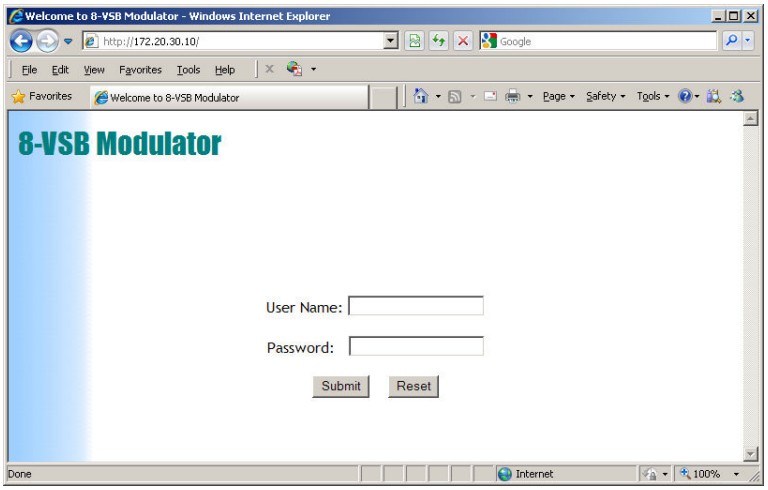



***Figure 5: 8-VSB Modulator Login Page***

### *Main Status Page*

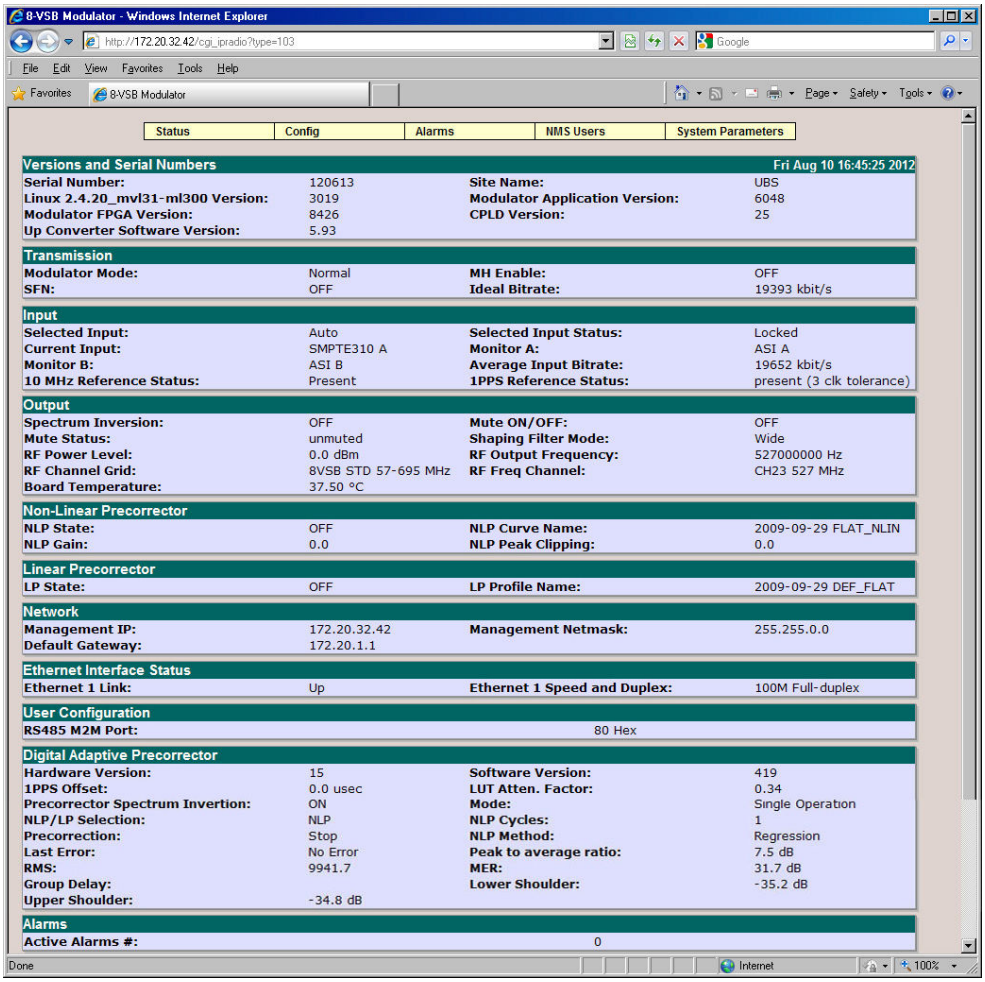



***Figure 6: Modulator Global Status Page (MFN Mode)***

The main (Global) status page provides general information about parameter settings and the modulator's alarm status. The pull down menus, located at the top of the status page, provide links to other pages that control various parameters and alarm functions.

***GUI Navigation and Structure***

The main (Global) status page seen in Figure 6 demonstrates the hierarchical structure of the Web GUI interface. Along the top of the page are a row of five icons with drop down menus. The five menu categories accessible via the Web GUI interface are:

- Status – Displays the current operating status of the modulator
- Config – Provides access to change the modulator operating parameters
- Alarms – Alarm status and settings as well as alarm log information
- NMS Users – Set user(s) log in authorization level, passwords and other information
- System Parameters – Set access control, network and SNMP parameters. Also used for system reset and software upgrades

The menu tree for the Web GUI is shown below:

| **Status** | **Config** | **Alarms** | **NMS Users** | **System Parameters** |
|---|---|---|---|---|
| ⬇ | ⬇ | ⬇ | ⬇ | ⬇ |
| Global Status | Modulator Mode | Alarm Properties | User Properties | Identification |
| | Transmission | Clear Logs | | Access Control |
| | Input | Alarm Status | | Network Parameters |
| | Output | | | SNMP Parameters |
| | RF Channels | | | System Time |
| | Non-linear Pre-corrector | | | Heartbeat Time |
| | Linear Pre-corrector | | | System Reset |
| | Site | | | User Configuration |
| | UART Baudrate | | | Download Config File(s) |
| | Digital Pre-corrector | | | Upgrade and Files Upload |
| | | | | List Uploaded Files |

***Table 6: Web GUI Menu Structure***

### *Changing Parameters*

Before changes to system parameters are accepted the user must first click the submit button. The example below has the user clearing the alarm log in the Clear Log screen.

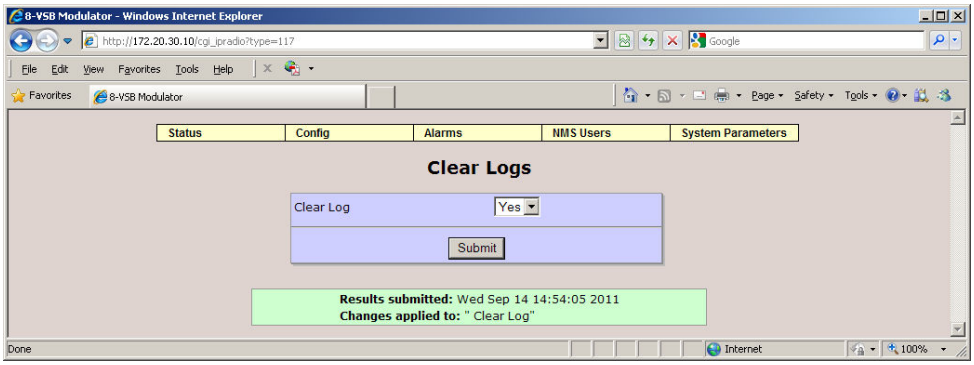



***Figure 7: Example of Submitting a Parameter Change***

Once the user has selected "Yes" for the Clear Log pull down box, the user will then need to click Submit. At that time a small green box will appear at the bottom of screen confirming the change.

### *Status Menu*

The Status menu contains the following drop-down items, as seen in Figure 8.

- Global Status

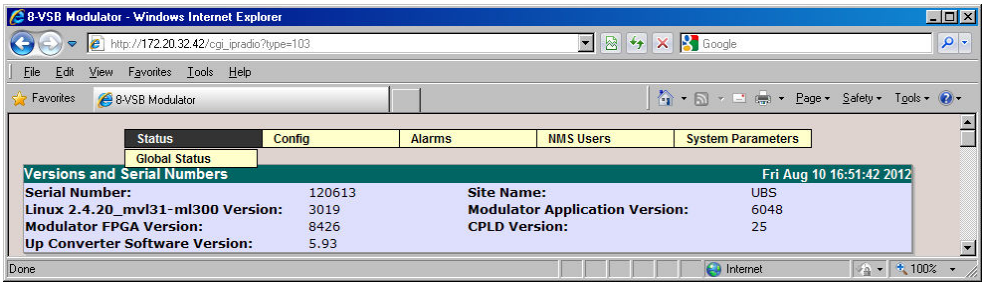



***Figure 8: Status Menu Selection***

***Global Status Page***

The Global status page appears upon login and provides general information about parameter settings and the modulator's alarm status. The list of parameters will change dynamically as the transmission mode (MFN or SFN) is changed. See Figure 8 or Figure 9 for details.

The drop down menus, located at the top of the status page, provide links to other pages that control various parameters and alarm functions.

- **Versions and Serial Numbers:** Displays the software and firmware version number for each of the main software components of the modulator.
- **Transmission:** Displays the Modulator Mode (**Normal or CW**), the SFN status (**On or OFF**) as well as the MH Enable status (**ON or OFF**) and the Ideal Bitrate. Additional transmission parameters, including Transmitter ID, OM_type, Stream Maximum SFN Delay, STS Backend Delay, STS Propagation Delay, Local DelayOffset, Net Id Pattern, Tx Id Level and Transmit Power will become available when SFN mode is enabled.
- **Field Rate Side Channel:** Indicates whether a Field Rate Side channel is present or not and displays the System Mode, Primary Communication Channel and Active Channel.
- **Input:** Displays the Selected Input (**A, B or Auto**) and the Input Status (**Locked or Unlocked**). This section also shows the input bit-rate and the status of the reference inputs: "10MHz" and "1pps".
- **Output**: Displays the status of the Mute parameter (un-muted in this case) and the spectrum inversion (**ON or OFF**). It also shows whether the output is muted or not (even though the Mute is OFF, the output might be muted as a result of an active alarm). This section also displays the RF Output Frequency and the RF Power Level.
- **Pre-corrector**: Displays the status of the Linear and non-linear pre-corrector
- **Network**: Displays the modulator IP addresses, gateway and the management netmask.
- **Ethernet Interface status**: Indicated the status of the Ethernet connection
- **User Configuration**: Displays the address assigned to the RS485 port for M2M communication.
- **Digital Adaptive Precorrector**: Indicates the Digital Pre-corrector Hardware and Software revisions as well as the user configured Pre-corrector settings (1PPS Offset, Mode, NLP/LP Selection, NLP Cycles and status). The window will also display the Non-linear and Linear measurements including Peak to Average Ratio, MER, Lower Shoulder, Upper Shoulder and Group Delay. The RMS measurement is a scaling factor used to indicate the Pre-corrector input power level. The maximum allowable value is 32,000,000.
- **Alarms**: Shows the number of active alarms.

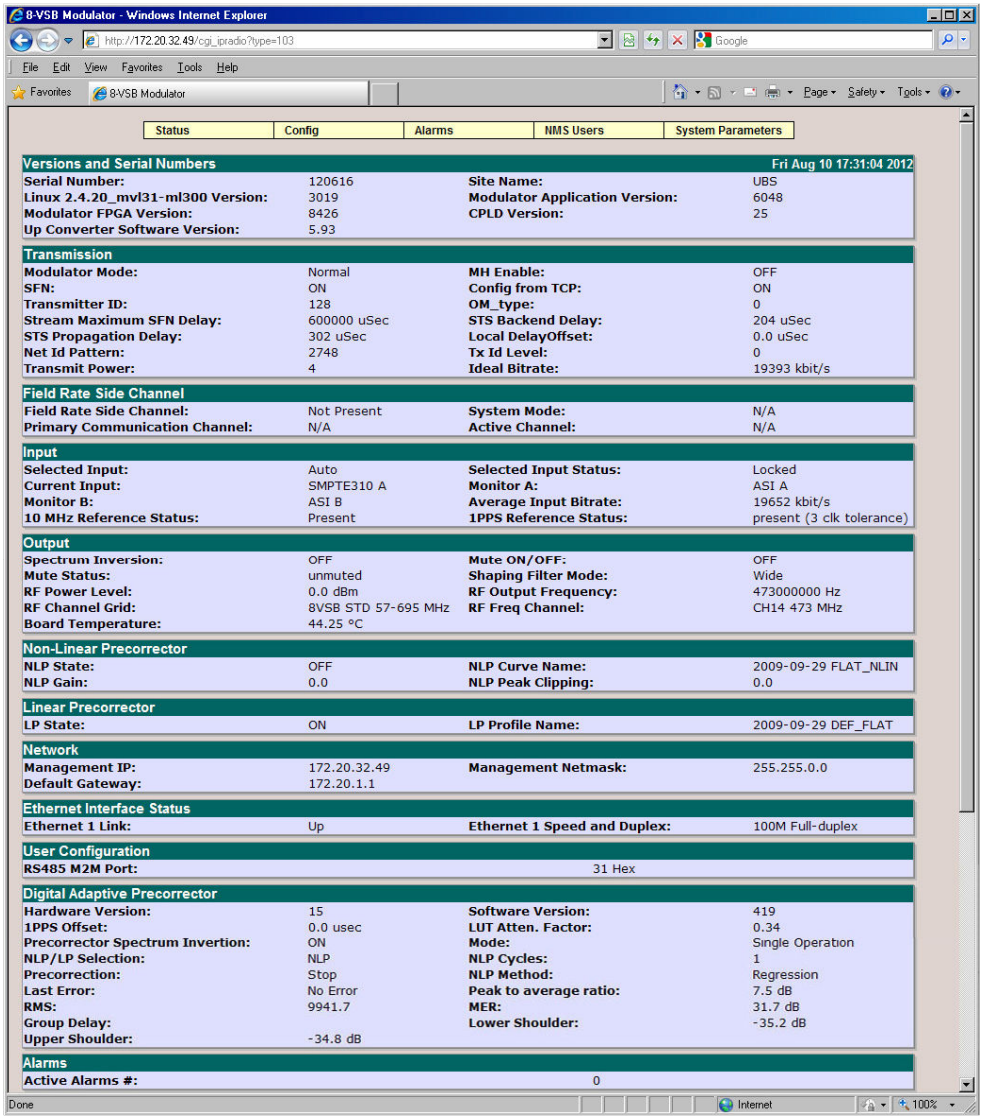



***Figure 9: Modulator Global Status Page (SFN Mode)***

***Config Menu***

The Config menu contains the following drop down items, as seen in Figure 10.

- Modulator Mode
- Transmission
- Input
- Output
- RF Channels
- Non-Linear Precorrector
- Linear Precorrector
- Site
- UART Baudrate
- Digital Precorrector

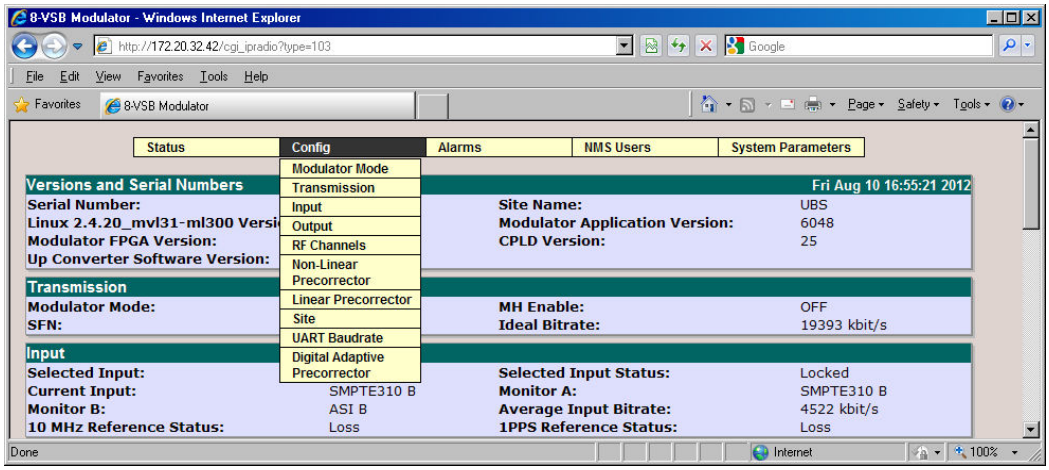



***Figure 10: Config Menu Selection***

### *Modulator Mode*

The Modulator Mode page allows the users to select a normal (8-VSB) or a CW output signal.

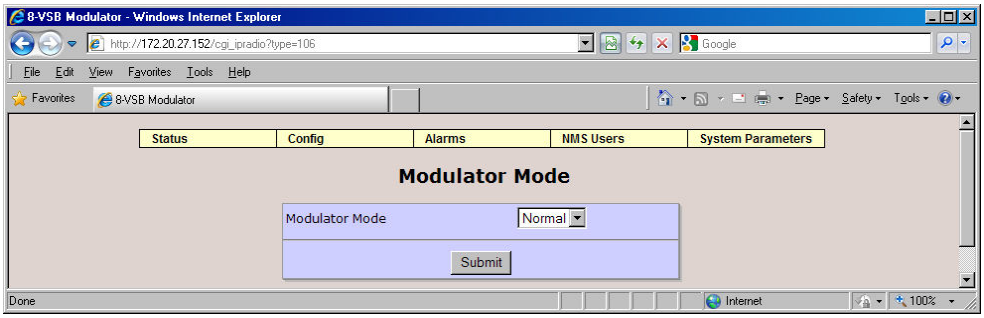



***Figure 11: Modulator Mode Configuration***

The available parameters are:

| Item | Option |
|---|---|
| Modulator Mode | Normal, CW |

***Table 7: Modulator Mode Configuration Parameters***

CW is a special test mode not used in regular operation. The CW mode generates a narrow-band frequency tone. This is useful for phase noise measurements or to view background noise.

### *Transmission*

The Transmission page allows the user to enable/disable ATSC-MH waveform support, enable/disable SFN network operation and configure parameters from the information imbedded in the TCP. The Transmission page will change dynamically, depending on enabled/disabled modes.

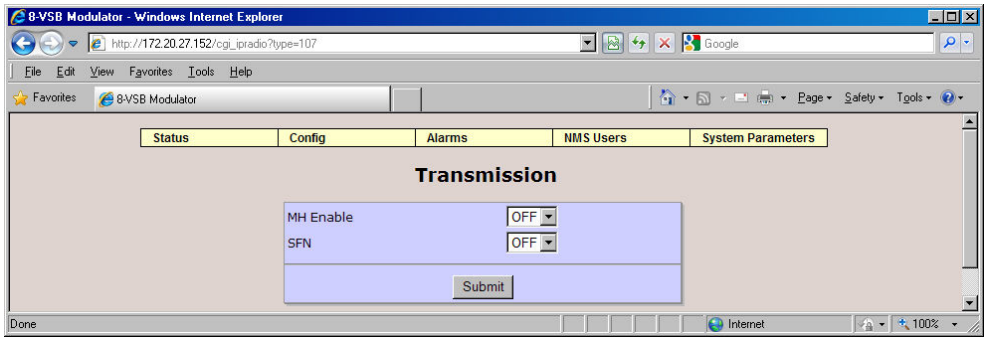



***Figure 12: MFN Transmission Configuration***

The available parameters in MFN Mode are:

| Item | Selection |
|---|---|
| MH Enable | OFF, ON<br><br>If this parameter is set to ON, ATSC-MH waveform support will be enabled. |
| SFN | OFF, ON<br><br>If this parameter is set to ON, the modulator will operate in SFN mode and a number of additional parameters can be edited by the user. |

***Table 8: MFN Transmission Parameters***

When the modulator is used in conjunction with a UBS DTx Adapter, the user must configure the modulator's Transmitter ID (tx_address) correctly, so that the TCP command information used to address the individual modulator (transmitter) is extracted.

The Transmitter ID is a 12-bit unsigned integer, with a user configurable range of 0 to 4095. The Transmitter ID's decimal value is equal to the DTx Adapter's three character hexadecimal string, which is determined by the DTx Adapter's tx_group_ number and tx id.

For example, a tx_group_number of "AB" and a tx id of "9", would generate a 3 character hexadecimal string of "AB9". In this case, the user must enter a Transmitter ID of 2745. A tx_group_number of "DE" and a tx id of "15", would generate a 3 character hexadecimal string of "DEF". In this case, the user must enter a Transmitter ID of 3567.

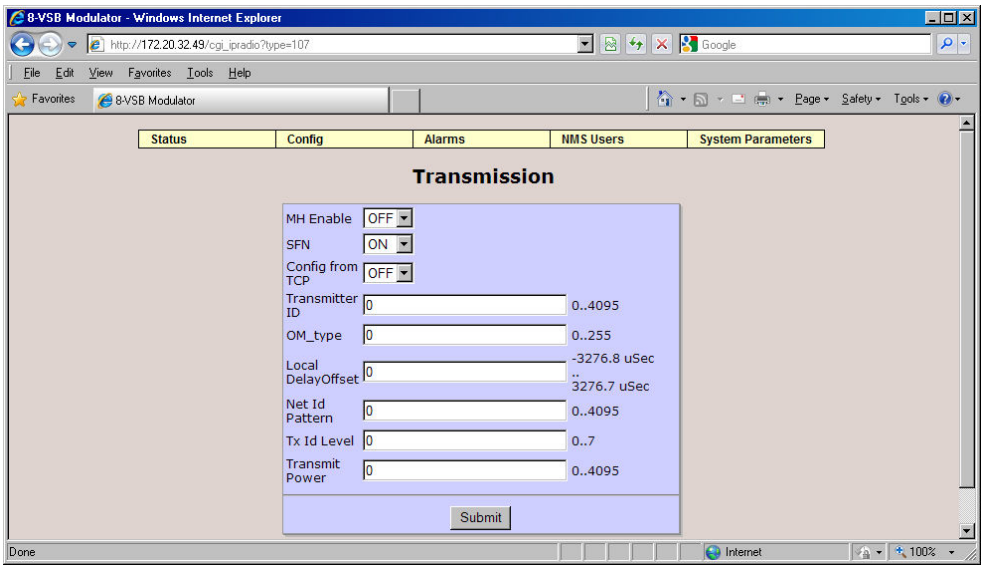



***Figure 13: SFN Transmission Configuration***

The available parameters in SFN Mode are:

| **Item** | **Option** |
|---|---|
| MH Enable | OFF, ON |
| SFN | OFF, ON |
| Config from TCP | ON, OFF<br><br>This parameter is only relevant when SFN is enabled. If "Config from TCP" is ON OM_type, Local Delay Offset, Net ID Pattern, Tx Id Level and Transmit Power will be automatically configured by the information imbedded in the TCP. |
| Transmitter ID | Range: 0 .. 4095 |
| OM_type | Range: 0 .. 255 |
| Local DelayOffset | Range: -3276.8 .. 3276.7 µsec |
| Net ID Pattern | Range: 0 .. 4095 |
| Tx Id Level | Range: 0 .. 7 |
| Transmit Power | Range: 0 .. 4095 |

***Table 9: SFN Transmission Parameters***

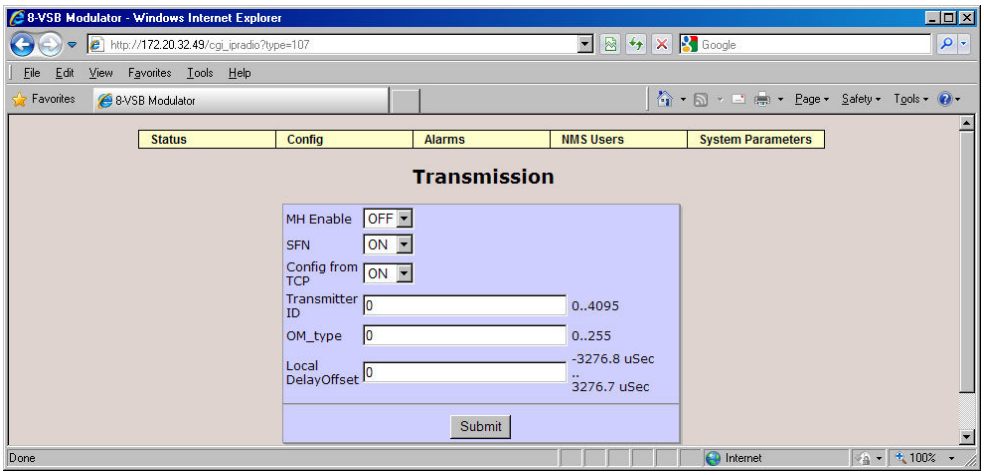



***Figure 14: SFN Transmission Configuration- Config from TCP On***

### *Input*

The Input page allows the user to configure the modulator input so that is can be selected automatically, or set to a specific input.

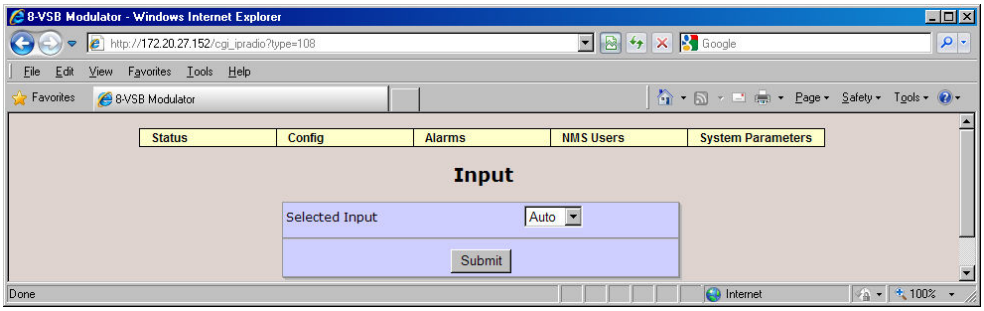



***Figure 15: Input Configuration***

The available parameters are:

| **Item** | **Selection** |
|---|---|
| Selected Input | A, B, Auto **(SMPTE310 A and SMPTE310B optional)** |

***Table 10: Input Parameters***

***Note: SMPTE 310M inputs are optional and are only visible when installed in the modulator.***

### *Output*

The Output page allows the user to Mute the modulator output, set the Spectrum Inversion, set the Shaping Filter Mode, modify the RF Power Level and modify RF Output Frequency.

There are two ways for the user to set the output frequency. The first option is to directly set the center frequency of the channel using the "RF Output Frequency" box in Figure 16. Once a value is entered the user will need to click "Submit" for the change to take effect.

The second option allows the user to select an RF Channel from pre-defined grid – see section on RF Channels.

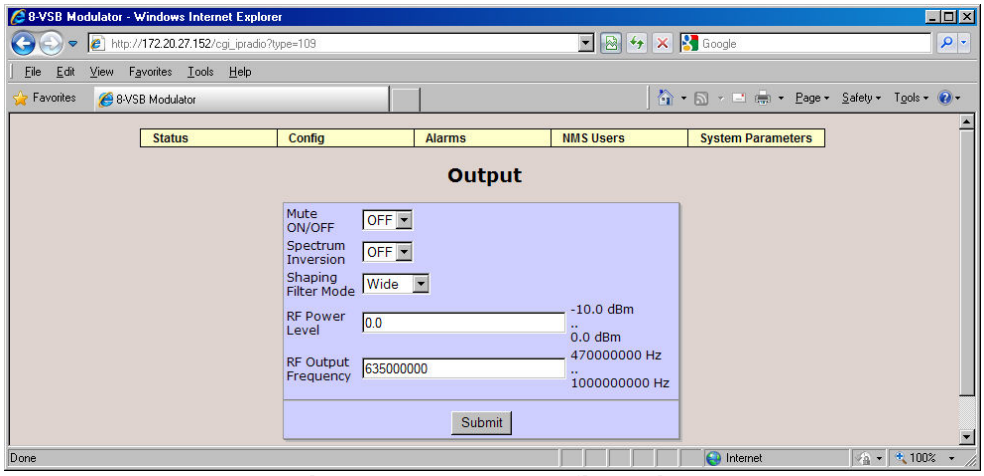



***Figure 16: Output Configuration***

The available parameters are:

| **Item** | **Selection** |
|---|---|
| Mute ON/OFF | OFF, ON |
| Spectrum Inversion | OFF, ON |
| Shaping Filter | Narrow, Wide |
| RF Power Level | Range: -10.0 .. 0.0 dBm |
| RF Output Frequency | Range: 470000000 .. 1000000000 Hz |

***Table 11: Output Parameters***

### *RF Channels*

The RF Channels page allows the user to select the RF output frequency via a pre-defined RF channel grid supplied with the modulator.

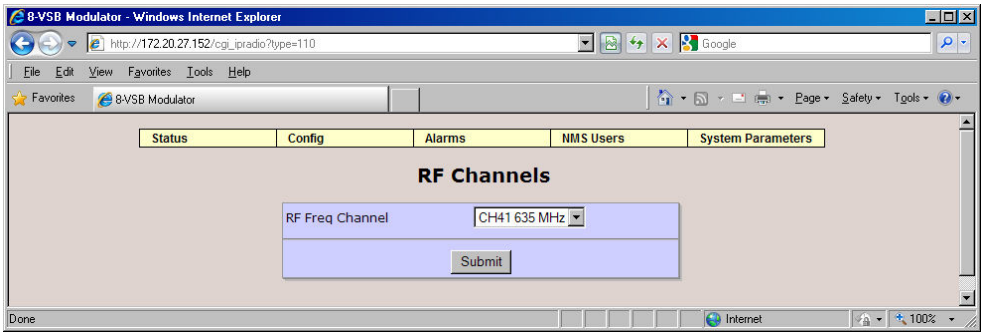



***Figure 17: RF Channels***

***Note: If the user tries to select a channel which is outside the frequency range supported by the modulator, an error message will occur.***


***Figure 18: RF Channel Selection Error***

### *Non-linear Pre-corrector*

This page allows the user to select the NLP (Non-Linear pre-corrector) State and Profile.

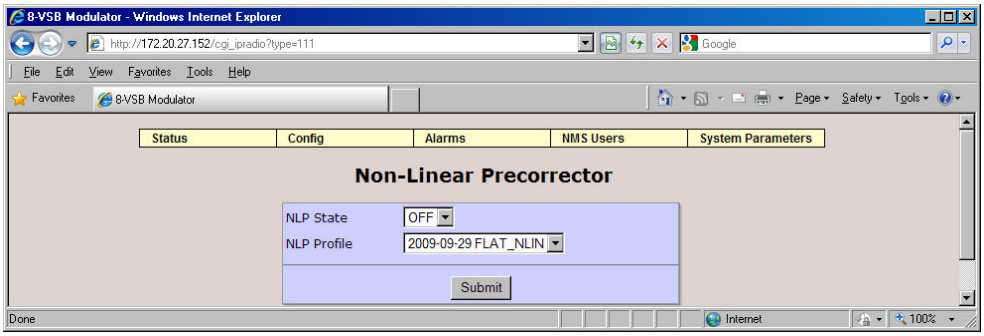



***Figure 19: Non-linear Precorrector Configuration***

The available parameters are:

| Item | Selection |
|---|---|
| NLP State | OFF, ON |
| NLP Profile | A selection of different NLP profile files |

***Table 12:Non-linear Precorrector Parameters***

### *Linear Pre-corrector*

This screen allows the user to select the LP (Linear pre-corrector) State and profile.

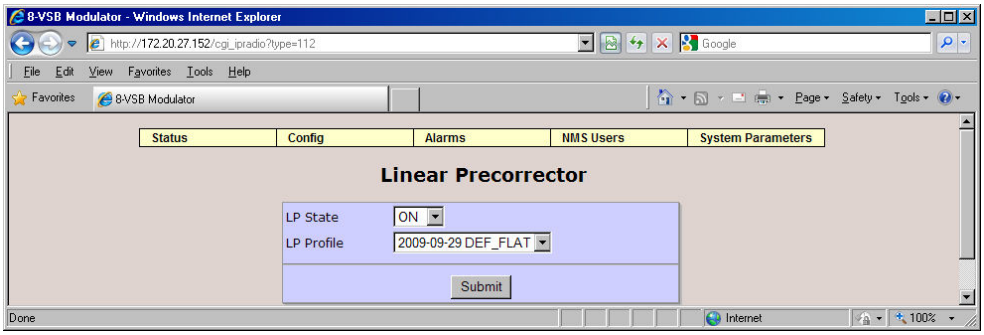



***Figure 20: Linear Precorrector Configuration***

The available parameters are:

| Item | Selection |
|---|---|
| LP State | OFF, ON |
| LP Profile | A selection of different LP profile files |

***Table 13: Linear Precorrector Parameters***

***Digital Adaptive Pre-corrector***

The Digital Pre-corrector page allows the user to configure the capture card cycle (adaptation process) settings and store the NLP and/or LP Profiles (coefficients) into memory.

**Pre-correction Set-up**

The user should first select which pre-correction cycles will be run by configuring the "NLP/LP Selection" parameter. The user may select Non-linear Pre-correction (NLP), Linear Pre-correction (LP) or both. The user should also select how many NLP cycles will run for every LP cycle. When the modulator is synchronized with a 1PPS reference signal (from a GPS receiver), the user can offset the cycle start time, relative to the 1PPS signal.

Note: The NLP cycle will always run before the LP cycle when both cycles are selected.

The user must then select the "NLP Method" to determine which pre-correction algorithm is used. The user should first try "Regression" mode. If the results are undesirable, the user should then try "RLS" mode, then "Legacy" mode.

The user must then select the "Mode" parameter and set the "Precorrection" parameter to "Run" to start the cycle(s) (adaptation process). When the "Mode" parameter is set to Adaptive, the NLP and/or LP coefficients will be optimized constantly. When the "Mode" parameter is set to "Single Operation", the NLP and/or LP coefficients will only be optimized once.

If the "Precorrector" parameter is set to "Stop", the NLP and/or LP cycles will stop, with the last calculated coefficients being used. In other words, the cycle(s) will stop, but the Non-linear Pre-correction and/or Linear Pre-correction will not be disabled. To disable the pre-correction, the "Precorrection" parameter must be set to "Stop" and "Reset Precorrector" must be set to "ON". Setting "Reset Precorrector" to "ON" while the cycle(s) have stopped will clear the NLP and LP coefficients.

Note: Any time a parameter is changed (i.e from NLP to NLP/LP) the user should first Stop the Precorrection then Reset the Precorrection prior to changing the parameter. This excludes saving NLP or LP profiles.

**Storing a Profile (Curve) to Memory**

To store the active Profile (coefficients) to memory, the user must set "Save Adaptive NLP Profile" or "Save Adaptive LP Profile" to "ON". Before saving, the user should configure the "Profile Name" and "Profile Number" accordingly.

**Loading a Profile (Curve) from Memory**

A NLP or LP Profile can be loaded from memory using the Non-linear or Linear Pre-corrector pages – see the Non-linear and Linear sections. The user must select the desired profile from the NLP or LP Profile pull-down menu and ensure that the NLP or LP State is set to "ON".

Note: If the user has saved a profile (curve) to memory and decides to stop the Adaptive Pre-correction process, the user should navigate to the Non-linear and/or Linear Pre-corrector pages and select the desired profile from the pull-down menu and ensure that the state is set to "ON". This will ensure that Non-linear and/or Linear Pre-correction is enabled following a modulator reset and that the correct profile (curve) is loaded.

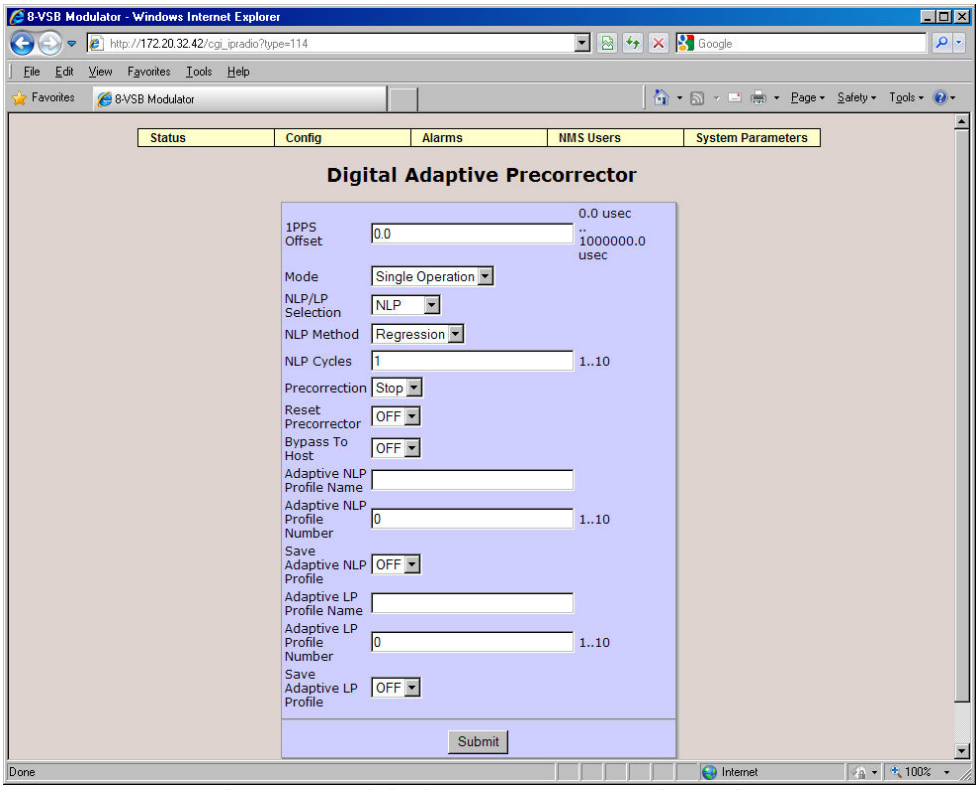



***Figure 21: Digital Precorrector Configuration***

The available parameters are:

| **Item** | **Selection** |
|---|---|
| 1PPS Offset | Range: 0.0 .. 10000000.0 usec<br><br>Used to offset the cycle start time, relative to the 1PPS reference signal. |
| Mode | Single Operation, Adaptive<br><br>Adaptive mode must be selected for continuous operation. |
| NLP/LP Selection | NLP, LP, NLP/LP<br><br>Used to determine which cycles (adaptation processes) will be run. |

| Item | Selection |
|---|---|
| NLP Method | Legacy, RLS, Regression<br><br>Used to select Pre-correction algorithm. |
| NLP Cycles | Range: 1 .. 10<br><br>Ratio of NLP cycles to LP cycles. "X" number of NLP cycles will run before one LP cycle is run. |
| Precorrection | Stop, Run<br><br>Used to Run or Stop the cycles (adaptation processes). Note: Pre-correction is not disabled when the cycles are stopped. |
| Reset Precorector | OFF, ON<br><br>Used to clear the NLP and LP coefficients. |
| Bypass To Host | OFF, ON<br><br>Parameter is only set to ON if the Digital Pre-corrector is controlled using the PC GUI application. |
| Adaptive NLP Profile Name | Up to 35 alphanumeric characters |
| Adaptive NLP Profile Number | Range: 1 .. 10 |
| Save Adaptive NLP Profile | OFF, ON<br><br>Set to ON, to save curve to memory. Profile name and number should be entered before saving. |
| Adaptive LP Profile Name | Up to 35 alphanumeric characters |
| Adaptive LP Profile Number | Range: 1 .. 10 |
| Save Adaptive LP Profile | OFF, ON<br><br>Set to ON, to save curve to memory. Profile name and number should be entered before saving. |

**Comment [M1]:** Added text

***Table 14: Digital Precorrector Parameters***

Note: If the user would like to use the Adaptive Pre-corrector PC GUI, several parameters must be configured via the Web GUI (or CLI) before communication between the modulator and Adaptive Pre-corrector GUI can be established. The user must set the "Bypass To Host" parameter to "ON" and the "Precorrection" parameter to "Stop".

### *UART Baudrate*

***Note: The UART Baudrate page is reserved for factory configuration and should not be modified by the user.***

### *Site*

The Site page allows the user to add information identifying the site, including the name of the site, address, contact information, etc. Each item is limited to 35 alphanumeric parameters.

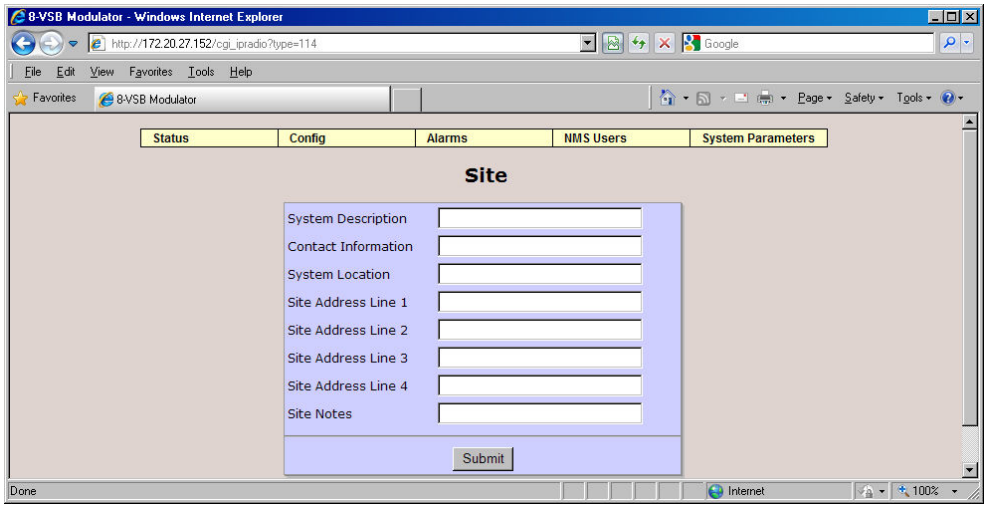



***Figure 22: Site Configuration***

The available parameters are:

| **Item** | **Option** |
|---|---|
| System Description | up to 35 alphanumeric characters |
| Contact Information | up to 35 alphanumeric characters |
| System Location | up to 35 alphanumeric characters |
| Site Address Line 1 | up to 35 alphanumeric characters |
| Site Address Line 2 | up to 35 alphanumeric characters |
| Site Address Line 3 | up to 35 alphanumeric characters |
| Site Address Line 4 | up to 35 alphanumeric characters |
| Site Notes | up to 35 alphanumeric characters |

***Table 15: Site Parameters***

### *Alarms Menu*

The Alarms menu allows the user to set the properties of each alarm including system actions, and allows the user to view alarm and event logs.

The Alarms menu contains the following pull-down items, as seen in Figure 23.

- Alarm Properties
- Clear Logs
- Alarm Status

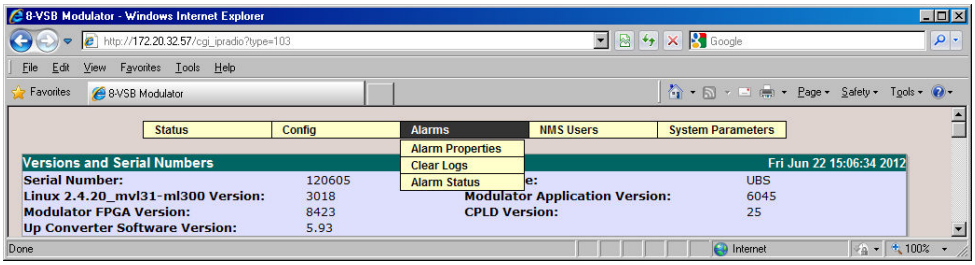



***Figure 23: Alarms Menu Selection***

### *Alarm Properties*

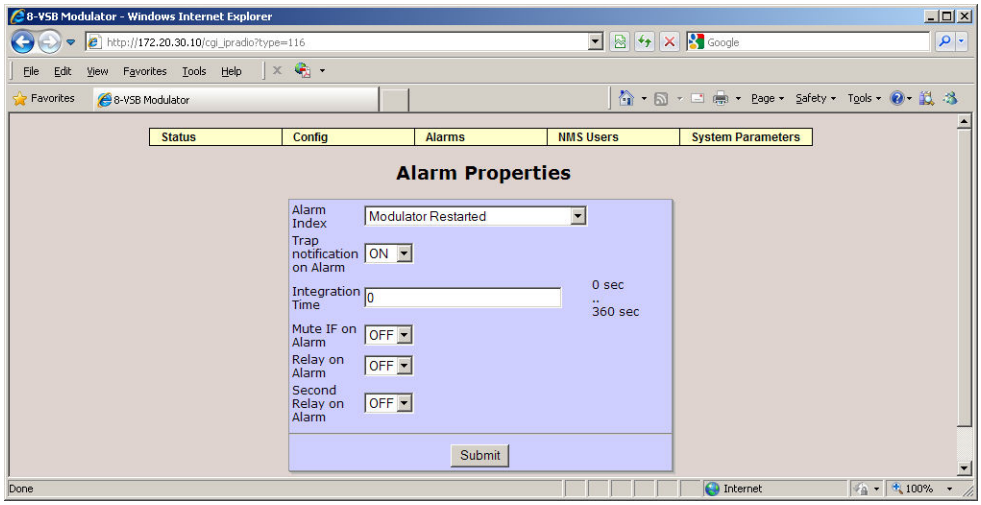



***Figure 24: Alarm Properties Configuration***

The first item in the Alarm Properties page is the Alarm Index. The Alarm Index box has a pull-down menu permitting the user to select a specific alarm from the list (see Figure 24). This permits the user to select a specific alarm for configuration. For a description of each alarm along with associated events, see the Alarms section.

Each active alarm can be set to send an SNMP trap, mute the modulator output, as well as trigger one or both alarm relays, if desired.

The integration time can be set to any value between 0 to 360 seconds. This parameter allows the modulator to avoid reporting intermittent alarms. Any alarm will be reported only if it is still active after the integration time has elapsed.

For each alarm the user can set the following:

| **Item** | **Selection** |
|---|---|
| Trap notification on Alarm | OFF, ON<br><br>Set as ON/OFF to control if an alarm will produce a SNMP trap notification |
| Integration Time | Range: 0 .. 360 sec<br><br>Length of time an alarm condition is present before the alarm is declared |
| Mute on Alarm | OFF, ON<br><br>Set to control whether the modulator output is muted for this alarm |
| Relay on Alarm | OFF, ON<br><br>Set to control whether the alarm relay is activated with this alarm |
| Second Relay on Alarm | OFF, ON<br><br>Set to control whether the second alarm relay is activated with this alarm |

***Table 16: Alarm Properties***

### *Clear Logs*

The alarm logs can be cleared by setting the Clear Log pull down box to ”Yes” and selecting Submit.

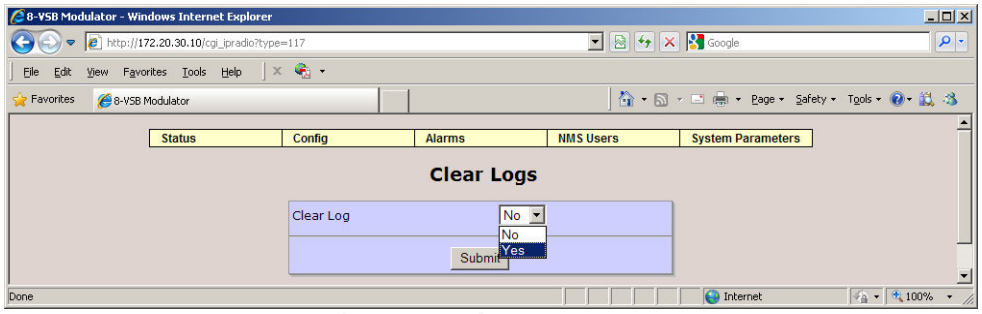



***Figure 25: Clear Logs Page***

### *Alarm Status*

The Alarm Status page includes a list of current alarms as well as the alarm log.

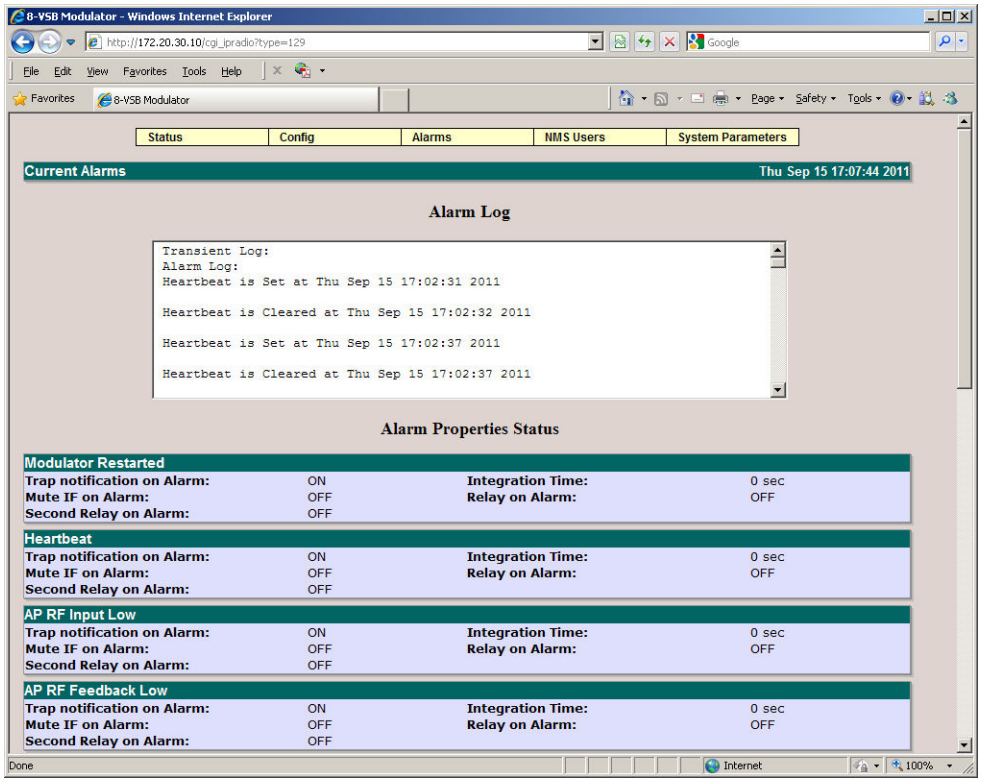



***Figure 26: Alarm Status***

### *NMS Users Menu*

The NMS Users menu sets the parameters required for an individual user to establish communications with the modulator via a SNMP Network Management System (NMS). From the User Properties menu, each NMS user can be configured with a user name, password, Cryptographic Hash Function authentication type (SHA, MD5, none) and Data Encryption mode (DES, AES, none) plus encryption password.

The NMS Users menu includes the User Properties menu, which is identical for each waveform.

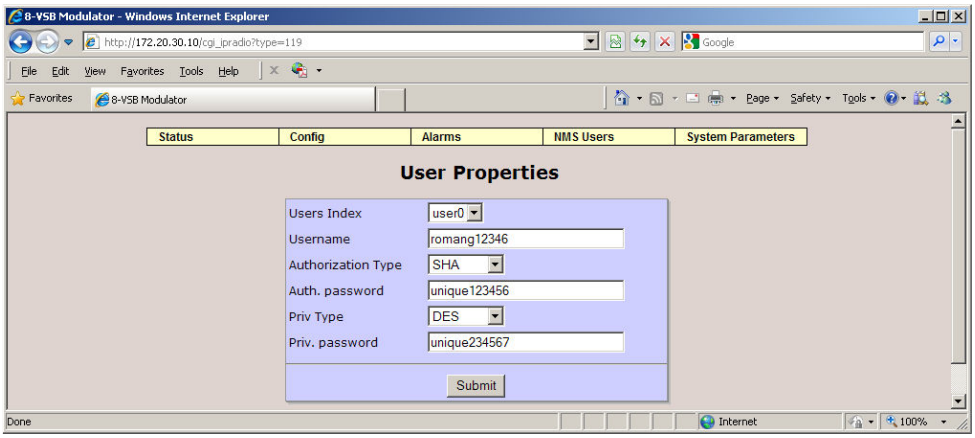



***Figure 27: NMS User Properties***

For each user, the following authorization parameters can be set:

| **Item** | **Selection** |
|---|---|
| Username | up to 35 alphanumeric characters |
| Authorization Type | Disabled, MD5, SHA<br><br>"Cryptographic Hash Function" |
| Auth. Password | up to 35 alphanumeric characters |
| Priv Type | Disabled, DES, AES<br><br>"Data Encryption" |
| Priv. Password | up to 35 alphanumeric characters |

***Table 17: NMS User Properties***

### *System Parameters Menu*

The System Parameters menu displays the modulator access control, network and SNMP parameters. It is also used for system reset and upgrades. The System Parameters menu is identical for each waveform.

The System Parameters menu contains the following pull-down menu, as seen in Figure 28.

- Identification
- Access Control
- Network Parameters
- SNMP Parameters
- System Time
- Heartbeat Time
- System Reset
- User Configuration
- Download Config Files(s)
- Upgrade and Files Upload
- List Uploaded Files

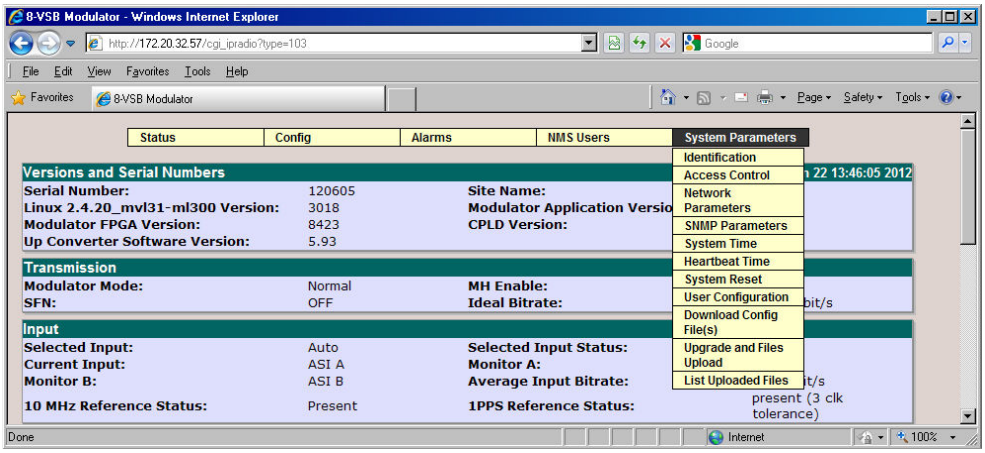



***Figure 28: System Parameters Menu Selection***

### *Identification*

The Identification page allows the user to add the following site identifiers:

| Item | Option |
|---|---|
| Site Name | up to 35 alphanumeric characters |
| *Site ID* | *up to 15 alphanumeric characters* |

***Table 18: Identification Parameters***

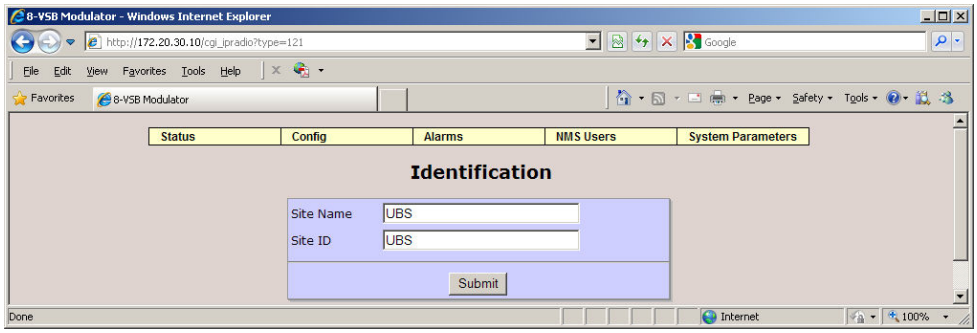



***Figure 29: Identification Configuration***

### *Access Control*

The Access Control page allows the user to set a password for the Web GUI interface.

| Item | Option |
|---|---|
| Web Password | up to 14 alphanumeric characters |

***Table 19: Access Control Parameters***

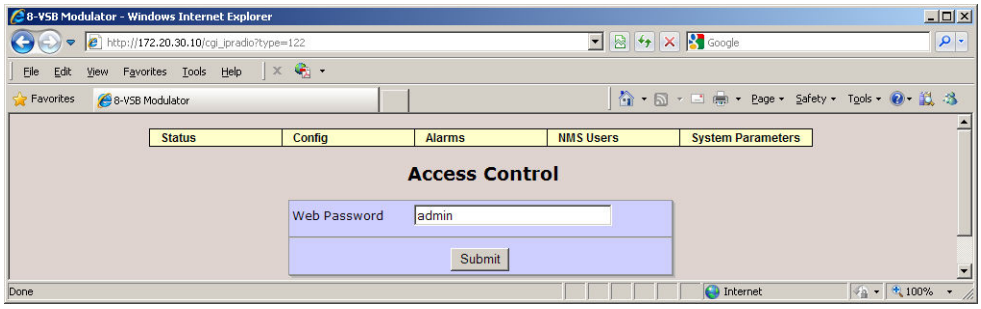



***Figure 30: Access Control Configuration***

### *Network Parameters*

The Network Parameters page allows the user to set the network parameters for the modulator.

***Note: The modulator must be reset following a change to any of the Network Parameters.***

| Item | Option |
|---|---|
| Management IP | Standard IP address e.g., 172.20.22.73 |
| Management Netmask | Standard netmask field e.g., 255.255.0.0 |
| Default Gateway | Standard IP address e.g., 172.20.1.1 |

***Table 20: Network Parameters***

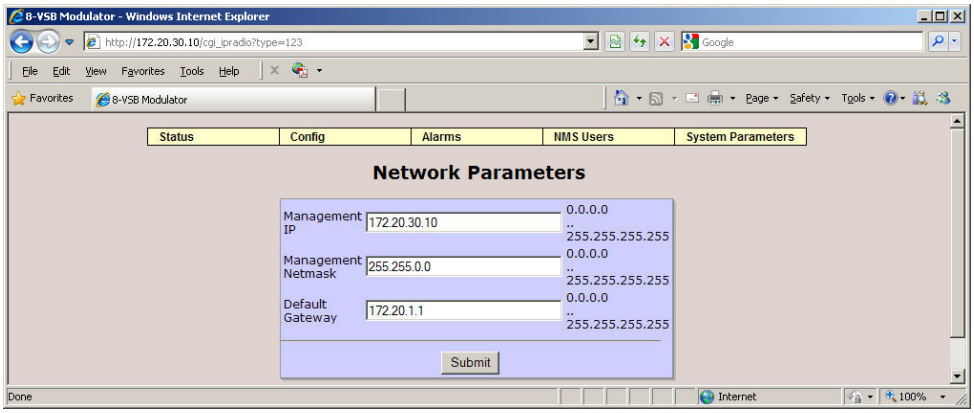



***Figure 31: Network Parameters Configuration***

### *SNMP Parameters*

The SNMP Parameters page allows the user to configure the SNMP interface for the modulator.

| Item | Option |
|---|---|
| SNMP Traps On/Off | ON/OFF |
| SNMP Trap Server IP Address | Standard IP address e.g., 172.20.1.145 |

***Table 21: SNMP Parameters***

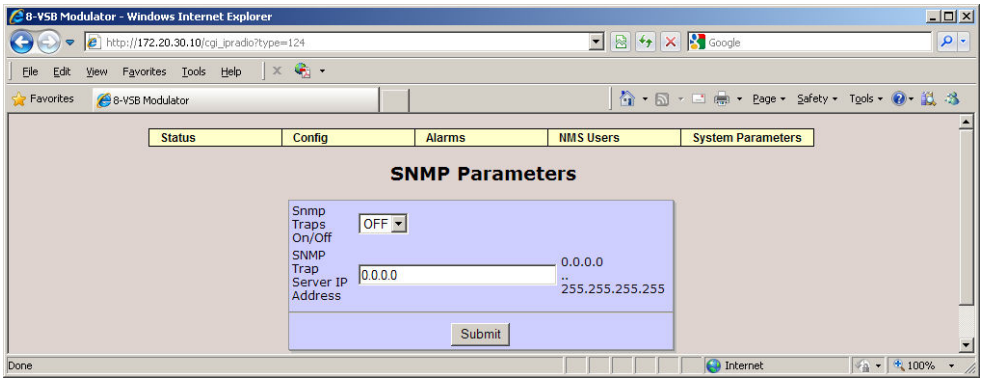



***Figure 32: SNMP Parameters Configuration***

### *System Time*

The System Time page allows the user to set the system time.

***Note: The modulator must be reset following a change to any of the System Time parameters.***

| Item | Option |
|---|---|
| Year | Range: 1900 .. 3000 |
| Month | Range: 1 .. 12 |
| Day | Range: 1 .. 31 |
| Hour | Range: 0 .. 23 |
| Minute | Range: 0 .. 59 |
| Second | Range: 0 .. 59 |

***Table 22: System Time Parameters***

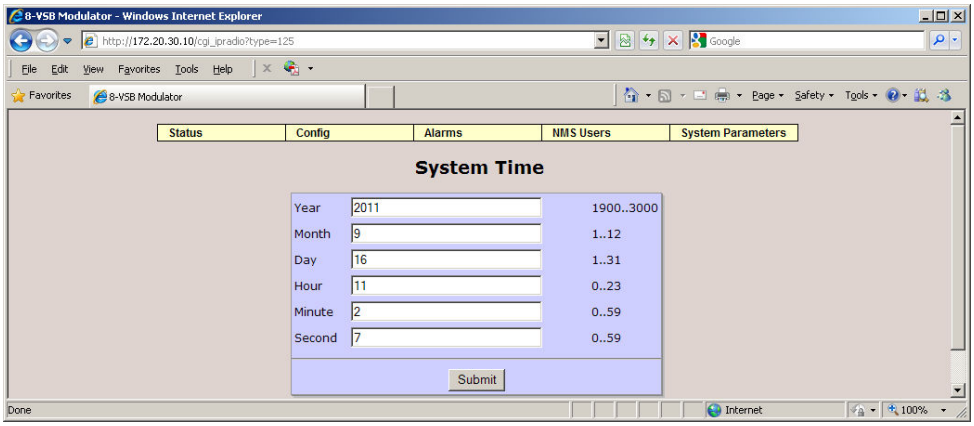



***Figure 33: System Time Configuration***

### *Heartbeat Time*

The modulator has the capability to periodically send "Heartbeat" alarms and traps in order to show that it is still operating and that communication is still active. The user can set the Heartbeat Hours Start, Heartbeat Minute Start and repetition frequency for the heartbeat (Heartbeat Pace).

| Item | Option |
|---|---|
| Heartbeat Hour Start | Range: 0 .. 24 |
| Heartbeat Minute Start | Range: 0 .. 60 |
| Heartbeat Pace | Range: 0 .. 99999999 |

***Table 23: Heartbeat Time Parameters***

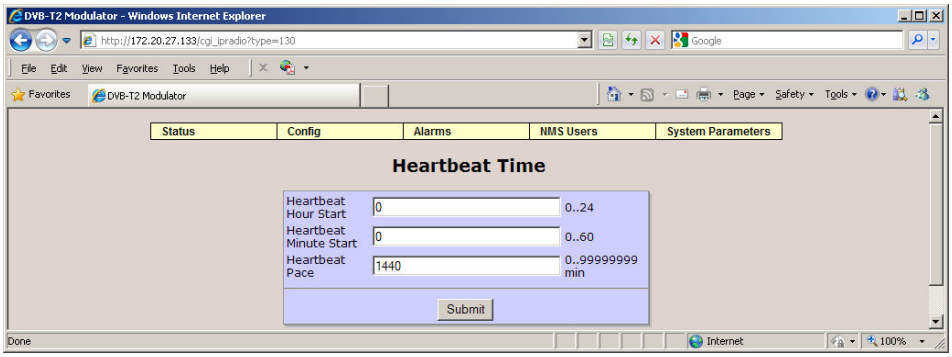



***Figure 34: Heartbeat Time Configuration***

### *System Reset*

The modulator can be reset by setting the Modulator Reset pull down box to "On" and selecting Submit.

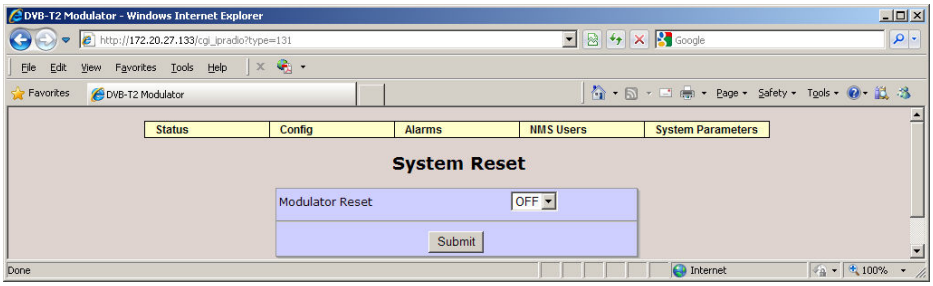



***Figure 35: System Reset***

### *User Configuration*

The User Configuration page allows the user to select the M2M interface (RS232 or RS485) and specify the address of the serial port used for machine-to-machine communication.

| Item | Option |
|---|---|
| M2M Port | Range: 0 .. ff Hex |
| M2M Interface | RS485, RS232 |

***Table 24: User Configuration Parameters***

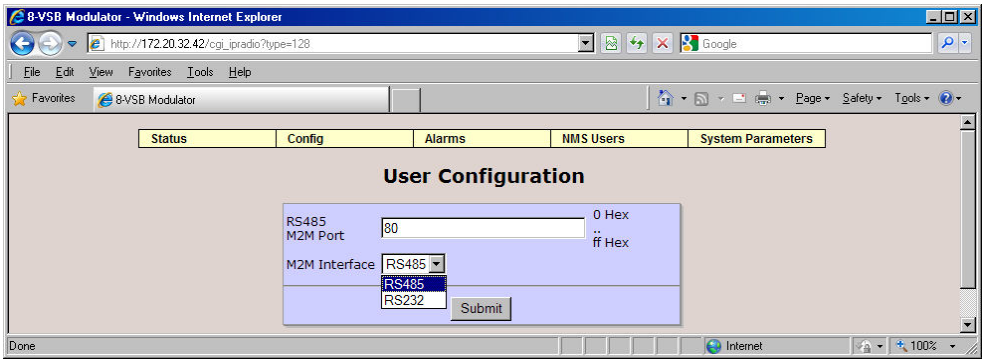



***Figure 36: User Configuration***

### *Download Config File(s)*

By clicking on the Download Config File(s) box, the user can download the Modulator Parameter File. When the Parameter File is selected, an operating system pop-up window will prompt the user to save the file on their system – see Figure 37.

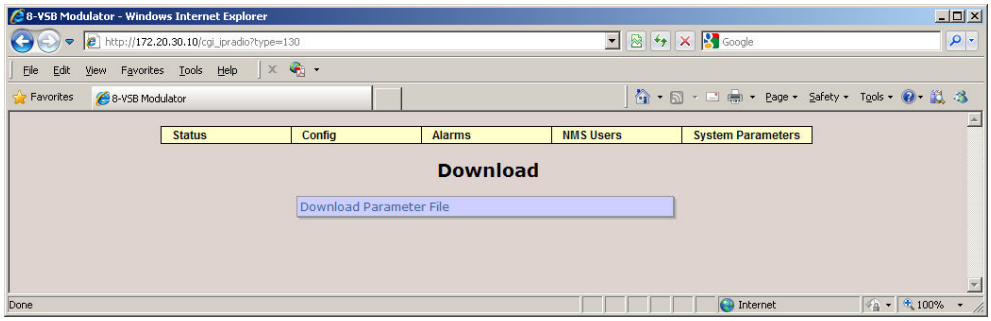



***Figure 37: Download Selection***

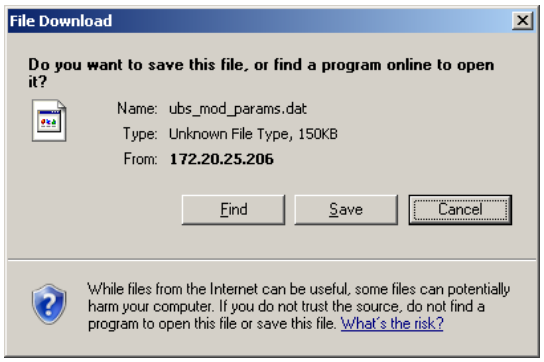



***Figure 38: Downloading Modulator Parameters***

### *Upgrade and Files Upload*

The Upgrade and Files Upload page allows the user to upgrade system software components such as:

- Modulator Application
- Linux Kernel (included in the Modulator Application)
- Modulator FPGA
- Up-converter Software

The first step in the upgrade process is the selection of the proper upgrade file using the "Browse" button – see Figure 34. Once the file is selected, click on "Start Download" to initiate the upgrade process. The upgrade file contains all the information required to define the component which is being upgraded.

Please note that the Web server is a single threaded server which only allows one connection at a time. Therefore if the upgrade is performed via a phone line, the file transfer can take 10 minutes depending on the connection speed and file size. The contents of the pop-up dialog will be blank. It will only start showing the upgrade information when the file is completely transferred.

The upgrade file contains all the information required to define the component which is being upgraded.

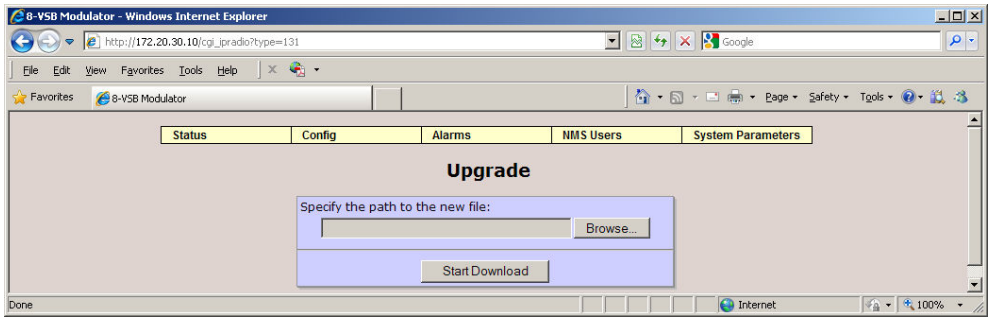



***Figure 39: Software Upgrade***

As the upgrade starts a pop-up dialog will appear with the current upgrade process information.

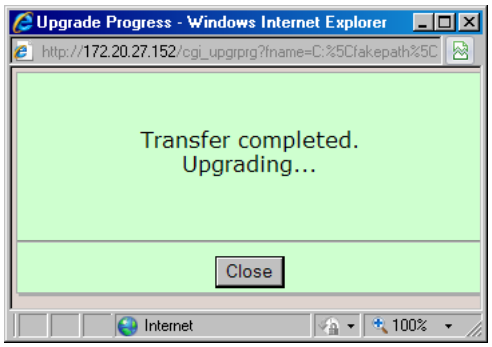



***Figure 40: Upgrade Begin Pop-Up***

Once the upgrade is complete the pop up dialog will display a corresponding message.

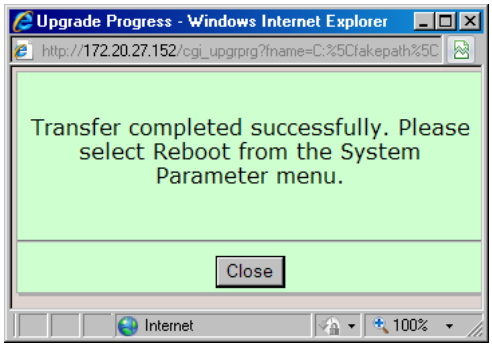



***Figure 41: Upgrade Complete Pop-Up***

### *List Uploaded Files*

The List Uploaded Files page provides a list of uploaded files on the modulator.

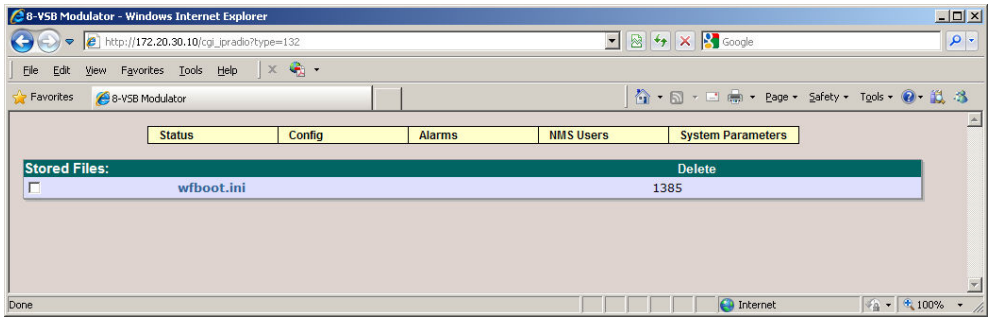



***Figure 42: List Uploaded Files***

**CLI (Command Line Interface)**

***Introduction***

The modulator can be controlled and monitored from the Command Line Interface (CLI) in addition to the Web GUI.

The CLI is accessible from the USB port via a HyperTerminal session or from the Ethernet port via Telnet or HyperTerminal sessions.

***Using the USB Port to Access the CLI***

The modulator must be connected to a laptop PC using a USB-to-USB cable. The cable will require a USB Type B connector to mate with the modulator USB port, while the other connector has to mate with the laptop PC USB port.

Open a HyperTerminal (or HyperACCESS depending on the operating system) session on the laptop PC and set the parameters as shown below.

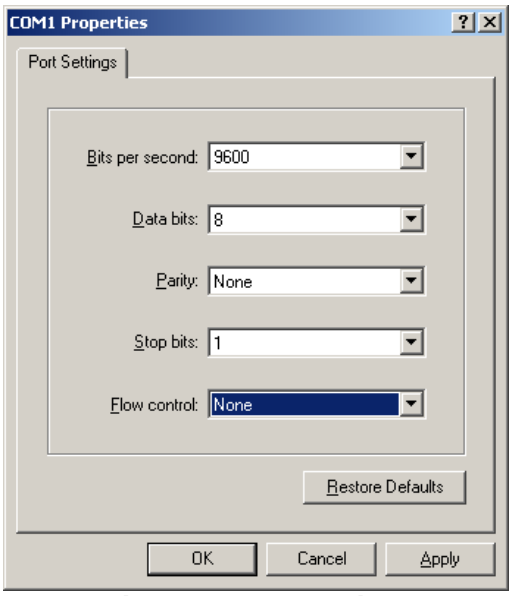



***Figure 43: Com Settings***

***Using the Ethernet Port to Access the CLI***

The modulator can be connected directly to a laptop PC or through a hub/switch using an RJ-45 straight-through cable.

The modulator and laptop PC must be configured to be on the same IP network so that a connection can be established.

A Telnet client can be opened from the "Start/Run" button on the laptop PC. Enter the IP address assigned to the modulator followed by the number 26 – see below.

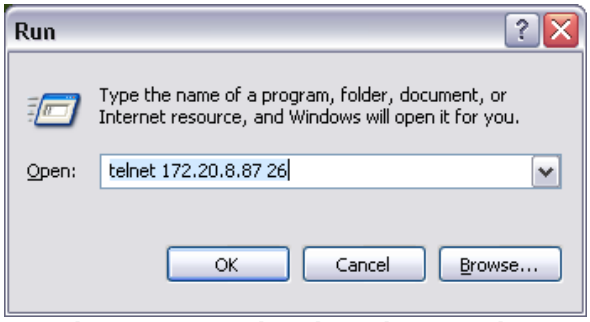



***Figure 44: Starting the Telnet Session***

A HyperTerminal session can also be used to access the CLI through the Ethernet port – see Figure 43.

***CLI Login Procedure***

1. Once the connection has been established, press enter to get to the login prompt.
2. Enter the password and press enter. **Note:** The password is "admin" by default, but can be changed through the Web GUI, CLI or SNMP.
3. After the password has been verified, the main menu will appear.

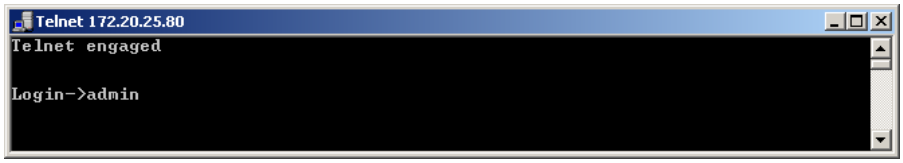



***Figure 45: Telnet Login Prompt***

***CLI Menu System***

The CLI contains a four level menu system where system parameters can be viewed and changed.

***Navigation***

Each menu has been assigned a numeric value for navigation purposes. To navigate through the CLI menu system, enter the number assigned to the desired menu. Depending on the menu accessed, the user may have the option to enter a sub-menu, or change a system parameter.
The following menu prompts are available for navigation and for changing system parameters:

- *Enter Selection – allows the user to change menus or exit the CLI*
- *Enter New Value – allows the user to change a system parameter*

At the "Enter Selection" prompt, the user may also use the following keys to navigate or exit the CLI menu system:

- *r – return to the previous menu*
- *e – exit the CLI*

If the user accesses the "Enter New Value" prompt by mistake or decides that they do not want to change a parameter, the prompt can be exited without making a parameter change. Simply clear all alphanumeric parameters and press enter. See the following example below:

```
Current Value: Auto
Range :
0. A
1. B
2. Auto
Enter New value:

No Changes
```

***Parameter Values***

In some cases, such as entering the Guard Interval or Constellation, the selectable parameters have been assigned a numeric value. This allows the user to change the parameter by simply entering the number assigned to a different parameter.

In other cases, such as entering the modulator IP address or Site Information, the user can enter a range of alphanumeric characters.

All parameter changes are made at the "Enter New Value" prompt.

```
Enter selection:
5 RF Output Frequency
Current Value: 474000000 Hz
Range: 470000000 .. 1000000000
Enter New value:
```

### *Main Menu Tree*

The CLI Main Menu tree is listed below.

```
Main Menu:
1. Status
2. Config
3. Alarms
4. NMS Users
5. System Parameters
6. Display Alarms
7. Firmware Upgrade
r. Return to previous menu
e. Exit CLI
Enter selection:
```

### *Status Menu*

The Status menu allows the user to access a number of pages that provide real-time modulator parameter values and settings. The information provided by the CLI status pages will be similar to the information provided by the Web GUI status pages.

```
Status:
1. Global Status
r. Return to previous menu
e. Exit CLI
Enter selection:
```

### *Config Menu*

The Config menu allows the user to access a number of sub-menus used to edit the modulation and RF parameters.

Please refer to 8VSB ATSC *Parameters* for the Config Menu structure and parameter values.

### *Alarms Menu*

The Alarms menu allows the user to access a number of sub-menus used to view and edit the modulator alarm settings.

Please refer to 8VSB ATSC *Parameters* for the Alarms Menu structure and parameter values.

### *NMS Users Menu*

The NMS Users menu sets the parameters required for an individual user to establish communications with the modulator via a SNMP Network Management System (NMS). From the User Properties menu, each NMS user can be configured with a user name, password, Cryptographic Hash Function authentication type (SHA, MD5, none) and Data Encryption mode (DES, AES, none) plus encryption password.

Please refer to 8VSB ATSC *Parameters* for the NMS Users Menu structure and parameter values.

### *System Parameters Menu*

The System Parameters menu displays the modulator access control, network and SNMP parameters. It is also used for system reset and upgrades.

Please refer to 8VSB ATSC *Parameters* for the System Parameters Menu structure and parameter values.

### *Display Alarms*

This selection will display all the alarms currently active. If there are no active alarms, the system will return to the previous menu.

### *Firmware Upgrade*

This section allows the user to enter a URL address from which the modulator can obtain a firmware upgrade.

```
Enter URL:
```

**SNMP**

The modulator supports a SNMP interface for remote management of the modulator via a SNMP Network Management System (NMS). Refer to SNMP Parameters and NMS Users Menu on how to use the Web GUI to configure the SNMP interface and set up a NMS user account.

Once the SNMP interface is established it is possible to use standard SNMP Network Managers (e.g., SNMPc, HP OpenView etc.) or a custom SNMP Network Manager for SNMP access. SNMP Traps can be emitted for each of the possible modulator alarms. The required Management Information Base (MIB) file for the modulator SNMP interface can be included on the manual CD delivered with the unit and is available upon request.

The SNMP parameters list is nearly identical to those used in the Web GUI and CLI. The exceptions are the controls for creating a NMS User account and the management of modulator configuration files for backup or software upgrades. This set of functions is purely local to each modulator and is not suitable for SNMP global access. Of course, these functions are still accessible for remote access via the system web interface or CLI interface.

Below is the menu tree for the web interface. The items enclosed in a grey box are excluded from the SNMP interface. All other menu items are accessible via SNMP.

| **Status** | **Config** | **Alarms** | **NMS Users** | **System Parameters** |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| Global Status | Modulator Mode | Alarm Properties | User Properties | Identification |
| | Transmission | Clear Logs | | Access Control |
| | Input | Alarm Status | | Network Parameters |
| | Output | | | SNMP Parameters |
| | RF Channels | | | System Time |
| | Non-linear Pre-corrector | | | Heartbeat Time |
| | Linear Pre-corrector | | | System Reset |
| | Site | | | User Configuration |
| | UART Baudrate | | | Download Config File(s) |
| | Digital Pre-corrector | | | Upgrade and Files Upload |
| | | | | List Uploaded Files |

***Table 25: Parameter Menu Item Available via SNMP***

**8VSB ATSC Parameters**

The ATSC parameter table lists the menus items and associated parameters available from the modulator interfaces. The main menu (or top level) items are capitalized and bolded. The subsequent sub-menus (Level 1 and Level 2) are listed below.

The numbered menu items and parameters are a reflection of the numbers the user will see when accessing the modulator CLI.

| **2. CONFIG** | | | |
|---|---|---|---|
| **Level 1** | **Level 2** | **Parameter Selection** | **Notes** |
| 1. Modulator Mode | | 0. Normal<br>1. CW | |
| 2. Transmission | 1. MH Enable | 0. OFF<br>1. ON | |
| | 2. SFN | 0. OFF<br>1. ON | |
| | 3. Config from TCP | 0. ON<br>1. OFF | SFN Mode Only |
| | 4. Transmitter ID | Range: 0 .. 4095 | |
| | 5. OM_type | Range: 0 .. 255 | |
| | 6. Local DelayOffset | Range: -3276.8 to 3276.7 µsec | |
| | 7. Net Id Pattern | Range: 0 .. 4095 | |
| | 8. Tx Id Level | Range: 0 .. 7 | |
| | 9. Transmitter Power | Range: 0 .. 4095 | |
| 3. Input | | 0. ASI A<br>1. ASI B<br>2. SMPTE310 A<br>3. SMPTE310 B<br>4. Auto | SMPTE310 A and B are only selectable when unit is equipped with this type of input |
| 4. Output | 1. Mute ON/OFF | 0. OFF<br>1. ON | |
| | 2. Spectrum Inversion | 0. OFF<br>1. ON | |
| | 3. Shaping Filter | 0. Narrow<br>1. Wide | |
| | 4. RF Power Level | Range: -10.0 .. 0.0 dBm | (0 to+10 dBm optional) |
| | 5. RF Output Frequency | Range: 470000000 .. 1000000000 Hz | |
| 5. RF Channels | | 1. CH 2 (57 MHz) to 50. CH 51 (695 MHz) | Configured frequency range is supported |
| 6. Non-Linear Pre-corrector | 1. NLP State | 0. OFF<br>1. ON | |
| | 2. NLP Profile | 0 .. 9 | |

| Level 1 | Level 2 | Parameter Selection | Notes |
|---|---|---|---|
| 7. Linear Pre-corrector | 1. LP State | 0. OFF<br>1. ON | |
| | 2. LP Profile | 0 .. 9 | |
| 8. Site | 1. System Description | Up to 35 characters | |
| | 2. Contact Information | Up to 35 characters | |
| | 3. System Location | Up to 35 characters | |
| | 4. Site Address Line 1 | Up to 35 characters | |
| | 5. Site Address Line 2 | Up to 35 characters | |
| | 6. Site Address Line 3 | Up to 35 characters | |
| | 7. Site Address Line 4 | Up to 35 characters | |
| | 8. Site Notes | Up to 35 characters | |
| 10. Digital Pre-corrector | 1. 1PPS Offest | Range: 0.0 .. 10000000.0 usec | |
| | 2. Mode | 0. Single Operation<br>1. Adaptive | |
| | 3. NLP/LP Selection | 0. NLP<br>1. LP<br>2. NLP/LP | |
| | 4. NLP Cycles | Range: 0 .. 1 | |
| | 5. Precorrection | 0. Stop<br>1. Run | |
| | 6. Reset Precorrector | 0. OFF<br>1. ON | |
| | 7. Bypass To Host | 0. OFF<br>1. ON | |
| | 8. Adaptive NLP Profile Name | Up to 35 characters | |
| | 9. Adaptive NLP Profile Number | Range: 1 .. 10 | |
| | 10. Save Adaptive NLP Profile | 0. OFF<br>1. ON | |
| | 11. Adaptive LP Profile Name | Up to 35 characters | |
| | 12. Adaptive LP Profile Number | Range: 1 .. 10 | |
| | 13. Save Adaptive LP Profile | 0. OFF<br>1. ON | |
| | 14. Adaptive Precorrector Uart Baudrate | 0. 1200<br>1. 2400<br>2. 4800<br>3. 9600<br>4. 19200<br>5. 38400<br>6. 57600<br>7. 115200 | |

| **3. ALARMS** | | | |
|---|---|---|---|
| **Level 1** | **Level 2** | **Parameter Selection** | **Notes** |
| 1. Alarm Properties | 1. Alarm Index | See Table 27 | |
| | 2. Trap notification on Alarm | 0. OFF<br>1. ON | |

| Level 1 | Level 2 | Parameter Selection | Notes |
|---|---|---|---|
| 1. Alarm Properties | 3. Integration Time | Range: 0 .. 360 | |
| | 4. Mute IF on Alarm | 0. OFF<br>1. ON | |
| | 5. Relay on Alarm | 0. OFF<br>1. ON | |
| | 6. Second Relay on Alarm | 0. OFF<br>1. ON | |
| 2.Clear Log | | 0. No<br>1. Yes | |
| **4. NMS Users** | | | |
| 1. User Properties | 1. User Index | 0. user0 | |
| | 2. Username | Up to 35 characters | |
| | 3. Authorization Type | 0. Disabled<br>1. MD5<br>2. SHA | |
| | 4. Auth. password | Up to 35 characters | |
| | 5. Priv Type | 0. Disabled<br>1. DES<br>2. AES | |
| | 6. Priv. password | Up to 35 characters | |
| **5. SYSTEM PARAMETERS** | | | |
| 1. Identification | 1. Site Name | Up to 35 characters | |
| | 2. Site ID | Up to 15 characters | |
| 2. Access Control | Enter Web Password | Up to 14 characters | |
| 3. Network Parameters | 1. Management IP | Range: 0.0.0.0 .. 255.255.255.255 | |
| | 2. Management Netmask | Range: 0.0.0.0 .. 255.255.255.255 | |
| | 3. Default Gateway | Range: 0.0.0.0 .. 255.255.255.255 | |
| 4. SNMP Parameters | 1. SNMP Traps On/Off | 0. OFF<br>1. ON | |
| | 2. SNMP Trap Server IP Address | Range: 0.0.0.0 .. 255.255.255.255 | |
| 5. System Time | 1. Year | Range: 1900 .. 3000 | |
| | 2. Month | Range: 1 .. 12 | |
| | 3. Day | Range: 1 .. 31 | |
| | 4. Hour | Range: 1 .. 23 | |
| | 5. Minute | Range: 1 .. 59 | |
| | 6. Second | Range: 1 .. 59 | |
| 6. Heartbeat Time | 1. Heartbeat Hour Start | Range: 0 .. 24 | |
| | 2. Heartbeat Minute Start | Range: 0 .. 60 | |
| | 3. Heartbeat Pace | Range: 0 .. 99999999 | |
| 7. System Reset | Modulator Reset | 0. OFF<br>1. ON | |
| 8. User Configuration | M2M Port | Range: 0x0 .. 0xff | |

***Table 26:8VSB ATSC Modulator Parameters***

**8VSB ATSC Alarms**

This section lists all alarms available for the modulator when an ATSC waveform is loaded. Each alarm is described along with its triggering conditions. The complete set of alarms is listed below.

| Alarm Index | Alarm Name | Alarm description |
|---|---|---|
| 0 | Modulator Restarted | A transient Informative alarm that is sent each time the modulator re-boots or is powered on. |
| 1 | Heartbeat | A periodic Informative alarm that is sent periodically at an interval determined by the system "Heartbeat Pace" parameter. |
| 2 | No Input data | Alarm is reported when the modulator cannot detect an input for the high priority channel in non-hierarchical mode, or for any input in hierarchical mode. |
| 3 | 10 MHz Reference Loss | Alarm is reported when an external 10MHz reference signal is not detected. **Alarm is only valid in SFN mode**. |
| 4 | 1PPS Reference Loss | Alarm is reported when an external 1PPS reference signal is not detected. **Alarm is only valid in SFN mode**. |
| 5 | TCP Packet Loss | Alarm is reported when no valid TCP packet data is decoded from the input stream. **Alarm is only valid in SFN mode**. |
| 6 | Data Input Too High | Alarm is reported when the high priority input bit rate is too high (shows that the internal input FIFO is almost full). |
| 7 | Up Converter Unlock | Alarm is reported when the internal Voltage Controlled Oscillator (VCO) is unlocked. |
| 8 | Input Bitrate Is Out Of Limit | Alarm is reported when the input bit-rate is 10% higher or lower than the ideal bit rate corresponding to the selected mode. **Alarm is only valid in SFN mode**. |
| 9 | Up Converter Communication Error | Alarm is reported when there is no communication between the main controller and the Upconverter. |
| 10 | Stream Unframed | Alarm is reported when a hardware mute condition is detected. i.e. enable/disable SFN or enable/disable M/H. Alarm is an indication that there could be a synchronization problem with the modulator or DTx. |
| 11 | Adaptive Precorrector Communication Error | Alarm is reported when communication between the modulator board and capture card fails. |

***Table 27:8VSB ATSC Modulator Alarms***

**Technical Specifications**

***ATSC Signal Processing***

| | |
|---|---|
| ATSC | A/53, A/54 A/64, A/110 and A/153 |
| Bandwidth | 6 MHz |
| Network Mode | MFN and SFN |
| Coefficient Mode | Narrow or Wide |

***Table 28: ATSC Signal Processing***

***Control Interfaces***

| | |
|---|---|
| Ethernet | Connector: RJ45<br>Speed: 10/100/1000 Base-T |
| USB | Connector: USB Type B |
| RS232 | Connector: 9-pin SUB-D Male |
| RS485 | Connector: 9-pin SUB-D Female |
| CLI (Command Line Interface) | Connector: USB (HyperTerminal) or<br>Ethernet (HyperTerminal or Telnet) |
| Web GUI | Internet Explorer, Firefox, etc.<br>Connector: Ethernet |
| SNMP | Connector: Ethernet<br>Note: MIBs can be provided |
| Alarm Relays | Connectors: RS232 and RS485<br>Two Dry Contact alarm relays, triggered by any major alarm. |
| Machine to Machine Interface | Connector: RS232 or Ethernet |

***Table 29: Control Interfaces***

***Inputs***

| | |
|---|---|
| DVB-ASI IN<br>(MPEG-2 Transport Stream) | 2x Connectors |
| SMPTE 310M<br>(MPEG-2 Transport Stream) | 1x Connector<br>***(SMPTE 3010M input connector is optional)*** |
| HPA Feedback Input<br>(Non-linear correction) | Frequency: 470 MHz to 1 GHz<br>Level: -25 dBm to -15 dBm |
| BPF Feedback Input<br>(Linear correction) | Frequency: 470 MHz to 1 GHz<br>Level: -25 dBm to -15 dBm |
| 10MHz<br>(Clock Reference) | Frequency: 10 MHz<br>Level: 0 dBm to 15 dBm |
| 1PPS<br>(Time Reference) | Frequency: 1 PPS<br>Level: TTL<br>Trigger: Positive transition |

***Table 30: Inputs***

***RF Output***

| | |
|---|---|
| Frequency Range | 470 MHz to 860 MHz |
| Frequency Step Size | 1 Hz |
| Frequency Stability | Internal reference 0.05ppm, or in accordance with external GPS reference accuracy |
| Spectrum Polarity | Inverted or non-Inverted, user selectable |
| Level | -10 dBm to 0 dBm; Step size 0.1 dB |
| Level Stability | ± 0.3 dB |
| Amplitude Flatness | Center frequency ± 3.8MHz: ± 0.4dB (Note 1) |
| Shoulder Level | ≤ -55 dBc (Note 1) |
| MER | ≥ 45 dB |
| Spurious | < -60 dBm @ 0 dBm output power |
| Phase Noise SSB | 10Hz: < -60 dBc/Hz<br>100Hz: < -85 dBc/Hz<br>1kHz: < -90 dBc/Hz<br>10kHz: < -103 dBc/Hz<br>100kHz: < -120 dBc/Hz<br>1MHz: < -135 dBc/Hz |
| Return Loss | > 20 dB |

***Table 31: RF Output***

**Note 1**: The values are for 8 MHz bandwidth. For smaller bandwidths, they are scaled accordingly. Levels are measured in 10 kHz bandwidth, where 0dB is the level of the carriers at the edge of the spectrum. Harmonics and spurious are not included.

***Manual Digital Pre-correction***

| **Non-Linear Pre-Correction** | |
|---|---|
| Curve Formats | S 21 and VO/VI |
| Amplitude Scale | Linear and Logarithmic |
| Correction Points | Max. 256, user-defined position |
| Spectral Regrowth Reduction | Max. 12 dB, subject to available headroom |
| Phase Correction | -6 to +30 degrees, subject to available headroom |
| | |
| **Linear Pre-Correction** | |
| Correction Points | 61 |
| Point Spacing | 1/60 of nominal spectrum BW |
| Amplitude Correction | ±10 dB |
| Amplitude Resolution | 0.01 dB |
| Group Delay Correction | ±2000 ns |
| Group Delay Resolution | 1 ns |
| Peak Power Clip Level | +17dB to +7dB<br>(peak power relative to average RMS level) |

***Table 32: Manual Digital Pre-correction***

***Initial On Site Turn-On Procedure***

After the Innovator CX Series drawer or drawers are installed and all input, output and AC connections are made, the system is ready for the initial on site turn on. Check that the output of the transmitter is connected to an appropriate rated load or to the digital mask filter and the antenna for your system. Check that the main AC power to the System is ON.

If your system contains an optional ASI to S310 converter module, K-Tech receiver drawer or Axciter, check that they have AC connected to them and that they are turned ON.

**NOTE:** If your system is mounted in a cabinet and contains an optional UPS, check that the ON/OFF button, located on the left side of the top panel of the UPS is On. The UPS is normally mounted behind the removable blank panel, located immediately above the exciter/driver drawer, which is held in place by four #10 Phillips head screws.

**Single or Multi Drawer Systems**

If you have a CU0TD-1 thru CU0TD-5 system, push ON the switch located on the rear panel of the drawer above the AC power jack. The large fan mounted on the rear panel of the drawer should operate.

If your system is a CU1TD/TD-1 or higher power system, switch ON the ON/OFF circuit breaker(s), located on the rear panel of the amplifier drawer(s), mounted on each side of the AC input power jack. The two fans mounted in the amplifier drawer should operate.

Place the system in Operate. The Operate/Standby LED and Status LEDs on the CU0TD-1 thru CU0TD-5 should be Green indicating the system is in Operate and performing normally. The Operate/Standby LED showing Amber indicates the System is in Standby. The Status LED showing a blinking Red LED indicates an Event (Fault) is occurring now. The Status LED showing Amber indicates that an Event (Fault) occurred since the last time the Event (Fault) indications were reset. **NOTE:** The modulator takes approximately 2 minutes to lock up for normal operation. During this time the modulator status screen will blink warm up.

If your system is CU1TD/RD-1 or higher power, the Enable LED and Status LEDs on the Amplifier Drawer should be Green indicating the system is in Operate and performing normally. The Enable LED showing Amber indicates the System is in Standby. The Status LED should be Green indicating no Events (Faults) in the system. If the Operate/Standby LED shows Amber it indicates that the System is in Standby. If the Status LED is blinking Red it indicates an Event (Fault) is occurring now. If the Status LED shows Amber it indicates that an Event (Fault) occurred since that last time the Event (Fault) indications were reset. The output power is factory set according to customer request and does not need adjusted. If a problem occurs, call UBS-Axcera field support at 724-873-8100 for information on modifying the power level of the system.

Once the modulator has finished its boot up process it can be configured for LAN access. Using the Web GUI, navigate to the System parameters sub-menu where the Network parameters can be configured. After changing any Network parameters, the modulator must be reset. Navigate to the System parameters sub-menu System Reset page to reset the modulator. The modulator can now be provisioned remotely through the Web GUI.

**NOTE:** The RF System Interlock is provided on J12, a 15 position "D" connector, located on the rear panel of the CU0TD-1 thru CU0TD-5 drawer. The RF System Interlock at J12-5 provides the customer with a means of connecting the system to protection circuits, for the loads, thermal switches, combiners, or the antenna, in the output of your system, that will place the system in Standby if the protection circuit opens.

The Reject Load Interlock is provided at J11, a 9 position "D" connector. J11-6 provides the customer with a means of connecting the system to protection circuits, for the reject load in multiple amplifier systems, which will place the system in Standby if the protection circuit opens. If the interlocks are not used in your system, a plug with a jumper from J12-5 to J12-15, ground, for RF system Interlock and another plug with a jumper from J11-6 to J11-9, for Reject Load Interlock, need to be connected. These jumpers provide the RF System and Reject Load Interlocks, which allow the system to go to operate. Without the jumpers, the system will remain in Standby.

**Adaptive Pre-Correction Set-up Procedure**

Adaptive Pre-correction is available as limited One-Touch Correction (OTC) or full feature correction. With One-Touch correction the adaptive process can be enabled for one cycle whereas full feature correction can be set to continuously adapt or automatically adapt when performance characteristics indicate that a change is needed.

Please refer to the Web GUI section Digital Adaptive Pre-corrector for full details.

**Typical System Operating Parameters**

| Typical Operating Parameters for a CU0TD/RD-1 | |
|---|---|
| **Parameter** | **Typical Reading** |
| Forward Power | 100% |
| Reflected Power | <5% |
| Power Supply Voltage | +48 VDC |
| Heatsink Temperature | 20º to 30º F/15º to 20º C above ambient temperature |
| Pin Attenuator Voltage | 1 Volt to 5 Volts |

| Typical Operating Parameters for a CU0TD/RD-2 | |
|---|---|
| **Parameter** | **Typical Reading** |
| Forward Power | 100% |
| Reflected Power | <5% |
| Power Supply Voltage | +28 VDC |
| Heatsink Temperature | 20º to 30º F/15º to 20º C above ambient temperature |
| Pin Attenuator Voltage | 1 Volt to 5 Volts |

| Typical Operating Parameters for a CU0TD/RD-3 | |
|---|---|
| **Parameter** | **Typical Reading** |
| Forward Power | 100% |
| Reflected Power | <5% |
| Power Supply Voltage | +48 VDC |
| Heatsink Temperature | 20º to 30º F/15º to 20º C above ambient temperature |
| Pin Attenuator Voltage | 1 Volt to 5 Volts |

| Typical Operating Parameters for a CU0TD/RD-4 & CU0TD/RD-5 | |
|---|---|
| **Parameter** | **Typical Reading** |
| Forward Power | 100% |
| Reflected Power | <5% |
| Power Supply Voltage | +42 VDC or 48 VDC w/888A devices |
| Heatsink Temperature | 20º to 30º F/15º to 20º C above ambient temperature |
| Pin Attenuator Voltage | 1 Volt to 5 Volts |

| Typical Operating Parameters for a CU0TD/RD-3 used as a Driver | |
|---|---|
| **Parameter** | **Typical Reading** |
| Forward Power | 20-70% (Depending on output power level of system) |
| Reflected Power | <3% |
| Power Supply Voltage | +48 VDC |
| Heatsink Temperature | 20º to 30º F/15º to 20º C above ambient temperature |
| Pin Attenuator Voltage | 1 Volt to 5 Volts |

| Typical Operating Parameters for the external Amplifier Drawer(s) in a C1TD/RD-1 or higher power System | |
|---|---|
| **Parameter** | **Typical Reading** |
| Forward Power | 100% |
| Reflected Power | <5% |
| Power Supply Voltage | +42 VDC or 48 VDC w/888A devices |
| Heatsink Temperature | 20º to 30º F/15º to 20º C above ambient temperature |

**Typical Problems, Indications and Causes in CU0TD/RD-2 or -3 Drawer**

| Problem | Indication | Cause |
|---|---|---|
| No power to drawer | Operate/Standby and Enable LED indicators and LCD display are Off | AC power cord not connected. Main AC to System missing. On/Off switch on back of drawer Off. 10 Amp fuse (F1) blown*. Power supply (A9) not operating |
| No Output Signal | Front Panel Status LED is Amber and blinking with no events, faults indicated. | On the 8VSB Modulator S310 MPEG Input Selection Set Up Screen, the Input is currently set incorrectly to "from Internal Source". Set to "from External Source". |
| Loss of Input Signal | Loss of Input on Modulator Menu | Loss of input signal. |
| Loss of Output Signal | Amber Operate/Standby LED.<br><br>Blinking Red Status LED. | Any Event, Fault, which Mutes the output. Including Input Fault, VSWR Cutback, Overdrive, Over-temperature and Overvoltage. |
| Loss of 24V, 28V, 32V, 42V or 48V | Power Supply Fault on Power Supply Menu | Power supply (A10) not operating |
| Loss of ±12V or 5V | Operate/Standby and Enable LED indicators and LCD display are Off | Power supply (A9) not operating |

***Table 33: Typical Problems***

**NOTE:** *A spare 10 Amp fuse is provided in the blank fuse holder under the active fuse.

If there is an Event (Fault) occurring in the system, the Status LED on the front panel will flash RED as long as the Event (Fault) is present. In addition, the menu will jump to the current Event (Fault) on the display and blink the Event (Fault) continuously, if the Jump to Fault screen is set to Yes. When the Event (Fault) is corrected, the drawer will turn the Status LED to AMBER to indicate that there was a Fault and the menu will still display the Fault but it will not flash. This gives the user the knowledge that there was an Event (Fault) and what type of Event (Fault) occurred. Before clearing the fault, check if there were other Events (Faults) by stepping through the menus. To reset the indication of previous Events (Faults) the user must push the Enter button with the Event (Fault) Reset Screen displayed. This will reset all previous Events (Faults).

**Front Panel Pushbutton and LCD/LED Operation**

***CX Exciter/Driver***

The CX Exciter/Driver front panel includes a LCD with menu control pushbuttons, Operate and Standby pushbuttons and several LEDs.


***Figure 46: CX Exciter/Driver Front Panel***

1) OPR (operate) pushbutton
2) STBY (standby) pushbutton
3) OPR/STBY LED
4) Status LED
5) LCD
6) LCD menu control pushbuttons (▲, ▼, ◄, ►)
7) Enter pushbutton
8) Serial port
9) Sample port

**NOTE:** J15 is a Front Panel, 50Ω, BNC RF Sample Jack that provides an RF output sample from the output detector board in the drawer. The sample level at J15 is approximately 60dB down from the output power level of the drawer.

| Pushbutton | Function |
|---|---|
| OPR | Places the system in Operate mode. |
| STBY | Places the system in Standby mode. |
| ENTER | Selects changes made in the LCD menus and sub-menus. |
| ▲ (up)<br>▼ (down) | Scrolls through the LCD main menus and after entering a main menu, scrolls through its sub-menus (when present). |
| ◄ (left)<br>► (right) | Used to exit a LCD main menu or sub-menu (when present). |

***Table 34: CX Exciter/Driver Pushbutton Functions***

| LED | Color | Description |
|---|---|---|
| OPR/STBY | Green | System is in Operate mode. |
| | Amber | System is in Standby mode. |
| STATUS | Green | CX drawer is functioning normally. |
| | Red (blinking) | CX drawer Event (fault) is present. |
| | Amber | CX drawer Event (Fault) occurred, but the CX drawer is now operating normally. |
| | Amber (blinking) | CX drawer MPEG input set to internal source (with no Events [Faults]). |

***Table 35: CX Exciter/Driver LED Indicators***

***High Power Amplifier***

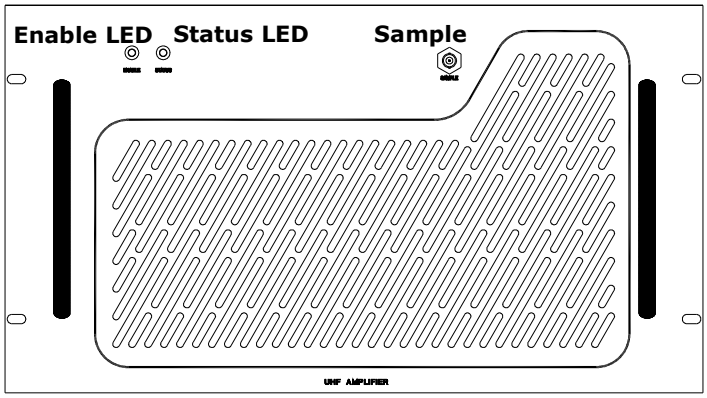



***Figure 47: High Power Amplifier***

| LED | Color | Description |
|---|---|---|
| ENABLE | Green | System is in Operate mode and operating normally. |
| | Amber | System is in Standby mode. |
| STATUS | Green | System is functioning normally with no faults. |
| | Red (blinking) | A system Event (fault) is present. |
| | Amber | A system Event (Fault) occurred, but the system is now operating normally. |
| **Jack** | | **Function** |
| SAMPLE (J6) | | Typical sample value is 65dB down from the output power level of the drawer. (500 Watts output power = -8dBm sample level) |

***Table 36: High Power Amplifier LED Indicators***

**LCD Front Panel Screens**

An LCD display, located on the front of the Innovator CX drawer, displays the current operating status of the system. When the drawer is powered On, the LCD will initially display two splash screens. The first splash screen will be displayed for a few seconds, then the second splash screen will be displayed for a few seconds and finally the RF Power Display default screen will be displayed. See typical examples of the screens below.

**NOTE**: These screens are typical examples of an operating system; your systems screens may be different. The RF Power Display default screen will be the screen displayed if no buttons are pushed to access other screens. While viewing the RF Power Display default screen, pushing the Left and Right arrow buttons together will also access the splash screens.

**NOTE:** In dual exciter systems, the On Air Exciter will display the operating parameters of the system.

***Implementation***

The first splash screen displayed indicates the manufacturer and the model number of the UBS-Axcera product.

***Figure 48: Splash Screen #1***



The second splash screen indicates the Firmware and Version Numbers of the software used in the system. The example shown is Firmware number 1312423 Version number 6.3a/2.7.

***Figure 49: Splash Screen #2***


The final screen is the default screen which indicates the Forward Power and Reflected Power for the system.

***Figure 50: Splash Screen #3***


The user can scroll through the following screens by using the buttons to the right of the LCD display. Pushing and releasing the Up & Down Arrows will scroll through the Main Menus (level 1), which are shown on the following pages and are aligned on the left side of the page.

The Sub-menus (level 2) are accessed by pushing and releasing the ENTER button. Once in the Sub-menu (level 2), the user can scroll through the menu items (level 3) listed in the Sub-menus (level 2) by pushing and releasing the Up & Down Arrows. The Sub-menus (level 2) are shown on the following pages, indented to be below the Main Menus (level 1).

The sub-menus (level 3) of the Sub-menus (level 2) are indented to be under the Sub-menu (level 2) in which they are contained.

In the Set-up Menus, changes are made to the display by Pushing and releasing the ENTER button. This will cause the item, which is to be changed, to blink. The user can then press the left and right arrow buttons to display the new parameter. Finally, pushing the ENTER button will accept the changes made upon exit of the Set-up Menu.

**NOTE:** An example of accessing and changing a parameter using the Set-up Menus is as follows. This procedure is to set the Off Air Receive Channel to the desired channel.

- Push and release the DOWN Arrow button until the SYSTEM SET-UP Main Menu is displayed.
- Push and release the ENTER button and the Authorization Warning screen is displayed.
- Push and release the ENTER button again and the ENTER BUTTON SETS TO CHANGE MODE screen is displayed.
- Push and release the ENTER button again and the first set-up menu, which is the SET-UP MENUS OF CHASSIS VALUES screen is displayed.
- Push and release the DOWN Arrow button until the SET-UP 8VSB DEMODULATOR screen is displayed.
- Push and release the ENTER button to display the submenus under the SET-UP 8VSB DEMODULATOR menu.
- Push and release the DOWN Arrow until the 8VSB DEMODULATOR USE OFF AIR CHxx is displayed.
- Push and release the ENTER button and the XX, which indicates the Channel Number, will blink.
- Push and release the UP or DOWN Arrow button until the desired new channel number is displayed.
- Push and release the ENTER button, and the PUSH ENTER TO ACCEPT CHANGES menu is displayed.
- Push and release the ENTER button again to accept the changes made. The channel is now changed.
- Push and release the LEFT Arrow to exit to the SET-UP 8VSB DEMODULATOR screen.
- Push and release the LEFT Arrow again to exit to the SYSTEM SET-UP Main Menu.
- Push and release the UP or DOWN arrows to browse the main menus.

The following screens are typical of an operating system. The values indicated on the screens in your system may vary from those shown below.

***Operation Screens***

**NOTE:** The following Operation screens provide operating information only. No adjustments are available using these screens.

***Figure 51: Transmitter Forward Power Screen***


This is the default screen that is displayed after the splash screens are displayed. This screen provides an indication of the Output Power of the transmitter in terms of Percent (typically 100%). The screen also provides an indication of the Reflected Power of the transmitter in terms of Percent (typically less than 5%). Push the DOWN Arrow to view the next main menu, which is the Transmitter Fault Log Main Menu.

***Figure 52: Transmitter Event Log Main Screen***


This is the Transmitter Event Log Main Screen. Push the ENTER button to access the Fault List submenu. Push the DOWN Arrow to view the next main menu, which is the Transmitter Details Main Menu.

***Figure 52.1: Transmitter Event List Screen***


When events occur, they will be displayed on this screen. The Up and Down arrow will scroll you through the different entries in the event log. The above screen indicates the 001 event of 013 total events that have occurred in the Transmitter. The number in the parenthesis on the top right, is this case 01, indicates the number of times the displayed event has occurred. The bottom line scrolls to indicate the event that occurred, in this case RF Interlock Fault, and the time the event occurred after the prior event. Push the LEFT Key to exit to the Transmitter Event Log Main Menu screen. Pushing the RIGHT Key will access the Event Reset Screen.

***Figure 52.2: Event Reset Screen***


This screen allows the user to reset the event log, after they are observed or corrected. **NOTE:** Resetting the events on an amplifier may cause the transmitter to momentarily mute.

***Figure 52.3: Event Reset Old Faults Screen***


This screen allows the resetting of old faults that are latched from the event log after they are observed or corrected. The transmitter can be configured to latch faults as detailed in Figure 54.1.4. That means that if a fault occurs and then it clears, the status of the parameter in the details screen will not blink indicating an active fault, but it will still show fault indicating that previously this parameter was faulted. Within the web pages, a latched fault is shown with an orange background while faulted parameters are shown in red and good values are shown in green. Resetting Old Faults will clear the latched fault and the display will show the value as OK or with other text that indicates that it is not faulted.

***Figure 53: Transmitter Details Main Screen***


This is the Transmitter Details Main Screen. Push the ENTER button to access the Device Details Chassis Values Main Sub Screen. Push the DOWN Arrow to view the next main menu, which is the Transmitter Set -Up Main Menu.

***Figure 53.1: Transmitter Device Details Chassis Values Screen***



This is the Transmitter Device Details Chassis Values Main Sub Screen. Push the ENTER button to access the Device Details Chassis Values submenus. Push the DOWN Arrow to view the next main submenu, which is the Modulator Sub Menu.

*Figure 53.1.1: Transmitter Driver Forward/Reflected Power Details Screen*


This screen provides an indication of the Output Power of the Driver Drawer in terms of Percent, typically 20-70%, when there are external amplifiers in the system. In single drawer systems, the driver power is actually the system power. It may be 100% when used as stand alone transmitter. This screen also provides an indication of the Reflected Output Power of the Driver Drawer in terms of Percent, typically less than 3%.

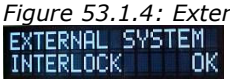
*Figure 53.1.2: Heatsink Temperature Details Screen*


This screen indicates the temperature of the amplifier heatsink assembly, mounted in the transmitter or driver drawer, in degrees Fahrenheit. If the temperature is below the trip point, it will indicate OK. Typically, the temperature is 15ºC to 20º C above ambient temperature.

*Figure 53.1.3: Power Supply Voltage Details Screen*


This screen shows the power supply voltage in the transmitter or driver drawer. If the power supply voltage is below the trip point, it will indicate OK.

*Figure 53.1.4: External Interlock Details Screen*




This screen indicates if an external interlock is present in your system. Typically Present - it must be present or system will remain in Standby.

*Figure 53.1.5: Reject Load Interlock Details Screen (BTD/BRD)*


This screen indicates if the external Reject Load interlock is present in your system. Typically Present – it must be present or system will remain in Standby.

*Figure 53.1.6: AGC Details Screen*


This menu indicates if the AGC circuit has an input. An AGC input fault indicates that there is no RF input to the board, which could occur if anything before it fails.

*Figure 53.1.7: AGC Overdrive Details Screen*


This menu indicates if the AGC circuit is operating within its range.

*Figure 53.1.8: AGC Auto/Manual Details Screen*


This menu indicates if the AGC circuit is operating in Auto or Manual.

*Figure 53.1.9: ALC Voltage Level Details Screen*


This menu indicates the Auto ALC voltage setting, typically 1 to 5 V.

***Figure 53.2: Modulator Device Details Screen***


This is the Transmitter Device Details Modulator Main Sub Screen. Push the ENTER button to access the Device Modulator submenus. Push the DOWN Arrow to view the next main submenu, which is the Upconverter Sub Menu. Push the LEFT Arrow to go back the Main Device Details Screen. Then push the DOWN Arrow to access the Transmitter Set -Up Main Menu.

*Figure 53.2.1: Digital Modulator Identification Screen*


This menu provides access to screens that display the Modulator's Date and Time or the Modulator's Site ID.

*Figure 53.2.1.1: Digital Modulator Time Set Date Set Screen*


This Screen displays the Modulator's date and time to allow confirmation that the communications system between the Innovator CX and the Digital Modulator is operational. Adjustments to the date and time are available through the Digital Modulator's web pages.

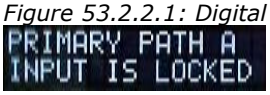
*Figure 53.2.1.2: Digital Modulator Site ID Set Screen*


This Screen displays the Digital Modulator's Site ID which confirms that the communications system between the Innovator CX and the Modulator is operational. Adjustment to the Site ID is available through the Modulator's web pages.

*Figure 53.2.2: Digital Modulator Signal Status Screen*


This menu provides access to screens that display the status of the Digital Modulator's signals. As these are detail screens, they are read only and not adjustable. They provide basic feedback on the configuration of the Digital Modulator. Configuration is completed through the Modulator's web pages.

*Figure 53.2.2.1: Digital Modulator Primary Path A Set Screen*




This Screen indicates the status of the Primary Input Path A. Configuration is completed through the Digital Modulator's web pages.

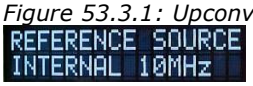
*Figure 53.2.2.2: Digital Modulator Secondary Path B Set Screen*


This Screen indicates the status of the Secondary Input Path B. Configuration is completed through the Digital Modulator's web pages.

***Figure 53.3: Upconverter Device Details Screen***


This is the Transmitter Device Details Upconverter Main Sub Screen. Push the ENTER button to access the Device Upconverter submenus. This is the final Device Details Main Sub Menu. Push the LEFT Arrow to go back the Main Device Details Screen. Then push the DOWN Arrow to access the Transmitter Set-Up Main Menu.

*Figure 53.3.1: Upconverter 10 MHz Details Screen*





This menu indicates if the 10 MHz reference used is generated internally or provided by an external reference source, such as a GPS.

*Figure 53.3.2: Upconverter Transmitter Channel Details Screen*


The upconverter transmit channel screen indicates the channel that the upconverter is currently set and the center frequency of that channel. Displayed above is CH: 47 that has a Center Frequency of 671MHz.

***Figure 53.4: External Amplifier Device Details Screen***


This is the Transmitter Device Details External Amplifier Main Sub Screen. This is the final Device Details Main Sub Menu. Push the ENTER button to access the Device External Amplifier #1. Push the LEFT Arrow to go back the Main Device Details Screen. Then push the DOWN Arrow to access the Transmitter Set-Up Main Menu.

**NOTE:** Shown below are the External Amplifier #1 Details Screens. The External Amplifier #2, #3 or #4 Details Screens are presented in the same order if they are present in the system.

*Figure 53.4.1: External Amplifier #1 Forward Power Details Screen*


Indicates the Output Power for external amplifier #1.
**NOTE**: See the final test data sheet for the typical value.

*Figure 53.4.2: External Amplifier #1 Reflected Power Details Screen*


Indicates the Reflected Power for external amplifier #1.
**NOTE**: See the final test data sheet for the typical value.

*Figure 53.4.3: External Amplifier #1 I1-A1 Current Details Screen*


Indicates the Current of the A1 device in the external amplifier #1.
**NOTE**: See the final test data sheet for the typical current value.

*Figure 53.4.4: External Amplifier#1 I2-A2 Current Details Screen*


Indicates the Current of the A2 device in the external amplifier #1.
**NOTE**: See the final test data sheet for the typical current value.

*Figure 53.4.5: External Amplifier#1 I3-B1 Current Details Screen*


Indicates the Current of the B1 device in the external amplifier #1.
**NOTE**: See the final test data sheet for the typical current value.

*Figure 53.4.6: External Amplifier#1 I4-B2 Current Details Screen*


Indicates the Current of the B2 device in the external amplifier #1.
**NOTE**: See the final test data sheet for the typical current value.

*Figure 53.4.7: External Amplifier #1 A Power Supply Details Screen*


Indicates the voltage of the A power supply in the external amplifier #1.
**NOTE**: Typical voltage value is +42VDC nominal.

*Figure 53.4.8: External Amplifier #1 B Power Supply Details Screen*


Indicates the voltage of the B power supply in the external amplifier #1.
**NOTE**: Typical voltage value is +42VDC nominal

*Figure 53.4.9: External Amplifier #1 A Temperature Details Screen*


Indicates the temperature of heatsink A in the external amplifier #1. **NOTE**: Typical temperature for DVB = ≈20-30°C above ambient.

*Figure 53.4.10: External Amplifier#1 B Temperature Details Screen*


Indicates the temperature of heatsink B in the external amplifier #1. **NOTE**: Typical temperature for DVB = ≈20-30°C above ambient.

*Figure 53.4.11: External Amplifier #1 Code Version Details Screen*


Indicates the code version in the external amplifier #

***Set- Up Screens***

***Figure 54: Transmitter Set-Up Main Screen***


This is the Transmitter Set-Up Main Screen. Push the ENTER button to access the Authorization Warning Main Sub Screen. This is the final Main Screen, pushing the DOWN Arrow will take you back to Transmitter Details Main Menu.

The Set-Up item or parameter that can be changed on the displayed sub menu screen, is indicated by pushing the ENTER button, which causes the changeable item to blink. The UP or DOWN arrow will change the selection until the desired result is displayed. Pushing the ENTER Button will accept the change.

***Figure 54A: Authorized Personnel Screen***


This screen of the transmitter notifies an operator that they are only to proceed if they are authorized to make changes to the transmitter's operation. Changes made within the following set-up screens can affect the transmitter's output power level, output frequency, and the general behavior of the transmitter. Please do not make changes within the transmitter's set-up screens unless you are familiar with the operation of the transmitter. Pressing the ENTER button will display the Enter Key Sets to Change screen.

***Figure 54B: Right Key Sets to Change Mode Screen***


This screen informs the operator that to make changes, the Right key or the Enter key must be pushed, which will cause the display that can be changed to blink. Use the up or down key to change the display and the left or right key to move the blinking item on the display. After changes are made in the Set-Up Menus pushing the enter Key, Button, will accept the changes made. With the Right Key Sets To Change Mode screen displayed, pushing the ENTER button will access the first main submenu under the Set-Up main menu, which is the Chassis Values Set-Up Menu.

***Figure 54.1: Chassis Values Main Set-Up Menu Screen***


This is the Transmitter Set-Up Chassis Values Main Sub Screen. Push the ENTER button to access the Chassis Values submenus. Push the DOWN Arrow to view the next Set-Up Main Sub Screen, which is the Set-Up Upconverter Main Sub Screen.

*Figure 54.1.1: Chassis Values Forward Power Set-Up Screen*


This screen allows remote or front panel adjustment of the output power of the transmitter. The bar graph indicates the range remaining in the adjustment.

**NOTE:** If the transmitter's output power is being adjusted through the web page, the transmitter's forward power will be blinking on this screen. It will remain blinking while the transmitter is adjusting to the desired target power level.

*Figure 54.1.2: Chassis Values Model Number Set-Up Screen*



This screen allows the set-up of the Model Number of the transmitter. This causes the system to access the proper parameters to be displayed on the LCD screens.

**NOTE:** Do not change this screen without first consulting with UBS-Axcera.

*Figure 54.1.3: Chassis Values Jump to Menu on Fault Set-Up Screen*


The 'Jump To Menu' setting screen allows an operator to change how the transmitter's display system works. When this value is set 'ON' and a new fault occurs, the transmitter will automatically change the display screen to show the new fault condition. When this value is set 'OFF', the display screen does not change when a new fault is detected.

*Figure 54.1.4: Chassis Values Latch On a Fault Set-Up Screen*


This screen, by selecting ON, allows the user to select that the system will latch the fault if it occurs, then if the problem is corrected the fault will still register. Since latched faults are used to set the status LED color. When fault latching is OFF, the status LED should only be green if there are no faults or red if there are one or more active faults. When fault latching is ON, the status LED will be amber if there are no current faults but a fault was previously detected and is now a latched fault. A blinking amber status LED indicates that there are no current faults or latched faults but that an internal signal source is selected instead of an external source.

*Figure 54.1.5: Chassis Values External Amplifier Fault Number Set-Up Screen*

**1**


**2**


This screen allows the user to set the number of faults that are allowed before the external amplifier is disabled. **NOTE**: Only used with external amplifiers are in the system.

**Screen 1:** If One Fault is selected and a fault occurs in an external amplifier, the entire transmitter is muted and the faulted external amplifier is latched off. The transmitter is then unmuted and any external amplifiers (fully or partially operational) are enabled.

**Screen 2:** If Three Fault is selected and a fault occurs in an external amplifier, the entire transmitter is muted and unmuted three times before the faulted external amplifier is latched off.

**NOTE:** Faulted amplifier sections are re-enabled when latched faults are cleared in the event log. See Table 9.1 for more information on clearing the logs.

*Figure 54.1.6: Chassis Values IF Processor Selection Screen*


This screen allows the user to select that the system has an IF Processor.

*Figure 54.1.7: Chassis Values Downconverter Selection Screen*


This screen allows the user to select that the system has a Downconverter.

*Figure 54.1.8: Chassis Values Amplifier Power Supply Voltage Screen*


This screen allows the user to select the Power Supply Voltage.

*Figure 54.1.9: Chassis Values Forward Power Fault Adjust Screen*


This screen allows the operator to configure a forward power fault threshold setting. When the exciter is enabled for at least a few seconds and the system forward power is not greater than or equal to this setting, a fault is indicated on the status LED and also on the remote fault indicator pin.

*Figure 54.1.10: Chassis Values number of Amplifiers in System Screen*


This screen indicates the number of external amplifier drawers in the system. By selecting the enter key, the system will scan to find the number of external amplifier drawers.
**NOTE:** Do not change this screen without first consulting with UBS-Axcera.

*Figure 54.1.11: Chassis Values Ethernet Option Set-Up Screen*


This screen is only displayed if Ethernet Controller is not present in your system.

*Figure 54.1.12: Chassis Values Reset Ethernet User Name Set-Up Screen*


When the optional Ethernet Controller is present, this screen is displayed. It is used to reset the first username / password account of the Ethernet controller. There are a total a five accounts available on the Web. If this operation is selected, ON, and the change accepted, only the fist username / password account file is replaced, with the user name set to 'admin' and the password set to 'UBS-Axcera'.

*Figure 54.1.13: Chassis Values Ethernet Address Set-Up Screen*


When the optional Ethernet Controller module is present, this screen is used to view or change the Ethernet TCP Address of the controller.

*Figure 54.1.14: Chassis Values Ethernet Netmask Set-Up Screen*


When the optional Ethernet Controller module is present, this screen is used to view or change the TCP subnet mask of the Ethernet controller.

*Figure 54.1.15: Chassis Values Ethernet Gateway Set-Up Screen*


When the optional Ethernet Controller module is present, this screen is used to view or change the TCP gateway (router) address of the Ethernet controller.

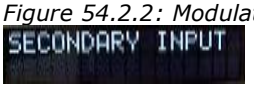
***Figure 54.2: Modulator Main Set-Up Menu Screen***


This is the System Set-Up Modulator Main Sub Screen. Push the ENTER button to access the Set-Up Modulator submenus or push the DOWN Arrow to view the next Set-Up Main Sub Screen, which is the Set-Up Upconverter Main Sub Screen.
**NOTE:** Refer to the description in Table 30B for how to change the values on the following set-up screens.

*Figure 54.2.1: Modulator Primary Input Selection Set-Up Screen*


This screen allows the user to select between an A and a B source input to the modulator. When set to automatic, the modulator will automatically sense an input and chose that input as the primary input.

*Figure 54.2.2: Modulator Secondary Input Selection Set-Up Screen*




This screen allows the user to select a secondary input source to the modulator.

*Figure 54.2.3: Modulator Linear Equalization Selection Screen*


This screen controls the operation of the linear equalizer. When set to ON, the modulator applies linear correction to the IF output. When set to OFF, no correction is applied to the IF.

*Figure 54.2.4: Modulator Non Linear Equalization Selection Screen*


This screen controls the operation of the non linear equalizer. When set to ON, the modulator applies non linear correction to the IF output. When set to OFF, no correction is applied to the IF.

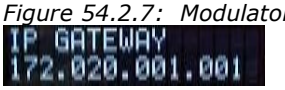
*Figure 54.2.5: Modulator Values IP Address Set-Up Screen*


This screen is used to view or change the IP Address of the modulator.

*Figure 54.2.6: Modulator Values IP Netmask Set-Up Screen*


This screen is used to view or change the IP subnet mask of the Modulator.

*Figure 54.2.7: Modulator Values IP Gateway Set-Up Screen*




This screen is used to view or change the IP gateway (router) address of the Modulator.

This is the final screen in the Transmitter Set-Up Modulator Main Sub Screens. Push the down arrow to repeat the Modulator Main Sub Screens or Push the LEFT Arrow to go back the Modulator Main Set-Up Screen.

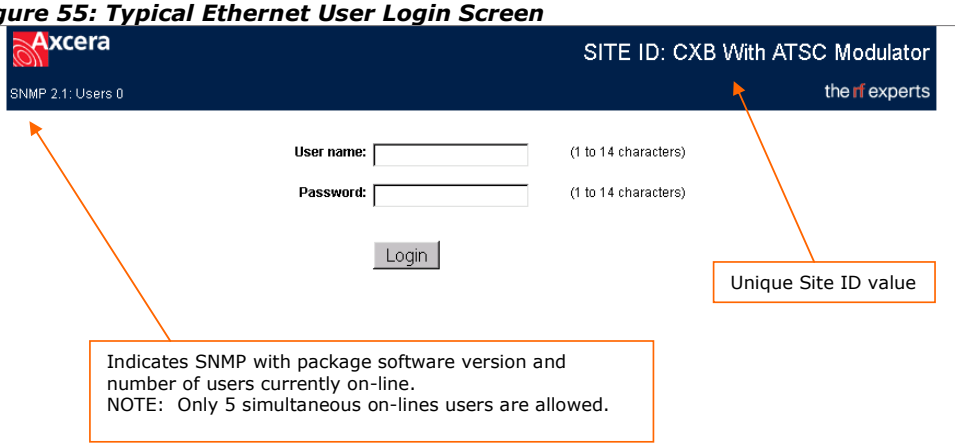
***Innovator CX Series Web Ethernet Interface Kit***

**Introduction**

The Innovator CX Series transmitter is available with an optional Web Ethernet interface package (1313100). Another Web Ethernet Interface package that provides an SNMP interface to transmitter parameters and serves HTML web pages is available (1316423). This option may be added to the Innovator CX Series transmitter if it was not originally installed at the factory. **NOTE:** If an ATSC modulator is present in your system, please refer to the ATSC Modulator section of this manual for more information on the ATSC modulator Web Interface.

**NOTE:** Mozilla Firefox is the preferred browser for this Web Ethernet interface kit.

***Figure 55: Typical Ethernet User Login Screen***




Once a connection has been established, the Web interface can be launched by entering the IP address of the Innovator CX Ethernet Controller (as a URL) in the browser of the remote computer. A login page will be displayed prompting the user to enter a User Name and Password, **which are case sensitive**.

The controller has three levels of user access: Administrative, Read/Write and Read Only. Administrators have full access to transmitter controls and controller configuration. Read/Write users have full access to transmitter controls and can change all controller configurations except for the user name and password accounts. Read Only users can view all transmitter parameters and the event log entries but they can not change the transmitter's state, clear faults, clear the event log or configure the Ethernet parameters.

Five unique login accounts are available. The factory default user name and password for account number one is:

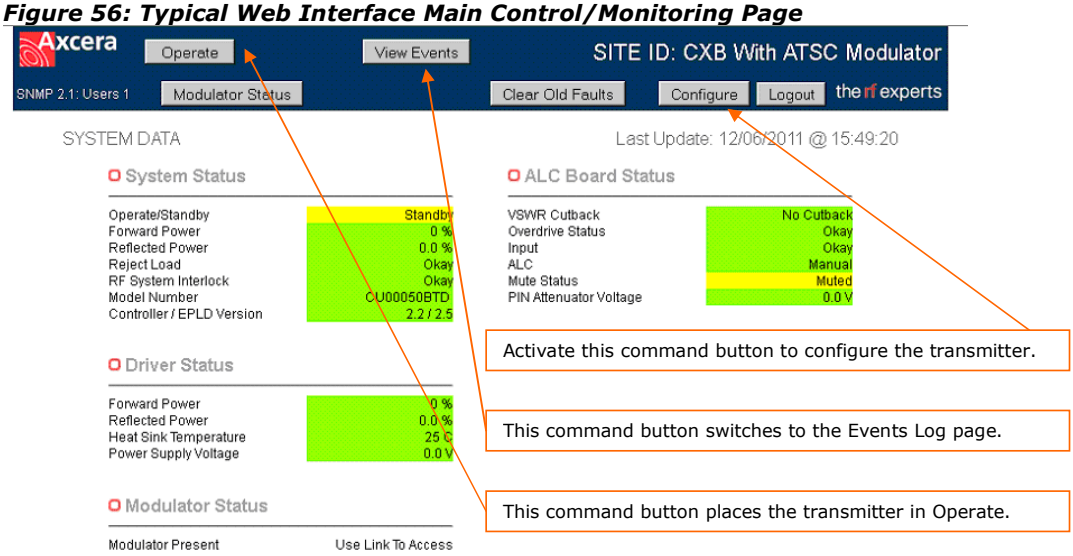
| User Name | Password | Access Level |
|---|---|---|
| admin | UBS-Axcera | Administrator |

The user name and password of account number one may be reset to factory default values through a transmitter setup page.

**Main Control/Monitoring Page**

After logging in, the main control/monitoring page is displayed. Administrators have the ability to change the transmitter's operate/standby state, and configure the application. All users have the ability to view the transmitter's event log, and review system parameters. Refer to Figure 56 for a sample of the main control/monitoring page.

***Figure 56: Typical Web Interface Main Control/Monitoring Page***




The buttons at the top of the page allow the user to access a number of status and configuration pages.

To place the transmitter in Operate mode, the user must click on the '**Operate**' button – see Figure 56. When the transmitter is in operate mode, Operate/Standby, found under System Status, will be highlighted Green and will indicate operate. To place the transmitter in standby mode, the user must click on the '**Standby**' button. When the transmitter is in standby mode, Operate/Standby, found under System Status, will be highlighted yellow and will indicate Standby.

System Status will display the status of a number of overall transmitter system parameters. These include Operate/Standby status, forward and reflected power levels (as a percentage), reject load status and RF system interlock status. Model number and software revisions are also displayed.

Driver Status will display the status of a number of CX drawer low power amplifier parameters. These include forward and reflected power levels (as a percentage), heatsink temperature and power supply voltage.

ALC Board Status will display the status of a number of CX drawer ALC board parameters.

Color Key:

Green = Okay or Normal Operation
Yellow = Warning, But Not faulted
Red = Currently Active Fault
Orange = Old or Previously Latched Fault

If an item on page is Orange, a latched fault is present. Activating the **'Fault Reset'** button will reset any latched faults, clear the transmitter's event log and cause the parameter to display normally.

The date and time of the last message received by the web page browser is present to assure connectivity. If the browser does not receive a new set of data from the Ethernet Controller, it will show the last update field with a yellow background indicating a connection problem is present.

From the main page, administrators and accounts with read/write access may change the Web interface settings by activating the '**Configure**' button near the top of the page.

The user can return to the main control/monitoring page by selecting the '**Back**' button.

***View Events Page***

The user can access the transmitter's event log by selecting the '**View Events**' button on the CX Ethernet Controller main control/monitoring page.

***Figure 57: Typical Event Log Page***


This page allows the user to view events and to determine the time between events. Events are logged in the order they are received. If more than 200 events are detected, the transmitter's System Controller drops the oldest event to record the new event. Transferring of events from the transmitter's System Controller and the Ethernet Controller is scheduled so that device details are continuously monitored. Therefore the event log page may update a few seconds behind the transmitter display when the log is full or changing quickly.

Each event record indicates the event number, the number of events, an occurrence counter and text describing the event. The occurrence counter keeps track of the number of times a specific event has occurred since the log was last cleared. Up to 99 occurrences are available for each event.

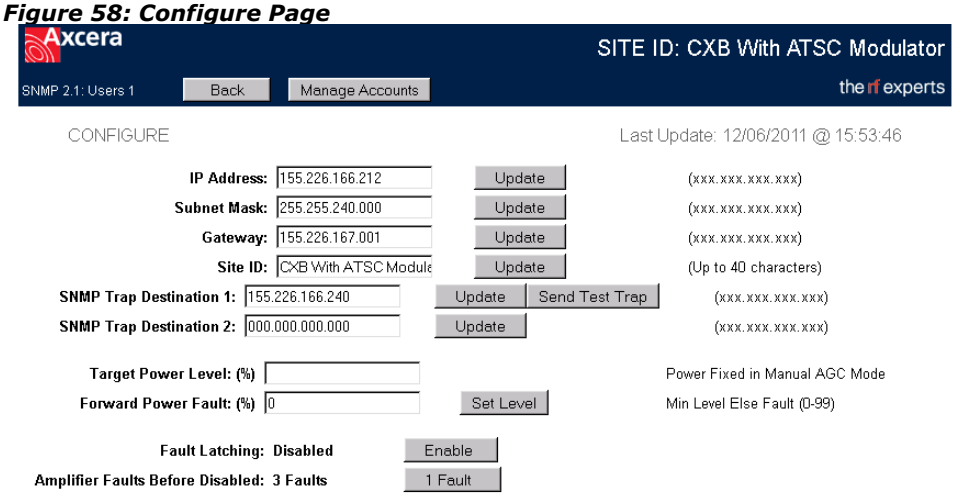
To view the next set of twenty events, activate the **'Next'** button. If viewing events higher in the log, the **'Previous'** button allows you to return to prior events.

The user can return to the main control/monitoring page by selecting the '**Back**' button.

***Configure Page***

The user can access the Configure page by selecting the '**Configure**' button on the CX Ethernet Controller main control/monitoring page.

***Figure 58: Configure Page***




**NOTE:** The Innovator CX Ethernet controller does not use DHCP addresses – TCP/IP settings must be fixed and entered manually. A crossover cable may be needed if connecting directly from a computer to the Innovator CX drawer.

***Note: If the transmitter system is pre-wired at the factory and includes a router and Remote Interface Panel, CX drawers connected to the router have been configured with a static IP address. The operator can access the CX drawers though the router, but the IP addresses must not be changed. Changing the static IP addresses of the CX drawers could prevent the drawers from communicating with other devices in the system and render the transmitter inoperative.***

When entering a site ID, be sure to not use special characters except underscores, dashes, and forward slashes.

The page above displays SNMP parameters and allows an operator to send a test trap. If this system did not have SNMP enabled, then fields would not be populated and the **'Send Test Trap'** button would not be present. New event log entries including an activated test trap are automatically forwarded to SNMP agents specified to receive trap messages. Trap messages do not need to be acknowledged by an agent.

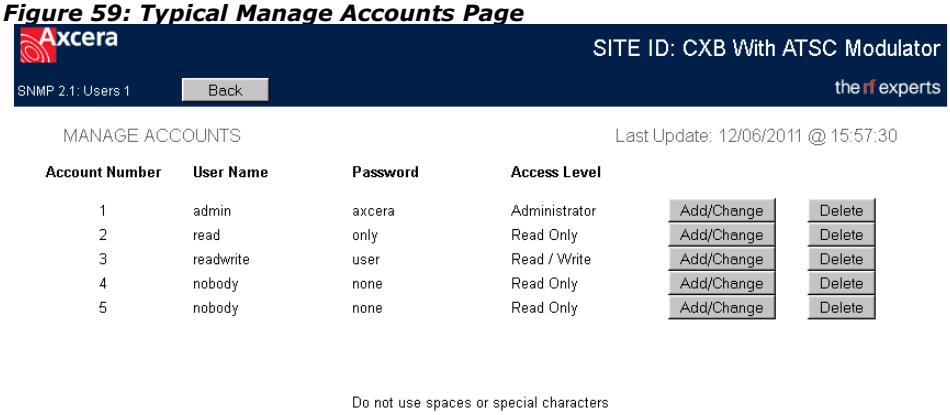
Changes to the transmitter's output power are available to administrators when the transmitter is operating. Once changed, the menu defaults back to the main display page and the systems forward power is noted as changing.

To manage user accounts, administrators may click the '**Manage Accounts**' button near the top of the configure page.

***Manage Accounts Page***

The user can access the Manage Accounts page by selecting the '**Manage Accounts**' button on the CX Ethernet Controller Configure page.

***Figure 59: Typical Manage Accounts Page***




The Innovator CX Ethernet controller supports up to 5 different user accounts. To add or change one of the accounts, click the '**Add/Change**' button in the row of the account you want to modify. Enter the desired name, password, and administrator or read/write access rights for the user and click save.

**NOTE:** The transmitter's set up menus contain a Reset Ethernet User ID page. This page allows a user to reset the first account User Name and Password. The Yes or No selection can be changed by pushing the Up or Down Button. After the selection has been made, the user needs to depress the right or left arrow and then the display will ask "PUSH ENTER TO ACCEPT CHANGES". If the ENTER button is depressed, the change will be accepted. If any other button is depressed, the change will not be made. If Yes is selected on the page, and accepted, the User name and Password will reset to the factory default of admin / UBS-Axcera.

Activate the '**Back**' button to return to the main control/monitoring page.

When you have completed using the web interface, please remember to log out via the **'Logout'** button at the top of the control/monitoring page.

***SNMP Interfaces***

The Innovator CX Ethernet Controller implements Simple Network Management Protocol (SNMP). SNMP is a standardized method of transferring information from one electronic device to another. SNMP is typically used to remotely control and monitor several transmitter devices from a centralized network management system (NMS). SNMP is a communication method between two applications and is not a graphical user interface. Therefore, SNMP functionality is included along with web page server functionality. SNMP is used to gather information or set control states but it requires additional computer applications for operator monitoring and control.

The Innovator CX Ethernet Controller implements SNMP version 2 (SNMP v2), using a Management Information Base (MIB). The MIB file defines all SNMP parameters of the transmitter, specifies the format of data, and orders the presentation of the parameters using a hierarchical namespace containing object identifiers (OID). Each OID identifies a variable that can be read, read and set, or only set via SNMP commands.

SNMP functionality also provides for alert messages that are issued from the Ethernet Controller to one or two network computers. A SNMP trap message is sent only once and is not acknowledged by the receiving device. The Ethernet Controller issues a trap message when data is added to the transmitter Event log (either activation of a fault or when a fault is cleared), or when the transmitter operate/standby status changes.

**SNMP Configuration**

The Ethernet Controller's TCP/IP Address, Subnet Mask, and Gateway must be configured with static values that are valid within your network. Dynamic Host Configuration Protocol (DHCP) is not implemented; however access to these configuration parameters is available through the front panel setup menus of the Innovator CX drawer.

The Innovator CX drawer’s SNMP MIB allows up to two SNMP trap destinations. The trap destination values can be set through WEB pages. The TCP/IP address of a trap processing computer can also be configured through the SNMP parameters called 'site_trap_adr1' and 'site_trap_adr2'. To clear a previously configured trap destination and cause the system not to issue traps to a specific address, set the value to '000.000.000.000'.

Reading of SNMP values is done with the message's community access set to 'public'. When setting SNMP values, a default community access level of 'private' is used. Future implementations of the Ethernet SNMP agent may allow for the set community access level to be defined through the device's web server.

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***Descriptions of Boards in the CU0TD/RD-1 thru CU0TD/RD-5 Systems***

**(A1) 8 VSB Demodulator Board (1308275)**

**NOTE:** The 8 VSB demodulator board is only used in RD systems except when the output of an external K-Tech Receiver is used**.**

***Overview***

The 8 VSB demodulator assembly receives an off air 8 VSB signal on any VHF or UHF channel and demodulates this to an MPEG-2 transport stream that is per the SMPTE-310M standard. The input to the assembly is at an "F" style connector on the shielded tuner and can be at a level of –8 to –78 dBm. The tuner (TU1) down converts the RF channel to a 44 MHz IF signal. This signal is the input to the digital receiver chip U1. The digital receiver chip subsequently decodes the IF and delivers an MPEG-2 transport stream on a parallel data bus to a programmable logic array, U8. U8 clocks the asynchronous MPEG data from the receiver chip and outputs a synchronous data stream at a 19.39 MHz rate to buffer/driver U11. U11 subsequently drives the output at J13 to a lower level that is AC coupled out of the board.

***Microcontroller Functions***

A microcontroller, U17, is provided on this assembly to supervise the operation of the receiver chip and the tuner. In addition, the microcontroller also interfaces to the front panel LCD display via connector J24 and pushbutton interface on J27. On power up, the microcontroller sets the tuner to the last channel that was selected when the unit was powered down. In addition, the microcontroller also configures the digital receiver to operate as an 8 VSB receiver. The communication between all of the devices on this board is via an I2C serial bus that is local to this board.

***Jumper and DIP Switch Settings***

This board can be used in various assemblies. When this assembly is installed in the Innovator CXB product, the jumpers on J7 and J8 should be placed between pins 2 and 3 for normal operation. The DIP switch SW1 should be configured as indicated in Table 12.

| Position | Function | When Switch is Off | When Switch is On |
|---|---|---|---|
| SW1-1 | Tuner Type | Original Tuner (DTT765xx) | Recent Tuner (DTT7680x) |
| SW1-2 | Signal Strength Gain | Gain = 8.0 | Gain = 9.3 |
| SW1-3 | Special Channel Plan | Normal | Channels 2, 3, or 4 are offset up 4 MHz |
| SW1-4 | Reserved for Future | | |
| SW1-5 | Reserved for Future | | |
| SW1-6 | Reserved for Future | | |
| SW1-7 | Reserved for Future | | |
| SW1-8 | Operation Type | Transcoder Operation | Innovator CX/CXB Operation |

***Table 37:*** **Innovator CX Receive /Demodulator/Transcoder Dip Switch SW1**

**NOTES:** SW1-8 operation is available in software versions greater than or equal to 2.3 with hardware versions greater than or equal to D0, unless the board was factory modified. These switch positions are factory set for your system and should not be changed.

### (A5) ALC Board, Innovator CX Series(1315006)

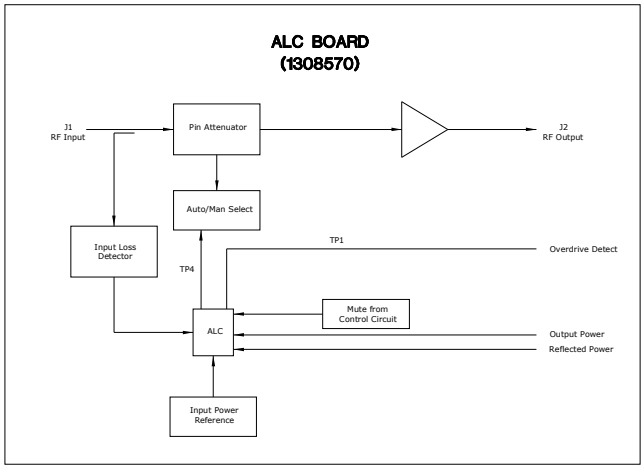


***Figure 60: ALC Board Block Diagram***

The ALC Board, Innovator CX Series, is used to control the RF drive power to the RF amplifier chain in the CU0TD/RD-1 thru CU0TD/RD-5 systems. The board accepts an 8-VSB RF input signal at a nominal input level of -3 dBm average power and amplifies it to whatever drive level is necessary to drive the final RF amplifier in the drawer to full power. The input signal to the board at J1 is split by U4, with one half of the signal driving a PIN diode attenuator, DS1 and DS2, and the other half driving a detector, U13, that is used to mute the PIN attenuator when there is no input signal. The output of the PIN attenuator is sent to two cascaded amplifiers, U2 and U3, which are capable of generating +10 dBm average power from the board at J2.

The PIN attenuator is driven by an ALC circuit or by a manual fixed voltage bias, depending on the position of switch S1. When the switch is pointing to the left, looking from the front of the drawer, the ALC circuit is enabled. When the switch is pointing to the right, the ALC circuit is disabled and the PIN attenuator is controlled through the Manual gain pot R62. When the switch is in either ALC or manual, the voltage in the unused circuit is preset low by the circuitry connected to pins 4-6 on SW1. This allows the RF power to ramp up slowly to full power when the switch changes positions. CR8, C33 and associated components control the ramp up speed of the manual gain circuit. CR9, C42 and their associated circuits do the same thing for the ALC circuit. The practical effect of this is to preset the RF drive power to near zero output power when enabling and disabling the ALC, followed by a slow controlled ramp up of power.

The ALC circuit normally attempts to hold the drawer output power constant, but there are four faults that can override this. These faults are Input Fault, VSWR Cutback Fault, VSWR Shutdown Fault and Overdrive Fault.

The Input Fault is generated by comparator U7C and presets the PIN attenuator and ALC circuit to maximum attenuation whenever the input signal drops below about -7 dBm. Test point TP2 allows the user to measure the detected input voltage.

The VSWR cutback circuit is set so that the ALC circuit will start reducing RF drive once the Reflected power reaches a level of about 6% and will keep reducing the drive to maintain that level. The cutback is generated by U8A, U8B and their associated components that diode-or the metering voltages. The forward power is scaled to 2V = 100 % and the reflected power is scaled to 2V = 25%. The Reflected metering voltage is doubled again by U8B so that when the voltage of U8B exceeds the voltage at the output of U8A, the reflected power takes over the ALC circuit. Once the U8B voltage drops below the forward power at U8A, the forward power takes over again.

The VSWR shutdown circuit will shut the drawer down if the Reflected power increases to 15% or higher, which can happen if the drawer sees reflected power when the ALC is in manual.

The Overdrive protection looks at a sample of the RF signal that is applied to J1 of the board. The peak level of this signal is detected and can be measured on TP1. This voltage is applied to a comparator with the threshold set by R38. If this threshold is exceeded, the ALC circuit mutes then ramps up to try again. This circuit also works in manual gain as well.

### (A6) Amplifier Assembly

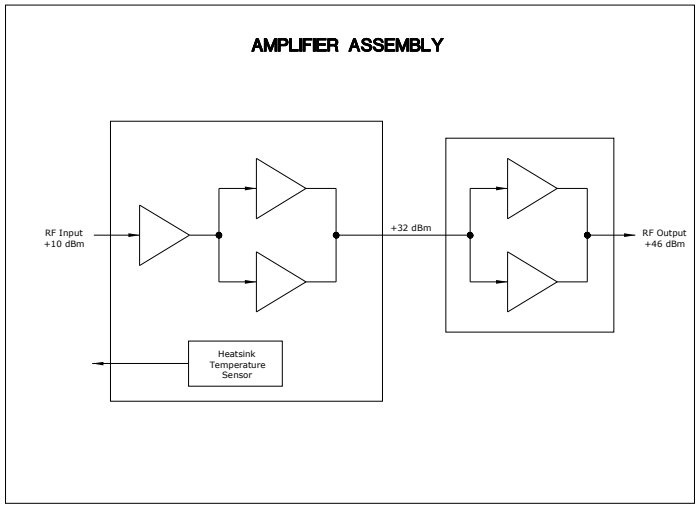


***Figure 61: Typical Amplifier Assembly Block Diagram***

**NOTE:** There are a number of different (A6) Amplifier Assemblies used in the multiple CX transmitter and driver drawers. They are listed in the following sections. Use the assembly that applies to your particular driver or transmitter or translator.

### *(A6) Amplifier Assembly (1316313) Used in CU0TD/RD-1*

The (A6) Amplifier Assembly (1316313) is made up of (A6-A1) the 1 Watt UHF Amplifier Board (1310282 and the (A6-A2) the BL881 Single Stage Amplifier Board (1314882). The assembly has approximately 35 dB of gain.

#### *(A6-A1) 1 Watt UHF Amplifier Module (1310282)*

This board is normally operated at a power of 200 mW pk sync or lower. It consists of two AH202 MMICs operating in parallel. The board is powered by +12 VDC and has no adjustments. The amplifier module has a gain of approximately 17 dB.

#### *(A6-A2) BLF881 Single Stage Amplifier Board (1314882)*

This board consists of a single stage amplifier operating at +48 VDC. The board has an overall gain of about 16 dB. The input to the board passes through a 3 dB attenuator consisting of R11-R13, and then is applied to the gain stage, which consists of a single LDMOS transistor Q1 operating in Class AB. The bias voltage for the transistor is generated through the voltage regulator U1, and is adjusted using pots R2 and R3. The Diode CR1 provides temperature compensation for the transistor. The transistor will output over 40 Watts pk sync, but is typically used in a driver application at much lower output powers. The Directional Coupler U2 provides a 20 dB down sample of the RF output at the SMA Jack J4.

### *(A6) Amplifier Assembly (1312566) – Used in CU0TD/RD-2*

The (A6) Amplifier Assembly (1312566) is made up of (A6-A1) the 2 Stage UHF Amplifier Board (1308784) and (A6-A2) the RF Module Pallet, Philips, High Output (1309580). The ALC Board (1315006) is also part of this assembly. The assembly has approximately 36 dB of gain.

#### *(A6-A1) 2 Stage UHF Amplifier Board (1308784)*

The 2 Stage UHF Amplifier Board, (1308784) consists of a driver stage and a parallel connected final amplifier stage which have a total gain of approximately 23 dB. The working point settings for the 2 Stage Amplifier Board are factory set using the potentiometers R32 for Q2, R15 for Q1, and R24 for Q3 and should not be altered. The input RF connects to the first amplifier stage U2, which has a gain of approximately 14 dB. The output is split by U2 and connected to the final amps. The final amplification circuit consists of parallel-connected push-pull LDMOS amplifier circuits Q1 and Q3 operating in class AB each with approximately 14 dB of gain. The board uses a power supply voltage of 28-32V. The RF transistors are operated at a voltage of 24V generated by the voltage regulators U1 for Q1, U5 for Q3 and U6 for Q2, which provide a separate regulated voltage to each transistor. In order to match the LDMOS impedance to the characteristic impedance of the input and output sides, matching networks are located before and after the amplifier circuits. The hybrid coupler U2 splits the input to the parallel amplifiers and the hybrid coupler U4 combines the amplified outputs. The combined output connects through a directional coupler to J1, the RF output jack of the board. The directional coupler provides an RF sample at J3 that is used by an external overdrive protection circuit located on (A5) the ALC Board. The RF output of the board is being used as a driver and has a level of 3W maximum 8-VSB. At this power level the board draws approximately 1.8A total from the power supply.

### *(A6-A2) RF Module Pallet, Philips, High Output (1309580)*

The RF Module Pallet, Philips, High Output, (1309580) is made from the RF Module Pallet, High Output w/o Transistors (1309579). This broadband amplifier is for the frequency range of 470 to 860 MHz. The amplifier is capable of delivering a maximum output power of 100 Watts peak, with an amplification factor of approximately 13 dB.

The amplification circuit consists of push-pull amplifier blocks V1 and V2, connected in parallel, operating in class AB. In order to match the impedance of the transistors to the characteristic impedance of the input and output sides, matching networks are placed ahead and behind the amplifier blocks. Transformers Z3 and Z4 at the input to V1 and V2 and Z5 and Z6 at the output of V1 and V2 serve to balance the input and output signals. The paralleling circuit is achieved using the 3-dB input coupler Z1 and the second part of Z1, which is the 3-dB output coupler. The working point settings of the amplifier circuits are factory implemented by means of the potentiometers R11 and R12 and should not be altered. The combined output of Z1 connects to the RF output jack of the board at J2. The output of the amplifier assembly at J2 connects to J1 on (A7) the output detector board.

## *(A6) Amplifier Assembly (1316636) – Used in CU0TD/RD-3*

The (A6) Amplifier Assembly (1316636) is made up of (A6-A1) the 1 Watt Amplifier Board (1310282), (A6-A2) the BLF881 Single Stage Amplifier Board (1314882), and (A6-A3) the Dual BLF 881 Pallet Assembly (1316084). The ALC Board (1315006) is also used with this assembly. The entire amplifier assembly has approximately 36 dB of gain.

### *(A6-A1) 1 Watt UHF Amplifier Module (1310282)*

This board is a broadband UHF amplifier that consists of two AH202 MMICs operating in parallel. The board is powered by +12 VDC and has no adjustments. The amplifier has a gain of approximately 16 dB.

### *(A6-A2) BLF881 Single Stage Amplifier Board (1314882)*

This board consists of a single stage amplifier operating at +48 VDC. The board has an overall gain of about 16 dB. The input to the board passes through a 3 dB attenuator consisting of R11-R13, and then is applied to the gain stage, which consists of a single LDMOS transistor Q1 operating in Class AB. The bias voltage for the transistor is generated through the voltage regulator U1, and is adjusted using pots R2 and R3. The Diode CR1 provides temperature compensation for the transistor. The transistor will output over 40 Watts pk sync, but is typically used in a driver application at much lower output powers. The Directional Coupler U2 provides a 20 dB down sample of the RF output at the SMA Jack J4.

### *(A6-A3) Dual BLF881 Pallet Assembly (1316084)*

This board consists of a two single stage amplifiers operating in parallel. The board has an overall gain of approximately 18 dB. The RF input to the board connects to U3 a hybrid splitter which produces two equal outputs. One output of the splitter is fed thru a matching and response network to the gain stage, which consists of the LDMOS transistor Q1 operating in Class AB. C11 is adjustable for best response.

The bias voltage for the transistor is generated from +48VDC that connects through the resistor R3 to the drain on Q1 and through the voltage regulator U1. The regulated voltage at the output of U1 is adjusted with the pots R7 and R6 before it is connected to the drain on Q1. The Diode CR1 provides temperature compensation for the transistor. The transistor is capable of producing an output of over 20 Watts ATSC. The amplified output is connected thru a matching network to one input of U4 a hybrid combiner.

The other output of the input splitter is fed thru an identical amplifier circuit as described for the Q1 transistor, except it is for the Q2 transistor. C45 is adjustable for best response, R16 and R17 are the bias adjustment pots and CR2 is the temperature compensating diode for the Q2 amplifier circuit. The amplified output of Q2 is connected thru a matching network to the other input of the U4 hybrid combiner. The hybrid combiner combines the two amplified outputs of the Q1 and Q2 LDMOS devices and produces a single RF output (≈+42dBm) of the board and the assembly, which a cabled to the (A12) Coupler Board.

### *(A6) Amplifier Assembly (1312191) – Used in CU0TD/RD-4 & CU0TD/RD-5*

The (A6) Amplifier Assembly (1312191) is made up of (A6-A1) the 1 Watt Amplifier Board (1310282), (A6-A2) the BL871 Single Stage Amplifier Board (1311041), and (A6-A3) the Dual 878 Pallet Assembly (1313170 or 1310138). The ALC Board (1315006) is also used with this assembly. The entire amplifier assembly has approximately 36 dB of gain.

#### *(A6-A1) 1 Watt UHF Amplifier Module (1310282)*

This board is a broadband UHF amplifier capable of producing an output power in excess of 1W Peak. It is normally operated at an average power of 100 mW 8VSB or lower. It consists of two AH202 MMICs operating in parallel. The board is powered by +12 VDC and has no adjustments. The board has a gain of approximately 16 dB.

#### *(A6-A2) BL871 Single Stage Amplifier Board (1311041)*

This board consists of a single stage amplifier operating at +42 VDC. The board has an overall gain of about 16 dB. The input to the board passes through a 3 dB attenuator consisting of R11-R13, and then is applied to the gain stage, which consists of a single LDMOS transistor Q1 operating in Class AB. The bias voltage for the transistor is generated through the voltage regulator U1, and is adjusted using pots R2 and R3. The Diode CR1 provides temperature compensation for the transistor. The transistor will output over 20 Watts DVB, but is typically used in a driver application at much lower output powers. The Directional Coupler U1 provides a 20 dB down sample of the RF output.

#### *(A6-A3) Dual 878 Pallet Assembly (1313170 or 1310138)*

This board is a LDMOS UHF power amplifier consisting of two power transistors operating in parallel. The board operates on a power supply voltage of +42 VDC. The voltage regulator U1 steps down the voltage to provide a bias voltage to each transistor. The diodes CR1 and CR3 are used to temperature compensate the bias voltage. As the RF transistors heat up, the diodes also heat up, causing the voltage across them to drop, lowering the bias voltage to the RF transistors so that it remains constant with device temperature.

The board has a gain of approximately 17 dB, and can operate at an output power of 150 Watts average power DVB, 220 Watts average power ATSC, or 440 Watts Peak Sync plus sound in analog operation. The transistors are operated in quadrature, with one transistor operating 90 degrees out of phase of the other, which provides for a very good return loss across the UHF band on both the input and output of the board.

### *(A6) Amplifier Assembly 1316035– Used in CU0TD/RD-4 & CU0TD/RD-5*

The (A6) Amplifier Assembly (1316035) is made up of (A6-A1) the 1 Watt Amplifier Board (1310282), (A6-A2) the BL881 Single Stage Amplifier Board (1314882, and (A6-A3) the Dual 888A Pallet Assembly (1315347). The ALC Board (1315006) is also part of this assembly. The entire amplifier assembly has approximately 36 dB of gain.

#### *(A6-A1) 1 Watt UHF Amplifier Module (1310282)*

This board is normally operated at a power of 200 mW pk sync or lower. It consists of two AH202 MMICs operating in parallel. The board is powered by +12 VDC and has no adjustments. The amplifier module has a gain of approximately 17 dB.

#### *(A6-A2) BLF881 Single Stage Amplifier Board (1314882)*

This board consists of a single stage amplifier operating at +48 VDC. The board has an overall gain of about 16 dB. The input to the board passes through a 3 dB attenuator consisting of R11-R13, and then is applied to the gain stage, which consists of a single LDMOS transistor Q1 operating in Class AB. The bias voltage for the transistor is generated through the voltage regulator U1, and is adjusted using pots R2 and R3. The Diode CR1 provides temperature compensation for the transistor. The transistor will output over 40 Watts pk sync, but is typically used in a driver application at much lower output powers. The Directional Coupler U2 provides a 20 dB down sample of the RF output at the SMA Jack J4.

#### *(A6-A3) Dual BLF888A Pallet Assembly (1315347)*

This board is a UHF LDMOS power amplifier consisting of two pair of power transistors operating in parallel. The board operates on a power supply voltage of +48VDC. The voltage regulator U1 steps down the voltage to provide a bias voltage to each pair of transistors. The diodes CR1 and CR3 are used to temperature compensate the bias voltage that is applied to the Q1 and Q2 RF transistor pairs. As the transistor pairs heat up, the diodes also heat up, causing the voltage across them to drop, lowering the bias voltage to the RF transistors so that the voltage remains constant with device temperature.

The board has a gain of approximately 18 dB. The RF input to the board is split by HL1 and each output is connected through hybrid couplers to the Q1 and Q2 transistor pairs. The amplified outputs of the transistor pairs are connected through hybrid couplers to the combiner HL2.

The transistor pairs are operated in quadrature, with one transistor pair operating 90° out of phase of the other, which provides for a very good return loss across the UHF band on both the input and output of the board.

**(A7) Output Detector Board (1312207)**

The (A7) Output Detector Board provides forward (2V=100%) and reflected (2V=25%) power samples to the CU Control Board for metering and monitoring purposes. R7 is the reflected power calibration pot and R23 is the forward power calibration pot. A Forward power sample, -10 dBm, connects to J4 on the board, which is cabled to the front panel sample jack of the drawer. The RF output of the board, typically +46 dBm, is at J2, which is cabled to J9 the RF Output Jack of the drawer. The (1312207) output detector board can be used as either an average, for digital, or peak, for analog, detector board using jumpers on J5 and J6.

**(A8) Control Card, Innovator CX (1312543)**

The Innovator CX control board provides the overall system control for the CX system. There are two main elements of the board, U7 and U9. U7 is a programmable logic device that is loaded with firmware, which provides the overall system control. It decides whether or not to allow the system to generate RF output power, and turns the +40 VDC power supply on and off depending on whether or not it is receiving any faults, either faults generated on board, or faults generated externally. The second major component of the board is the microcontroller U9, which controls the front panel indications and drives the display. The U9 microcontroller is not involved in the decision making process, U7 does that. Rather, it is layered on top of U7 and is the EPLD's interface to the outside world. Information is passed between the microcontroller and the EPLD. The microcontroller communicates information to and from the front panel and sends the EPLD the information it needs to decide whether or not to allow the system to turn on. The front panel viewable LEDs DS3 for Operate/Standby and DS4 for Status indicate the current operating condition of the system are mounted on and controlled by this board. The U9 microcontroller can also communicate, using the Optional Ethernet Kit, with a daughter card that allows the user to view remote control parameters via a web Ethernet interface.

The ±12 VDC and +5 VDC from the (A9) power supply and the 39-42 VDC from the (A10) power supply are routed to the other boards in the drawer through this board. The +40 VDC power supply operates all the time, and connects the 39-42 VDC to the board at J19-1, 2, & 3 with 5 common. Q13 on the control board is turned on and off to gate the 39-42 VDC, which connects through J19-6, 7 & 8, to the RF output stages.

The ±12 VDC and +5 VDC input voltages to this board is connected through J21 and filtered before being connected to the rest of the board. +12 VDC connects through J21-1, +5VDC through J21-2 & 3, and -12 VDC through J21-6. Common connections for the input voltages are connected to J21-4 & 5. The ±12 VDC and +5 VDC are used on this board and also routed to the other boards in the drawer through this board. The +3.3 VDC for the microcontroller and programmable logic array, mounted on the board, is provided by the voltage regulator IC U6 from the filtered +5 VDC input. The output of U6 can be adjusted to +3.3 VDC using R120.

**(A9 & A10) Power Supplies used in CX Exciter/Driver**

| MODEL | (A10) POWER SUPPLY VOLTAGE | AC INPUT VOLTAGE |
|---|---|---|
| **CU0TD/RD-1** | **+48VDC** | **115VAC or 230VAC** |
| **CU0TD/RD-2** | **+28VDC** | **115VAC or 230VAC** |
| **CU0TD/RD-3** | **+48VDC** | **115VAC or 230VAC** |
| **CU0TD/RD-4** | **+42VDC w/878A or +48VDC w/888A** | **230VAC** |
| **CU0TD/RD-5** | **+42VDC w/878A or +48VDC w/888A** | **230VAC** |

***Table 38:*** **Model Number with corresponding (A10) Voltages and AC Input Voltages**

Voltages for the operation of the boards in the drawer are generated by (A9) a +5VDC and ±12VDC power supply and (A10) a switching power supply which is a different power supply providing a different voltage in each model. See the chart above. The 115VAC or 230VAC input to the CU0TD/RD-1 thru CU0TD/RD-3 drawer connects through the AC power cord at J6, the power entry module located on the rear panel of the drawer.

The CU0TD/RD-4 & CU0TD/RD-5 drawer only operates with 230VAC. An On/Off 10A/250VAC circuit breaker is part of the power entry module. With the circuit breaker switched On, the (L) line input is wired to F1 a 10 Amp fuse for over current protection. The AC lines are connected to terminal block TB1, which distributes the AC to (A9 and A10) the two DC power supplies. There are two varistors, mounted on TB1, connected from the line input to neutral and to ground for surge protection. The AC in the CU0TD/RD-4 & CU0TD/RD-5 also connects to the (A11) fan mounted on the rear panel of the drawer. The fan will run when AC is applied to the drawer and the circuit breaker is switched On. The +5VDC and ±12VDC outputs of the (A9) power supply connects to the terminal block (TB2) that distributes the DC to the boards in the drawer. Some of the +5VDC and ±12VDC outputs connect directly to the 8 VSB Demodulator and 8 VSB Modulator

The +28/+42/+48VDC outputs of the (A10) power supply connect to the (A8) CX Control Board, which then supplies the switched +28/+42/+48VDC VDC to the (A6) Amplifier Assembly. In CU0TD/RD-1 thru CU0TD/RD-3 drawers the DC output of the (A10) power supply also connects to the (A11) fan mounted on the rear panel, which will operate when AC is applied to the drawer, the On/Off circuit breaker is On and the (A10) power supply is operating.

**Descriptions of Boards Used in External ATSC Amplifier Drawers**

***(A7) Amplifier Control Board (1315011 or 1312260)***

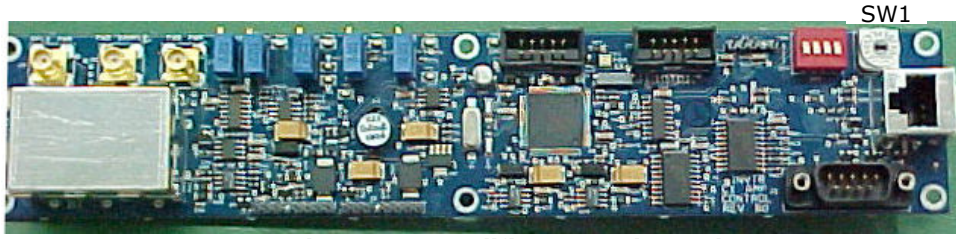


***Figure 62: Amplifier Control Board***

The Amplifier Control Board is mounted in the top front facing the rear of the Amplifier Drawer as shown above.

The Amplifier Control Board uses a Programmable logic device, U12, to control the amplifier drawer. It takes an enable signal from an external driver drawer, and turns the power supplies on whenever the driver has told it to turn on, unless it detects faults internal to the drawer. The board monitors the forward and reflected power, the heatsink temperature, the pallet currents, and the power supply voltage and will generate alarm signals if any of those parameters exceed safe limits. The amplifier drawer has no front panel display other than a two LEDs, one for Status and one for Enable. The board sends all its output information, including the forward and reflected levels, back to the driver drawer, through J4, so the information can be displayed on that drawer's LCD Display. The board will generate a Red Blinking Status LED if it detects an alarm, fault, prompting the operator to look at the LCD display on the driver drawer to see what fault has occurred.

A CUB transmitter System can have up to 4 external amplifier drawers and since they are all the same, without differences in the wiring harness, there needs to be a way to identify which amplifier drawer is which. The rotary switch SW1 is used to specify the amplifier ID number which generates a unique serial address so that the individual amplifier drawers will respond when polled for information.

The +5 VDC inputs to this board are routed through J4-8 and J5-8. The +5 VDC inputs are diode Or connected so that either the +5VDC from the (A8) power supply or the +5VDC from the (A9) power supply will operate the board. The +5VDC is split with one output connected to U1 a voltage regulator IC, which provides +5V and +5V_ANALOG as outputs. The +5 VDC is filtered before being connected to the rest of the board. The other +5 VDC output is connected to the regulator IC U2 that supplies +3.3 V to the microcontroller and programmable logic array.

***(A10) Current Metering Board (1309130)***

The current metering board measures the current into the RF output amplifier pallets and supplies this value to the control board. In the single pallet amplifier drawer, there are two sensing circuits which are used. In the multiple pallet amplifier drawer, there are four sensing circuits which are used. Each circuit has two parallel .01Ω series current sensing resistors and a differential input IC that supplies a voltage output that is proportional to the current for metering purposes. The +42VDC from the (A8) power supply connects to TB2 and TB4 on the board. The +42VDC from the (A9) power supply connects to TB8 and TB10 on the board. The +42VDC input at the TB2 input senses the current to the (A1) 878 output amplifier pallet through TB1 on the board. The +42VDC input at the TB4 input senses the current to the (A2) 878 output amplifier pallet through TB3 on the board. The +42VDC input at the TB8 input senses the current to the (A3) 878 output amplifier pallet through TB7 on the board. The +42VDC input at the TB10 input senses the current to the (A4) 878 output amplifier pallet through TB9 on the board.

The two or four sensing circuits are identical therefore only one will be described. For the (A1) 878 amplifier pallet, the +42VDC from the (A8) switching power supply connects to TB2. R1 and R2 are the parallel .01Ω current sensing resistors which supplies the voltage values to the U1 current sense amplifier IC. R11 is a gain adjust, which is adjusted to eliminate any rSense Error and to place the OpAmp output at 2.61V for 40Amps sense as measured at TP3. The current sense output at J1-1 connects to the (A7) control board for metering purposes.

***(A5) 2 Way Splitter Board (1313158)***

The 2-way splitter board takes the RF Input at J1 (≈12.5 Watts ATSC) on the board and splits it into two equal outputs (≈5Watts ATSC), which are connected to the inputs of the two 878A or 888A amplifier pallets at J1.

***(A5) 4 Way Splitter Board (1308933)***

The 4-way splitter board takes the RF Input at J1 (≈11Watts ATSC) on the board and splits it into four equal outputs (≈4.75Watts ATSC), which are connected to the inputs of the four 878A amplifier pallets at J1.

***(A1-A4) 878A Amplifier Pallets (1314098, 1313170 or 1310138)***

There are two 878A Amplifier Pallets mounted on the two pallet Amplifier Heatsink Assembly and there are four 878A Amplifier Pallets mounted on the four pallet Amplifier Heatsink Assembly. Each of the 878A pallets has approximately +16dB of gain for the UHF frequency range of 470 to 860 MHz. The pallets operate Class AB and generate 150 Watts ATSC with an input of 4.75 Watts ATSC.

***(A1-A2) Dual 888A Amplifier Pallets (1314173)***

There are two 888A Amplifier Pallets mounted on the two pallet Amplifier Heatsink Assembly. Each of the 888A pallets has approximately +16dB of gain for the UHF frequency range of 470 to 860 MHz. The pallets operate Class AB.

***(A1-A4) 888A Amplifier Pallets (1315347)***

There are four 888A Amplifier Pallets mounted on the Amplifier Heatsink Assembly. Each of the 888A pallets has approximately +15dB of gain for the UHF frequency range of 470 to 860 MHz. The pallets operate Class AB and generate approximately 230 Watts ATSC with an input of 8 Watts ATSC.

***(A6) 2 Way Combiner Board (1313155)***

The 2 way combiner board takes the two RF Inputs at J4 & J5 (≈230Watts ATSC) on the board and combines them to a single output (≈375Watts) at J1, which is connected to J2 the 7/16" (1.1cm) Din RF output jack of the drawer.

***(A6) 4 Way Combiner Board (1312368)***

The 4 way combiner board takes the four RF Inputs at J4, J5, J6 & J7 (≈150Watts ATSC) on the board and combines them to a single output (≈500Watts/600Watts) at J1 that connects to J2 the 7/16" (1.1cm) Din RF output jack of the drawer.

***(A8 & A9) One, two & three pallet Amplifier Drawer Power Supplies***

The 230VAC, needed to operate the drawer, connects through the AC power cord at J3, the power entry module located on the rear panel of the drawer. The AC lines are connected to a terminal block TB1 to which the circuit breaker(s) connect. In a N+1 one pallet amplifier drawer and all multiple pallet amplifier drawers, there are two On/Off 20A/250VAC circuit breakers that are mounted on the back panel of the drawer on either side of J3 the AC input jack. With the circuit breakers switched On, the AC is distributed to the two (A8 and A9) DC power supplies. In a standard one pallet amplifier drawer one 20 Amp circuit breaker CB1 connects the AC to the (A8) DC power supply. TB1 has three varistors (VR1-VR3) connected across the AC input lines for surge and over voltage protection. The AC input from TB1 also connects to through 2 amp fuses to the two fans (A11 & A12) mounted in the drawer. Both fans will run immediately when AC is applied to the drawer.

The +5VDC for the operation of the amplifier control board in the drawer is generated by the (A8 & A9) power supplies at J1-9 on each power supply. The +5VDC from the (A8) power supply connects to J4-8 and the +5VDC from the (A9) power supply connects to J5-8 on the control board. The +5VDC is produced when AC is connected to the drawer and the CB1 and/or the CB2 circuit breakers are turned On. Either or both power supplies provides the +5VDC for use by the control board.

The +48VDC needed by the amplifier modules on the heatsink assembly is generated by the (A8 & A9) power supplies in the amplifier drawer. In a standard single pallet amplifier drawer there is only the (A8) power supply. The power supplies will operate when AC is connected to the drawer, the CB1 circuit breaker for the (A8) power supply and the CB2 circuit breaker for the (A9) power supply, are turned On and a Low is provided on the Inhibit Line that connects to J1-6 on the power supplies from the control board. The CB1 circuit breaker supplies the AC to the (A8) power supply which provides the +48VDC to the (A1) and (A2) 878 amplifier pallets. The CB2 circuit breaker supplies the AC to the (A9) power supply which provides the +48VDC to the (A3) and (A4) 878A amplifier pallets.

**Descriptions of External Boards Used in Transmitters w/Multiple External Amplifier**

***(A5) System Metering Board (1312666)***

**Note:** The external System Metering Board is only used in Transmitters with multiple external Amplifier Drawers.

The function of the System Metering Board is to detect forward and reflected output power samples and generate output voltages that are proportional to the power levels of the sampled signals for use by the control monitoring assembly in the exciter/driver drawer.

There are two identical signal paths on the board: one for forward power and one for reflected power. A sample of the forward output power, from the external (A11) output coupler, enters the board at the SMA jack J3. The signal is filtered and connected to resistors R5, R3 and R6 that form an input impedance-matching network to Pin 3 on U1. The forward power signal is detected by the RF detector IC U1. The detected output at pin 7 is split with one half connected to the forward average calibration pot R7, digital, which adjusts the level of the signal connected to Pin 11 on U2.

The other half of the split is connected to the peak calibration pot R18, analog, which adjusts the level of the signal connected to Pin 8 on U2. U2 is a Bilateral Switch IC whose output, digital or analog, is controlled by the selection of the modulation type in the exciter/driver drawer. In this BTC transmitter the average, digital, output connects to the amplifier IC U3A that is wired to the SYS_FWD and RMT_FWD Power Metering Outputs. A reading of 2 VDC measured at TP1 is equal to a 100% Forward Power reading on the meter. The SYS_FWD level connects to J9 on the board that is cabled to J11 on the exciter/driver drawer for use in the control monitoring assembly. The RMT_FWD level connects to J10 on the board for use by remote control and monitoring.

A sample of the reflected output power, from the external (A11) output coupler, enters the board at the SMA jack J8. The signal is filtered and connected to resistors R26, R22 and R27 that form an input impedance-matching network to Pin 3 on U6. The reflected power signal is detected by the RF detector IC U6. The detected output at pin 7 is connected to the reflected calibration pot R25, which adjusts the level of the signal connected to the amplifier IC U3B that is wired to the SYS_RFLD and RMT_RFLD Power Metering Outputs. A reading of 2 VDC measured at TP2 is equal to a 25% Reflected Power reading on the meter. The SYS_RFLD level connects to J9 on the board that is cabled to J11 on the exciter/driver drawer for use in the control monitoring assembly. The RMT_RFLD level connects to J10 on the board for use by remote control and monitoring.

+12 VDC enters the board at J9-1, from the exciter/driver drawer and is connected through a filter and isolation circuit consisting of C31, C14 and L5 before it is connected to the regulator IC U5. U5 supplies the +5 VDC needed for operation of the ICs on the board. The +5 VDC is connected through a filter circuit consisting of C15, C19 and C21 before it is connected to the rest of the board.

### *(Optional) ASI to S310 Converter Module*

**NOTE:** The ASI to S310 Converter Modules is only used with STL ASI feed inputs.

The ASI to SMPTE 310M converter takes the STL ASI feed input, if present in your system, and converts it to a SMPTE 310M output which connects to the input to the UBS-Axcera system. The converter contains an ASI Motherboard (1311179), an ASI to 310 Conversion Board, Non-SFN (1311219) or ASI to 310 Conversion Board, SFN (1309764), and a 120 VAC to +12 VDC converter module.

#### *ASI Motherboard (1311179)*

The ASI motherboard takes the +12 VDC, from the 120 VAC to 12 VDC converter module, and converts it to +5 VDC and +3.3 VDC which are used by the ASI to S310 conversion board.

U1 is a regulator IC that supplies an output of +5 VDC at J2-7 that connects to the ASI to 310 converter board. U2 is a regulator IC that supplies an output of +3.3 VDC at J2-11 that connects to the ASI to 310 converter board. Also +12 VDC is wired to J2-3 that connects to the ASI to 310 converter board.

The ASI motherboard is the mounting platform for the four LEDs that are displayed on the front of the module. The LEDs will be Green if everything is OK or Red if the indicated function is malfunctioning.

The LEDs are Power, which indicates +12 VDC is connected to the converter, FIFO ERROR, which indicates an overflow or underflow condition in the input buffer, S310 Lock, which indicates the converted S310 signal is in a locked condition, and ASI Lock, which indicates the recovered ASI signal is in a locked condition.

***ASI to 310 Conversion Board, Non-SFN (1311219)***

The ASI signal is input to the ASI to S310 conversion board via J1. U2 de-serializes the ASI input signal into a parallel byte stream. The parallel byte stream is clocked into U6 which buffers and converts it to a valid S310 bi-phase encoded signal. Null packets are added or dropped during this process to obtain the valid 19.393 Mb/s output. U6 is also responsible for re-stamping the PCR clock. The final S310 output of the board is at J5.

***ASI to 310 Conversion Board, SFN (1309764)***

The ASI signal is input to the ASI to S310 conversion board via J1. U2 de-serializes the ASI input signal into a parallel byte stream. The parallel byte stream is clocked into U6 which buffers and converts it to a valid S310 bi-phase encoded signal. For SFN operation the ASI payload must be 19.392568 Mb/s +/- 2 ppm. A 38.785317 MHz VCXO locks to the exact S310 bit-rate using a Digital PLL. This method ensures the extracted S310 stream is frequency locked without modifying its content i.e. add/drop null packets, PCR restamp, etc. The final S310 output of the board is at J5.

**(Optional) K-Tech Receiver**

**NOTE:** If your system contains an (Optional) K-Tech Receiver, information on the receiver is contained in the separate manufacturers supplied instruction manual.

***System Set Up Procedure***

This system was aligned at the factory and should not require additional adjustments to achieve normal operation.

This Innovator CX Series system is of a drawer design with multiple boards inside the drawer. If a board fails, that board needs to be changed out with a replacement board. The failed board can then be sent back to UBS-Axcera for repair.

**NOTE:** Contact UBS-Axcera Customer Service Department at 1-724-873-8100 or fax to 1-724-873-8105, before sending in any board or module.

**ALC Board Set-Up - Forward and Reflected Power Calibration**

**NOTE:** If your system is a CU1TD/RD-1 or higher power with one or more external amplifier drawers, refer to the next section for the forward and reflected power calibration procedures.

The steps for calibrating the forward and reflected power using the ALC board are as follows:

1. Locate (A4) the ALC Board (1315006).
2. Set the Overdrive Threshold potentiometer (R38) fully CW.
3. Set the Manual Adjust potentiometer (R62) fully CCW.
4. Set the ALC Adjust potentiometer(R75) fully CCW.
5. Switch S1 to Manual Gain.
6. Increase the output power to 100% using R62.
7. Calibrate the system output power for 100% using the Forward Calibration potentiometer (R23) on the Output Detector Board - Refer to Figure 63.
8. Turn the output power down to 10% power using R62 on the ALC Board.
9. Remove the RF output connector from J2 on the drawer.
10. Calibrate the reflected power to 10%, using the Reflected Calibration potentiometer (R7) on the Output Detector Board - refer to Figure 63.
11. Re-connect the RF output connector to the drawer.
12. Increase the power, in Manual gain mode, to 115% using R62 on the ALC Board.
13. Adjust the Overdrive pot (R38) on the ALC Board, CCW until the overdrive threshold just trips and the Overdrive Fault LED DS4 lights.
14. Turn R38 slightly CW so that power comes back up and DS4 goes out.
15. Switch S1 on the ALC Board to ALC.
16. Turn the ALC Adjust potentiometer (R75) on the ALC Board until the power is 100%.
17. Switch S1 between ALC and Manual to verify smooth switching, with minimal change in power. If necessary repeat the above procedure.
18. With the drawer in ALC, use the ALC Adjust potentiometer (R75) to decrease the power to 10%.
19. Remove the RF output connector from the drawer.

20. Verify that the VSWR Cutback LED, DS6, comes on and the Reflected Power drops to approximately 6%.
21. Reconnect the RF output connector and increase the power back up to 100% using R75.

This completes the set up of the ALC board and the Forward and Reflected Power Calibration.

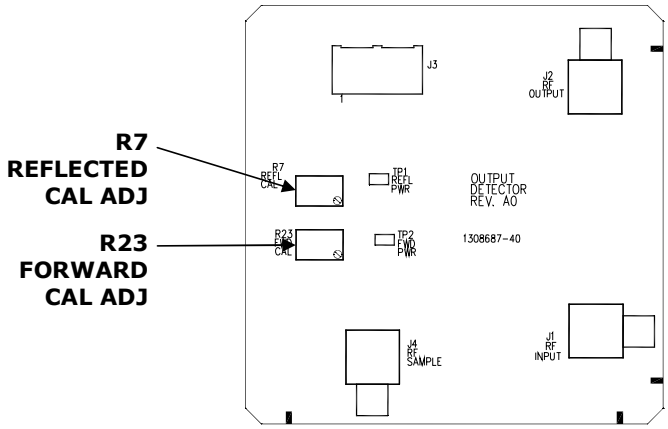


***Figure 63: (A4) Output Detector Board (1312207)***

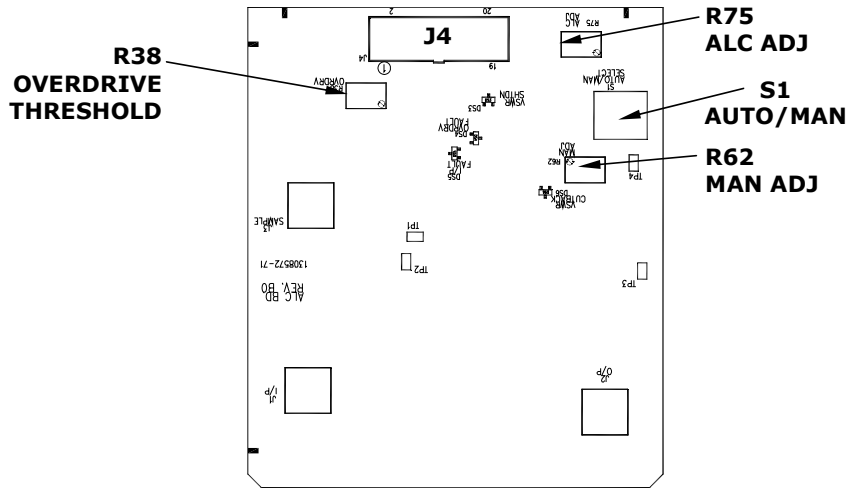


***Figure 64: (A5) ALC Board (1315006)***

**Forward and Reflected Power Calibration of a Higher Power System**

**NOTE:** If your system is a CU0TD/RD-1 thru CU0TD/RD-5, refer to the previous section for the forward and reflected power calibration procedures.

***Forward Power Calibration***

1. Connect a calibrated coupler and average reading power meter to the output of the DTV mask filter.
2. On the ALC Board (1315006), mounted in the Driver Drawer, set the Switch S1, Auto/Manual ALC, to the Manual position - refer to Figure 64.
3. Adjust the Manual adjustment Pot (R62) for the desired output power level as indicated on the average reading power meter.
4. In the Amplifier Drawer, on the Amplifier Control Board (1309822), adjust the Forward Calibration Adjustment potentiometer (R8), for a reading of 100% on the External Amplifier Forward Power screen, which can be viewed on the CX drawer LCD.
5. On the ALC Board (1315006), mounted in the Driver Drawer, set the Switch S1, Auto/Manual ALC, to the Auto position.
6. Adjust the ALC adjustment Pot (R75) for a reading of 100% on the External Amplifier Forward Power screen, which can be viewed on the CX drawer LCD. This completes the reflected power calibration adjustment.

***Reflected Power Calibration***

1. On the ALC Board (1315006), mounted in the Driver Drawer, adjust the ALC adjustment potentiometer (R75) for a reading of 10% on the External Amplifier Forward Power screen, which can be viewed on the CX drawer LCD.
2. Disconnect the load or the antenna connected to the system.
3. In the Amplifier Drawer, on the Amplifier Control Board (1309822), adjust the Reflected Calibration Adjustment potentiometer (R26) for a reading of 10% on the External Amplifier Reflected Forward Power screen, which can be viewed on the CX drawer LCD.
4. Reconnect the load or the antenna to the system.
5. Adjust the ALC adjustment potentiometer (R75) for a reading of 100% on the External Amplifier Forward Power screen, which can be viewed on the CX drawer LCD. This completes the reflected power calibration adjustment.

**R26 REFL CAL ADJ** **R8 FWD CAL ADJ**

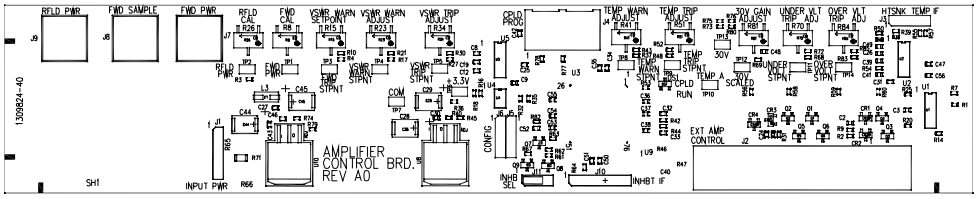


***Figure 65: (A5) Amplifier Control Board (1309822)***

**Linearity Correction Adjustment (Non-Linear Distortions)**

**NOTE:** See the separate Digital Pre-Corrector GUI Software Instruction Manual for information on the setting up of the Non-Linear Distortions pre-correction.

**Linearity Correction Adjustment (Linear Distortions)**

**NOTE:** See the separate Digital Pre-Corrector GUI Software Instruction Manual for information on the setting up of the Linear Distortions pre-correction.

**NOTE:** If the system contains the 8VSB ATSC Modulator board, any correction adjustments are done using the Modulator board. Refer to the sections of this manual on the Modulator board for information on the procedure.

If a problem occurred during the set up, help can be found by calling UBS-Axcera field support at 1-724-873-8100.

**APPENDIX A:**

Innovator CX,
Innovator CU0TD-1/CU0RD-1 – CU4TD/CU4RD,
Transmitter or Regenerative Translator
System and Drawers Drawings and Parts Lists

**Innovator CU0Tx-1 Transmitter System**
**Drawing List**

**CU0Tx-1 Transmitter System**
**(Consists of Dual CU0Tx-1 Drawers)**

CU0Tx-1, QWTO System Parts List .....CB005923

**CU0Tx-1 Drawer**

CU0Tx-1 Drawer, Interconnect.....1316735
CU0Tx-1 Drawer, Parts List.....CB006067