INSTALLATION AND OPERATING MANUAL

80W C-BAND HUB-MOUNT

SOLID STATE BLOCK UP-CONVERTER

SSPBM - C80 – CSE

PM 1R0-3171A0-3N06 REV. 9

WARRANTY

This Advantech Wireless product is warranted against defects in material and workmanship for a period of 2 years from the date of shipment. During the warranty period, Advantech Wireless will, at its option, either repair or replace products that will prove to be defective.

To return a product for warranty or repair service, you must first request a Return Material Authorization (RMA) number by contacting Advantech Wireless at:

Phone:	(514) 420-0045	or	Fax: (514) 420-0073
Website:	www.advantechwireless.com	or	e-mail: support@advantechwireless.com

The unit should be shipped to the following address, in original shipping container (box), with shipping charges prepaid.

Advantech Wireless
657 Orly Avenue
Dorval, Quebec
H9P 1G1
CANADA

Please indicate the RMA number on all shipping documentation.

Units shipped without prior issued RMA, or shipped not in original packing, may be subject of rejection and returned at sender's own expense.

LIMITATIONS OF WARRANTY

Advantech Wireless warrants this product to be free of materials and workmanship defects.

The foregoing warranty shall not apply to defects resulting from improper handling or abuse by the Buyer, unauthorized modification, operation outside of the environmental specifications for the product, or improper installation or maintenance.

Advantech Wireless shall not be liable for any direct, indirect, special, incidental or consequential damages.

CONTENTS

FIGURES

TABLES

1. SAFETY

In addition to this section, included by reference are the following pertinent sections of the International Standard IEC-215, 'Safety requirements for radio transmitting equipment':

Appendix D, 'GUIDANCE ON ASSESSING THE COMPETENCE OF PERSONNEL FOR DESIGNATION AS SKILLED' and also Sub-clause 3.1 of the Standard.

Appendix E, 'GUIDANCE ON SAFETY PRECAUTIONS TO BE OBSERVED BY PERSONNEL WORKING ON RADIO TRANSMITTING EQUIPMENT', also Sub-clauses 3.2, 3.7 and 22.1 of the Standard.

To prevent the risk of personal injury or loss related to equipment malfunction Advantech Wireless uses the following symbols for safety related information. For your own safety, please read the information carefully BEFORE operating the equipment.

Symbols used in manual:

WARNING: This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

CAUTION: This indicates a hazardous and dangerous procedure that could result in light-to-severe injury or loss related to equipment malfunction, if proper precautions are not taken.

---------- **WARNING ---**----------

When supplying power to this equipment, use the 3-pin connector provided, to connect to a **grounded power outlet**. If power is supplied without grounding to the equipment, there is a risk of receiving a severe or fatal electric shock.

In the context of this document any voltage that is lethal is viewed as 'High Voltage'. Therefore, even prime power (90 to 264 V AC) is dangerous because prime power potentials have been known to cause death or injury.

---------- **WARNING --**----------

This equipment can not be repaired by the operator. DO NOT attempt to remove the equipment cover or to disassemble internal components. Only qualified service technicians should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury to untrained personnel. In addition, there is a risk of damage to precision components.

---------- **WARNING --**----------

ALWAYS TERMINATE THE OUTPUT OF THE BLOCK UP-CONVERTER WITH A RF LOAD CAPABLE OF DISSIPATING FULL CW RF POWER. SIMILARLY TERMINATE THE INPUTS TO AVOID THE POSSIBILITY OF THE UNIT BEING DRIVEN BY STRAY LEAKAGE SIGNALS. Incorporate the terminations prior to applying prime power to the unit. This procedure prevents self-oscillation and irradiation of the local environment. Even if a source is not connected to the unit you are working with, there are situations where the block up-converter can go into a self-induced mode and generate high levels of RF energy. Destruction caused under excessive load voltage standing wave ratio (VSWR) will void the warranty. Although this equipment has internal protection for VSWR higher than 3:1 and will automatically go in shutdown (with a delay of 1 second), still it is a safe procedure to avoid unwanted effects.

---------- **WARNING** ----------

DO NOT LOOK INTO THE OUTPUT PORTS OF THE POWERED RF TBLOCK UP-CONVERTER. Treat the powered RF unit with extreme care. Keep in mind that levels of microwave radiation that do not induce immediate physical discomfort in most individuals can be sufficiently high to induce longer term effects. Your eyes are particularly vulnerable parts of your body.

The permissible levels of exposure are quite low compared to the power levels of the amplifiers built by Advantech Wireless (e.g. less than 10 mW versus 10 to 500 W delivered by various units). The permissible levels are currently being studied by a number of organizations. In the past the U.S. safety Code established a dosage rate of 10 mW/cm^2. Currently there is consideration being given to reducing the permissible level to 1 mW/cm^2 in the United States, as has been the case for several European countries.

---------- **CAUTION**----------

THIS IS A HEAVY EQUIPMENT. USE TWO OR MORE PEOPLE TO LIFT AND MOVE this equipment or use an equipment cart. There is a risk of back injury, if this equipment is lifted by one person.

2. PACKING LIST

2.1 PACKING LIST FOR ONE UNIT

PACKING LIST FOR SSPBM-C80-CSE UP-CONVERTER (Shipping Kit P/N 19R-3171A0-0N6)			
Item	**Quantity**	**Description**	**Part #**
1.	1	Installation and Operating Manual	PM 1R0-3171A0-3N06 Rev. 9
2.	1	80W C-Band Block Up-Converter, model SSPBM-C80-CSE	1R0-3171A0-3N06
3.	1	Connector circular MIL C-5015, straight cable plug, 3 sockets, MS3106F16-10S (connector for J5)	631-310616-001
4.	2	Connector circular, MIL-C-26482, 6 contacts female, straight cable plug, shell 10-6, MS3116F10-6S (connectors for RS-232 and RS-485 Serial Interfaces)	631-311606-001
5.	1	Connector circular, MIL-C-26482, 10 contacts female, straight cable plug, shell 12 (connector for RELAY Interface)	631-311612-003
6.	1	WR137 CPR Half Gasket Silicone	705-137000-001
7.	1 roll	Moisture sealing/insulating tape (mastic tape)	709-224200-001
8.	8	10-32x1/2" Mach Screw Hex Head 18-8 Stainless Steel (SS)	802-103290-001
9.	8	#10 Split Washer 18-8 SS	803-100100-001
10.	8	#10 Flat Washer 7/16 OD x20 ID x031 Thk 18-8 SS	803-100200-001

3. GENERAL INFORMATION

This manual contains information that describes installation, operation and maintenance procedures for the 80 W C-Band hub-mount (outdoor) Solid State Block Up-Converter, model SSPBM-C80-CSE. Because specialized training is required for some phases of installation and operation, certain parts of this manual are directed only to trained personnel. Warnings appear at the appropriate points to caution all users of potential RF and high-voltage hazards.

For a safe and versatile operation, please read the information carefully BEFORE using the equipment.

4. MAJOR SUBSYSTEMS AND THEIR FUNCTIONS

4.1 INTRODUCTION

This manual contains information required to install and operate the 80W C-Band Hub-mount (Outdoor) Solid State Block Up-Converter model SSPBM-C80-CSE.

4.2 DESCRIPTION

The Solid State Power Block Up-Converter (SSPB) unit is self-contained and is intended for mounting near the hub of the antenna. Each Up-Converter unit incorporates a DC main power supply and forced air cooling system, see **Figure 1:** Product Outline at page 15. Each unit features a serial RS-485 interface that provides full remote monitor and control capabilities via a computer interface as well as serial RS-232 interface (that may be used in Terminal mode) and a discrete interface (Relay) for local or remote monitoring and control of selected functions. A functional block diagram of the unit is shown in **Figure 2** at page 16.

4.3 SINGLE UNIT MAJOR COMPONENTS

The SSPB Up-Converter consists of the following major components:

- L-Band to C-Band Up-Converter Module,
- Power Amplifier Module,
- 10 MHz Reference Oscillator,
- Main Controller Board,
- Power Supply,
- Current Sensor, and
- Power Monitor Board.

These components are interconnected using dedicated wiring harnesses and coaxial cables.

To clarify the explanation of the components in the following paragraphs, refer to the block diagram in **Figure 2** at page 16.

4.3.1 L-BAND TO C-BAND UP-CONVERTER MODULE

The **L/C-Band Up-Converter Module** converts and amplifies the incoming L-Band carrier into the desired C-Band carrier.

The module has an internal synthesizer, which is fixed at 4900 MHz.

The up-converter module has RS-485 communication port that connects to the main controller board. It also provides a discrete ALARM signal to the Main Controller.

4.3.2 POWER AMPLIFIER MODULE

The **Power Amplifier Module** amplifies the RF signals from the L/C-Band up-converter module over the frequency range of 5850 MHz to 6425 MHz. The power amplifier has a fixed gain of 50 dB, typical.

The monitoring and control signals are the Alarm Output and the Relay Input for muting the power amplifier.

Temperature sensors are installed at the module's hot spots to prevent the RF devices from overheating and operating at temperatures exceeding 85ºC.

The power amplifier also has the following functions:

1. Provides and removes the DC voltages to the GaAs FET devices within the module.
2. Provides a temperature dependent DC voltage to the L-C up-converter for temperature compensation.
3. Sends a FAULT signal to the main controller board when detecting a fault.
4. Any Synthesizer is out of lock

The power amplifier will be in the Mute mode if:

1. The user sends a MUTE command through the Relay, RS-232, or RS-485 interfaces.
2. The hot spot temperature exceeds +85 °C.
3. Any of the GaAs FET devices failed (drain current out of range).

4.3.3 WAVEGUIDE ASSEMBLY

The **Waveguide Assembly** contains a forward and reflected power detector, an RF output circulator and a waveguide receive reject filter.

The forward power detector and the reflected power detector monitor the RF output power level and the reflected power level respectively. The detected voltage signals are delivered to the Power Monitor Module that converts the analog signals in digital signals and delivers them to the Main Controller Board.

The circulator provides a VSWR protection at the SSPB RF output port. The VSWR at the circulator output is 1.25:1, maximum. The termination load of the isolator is capable of fully absorbing any reflected power. A CPR137 grooved type waveguide flange is the unit output.

4.3.4 10 MHz Reference Oscillator

This module is used to generate a highly stable and very low phase noise 10 MHz reference frequency with a high stability (of ±5 x 10^{-8} MHz/year typical), which is required by all converter modules. A 10 MHz reference is sent to each converter module via a coaxial cable.

4.3.5 Main Controller Board

The **Main Controller Board** contains a microprocessor controller that performs all of the monitoring and control, input/output communication and the decision-making. The main controller board provides:

1. Fault detection and indication from each module of the unit
2. Mute control and indication
3. Forward RF power indication
4. Reflected RF power indication
5. Unit Gain control (attenuation setting)
6. Relay, RS-232 and RS-485 customer interface

4.3.5.1 FAULT Detection and Indication

The unit will automatically go into a shutdown mode (MUTE) and send a message to all of the external interfaces (including the red Tx LED) when any one of the following occurs:

1. The local oscillator within an up-converter module is out of lock.
2. The hotspot temperature exceeds 85°C.
3. Any of the GaAs FET devices failed.
4. Reflected power is greater than 42 dBm.

The SSPB continually monitors the internal temperature and the current consumption. It also has an automatic shutdown feature to prevent operation at excessive temperatures. The unit will automatically restart when the hotspot temperature falls below to 65°C.

A thermal alarm may result from any one of the following conditions:

1. High ambient temperature (the SSPB Up-Converter is designed to operate between -30°C and +55°C ambient).
2. Blockage at the air intake or exhaust vents.

4.3.5.2 MUTE Control

The user can disable the RF output power remotely by:

1. Leaving unconnected pins G and H of the Relay interface connector the Transmit way will be MUTE (see **Section 5.1** at page 20).
2. Sending a mute command in terminal mode through the RS-232 interface for transmit.
3. Sending a mute command in packet mode through the RS-485 interface for transmit.

This feature is useful if the user wishes to perform a maintenance check or to check out the transmission system.

4.3.6 POWER SUPPLY

The **Power Supply Module** provides +12 VDC output to the following modules:

1. Power amplifier module (high current),
2. L/C-Band up-converter module,
3. 10 MHz oscillator,
4. Power monitor module,
5. Current sensor,
6. Main controller board, and

The power supply also provides the following outputs:

- -12 VDC
- +48 VDC for the cooling fan

The separate +48 VDC is necessary to operate the cooling fan. This will be a variable, temperature dependent, voltage that will ensure a variable rotation speed of the cooling fan related to the temperature (the fan will rotate slower when the temperature is low and faster when the temperature is high).

The power supply is configured to operate from an 90-138 VAC or 180-264 VAC (autoranging), 47-63 Hz, single phase supply. The overall typical power consumption, at the rated RF output power, is approximately 500 W.

4.3.7 COOLING SYSTEM

The thermal conduction from the modules to the heatsink and the cooling fan provide a sufficient cooling for the SSPB.

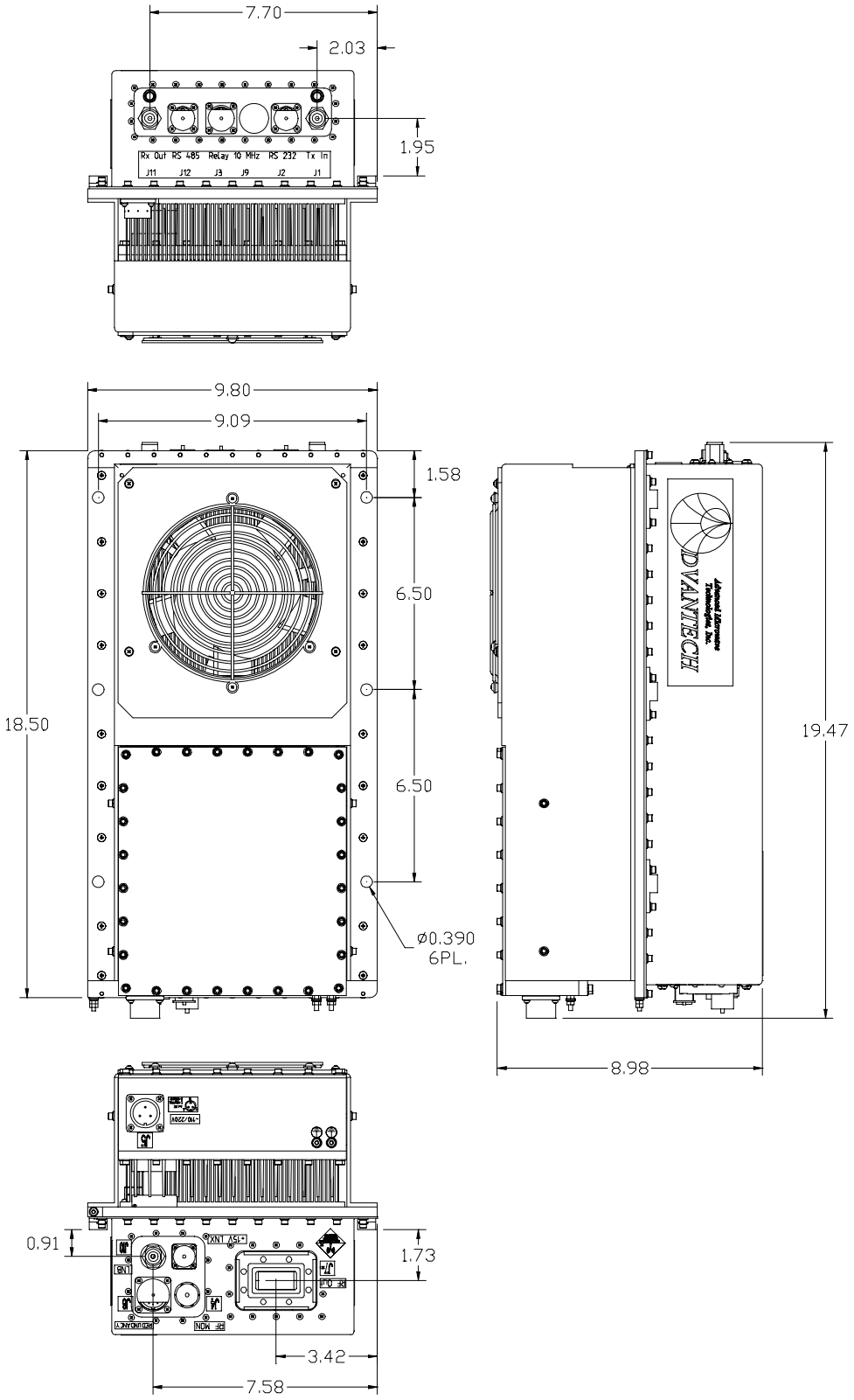


Figure 1: Product Outline

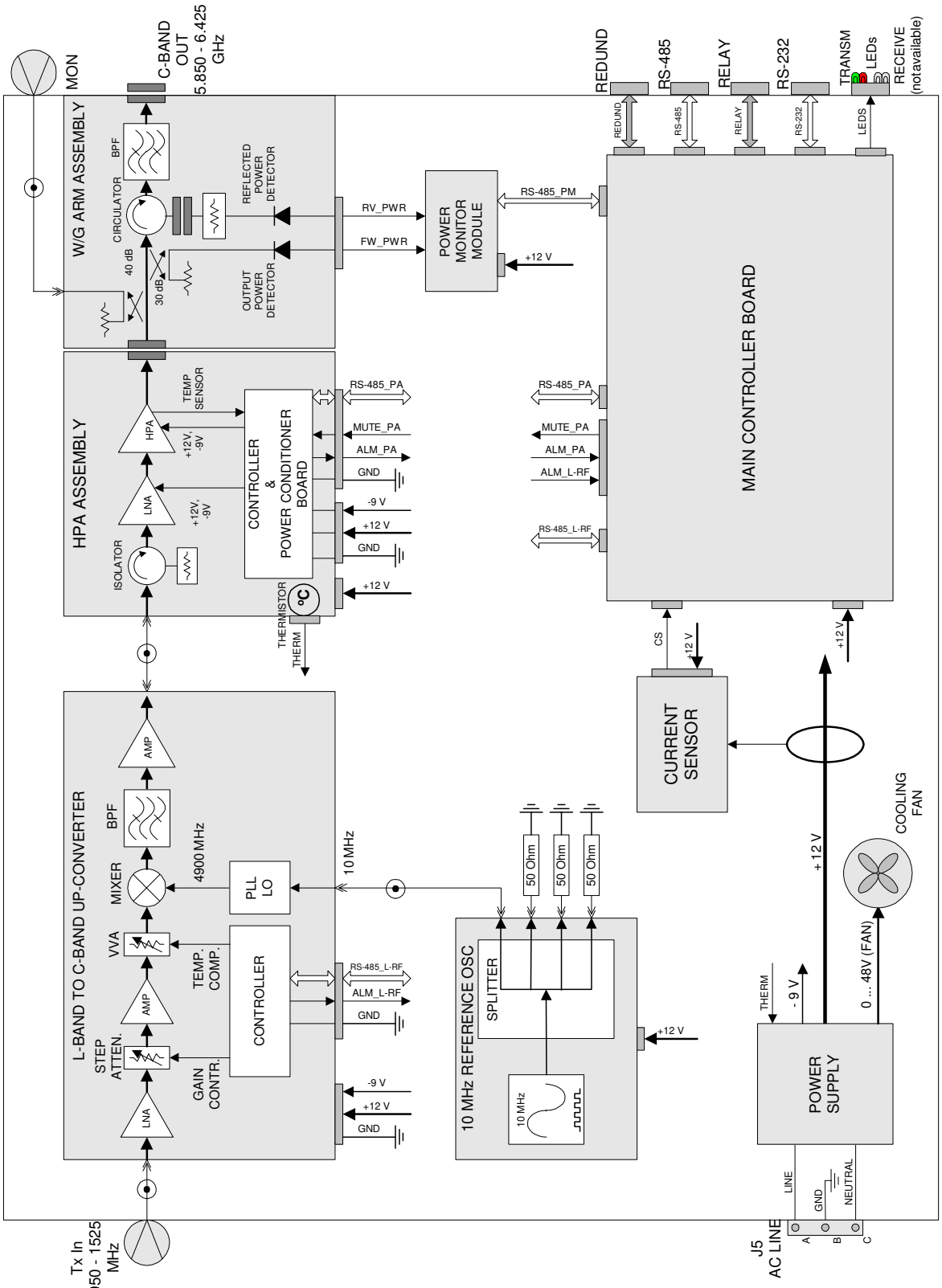


Figure 2: Block Diagram

4.4 SPECIFICATIONS

The Block Up-Converters specified herein are capable of meeting or exceeding the performance specifications listed in the following table over frequency range, operating temperature and line voltage variation, unless otherwise specified. The units will meet all RF performance specifications within thirty minutes of application of prime power.

TABLE 1: ELECTRICAL SPECIFICATIONS

L-Band Input Frequency	950 – 1525 MHz
RF Output Frequency Range	5.850 – 6.425 GHz
Frequency Stability	Based upon 10 MHz Internal Reference
RF Output Power @ 1 dB Gain Compression (P1dB)	+ 48 dBm, min. (80 W saturated power)
Linear Gain	75 dB ± 0.5 dB, @ 6.150 MHz and +23 °C
Gain Flatness: over 500 MHz over 10 MHz	4 dB p–p, max 0.3 dB, max
Gain Variation Over Temperature	3 dB p-p, over the entire bandwidth
L-Band Input Impedance	50 Ω
L-Band Input Return Loss	18 dB, min
Output Return Loss	20 dB, min
Noise Power Density (at maximum gain): In-band (5.850 – 6.425 GHz) In receive band @ 4.200 GHz	 - 70 dBm/Hz - 155 dBm/Hz
Spurious at rated P1dB	- 60 dBc, max
Harmonics at rated P1dB	- 60 dBc, max
Third Order Intermodulation (two equal tones 5 MHz apart)	- 26 dBc, max @ 3 dB total back-off from rated P1dB
Local Oscillator Frequency	4.900 GHz
Local Oscillator Leakage	-50 dBc, at 3 dB back-off from rated P1dB
Output Phase Noise @ Offset: 100 Hz 1 kHz 10 kHz ≥100 kHz	C-Band Single Side Band Phase Noise (max) - 65 dBc/Hz - 75 dBc/Hz - 85 dBc/Hz - 95 dBc/Hz

TABLE 2: MECHANICAL SPECIFICATIONS	
Physical Dimensions	See **Figure 1:** Product Outline at page 15
Approximate Weight	62 lbs. (27 kg)
Mounting Requirements	See **Figure 1:** Product Outline at page 15

TABLE 3: POWER REQUIREMENTS	
Power Requirements	90–138 or 180 –264 VAC (autoranging), 47-63 Hz, single phase
Power Consumption	9 A typical @ 110 VAC, 500W (each unit)

TABLE 4: ENVIRONMENTAL CONDITIONS	
Temperature: Non-operating (continuous exposure) Operating (ambient)	 - 50° C to + 85° C - 30° C to + 55° C
Relative Humidity:	100% max., condensing, up to 2"/hr rain
Altitude:	10,000' AMSL, derated 2° C / 1,000' from AMSL

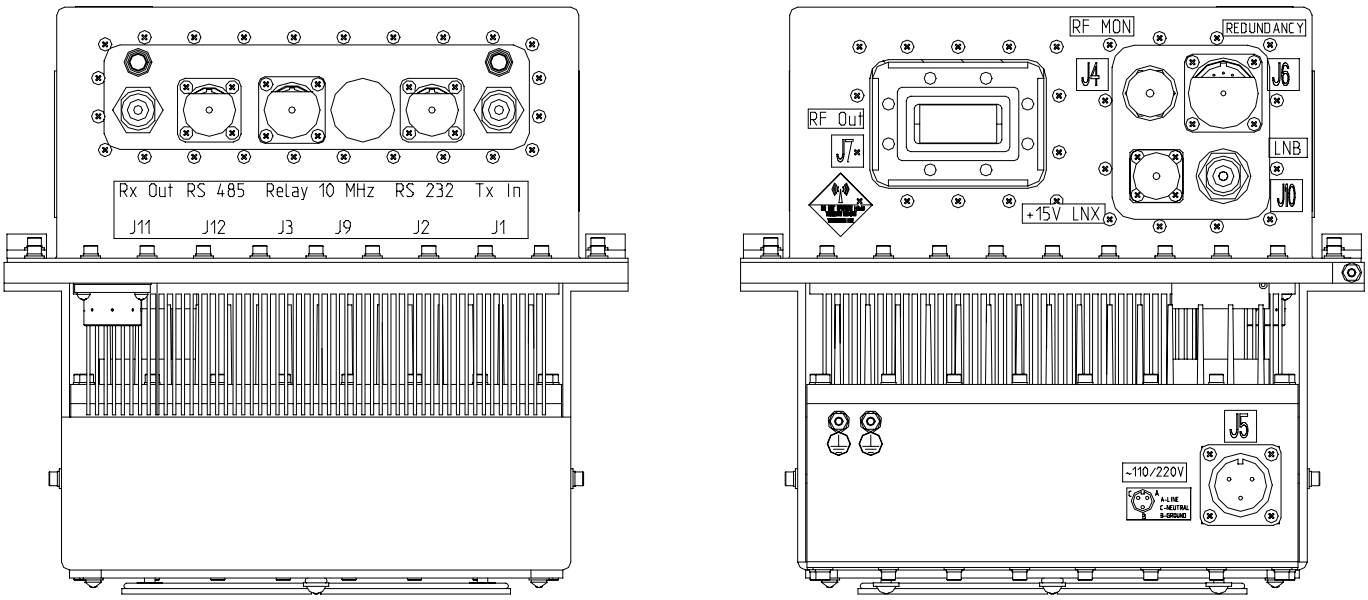


Figure 3: Connectors

TABLE 5: CONNECTORS			
Connector	**Function**	**Description**	**Mating Connector**
Tx In (J1)	L-Band Input	N-Type (F) 50 Ω	N-Type (M) 50 Ω
RS 232 (J2)	Serial Interface	MS3112E10-6P (M)	MS3116F10-6S (F)
Relay (J3)	Discrete Interface	MS3112E12-10P (M)	MS3116J12-10S (F)
RS 485 (J12)	Serial Interface	MS3112E10-6P (M)	MS3116F10-6S (F)
RF MON (J4)	RF Output Monitor	N-Type (F) 50 Ω	N-Type (M) 50 Ω
(J5)	AC Line	MS3102R16-10P (M)	MS3106F16-10S (F)
REDUNDANCY (J6)	Redundancy Interface	MS3112E16-26P (M)	MS3116F16-26S (F)
RF Out (J7)	RF Output	CPR 137 (Grooved)	CPR 137 (Flat)

5. INTERFACES

Each unit provides four interfaces that can be used to connect the unit to several optional external devices. The interfaces for this model are listed below:

1. **Relay (Discrete) Interface:** This interface offers the essential monitoring and control of the Block Up-Converter by discrete signals.
2. **RS-232 Interface:** This interface offers the operator essential monitoring and control of the Block Up-Converter or of the unit, using a PC with Term95 or HyperTerminal communications programs.
3. **RS-485 Interface:** This interface offers the complete monitoring and control of the SSPB Block Up-Converter or of the unit and provides the communication and remote control through the RS-485 serial communication port in packet mode. The unit may be connected to a Monitor & Control Panel or to a Network Manager System.
4. **RF Output Monitor Interface:** This interface provides a sample of the output power of the unit through a 40 dB coupler.
5. **TX LED**: a green/red LED indicating the state of the transmission path.
   - If this LED is not lit, the unit is not powered (or the power supply failed).
   - If this LED is RED lit, it indicates that the unit is in FAULT or ALARM condition.
   - If this LED is blinking RED, it indicates that the unit is in MUTE state (following a MUTE command).
   - If this LED is GREEN lit, it indicates that the unit is functioning properly.

5.1 RELAY INTERFACE

The **Relay Interface** uses a 10-pin circular connector mounted on the Block Up-Converter enclosure. The connector type is listed in **TABLE 5** at page 19 and the location is shown in **Figure 3** at page 19. The pin assignment for this interface is shown in **TABLE 6** at page 21.

Pins A, B and C of the connector are of Form-C relay type outputs that provide for the user an indication informing the status of the transmission path of the SSPB unit.

Pins D, E and F are disabled (not used) for these units.

Pin G and H of the connector are inputs, allowing the user to mute or un-mute the RF path of the SSPB transmission.

Pin J and H are disabled (not used) for these units.

CAUTION: If pin G is not connected to pin H, the transmission path will remain disabled.

TABLE 6: RELAY INTERFACE – PIN ASSIGNMENT		
Pin	Signal Name	**Description**
A	Tx AL-NC	Normal closed contact of the Tx ALARM Form - C relay. Pin A closed to pin B indicates ALARM in the transmission path.
B	Tx AL-COM	Common contact of the Tx ALARM Form - C relay
C	Tx AL-NO	Normal open contact of the Tx ALARM Form – C relay. Pin C open relative to pin B indicates ALARM in the transmission path.
D	N/C	Not connected
E	N/C	Not connected
F	N/C	Not connected
G	Tx MUTE	Tx MUTE command: If pin G is NOT connected to pin H, the transmission path is MUTE. If pin G is connected to pin H, the transmission path is ON.
H	MUTE-COM	Common contact of the Tx MUTE and Rx MUTE Commands
J	N/C	Not connected
K	AN_OUT	Analogue Output - Output Power Monitor (voltage: 5 V DC at rated P1dB; > 0 V DC at 20 dB back-off)

5.2 RS-232 INTERFACE

This serial communication interface offers to the operator the essential monitoring and control of the SSPB or the unit using any PC terminal software. An IBM compatible personal computer can be connected to this port. The interface uses a 6-pin circular connector mounted on the SSPB enclosure. The type of mounting connector is listed in **TABLE 5** at page 19 and the location is shown in **Figure 3** at page 19. The pin assignment for this interface is shown in **TABLE 7**.

TABLE 7: RS-232 INTERFACE – PIN ASSIGNMENT

Pin	Type	Signal Name	Description
A	N/C	N/A	Not connected
B	N/C	N/A	Not connected
C	Input	RX	Serial receive RX
D	Output	TX	Serial transmit TX
E	DC supply	+5V	Power supply for hand held terminal
F	Common	GND	Serial common

5.3 RS-485 INTERFACE

This serial communication interface provides access to all monitor and control functions for the SSPB Block Up-Converter.

The RS-485 interface must be connected to the Network Management System (NMS).

The interface uses a 6-pin circular connector mounted on the SSPB unit enclosure. The type of mounting connector is listed **TABLE 5** at page 19 and the location is shown in **Figure 3** at page 19. The pin assignment for this interface is shown in **TABLE 8**.

If this interface is being used, an interconnecting cable with the proper mating connector must be fabricated.

TABLE 8: RS-485 INTERFACE – PIN ASSIGNMENT

Pin	Type	Signal Name	Description
A	Output	TX+	Serial transmit TX+
B	Output	TX-	Serial transmit TX-
C	Input	RX+	Serial receive RX+
D	Input	RX-	Serial transmit RX-
E	N/C	N/A	Not connected
F	Common	GND	Safety ground / Shield

5.4 RF OUTPUT MONITOR INTERFACE

This RF output sample port is located at the Mon connector, which is mounted on the SSPB enclosure. The type of mounting connector is listed in **TABLE 5** at page 19 and the location is shown in **Figure 3** at page 19. This interface is used for the independent monitoring of the SSPB output. A table of the coupling factor versus the frequency is provided with each unit. Note that because this port is located before the band-pass filter (BPF) the signal on this port may contain spurious signals and harmonics. This port should only be used for output power monitoring (via an external power meter) or should be kept capped if not used.

6. UNPACKING AND INSTALLATION

This Section contains instructions for the site preparation, unpacking and the installation of the SSPB Block Up-Converter.

6.1 INITIAL INSPECTION

Inspect the shipping container(s) for damage resulting from the shipment. If damaged, immediately contact the carrier that delivered the equipment and submit a damage report. Failure to do so may invalidate future claims.

6.2 UNPACKING

Carefully remove all of the items from the shipping container. Save all of the packing material until completing successfully the visual inspection. For a single unit, verify that all of the items listed on the packing list (see **Section 2** at page 9) have been received. If any of the items are missing, contact Advantech Wireless immediately. Inspect all of the items for evidence of damage resulting from the shipment. If damage seems evident, immediately contact the carrier that delivered the equipment and file a claim. Failure to do so may invalidate future claims. Check the SSPB units thoroughly for damaged or loose parts.

6.3 INSTALLATION

Installation of the SSPB Block Up-Converter requires the following phases:

Relay, Serial Interface and AC Power interconnecting cable construction

Environmental and adequate ventilation considerations

Mechanical, RF and electrical installation

TABLE 5 at page 19 lists all of the mounting connectors used by the SSPB unit and their corresponding mating connectors. **Figure 3** at page 19 shows the location of the mounting connectors.

6.3.1 RELAY, SERIAL INTERFACES AND AC POWER CABLES CONSTRUCTION

Prior to constructing the interconnecting cables, verify that the all of the cables are of sufficient length in order to connect the SSPB unit to the user's remote monitor and control system. Construct the Relay, RS-232, RS-485 Serial Interfaces and Power interconnecting cables as follows:

1. If using the Relay interface, construct the interconnecting cable(s) using the mating connector(s) provided in the shipping kit (see **Section 2** at page 9). Refer to **TABLE 6** at page 21 for the correct pin assignment. Verify that pins G and H of the Relay connector are connected together in order to un-mute the transmission path (Tx ON). If pins G and H are left disconnected, the transmission path will remain muted.
2. If using the RS-232 serial interface, construct the interconnecting cable(s) using the mating connector(s) provided in the shipping kit (see **Section 2** at page 9). Refer to **TABLE 7** at page 22 for the correct pin assignment.
3. If using the RS-485 serial interface, construct the interconnecting cable(s) using the mating connector(s) provided in the shipping kit (see **Section 2** at page 9). Refer to **TABLE 8** at page 23 for the correct pin assignment.
4. Construct the prime power cable(s) using the connector(s) provided in the shipping kit (see **Section 2** at page 9). For the correct pin assignment, refer to **TABLE 10** at page 28.

6.3.2 ENVIRONMENTAL AND ADEQUATE VENTILATION CONSIDERATIONS

Each SSPB unit contains a forced air cooling system, which prevents the internal components from overheating. The cooling subsystem consists of a single fan operating at a variable speed to effectively distribute and remove the air from within the SSPB unit.

Prior to installing the SSPB unit, verify that:

1. Environmental conditions listed in **TABLE 4** at page 18 will be met.
2. A minimum clearance of 30-cm (12 inches) is necessary in front of the air intake and exhaust openings on the SSPB unit mounting-frame.
3. A minimum clearance of 30-cm (12 inches) is necessary at the fan side of the unit.
4. The grill of the fan intake and the exhaust openings of each installed SSPB unit are free of any obstructing debris.

CAUTION: Obstructing objects and/or debris may reduce the efficiency of the cooling system and significantly impact the transceiver longevity.

6.3.3 MECHANICAL, RF AND ELECTRICAL INSTALLATION

1. Bolt the SSPB unit at the antenna hub by using the six mounting holes provided by the enclosure, see **Figure 1** at page 15.
2. Position the interconnecting waveguide system flange so that it aligns precisely with the waveguide flange of the SSPB RF output port.
3. Install the supplied waterproof gasket (supplied in the packing list) on to the interconnecting waveguide flange.

CAUTION: If the waveguide is intended to be pressurized, do not exceed 2-3 psi pressure, in order to protect the inside pressure window installed by ADVANTECH AMT™.

4. After alignment verification, loosely attach the interconnecting waveguide on to the RF output port using the hardware provided in the shipping kit.
5. Carefully tighten all bolts (in opposite pairs rather than sequentially around the perimeter of the flange) so that the connection is firm.

CAUTION: Do not over-tighten the waveguide flange screws. Over-tightening the bolts may cause the stripping of the threads or distort the mating flange. Recommended torque is 30 in-lbs for #10-32 bolts.

6. Ground the SSPB unit by attaching a #6 gauge copper wire to the ground terminal provided by the unit enclosure to a properly grounded structure.
7. If it is desired to use the Relay interface, then attach the interconnecting cable fabricated per **Section 6.3.1** to the Relay connector of the SSPB unit. Connect the free end of the interconnecting cable to the operator's monitor and control system.

NOTE: Whether this interface is being used or not, it is necessary to connect pin G of the Relay connector to pin H (common) in order to enable (un-mute) the transmission path. If pin G of this interface is not connected to pin H, the transmission path of the unit will remain muted.

8. If it is desired to use the RS-485 interface, then connect the interconnecting cable fabricated per **Section 6.3.1** to the RS-485 port of the SSPB unit.

9. If it is desired to use the RS-232 terminal mode, then:

a. Connect the interconnecting cable fabricated per **Section 6.3.1** to the RS-232 port of the SSPB unit.
b. Attach to the free end of the interconnecting cable a 9-pin or 25-pin D-type connector with a pin assignment as listed in **TABLE 9**.
c. Attach the cable with the 9-pin or 25-pin D-type connector to RS-232 port of the personal computer.

TABLE 9: SERIAL INTERFACE RS-232 CONNECTION INFORMATION

Serial Interface RS-232 Pin	Active Condition	RS-232 at PC Pin	
		DB-9	DB-25
C	RX ⇦	3	2
D	TX ⇨	2	3
E	**+5 VDC power source**	-	-
F	**Common**	5	7

10. Connect the L-Band input source to the N-type 50 Ω female connector Tx In input port of the SSPB unit.

11. Verify that AC power source is switched OFF.
12. Verify that the AC power source can satisfy the power requirements as given by **TABLE 3** at page 18.

WARNING: Proper grounding of the AC power outlet is necessary for personnel and equipment safety. Improper grounding may cause serious injury or death of the operator.

CAUTION: Ensure that the proper pin is selected for AC operation. Applying power on the wrong pin may permanently damage the AWMT unit necessitating factory repair. Refer to **TABLE 10** at page 27 for the correct pin assignment.

13. Using the AC power cable fabricated per **Section 6.3.1**, connect one end of the power cable to port (J5) of the SSPB Block Up-Converter.

14. Connect the remaining end of the cable to the AC power source.

TABLE 10: AC LINE (J5) CONNECTOR – PIN ASSIGNMENTS	
Description	**Pin**
Phase (live)	A
Ground	B
Neutral	C

15. If necessary, connect a power meter or a spectrum analyzer to the RF output monitor port (RF MON).

7. PRE-POWER AND UNIT CHECKOUT

This Section describes the pre-power procedure for the SSPB Block Up-Converter and an initial checkout of the unit.

WARNING: The information presented in this section is addressed to technicians who have specific training in, and knowledge of Microwave Power Transceivers. Inappropriate use of the SSPB unit may cause serious injury to the operator or may result in damage of the unit. Do not attempt to operate the SSPB before becoming thoroughly familiar with the contents in this Section.

NOTE: When prime power is ON, the Monitor and Control Board will start operating!

7.1 PRE-POWER PROCEDURES

Before applying power to the SSPB Block Up-Converter, verify that the following conditions are met:

4. Verify that the voltage of the station's AC prime power matches with the value marked on the ID label. It is 85-264 VAC for the unit(s).
5. The prime power station is properly grounded.
3. All cable and connections are secure and there is no evidence of pinched wires and loose hardware.
4. The circuit breaker at the prime power station is switched OFF.
5. The IF input and RF output ports are connected to a matched source and a proper load capable of withstanding full CW RF power.
6. The cooling fan(s) is/are not obstructed.

7.2 OPERATIONAL SETTINGS VERIFICATION

The SSPB arrives with all of its factory-pre-set operational values that meet the requirements of a typical installation. Before starting the unit at the installation site, check the configurable settings and if necessary, reset to meet the customer's requirements.

8. OPERATION

8.1 INTRODUCTION

This Section describes the normal operation of the SSPB Block Up-Converter. The design of this equipment allows for minimal operator intervention and maintenance.

The SSPB may be monitored and controlled via the RS-232 or the RS-485 serial interfaces, or via the Relay interface. The Relay interface provides for the user an alarm indication and remote RF mute capability of the designated SSPB unit. The RS-232 and the RS-485 serial interfaces provide access to the SSPB functions, including the monitoring of key operating parameters and shutdown (mute) command.

8.2 SAFETY CONSIDERATIONS

WARNING: Prolonged operation without a load at the output may cause severe bodily harm, loss of sight, even death. Do not operate any transceiver if the RF output connector is not connected to a load.

Please note that an SSPB Block Up-Converter failure due to the above condition will be attributed to abuse or neglect and will not be covered by the standard warranty.

8.3 BASIC OPERATING PROCEDURE

Perform the following operating procedure:

1. Verify that the 'Pre-Power and Unit Checkout' procedure as described in **Section 7** was performed successfully.
2. Switch ON the main power source.
3. Wait for the software to boot into PC.
4. If using either the RS-232 or the RS-485 interface, set up the serial communication linkage between an SSPB Block Up-Converter and the user's computer terminal. See **Section 6.3**.
5. Ensure that the L-Band input signal is being applied to the SSPB unit.
6. Allow the SSPB to warm up for 30 minutes, ensuring that all electrical specifications are met (see **TABLE 1** at page 17).

8.4 AUTOMATIC LEVEL CONTROL (ALC)

The unit has Automatic Level Control feature (ALC) that will keep the output level at a previously set value. Normally the unit should work with 10 dB less gain (set by operator) than the maximum gain, in ALC mode and at an output power 3 to 15 dB back-off from P1dB. The 10 dB less gain set is necessary as a reserve, in order to allow the ALC system to ensure a constant output power in case the input power dropped.

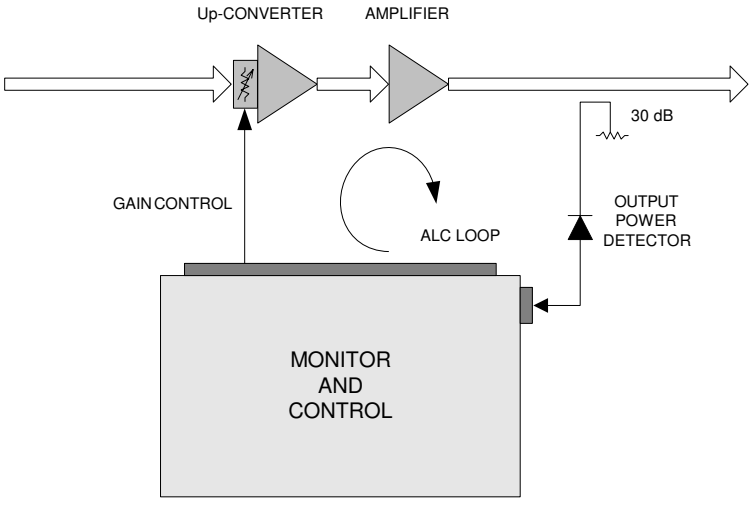
The output power is monitored via an output power detector that sends to the Monitor & Control Board an analogue voltage signal proportional with the actual output power. This signal is converted into a digital value and stored in a calibration table putting in correspondence digital values with actual output power levels. After a certain output power is set (by setting a certain gain level to the unit) the M&C is able to maintain this set output power level by increasing or decreasing the attenuation command signal that is sent to the attenuator for gain control. An ALC control loop is so created ensuring the maintaining of the output power at the set level when the input power varies.

The ALC command may be followed by a value of the needed output power level and in this case the target power will be set to that value. If the ALC command is not followed by any value, the current value of the output power level will be considered as target value.

Note that if the ALC feature is ON, the gain control is not available for the operator.

The ALC “high” alarm is issued when the input power is too high and the attenuation reached the maximum allowable value (the attenuator cannot ensure enough attenuation of the input power).

The ALC “low” alarm is issued when the input power is too low and the attenuation reached the minimum allowable value (even with 0 dB attenuation, at maximum gain set, the input power level is too low for maintaining the target output level).



8.5 USING THE SSPB SOFTWARE

The RS-232 and the RS-485 interfaces provide the serial communication between the user's monitoring and control system and the micro-controller within an SSPB Block Up-Converter. The user may employ any RS-232 terminal communications software (like Term95 or HyperTerminal) or the RS-485 serial communication protocol.

8.5.1 USING THE RS-232 INTERFACE

Before using the RS-232 Interface, become thoroughly familiar with the items listed in **TABLE 11** at page 34 and **TABLE 12** at page 37.

Operate the SSPB via the RS-232 Interface as follows:

1. Switch on the power station's circuit breaker to power up the SSPB.
2. Run any terminal program in the personal computer.
3. Use the following communication parameters:
   - Bits per second: 19200
   - Data Bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow Control: None
4. After running the program in the computer and pressing the **<Enter>** key a display similar to **Figure 4** at page 33 will be shown.
5. If necessary, to change the status of the SSPB, use the commands listed in **TABLE 12** at page 37.

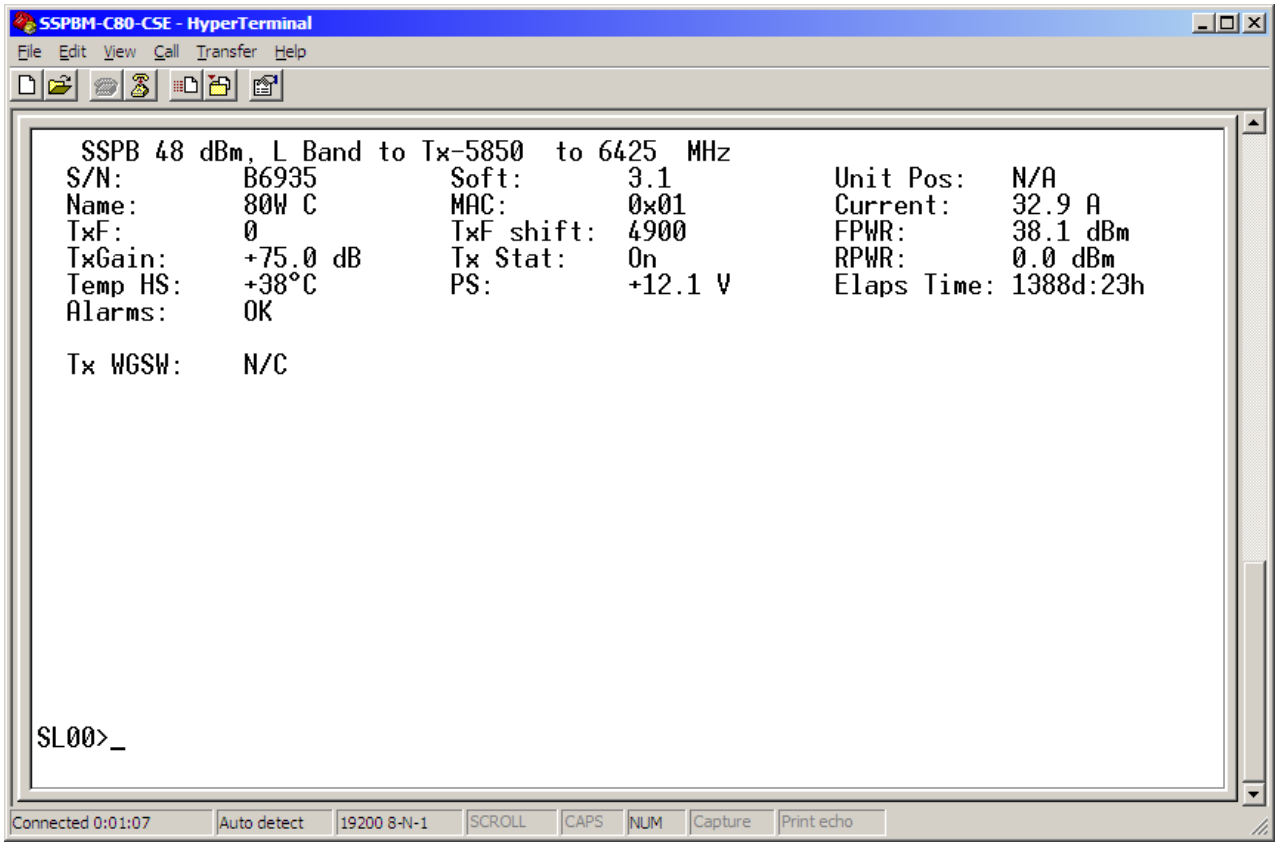


Figure 4: RS-232 HyperTerminal Communication – Status Display after pressing <ENTER>

NOTE: All shadowed lines in the following table are not applicable for these units

TABLE 11: RS-232 MENU ITEM DEFINITION	
Item	**Description**
S/N	Serial Number of the SSPB Block Up-Converter
Soft	Version number of the main controller board software within the SSPB that is connected to the RS-232 port of the PC
Unit Pos	Indicates the position of the unit (A or B) in the redundant system
Name	Indicates the name of the unit
MAC	Indicates the serial address of the Monitor and Control of the unit (in hex)
Current	Indicates the 12 VDC current consumption of the unit, in amperes
TxF	Transmission frequency (not applicable for these units)
TxF Shift	Indicates the LO Frequency of the Block Up-Converter transmission path, in MHz
FPWR	Indicates the Forward Power of the Block Up-Converter (the transmission path output power) in dBm
TxGain	Indicates the transmission Gain in dB
Tx Stat	Indicates the transmission status (On or Mute)
RPWR	Indicates the Reverse (reflected) Power of the Block Up-Converter (the transmission path reflected power) in dBm (0.0 dBm displayed if reflected power is less than 20 dBm)
Temp HS	Hot Spot Temperature of the unit in degrees Celsius
PS	Power Supply Voltage (12 V)
Elaps Time	Elapsed functioning time (days:hours) from the first start-up of the unit
ALC Status	ALC Status (ON or OFF)
Ref	Indicates the AUTO internal (INT) or external (EXT) 10 MHz reference. These units have only internal reference

TABLE 11: RS-232 MENU ITEM DEFINITION (continued)	
Item	**Description**
Faults	Provides the fault messages and the normal status message: 1. OvrTemp (high temperature, over 85 °C) 2. HPAL (left high power amplifier fault, or single high power PA fault) 3. HPAR (right high power amplifier fault) 4. PA (driver or single PA fault) 5. VSWR (high reflected power fault – reflected power is higher than (P1dB-6 dB)) 6. LOW_PWR (output power is under the set threshold, if the low power condition is set as a fault) 7. L-RF (L-RF up-converter module failure). 8. OK (SSPB unit has no FAULT).
Alarms	1. Temp (temperature alarm - hot spot temperature exceeds 75 ºC) 2. HPAL (left high power amplifier alarm, or single high power PA alarm) 3. HPAR (right high power amplifier fault) 4. PA (driver or single PA fault) 5. LOW_PWR (output power is under the set threshold, if the low power condition is set as a alarm) 6. Curr (current consumption exceeds the set threshold) 7. OVD (overdrive alarm – output power exceeds by 1.5 dB the P1dB) 8. TXSWALM (transmission switch alarm) –for redundant systems 9. +12V (power supply voltage out of pre-set low and high limits) 10. ALCL (ALC low – the target power for ALC is set too low) 11. ALCH (ALC high – the target power for ALC is set too high) 12. ALCS (ALC process was suspended) 13. OK (SSPB unit has no ALARM).
Tx WGSW	Transmission Waveguide position (on-line or stand by) – N/C (not connected) for single unit

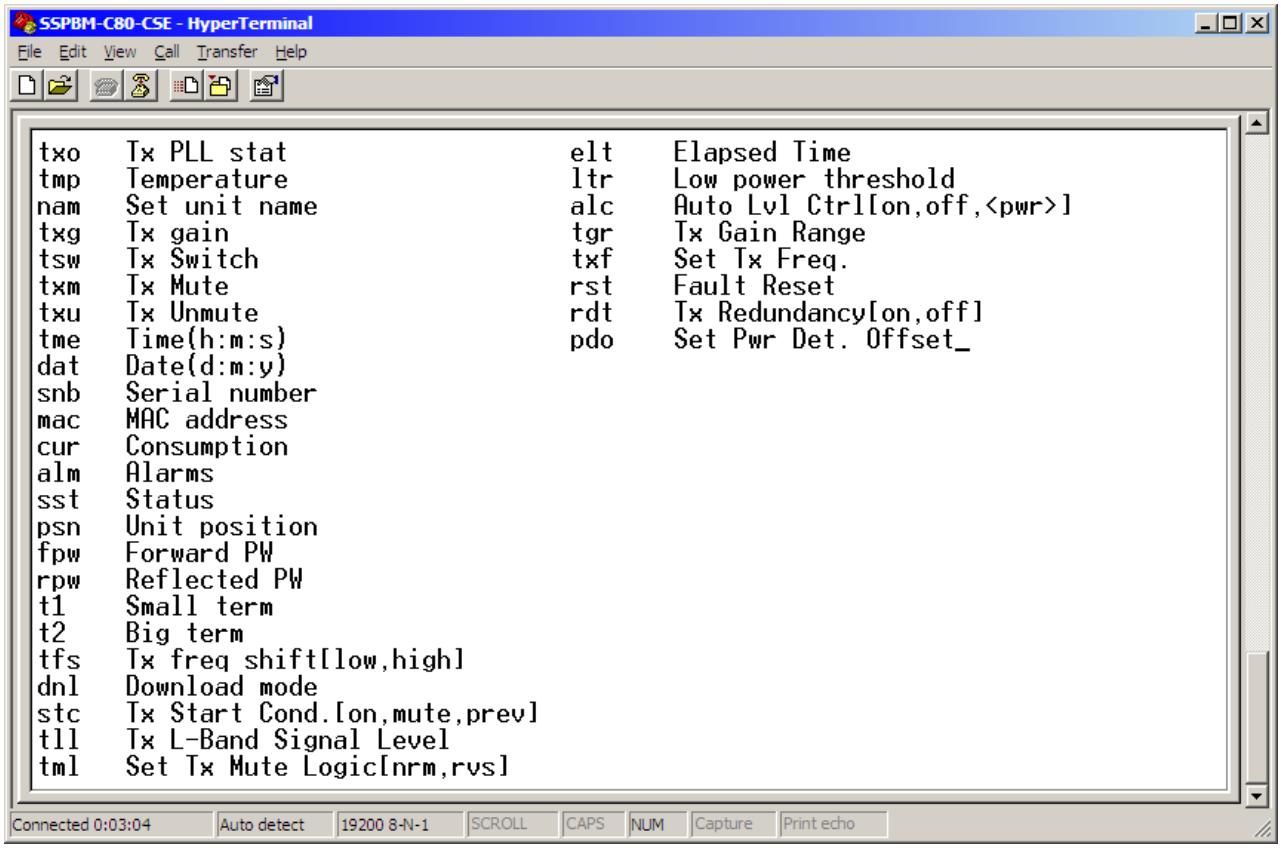


Figure 5: RS-232 HyperTerminal Communication List of Commands - after pressing h <ENTER> for help

NOTE: All shadowed lines in the following table are for commands not applicable for these units

TABLE 12: COMPUTER TERMINAL COMMANDS FOR RS-232 INTERFACE		
Command	**Description**	**Response**
h	**Help function**	Provides the list of commands that can be used to modify the status of a unit.
<ENTER>	**ENTER key of keyboard**	Provides and refreshes the main menu display on the computer monitor screen.
txo	**Tx PLL stat**	The status of the transmission PLL will be displayed
tmp	**Temperature**	The temperature of the L/C Up-Converter
nam	Set unit name	Allows for a name to be attributed to the unit
txg	**Set Tx gain**	Allows for the adjustment of the transmission gain of the unit, in dB. (Tx gain range: 55 to 75 dB)
tsw	Tx Switch	Allows for the switching of the transmission to this unit
txm	**Tx Mute**	Transmission Mute command. The transmission path of the unit is muted (no RF output power)
txu	**Tx Unmute**	Transmission un-mute command. The transmission path of the unit is enabled
tme	**Time(h:m:s)**	Current time will be displayed (in format hour : minutes : seconds)
dat	**Date(d:m:y)**	Current date will be displayed (in format day : month: year)
snb	**Serial number**	Displays the serial number of the unit
mac	**MAC address**	Displays and sets the Monitor and Control address
cur	**Consumption**	Displays the DC current consumption of the unit
alm	**Alarms**	Displays the ALARMS of the unit (OK if no alarm)
sst	**Status**	Displays the system status
psn	**Unit position**	Displays the position of the unit in the system (A or B)
fpw	**Forward PW**	Displays the forward transmission output power (in dBm)
rpw	**Reflected PW**	Displays the reflected transmission power (in dBm)

TABLE 12: COMPUTER TERMINAL COMMANDS FOR RS-232 INTERFACE (continued)		
Command	**Description**	**Response**
t1	**Small term**	Command to switch to Hand Held Terminal (this is the default mode; the unit will start in this mode)
t2	**Big term**	Command to switch to PC Terminal. If connected to a PC, always type **t2** to achieve connection to PC, because the default mode is **t1**
tfs	**Tx freq shift**	Displays the frequency shift in L-C Up-Converter
dnl	**Download**	Command for software downloading
stc	**Startup Condition**	Command for reading the startup condition
tll	**Tx L-Band signal level**	Allows for the display of the Tx L-Band signal level (in dBm)
tml	**Set Tx mute logic**	Allows for the setting of the logic of mute command for Tx (normal, or reversed)
elt	**Elapsed Time**	Elapsed functioning time
ltr	**Low Power Alarm/Fault Threshold**	Allows for the reading and the setting of the low output power threshold as alarm or as fault (causing a shutdown)
alc	**Automatic level control**	Allows for ALC set (on, off) and the ALC level set
tgr	**Transmission gain range**	Displays the transmission gain range (in dB)
txf	**Transmission frequency**	Allows for the set of transmission frequency, so as to improve the gain accuracy and the temperature compensation. For wide band, use **txf 0**; for a certain frequency, use **txf freq**, where freq is L-Band input frequency in MHz.
rst	**Reset**	Reset command after FAULT signaling
rdt	**Redundancy mode**	Sets the Tx Redundancy mode (on/off) for redundant systems
pdo	**Power Detector Offset**	Set an offset for the power detector, so that the detected power will match the real output power of the unit at different frequencies (between –3.0 and 2.0 dB)

8.5.1.1 Downloading the Customer Supplied Software

If it is required to change the internal software features, then download the supplied software as follows:

1. Create a new folder in the hard drive of a PC.
2. From the supplied source, copy the file "dlapp2000.exe" and the file with extension ".hex" into this folder.
3. Make R2-232 connection between PC and the unit.
4. Disconnect redundancy cable from unit (in case of a redundancy system).
5. Run the terminal mode program provided by the PC.
6. Run the "big terminal" mode (command "t2").
7. From the terminal mode type "dnl" command and press **<Enter>**.

   The message "Enter **<yes>** to confirm download" appears on the display.

> **CAUTION:** Typing **<yes>** for download will cause the contents in the non-volatile memory to be cleared. If the user desires to retain the contents in the non-volatile memory, any other key may be pressed.

8. Follow the screen instructions to set download mode.
9. After several seconds, the LED on the unit will flash red-green and the message "Ready for download from RS232" after typing **<yes>**.

From this moment, the memory of the unit is cleared! It is necessary to download the application!

10. Close the terminal mode program.
11. Open the new folder and start the dlapp2000.exe program.

The DLAPP2 display with instructions appears on the screen.

12. At the prompt type "s[space]comX" and then press **<Enter>**.

NOTE: X is the number of the communication port connected to the unit.

13. At the prompt type "pl[space] 19200 and then press **<Enter>**.
14. At the prompt type "l[space] filename.hex" and then press **<Enter>**.
15. After 20–30 seconds the download process should start. You will see progress on the screen.
16. When loading is complete, press "q" and **<Enter>** to close "dlapp2000".
17. Go to the terminal and check unit's settings.

If download process was interrupted, it is need to restart power of the unit and start download process again without items from 6 to 9.

8.5.2 USING THE RS-485 INTERFACE

In order to use this interface, refer to **Section 10 APPENDIX A: RS-485 SERIAL COMMUNICATION PROTOCOL.**

9. MAINTENANCE

This Section describes scheduled maintenance procedure for the SSPB.

CAUTION: Improper maintenance of the SSPB Up-Converter unit may void the warranty.

9.1 PREVENTIVE MAINTENANCE

This product requires minimum maintenance, which consists of visual inspection and cleaning.

WARNING: The person performing maintenance of this equipment must have training and knowledge of both the product and safety requirements and safety issues related to the equipment. Read and practice the safety guidelines at the beginning of this manual (**Section 1** SAFETY at page 6).

9.2 MECHANICAL PREVENTIVE MAINTENANCE

Mechanical preventive maintenance consists of verifying the condition of all mechanical parts, with the AC power switched off. Perform the following inspection:

1. Check all connectors and plugs for evidence of damage and improper seating. Replace defective connector plugs and reset any that are dislodged.
2. Inspect the electrical wiring for signs of discolored, broken or poor insulation. Repair or replace if necessary.
3. Inspect all RF cables for discoloration, cracks, loose connectors and improper sealing. Replace as required.
4. Check for other defects such as, wear, breakage, deterioration, fungus, excess moisture and mounting integrity.

9.3 COOLING FAN CHECK

The SSPB Block Up-Converter unit is forced-air cooled, using a single fan. The cooling fan is located at the bottom shroud of the SSPA. Verify that the fan is operating smoothly. Any suspect noise may indicate wear and fan will have to be replaced. Check for debris or dust in the fan intake and in all openings on the unit. This may reduce the efficiency of the cooling system. The fan should be replaced every two years, in order to ensure the proper cooling of the unit.

WARNING: Do not come in contact with any electrical assembly while power is applied.

10. APPENDIX A: RS-485 SERIAL COMMUNICATION PROTOCOL

The protocol described in this Section is used for the interconnection between the SSPB Up-Converter unit and the user's monitoring and control system. The protocol supports the 4-wire RS-485 interface, using the communication set-up 9600.N.8.1.

10.1 FRAME STRUCTURE

Each frame begins with the same starting byte: 0x55.

After the starting byte, 7 bytes are following.

The first byte in the master-to-slave direction is the address of the correspondent unit (0x01 to 0x07; the address 0x00 is the broadcast address - it must be used only for commands).

The first byte in the slave-to-master direction contains the address of the unit, shifted to the left by 4 (e.g. the unit with the address 0x05 will return address 0x50).

The second byte in the master-to-slave direction is a command or a data request.

The third byte in the master-to-slave direction is an expansion of command (if applicable).

The forth, fifth and sixth bytes in the master-to-slave direction carry the value of parameter. The fourth byte is the most significant (MS) byte, the fifth is the less significant (LS) byte, and the sixth byte is the value after the decimal point.

The second to the sixth bytes in the slave-to-master direction carry data or status from the slave unit.

The seventh byte in both the master-to-slave and the slave-to-master directions carry the check-sum, calculated as algebraic sum of bytes 1-6.

All not used (N/U) bytes are always set to 0xAA.

The format for gain, power level, current consumption and temperature is a 2-bytes hexadecimal value in 0.1 dB, 0.1 dBm, 0.1 Amp or 0.1 degree (signed integer).

The format for frequency is a 2-bytes hexadecimal value in MHz (unsigned integer). The third byte contains the frequency after decimal point in 125 kHz steps (0x00=0; 0x01=125kHz; 0x02=250kHz; 0x03=375kHz; 0x04=500kHz; 0x05=625kHz; 0x06=750kHz; 0x07=875kHz).

If the unit does not recognize the command, or if the checksum is not correct, the response will be always “condition status” (see **TABLE 14**).

The commands marked N/U are not used for these units.

10.2 COMMANDS

TABLE 13 at page 44 lists all of the commands that go in the master-to-slave direction.

NOTE: If the slave does not recognise the command from the master, the response of the slave is given in **TABLE 14** at page 45.

TABLE 13: COMMAND FRAME STRUCTURE				
#	**Description**	**2nd byte**	**3rd, 4th, 5th & 6th bytes**	**Response: 2nd, 3rd, 4th, 5th & 6th bytes**
1.	Mute/Un-mute command	0x02	0x5A – mute Tx 0xA5 – un-mute Tx	See **TABLE 14**
2.	Set gain*	0x05	0x5A XX XX XX for Tx	See **TABLE 14**
3.	Read Identification	0x07	0xAA AA AA AA	See **TABLE 15**
4.	Read serial number	0x08	0xAA AA AA AA	5 ASCII characters
5.	Read RF frequency range	0x09	0x5A for Tx	See **TABLE 16** (response in MHz)
6.	Read gain Set.	0x0A	0x5A for Tx	2nd & 3rd bytes – real gain (in 0.1 dB).
7.	Read elapsed time	0x0C	0xAA AA AA AA	2nd & 3rd bytes for days; 4th byte for hours
8.	Read real gain range	0x0D	0x5A for Tx	See **TABLE 17** (response in 0.1 dB)
9.	Read hot spot temperature and DC voltages	0x12	0xAA AA AA AA	2nd & 3rd bytes – temperature; 5th & 6th bytes – DC voltages
10.	Read current consumption	0x13	0xAA AA AA AA	5th & 6th bytes – current consumption
11.	Read unit status and switch position and status	0x23	0xAA AA AA AA	See **TABLE 19**
12.	Read forward and reflected power levels	0x25	0xAA AA AA AA	2nd & 3rd bytes – forward power; 5th & 6th bytes – reflected power
13.	Read frequency shift (LO frequency)	0x27	0x5A for Tx	See **TABLE 18**
14.	Request condition status	0x2A	0xAA AA AA AA	See **TABLE 14**

***Example for Gain Set command.** To set the gain of unit with address 0x01 to 65.5 dB, the following string should be sent:

0x01 0x05 0x5A 0x02 0x8F 0xAA 0x9B, where 028F is the hex value for 655 (the gain expressed in 0.1 dB units) and 9B is the checksum (truncated to 1 byte).

10.3 RESPONSE TO COMMANDS FROM SLAVE TO MASTER

For command 1 (request condition status) the response is given in the following table.

TABLE 14: CONDITION STATUS RESPONSE					
Bit #	**2nd byte**	**3rd byte**	**4th byte**	**5th byte**	**6th byte**
0	Output level MS byte	Output level LS byte	Internal Communication Status	Tx status 1-ON, 0-FF	N/U
1				1- Tx Sum Alarm	N/U
2				1- Check sum error in command	1 – Unknown command
3				Power Class for P1dB (power in dBW) 5 bits From 30dBm – step 1dB 0 dBW = 30 dBm 1 dBW = 31 dBm … 18 dBW = 48 dBm	N/U
4					N/U
5					N/U
6					N/U
7					N/U

4-th byte – Internal Communication Status is:

1 – for no communication, 0 – for communication O/K.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
N/U	N/U	N/U	N/U	Power Amplifier Module	N/U	L-RF U/C Module	Digital Power Monitor Module

TABLE 15: READ IDENTIFICATION RESPONSE					
Bit #	**2nd byte**	**3rd byte**	**4th byte**	**5th byte**	**6th byte**
0	1 – Up	0	0x00 – N/A 0x07 – L to C 0x08 – L to Ku 0x0A – L to DBS 0x0B – L to X	0	Software Version number 0xXX
1	0	0		0	
2	1 – PA	0		0	
3	0	0		0	
4	0	0		0	
5	0	0		0	
6	0	0		0	
7	0	0		0	

TABLE 16: READ FREQUENCY RANGE RESPONSE					
Bit #	**2nd byte**	**3rd byte**	**4th byte**	**5th byte**	**6th byte**
0 1 2 3 4 5 6 7	MS byte Lowest Frequency	LS byte Lowest Frequency	0x5A for Tx	MS byte Highest Frequency	LS byte Highest Frequency

Example: 16 DA 5A 19 19 is the response for 5850 6425 frequency range

TABLE 17: READ GAIN RANGE RESPONSE					
Bit #	**2nd byte**	**3rd byte**	**4th byte**	**5th byte**	**6th byte**
0 1 2 3 4 5 6 7	MS byte minimum value	LS byte minimum value	0x5A for Tx	MS byte maximum value	LS byte maximum value

Example: 02 26 5A 02 EE is the response for 55.0 to 75.0 dB gain range (550 to 750 in 0.1 dB)

TABLE 18: READ FREQUENCY SHIFT RESPONSE					
Bit #	**2nd byte**	**3rd byte**	**4th byte**	**5th byte**	**6th byte**
0 1 2 3 4 5 6 7	MS byte frequency	LS byte frequency	0x5A for Tx	Value after decimal point	0xAA

Example: 13 24 5A 00 AA is the response for 4900 MHz LO frequency

TABLE 19: UNIT STATUS AND SWITCH POSITION AND STATUS RESPONSE					
Bit #	**2nd byte**	**3rd byte**	**4th byte**	**5th byte**	**6th byte**
0	1–B; 0-A	1- Tx alarm; 0-Tx O/K	0	1 - Consumption Current alarm	1-Tx W/G Switch Alarm
1	Tx 1-un-mute; 0-mute	0	0	1 – High Reflected Power Alarm	0
2	0	1-L-RF alarm	0	1 - Overdrive (when output power is more than 1.5 dB over P1dB)	1 – Tx W/G Switch not connected
3	Tx 1- ON-LINE 0 – STANDBY	1- Temperature alarm (>85 °C)	0	0	0
4	0	1-PA devices alarm	0	0	0
5	1 - standalone 0 - redundant	0	0	0	0
6	0	0	0	0	0
7	0	1 – Temperature Pre-alarm (>75 °C)	0	0	0

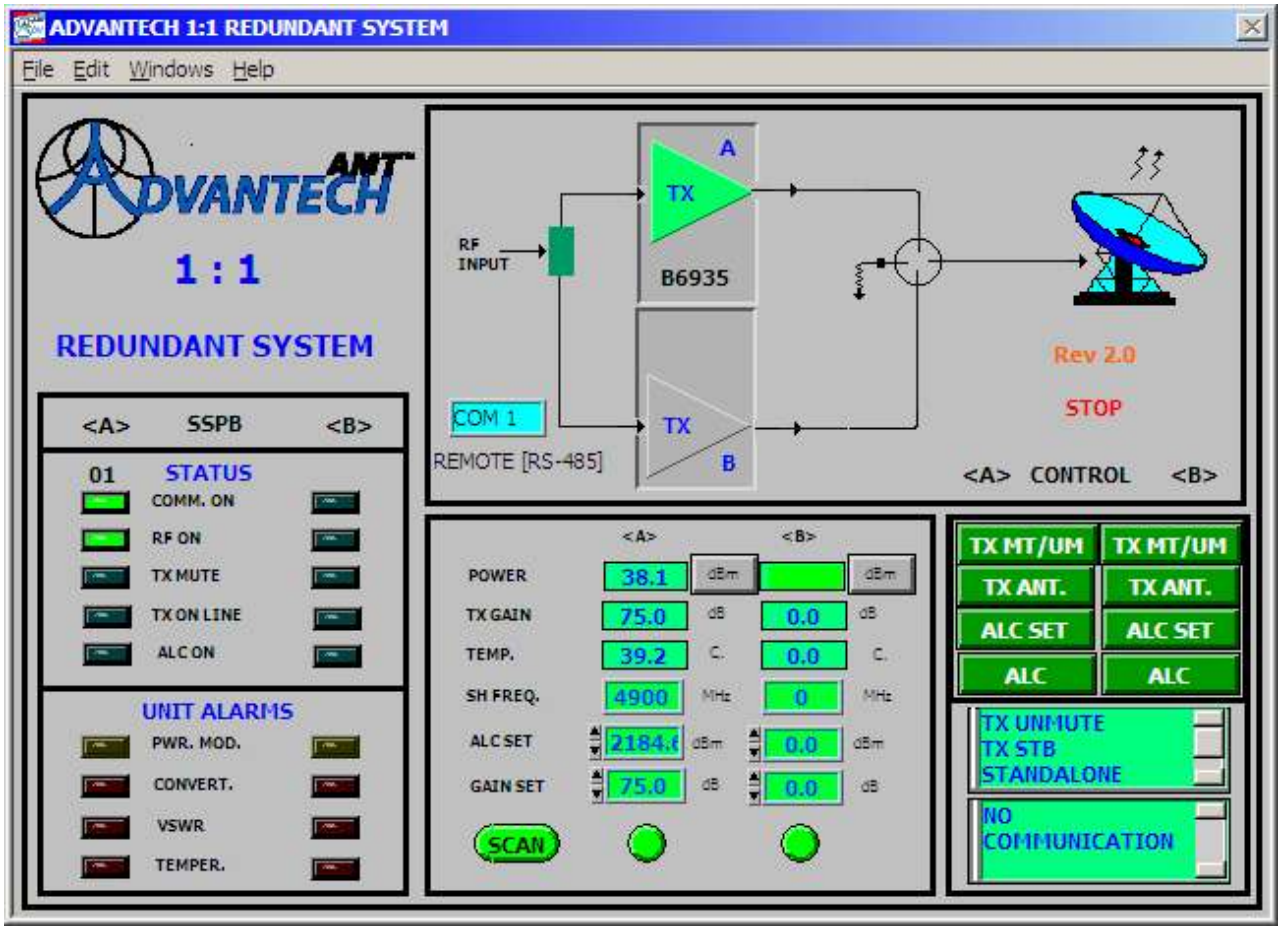


Figure 6: Proposed Graphic User Interface (GUI) based on RS-485 Protocol (no ALC set)

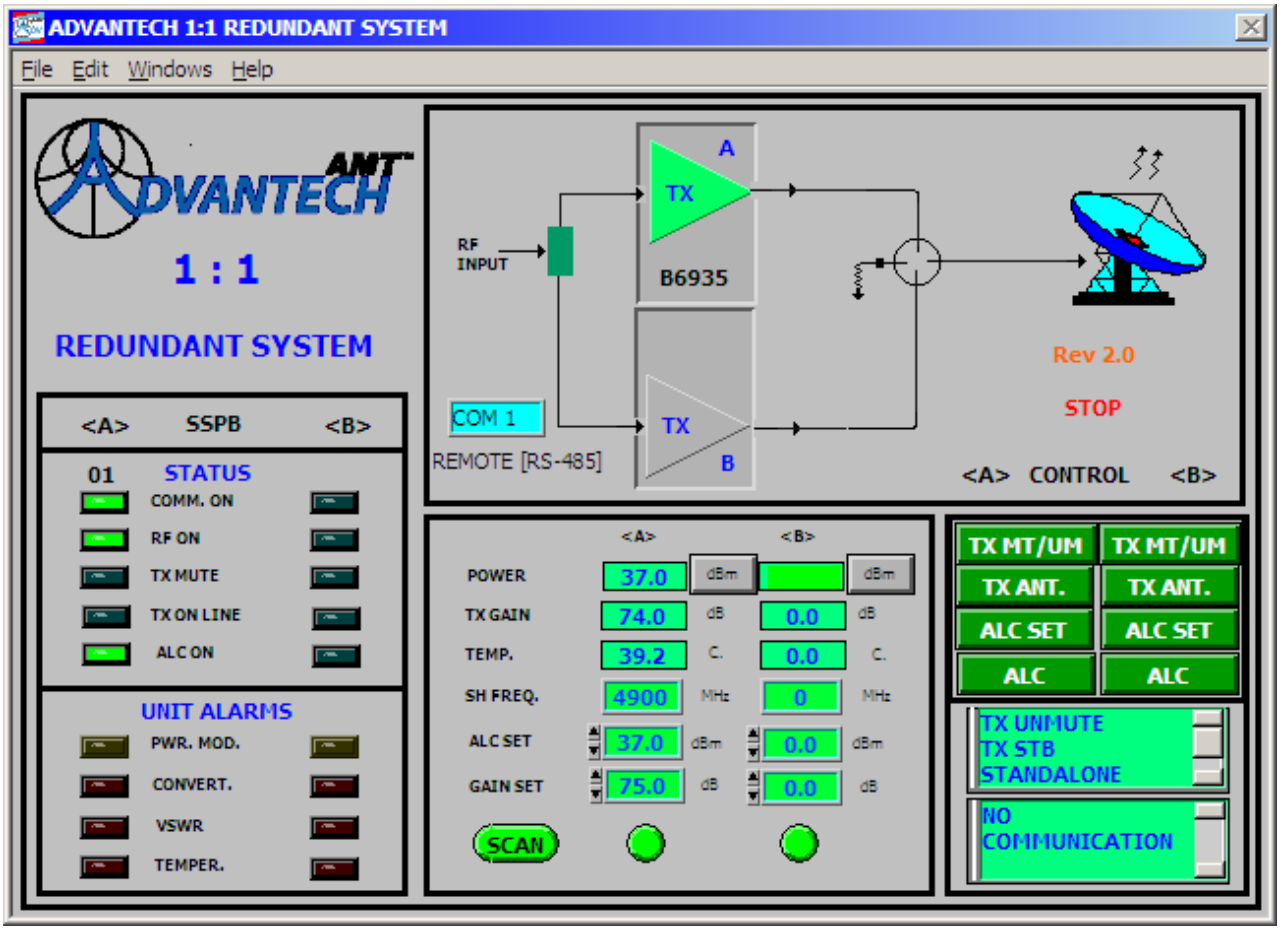


Figure 7: Proposed Graphic User Interface (GUI) based on RS-485 Protocol (with ALC set)

11. APPENDIX B: SAFETY AND EMC COMPLIANCE

Advantech Wireless products are compliant with following standards:

SAFETY: IEC 60950-1 second edition 2005

EMC: EN301489-1 2004 (EMC for radio equipment and services, common technical requirements):

EN 55022: 1998 / A1: 2000 - Class A
EN61000-4-4 Transient/burst 0.5kV Signal Lines, 1 kV Power Lines
EN61000-4-2 Electrostatic discharge 4kV CD, 8 kV AD
EN61000-4-5 Surge 1kV, 0.5 kV
EN61000-4-11 AC port dips 70%, 40%, 0%
EN 61000-4-3 Radiated Immunity 80-1000 MHz @ 3 V/m

SUPPLEMENTARY INFORMATION:

The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and of the EMC Directive 89/336/EEC and may carry the CE-marking accordingly.