Mini Compact Outdoor
Solid State Power Amplifier
Operations Manual

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1.0 Introduction

This section provides the general information for the Paradise Datacom LLC line of Mini Compact Outdoor Solid State Power Amplifiers. The Mini Compact Outdoor SSPA has been designed and manufactured to be an extremely robust and reliable amplifier. It is well suited for harsh outdoor environments.

1.1 Description

The Mini Compact Outdoor SSPA is a smaller version of Paradise Datacom's popular Compact Outdoor SSPA. It is a one-piece integrated Satcom amplifier system which includes an AC/DC power supply, microwave amplifier module, microprocessor based monitor and control circuitry, and an efficient thermal management system. The unit's enclosure protects these components against the ingress of dirt and water.

The reduced size and weight of this amplifier system allow it to be used in a wide variety of installations. This amplifier is ideal for mounting on the boom of small antennas or anywhere that size and weight are a major concern.

Features include:

- Compact Size: 9.0 in x 12 in x 6.50 in. (229 mm x 305 mm x 165 mm)
- Very light weight: Base units weigh as little as 24.5 lb. (11.1 kg)
- Auto-Sensing Power Factor Corrected Power Supply
- RF Gain Adjustment: 55 dB to 75 dB minimum with 0.1 dB resolution
- Output Power Detection
- Output Power Sample Port
- Internal 1:1 Redundant Capability
- Serial (RS 232 / RS 485), Ethernet or Parallel Monitor & Control Circuitry
- Windows Monitor & Control Software

Available options include:

- Optional L-Band Input Capability
- Mounting kit
- 1RU Remote Control Panel
- 1:2 Redundant Capability with external 1RU Redundant Control Panel

1.2 Specifications

Refer to Appendix A for full specifications of the Mini Compact Outdoor SSPA.

1.3 Inspection

When the unit is received, an initial inspection should be completed. First ensure that the shipping container is not damaged. If it is, have a representative from the shipping company present when the container is opened. Perform a visual inspection of the Compact Outdoor Amplifier to make sure that all items on the packing list are enclosed. If any damage has occurred or if items are missing, contact:

> Paradise Datacom LLC
> 328 Innovation Park
> State College, PA 16803
>
> Phone: 1 (814) 238-3450
> Fax: 1 (814) 238-3829

1.4 Equipment Supplied

The following equipment is supplied with each unit:

- The Mini Compact Outdoor Amplifier Assembly;
- Prime power mating connector: AC - MS3102R16-10P
- Quick Start Serial (Ethernet) Communication Cable, L207755-2, -OR- Quick Start Serial (RS 232 / RS 485) Communication Cable, L207998-2
- Product Guide CD with SSPA Monitor & Control Software
- M&C (J4) Mating Connector, MS3116F18-32P
- Waveguide gaskets (dependent on frequency band)
- Sealing tape (87F730)

1.5 Safety Considerations

Potential safety hazards exist unless proper precautions are observed when working with this unit. To ensure safe operation, the user must follow the information, cautions, and warnings provided in this manual as well as the warning labels placed on the unit itself.

1.5.1 High Voltage Hazards

Only qualified service personnel should service the internal electronic circuitry of the Compact Outdoor Amplifier. High DC voltages are present in the power supply section of the amplifier. Care must be taken when working with devices that operate at this high voltage levels. It is recommended to never work on the unit or supply prime AC power to the unit while the cover is removed.

1.5.2 RF Transmission Hazards

RF transmissions at high power levels may cause eyesight damage and skin burns. Prolonged exposure to high levels of RF energy has been linked to a variety of health issues. Please use the following precautions with high levels of RF power.

- Always terminate the RF input and output connector prior to applying prime AC input power.
- Never look directly into the RF output waveguide
- Maintain a suitable distance from the source of the transmission such that the power density is below recommended guidelines in ANSI/IEEE C95.1. The power density specified in ANSI/IEEE C95.1-1992 is 10 mW/cm^2. These requirements adhere to OSHA Standard 1910.97.
- When a safe distance is not practical, RF shielding should be used to achieve the recommended power density levels.

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2.0 Introduction

This section provides a physical description of the Mini Compact Outdoor, including pin-outs of all connectors, power requirements for the installed unit, and instructions on single-unit boom mounting.

2.1 Dimensions and Weight

The Mini Compact Outdoor SSPA enclosure dimensions are 9.00 in. W x 12.00 in. L x 8.00 in. H. The addition of the RF Output waveguide and I/O connectors add a few inches to the over-all length of the unit, but the width and height remain constant, independent of the frequency band of the unit. See **Figure 2-1** for an outline drawing of a Ku-Band Mini Compact Outdoor SSPA.
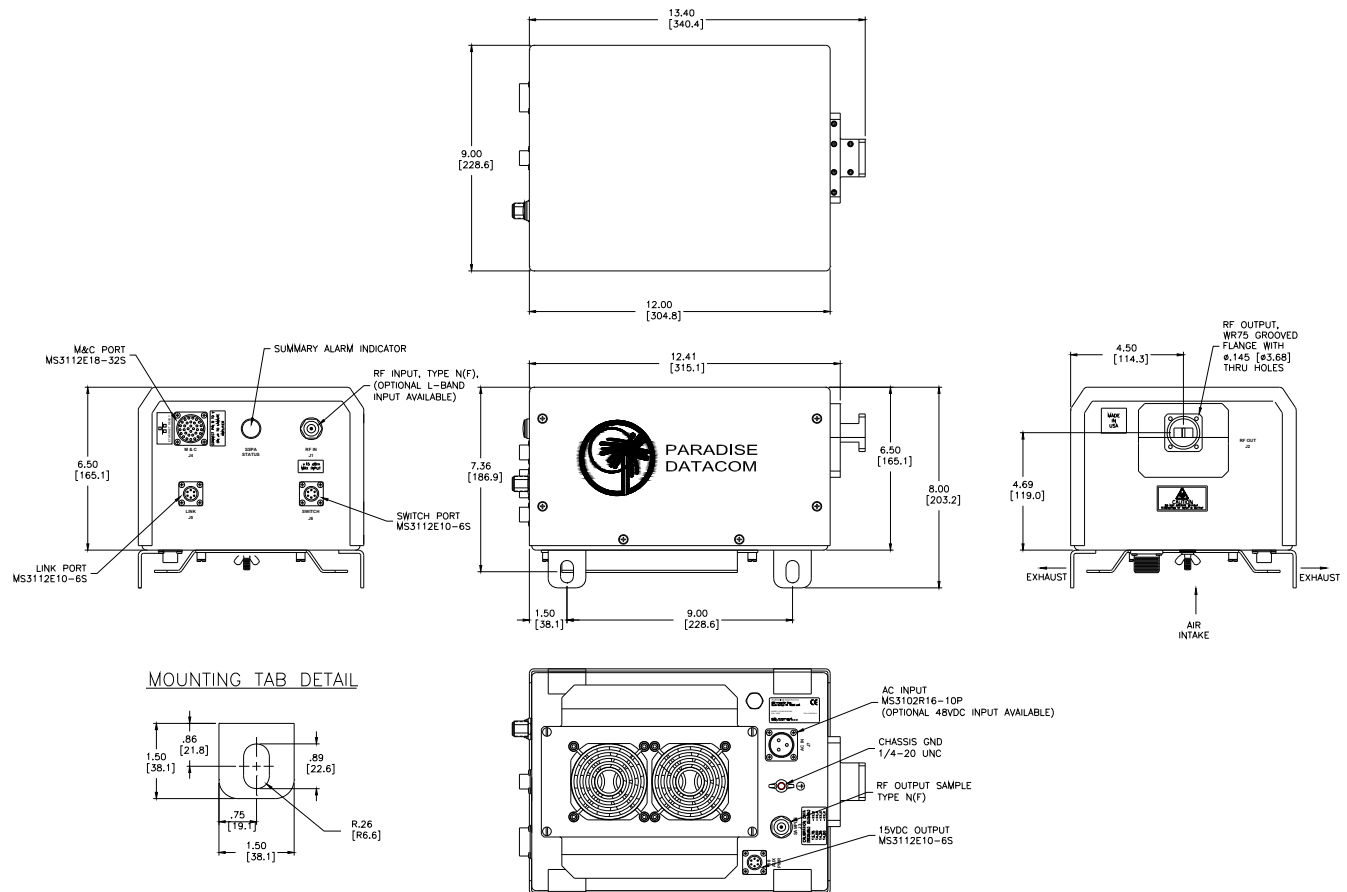
Figure 2-1: Outline Drawing, Ku-Band Mini Compact Outdoor SSPA

The base unit weighs approximately 24.5 lbs. There are several options available for the Mini Compact Outdoor SSPA that will add to the base weight. These are listed in **Table 2-1**, along with the approximate weights for each power level.

Table 2-1: Unit weights (typical)

Model Number	Weight	Units
HPACC3075AC_XXXX	26.0 (11.8)	lbs. (kg)
HPACC3100AC_XXXX	26.0 (11.8)	lbs. (kg)
HPAXX3050AC_XXXX	25.5 (11.6)	lbs. (kg)
HPAXX3075AC_XXXX	25.5 (11.6)	lbs. (kg)
HPAXX3100AC_XXXX	25.5 (11.6)	lbs. (kg)
HPAXX3175AC_XXXX	25.5 (11.6)	lbs. (kg)
HPAKU3050AC_XXXX	24.5 (11.1)	lbs. (kg)
HPAKU3080AC_XXXX	24.5 (11.1)	lbs. (kg)

2.2 Connector Pin-Outs

The Mini Compact Outdoor SSPA utilizes a variety of connectors for communication with the amplifier.

2.2.1 RF In (J1) [Type N (F)]

The RF Input signal is applied to J1, which is a type N female connector. The Mini Compact Outdoor SSPA has a default maximum nominal gain of 75 dB minimum. Therefore the maximum input signal required to saturate the amplifier can be calculated as:

$$\text{Input Power} = P_{sat} - 75 \text{ dB}$$

For example, if a 50 W Ku-Band Mini Compact Outdoor amplifier is used in a system it has a P_{sat} = 47.0 dBm. Therefore the maximum input power should be limited to -28 dBm. Slightly higher input power levels will not damage the amplifier but will result in higher levels of distortion in the output signal.

> **WARNING! The maximum input level should be limited to +15 dBm to avoid damaging the amplifier.**

2.2.2 RF Out (J2)

The amplifier's output is brought out through the waveguide port, J2. Caution should be observed here to make sure that the antenna or a suitable termination is connected to this port before operating the amplifier. The amplifier is protected against full reflection but dangerous levels of microwave energy can be present at this port.

Ku-Band amplifiers have a WR-75 Grooved Flange while the C-Band and X-Band amplifiers have CPR style grooved flanges (CPR-137G for C-Band; CPR-112G for X-Band). An isolator is provided at the output flange with a termination capable of handling full reflected output power.

> **WARNING! Never look directly into the RF output waveguide.**

2.2.3 RF Output Sample Port (J3) [Type N (F)]

The RF Output Sample port, J3, is located on the bottom of the amplifier as shown in **Figure 2-1**. This connector provides a -40 dBc coupled sample of the amplifier's output signal. It is a type N female connector.

2.2.4 Monitor & Control Port (J4) [MS3112E18-32S]

The M&C (Monitor and Control) connector is the primary input for controlling the amplifier and monitoring fault conditions. It is a 32-pin circular connector, MS3112E18-32S. It requires a mating connector, MS3116F18-32P, which is supplied with the unit. The pin-out for this connector is described in **Table 2-2** on the following page.

The Mini Compact Outdoor Amplifier has no on/off switch or circuit breaker in the AC Input path. As soon as AC power is applied to J7, the unit's power supplies and microcontroller are enabled and the cooling fans should begin to spin. **However, the internal amplifier module is disabled until the Mute Line Input (J4, Pin B) is pulled to Ground (J4, Pin V).** If it is desired to have the RF enabled every time the AC input is applied, a permanent connection can be made between J4, Pin B and J4, Pin V.

2.2.4.1 Alarms on J4

A variety of alarm signals are present at the M&C connector, J4. Both Form-C relays and open collector outputs are available.

2.2.4.1.1 Summary Alarm (J4) Form C Contacts

The Summary Alarm is accessible in both Form C relay and open collector format. The Form C relay is "energized" under normal operating conditions and "de-energized" when a Fault condition exists.

2.2.4.1.2 Auxiliary Alarm (J4) Form C Contacts

The Auxiliary Alarm relay is an end user alarm that can be used to signal an alarm condition that is dependent on the state of the Auxiliary Input (J4-Pin P).

The Auxiliary Input is a contact closure to ground. When this input is pulled to ground the Auxiliary Alarm relay is energized (Normal State). When the Auxiliary Input is open circuited the Auxiliary Alarm relay is de-energized (Alarm State).

2.2.4.1.3 Open Collector Alarm Outputs (J4)

The open collector alarm outputs will require external pull-up resistors (unless connected to the Auxiliary Input). They are capable of sinking up to 20mA current at 30 VDC. The open collector outputs are pulled to ground under normal operating conditions and switch to high impedance state during an alarm condition.
- Auxiliary Alarm: follows state of Auxiliary Input as described above

Table 2-2: J4 Monitor & Control Port Pin-Outs

Pin #	Signal	Type	Function	Notes
B	Mute Input	Closure to Ground	Disables DC power to SSPA	Unit powers up muted. This line must be pulled to ground (V or d) to enable amplifier.
P	Auxiliary Input	Closure to Ground	Auxiliary Fault Input	
L a b	Summary Alarm	Form C Relay	Closed on Fault Common Open on Fault	L-a: normally open a-b: normally closed
N Z M	Auxiliary Alarm	Form C Relay	Closed on Fault Common Open on Fault	N-Z: normally open Z-M: normally closed
G	Auxiliary Alarm	Open Collector	High on Fault	Requires external pull-up
W	10 Base-T Tx-			Refer to M&C Section
H	10 Base-T Rx+			Refer to M&C Section
J	10 Base-T Rx-			Refer to M&C Section
X	10 Base-T Tx+			Refer to M&C Section
S	Reserved			Make no connection
R	Reserved			Make no connection
A	Reserved			Make no connection
f	Reserved			Make no connection
D	RS232/RS485 Select	Closure to Ground	Selects Serial Communication	Default is RS485; Pull to ground (d) to enable RS232
E	RS485 TX- or RS232 OUT	Serial TX Output	Serial Link Data Port	Refer to M&C Section
F	RS485 RX- or RS232 IN	Serial RX Input	Serial Link Data Port	Refer to M&C Section
T	RS485 TX+	Serial TX Output	Serial Link Data Port	Refer to M&C Section
U	RS485 RX+	Serial RX Input	Serial Link Data Port	Refer to M&C Section
V	Chassis Ground	Signal Ground	Common Signal Return	
d	Isolated Ground	Signal Ground	Isolated Comm Ground	Ground for Signals D, E & F
j	Interface Select 0	Closure to Ground	Select Baud Rate & Protocol	Refer to M&C Section
e	Interface Select 1	Closure to Ground	Select Baud Rate & Protocol	Refer to M&C Section
g	PGM Switch		Flash Firmware Port	Reserved for Programming
c	PGM CLK		Flash Firmware Port	Reserved for Programming
K	PGM-Sout		Flash Firmware Port	Reserved for Programming
Y	PGM-Sin		Flash Firmware Port	Reserved for Programming
h	PGM +5V		Flash Firmware Port	Reserved for Programming
C	PGM Enable		Flash Firmware Port	Reserved for Programming

2.2.4.2 Serial I/O Control (J4)

For serial data control of the Compact Outdoor SSPA, a Windows-based Monitor &Control program is supplied with the amplifier that allows all of the control and alarm functionality over a serial communication link.

Both RS-232 and RS-485 can be used to communicate with the amplifier. The amplifier default is to operate on RS-485 but can easily be set to RS-232 by pulling the RS-232/ RS-485 Select line low. This is done by connecting J4-Pin D to J4-Pin V.

The Mini Compact Outdoor Amplifier may be supplied with a Quick Start Cable in which this connection is already made. This allows the user to quickly setup the amplifier and verify its operation. The other side of the cable has a 9-Pin female D connector that mates with most notebook and desktop personal computers.

Communication links using RS-232 are typically good up to 30 ft. (9 m) in length. Installations exceeding this length can use the RS-485 mode which will allow serial control up to 4000 ft. (1200 m).

2.2.5 Link Port (J5) [MS3112E10-6S]

The interface connector is used to connect between two Compact Outdoor Amplifiers when used in a 1:1 redundant system. It is a 6-pin circular connector, MS3112E10-6S. It requires a mating connector, MS3116F10-6P. A link cable is provided with a 1:1 Redundancy Kit, which can be purchased separately. See **Table 2-3** for a pin-out of this connector.

Table 2-3: J5 Link Port Pin-Outs

Pin #	Connection	Pin #	Connection
A	Link Out	D	N/C
B	Link In	E	N/C
C	N/C	F	Ground

2.2.6 Switch Port (J6) [MS3112E10-6S]

When used in a 1:1 redundant system, the waveguide switch must be connected to the switch port of each amplifier (MS3112E10-6S). See **Table 2-4**.

Table 2-4: J6 Switch Port Pin-Outs

Pin #	Connection	Pin #	Connection
A	N/C	D	N/C
B	N/C	E	Pos 2
C	+28 VDC	F	Pos 1

2.2.7 AC In (J7) [MS3102R16-10P]

The Prime power connector is a 3-pin circular connector, J7. The power supplies provide universal AC input by using auto-sensing power supplies. The AC input can operate over a range of 85-265 VAC, at 47 to 63 Hz. The power supply is also power factor corrected, enabling the unit to achieve a power factor greater than 0.95.

The AC Line input connector configuration is given in **Table 2-5**.

Table 2-5: J7 AC In Port Pin-Outs

Pin #	Connection
A	L1
B	GND
C	L2/N

The prime power requirements for each model is summarized in **Table 2-6**.

Table 2-6: Power Requirements

Model Number	RF Output (P_{sat})	RF Output (P_{1dB})	AC Input w/ RF
HPACC3075AC_XXXX	48.8 dBm (76W)	48.5 dBm (70W)	550 W
HPACC3100AC_XXXX	50.0 dBm (100W)	49.5 dBm (89W)	660 W
HPACC3175AC_XXXX	52.5 dBm (175W)	48.5 dBm (70W) ◊	1100 W
HPAXX3050AC_XXXX	47.0 dBm (50W)	46.5 dBm (45W)	465 W
HPAXX3075AC_XXXX	48.8 dBm (76W)	48.3 dBm (68W)	600 W
HPAXX3100AC_XXXX	50.0 dBm (100W)	49.5 dBm (89W)	710 W
HPAXX3175AC_XXXX	52.5 dBm (175W)	48.5 dBm (70W) ◊	1120 W
HPAKU3050AC_XXXX	47.0 dBm (50W)	46.0 dBm (40W)	665 W
HPAKU3080AC_XXXX	49.0 dBm (80W)	45.0 dBm (32W) ◊	820 W

◊ at P_{LINEAR} rather than P_{1dB}

2.2.8 Auxiliary Power Port (J8) [MS3112E10-6S]

The +15 VDC Output, J8, is located on the bottom side of the amplifier as shown in Figure 2-1. This provides +15 VDC and up to 1 Amp current to any external equipment. It is a 6-pin MS-type connector. See **Table 2-7**.

Table 2-7: J8 Auxiliary Power Port Pin-Outs

Pin #	Connection	Pin #	Connection
A	External Fault IN	D	Ground
B	Fault Pullup	E	+15V External
C	+15V LNA	F	Ground

2.2.9 Chassis Ground Pin

A Chassis ground terminal is provided on the bottom side of the amplifier. A ¼ - 20 threaded terminal is provided for equipment grounding.

2.3 Physical Features

In addition to the I/O connectors, the Mini Compact Outdoor user-friendly features include a summary alarm indicator and a removable fan tray.

2.3.1 Summary Alarm Indicator

A summary alarm indicator LED is located on the input side of the amplifier. When the SSPA is online, this indicator illuminates GREEN. When in a fault condition, it illuminates RED.

2.3.2 Removable Fan Tray

The Mini Compact Outdoor Amplifier's cooling system represents a landmark in microwave telecommunication amplifiers. It is a unique system of heatsinks that have been computer optimized to provide extremely efficient cooling of all of the system's functional blocks. This high efficiency cooling system is primarily responsible for the small overall package size and reduced weight of the unit (approximately 24.5 lbs or 11.1 kg).

The cooling system is based on a forced convection technique in which the system fans provide the air intake while the exhaust is brought out around the outer perimeter of the fans. The fans are 132 CFM rated and operate into approximately 0.3 in. H_2O back pressure, and produce 68.0 dB-A measured at a distance of 1 meter from the fan intake.

The air intake and exhaust are both located on the bottom side of the amplifier. The intake is brought through two fans while the exhaust is along the two rows of heatsink fins as seen in **Figure 2-2**.
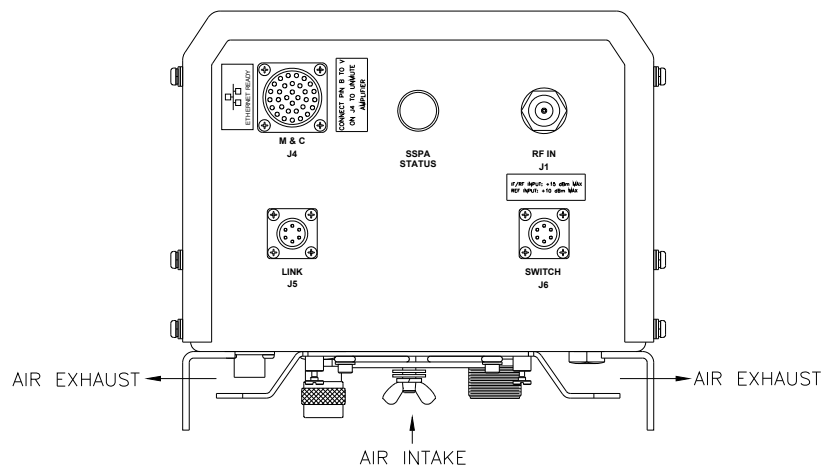
Figure 2-2: Mini Compact Outdoor SSPA Air Flow

A minimum clearance of 6 inches (152 mm) should be maintained between the bottom of the amplifier and any mounting surface. This will ensure that there is no forced re-circulation of airflow from exhaust to intake.

Warning! The Mini Compact Outdoor SSPA should NEVER be mounted with the fans facing up. Doing so will void your warranty.

The fans should be examined periodically and any obstruction or debris should be cleared. Inadequate air flow can cause the amplifier to overheat and cause a temperature fault. See *Section 6: Troubleshooting and Maintenance* for cleaning instructions.

2.4 Installation

The light-weight chassis of the Mini Compact Outdoor SSPA is ideal for mounting the unit—or redundant assembly—directly to an antenna boom. These instructions outline how to install a Mini Compact Outdoor SSPA unit onto an antenna boom using a Universal CO mounting Kit. This kit allows installation of the Mini Compact Outdoor SSPA on antenna booms up to 10" thick.

2.4.1 Safety Considerations

These instructions are designed to be used by a single operator. As such, several safety issues should be kept in mind during the installation.
1. The Paradise Datacom Mini Compact Outdoor SSPA base unit weighs approximately 24.5 lbs., and should be handled with care to avoid scratching the exterior coating and compromising the unit's corrosion resistance;
2. All bolts should be torqued down to within reasonable limits to avoid stripping the threads.
3. The section of antenna boom the unit is to be mounted on should be straight, dry and free from corrosion or defects.

2.4.2 Inspection

On receiving the Universal CO Mounting Kit, inspect the contents to ensure all parts listed in **Table 2-8** are present.

Table 2-8: Universal CO Mounting Kit Parts List

Item #	Qty	Description	Part No.
1	4	Bracket, Mounting	L201394-2
2	4	Uni-Strut, 13.5" Lengths	L201393-1
3*	4	1/2"-13 All-Thread Stud, SS	188FTS 8-11 or -15
4	12	1/2" Lock Washer	50LW188
5	12	Nut, Hex, 1/2"-13	1/2-13 Nut
6	16	Washer, Flat, Std. 1/2"	MS15795-819
7	4	Bolt, Hex, 1/2"-13 x 1.25, SS	MS35307-411
8	1	Gasket,6"x12",1/32" THK, Adhesive backed	8991K51
9	4	Nut, Self-hold, 1/2"	B911-1/2

* Kits are supplied with two different All-Thread lengths (11.0" or 15.0") depending on the installation. The 11-inch All-Thread allows mounting on booms up to 6" diameter. The 15-inch All-Thread allows mounting on booms up to 10" diameter.

2.4.3 Installation

1. Cut gasket (Item 8) into four (4) 1.5" x 7" pieces. Attach gasket to each support bracket (Item 1) as shown in Figure 2-3. Trim gasket around bottom corners and slot in bracket.
2. Locate the mounting studs on the bottom of the Mini Compact Outdoor SSPA unit. Using a 1/2" bolt (Item 7), two flat washers (Item 6), and a 1/2" nut (Item 5), firmly bolt one mounting bracket to each mounting stud, as shown in **Figure 2-3**. Be sure the gasket installed in Step 1 is between the bracket and the unit, that each bracket is vertical, and the top flange of the mounting bracket points away from the unit.
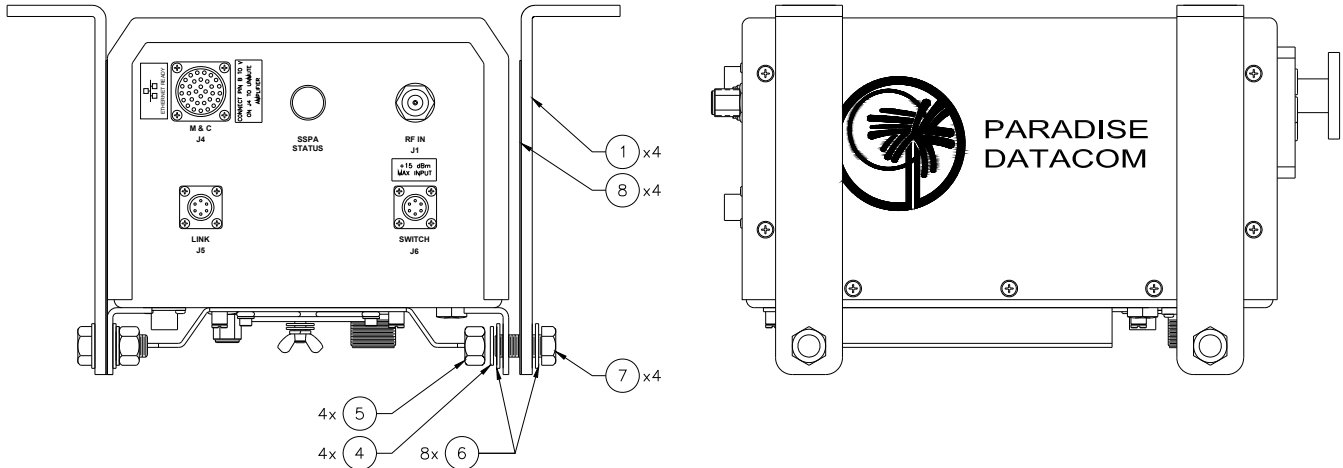
Figure 2-3: Attach Mounting Supports to Unit

3. Place one piece of Uni-Strut (Item 2), with the open channel up, at each end of the unit, across the flanges of the mounting brackets, lining up the holes. Run on a self-holding nut (Item 9) about 1" from the end of each All-Thread stud (Item 3). Slip the self-holding nut into the channel and through the Uni-Strut and mounting flange. Secure firmly in place with a flat washer (Item 6), lock washer (Item 4) and nut (Item 5). The unit should now look as shown in **Figure 2-4**.
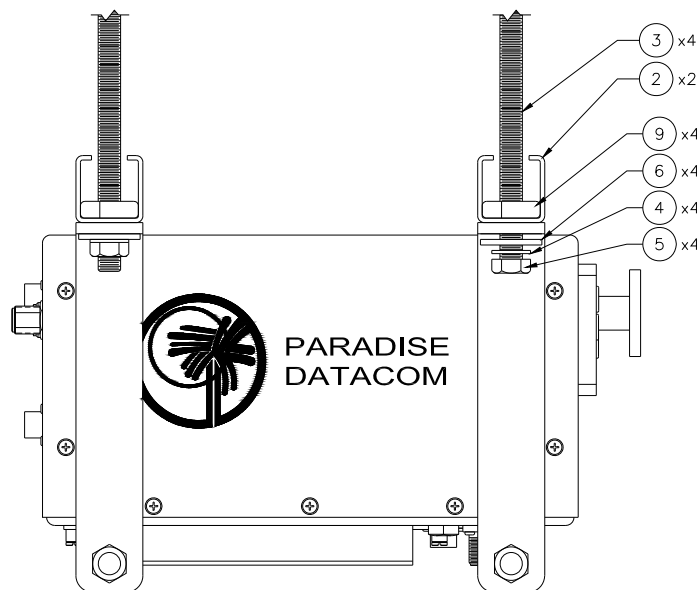
Figure 2-4: Install All-Thread stud

4. Bring the unit up tight under the boom (with the long axes parallel), sliding the All-Thread studs past the sides of the boom to show above the boom top. Place the remaining pieces of Uni-Strut (Item 2) open channel down across the boom onto the protruding All-Thread stud ends. Secure firmly with a flat washer (Item 6), lock washer (Item 4) and 1/2" nut (Item 5) on each of the four All-Thread stud ends. Looking from the end of the boom, the mounted unit should look as shown in **Figure 2-5**.
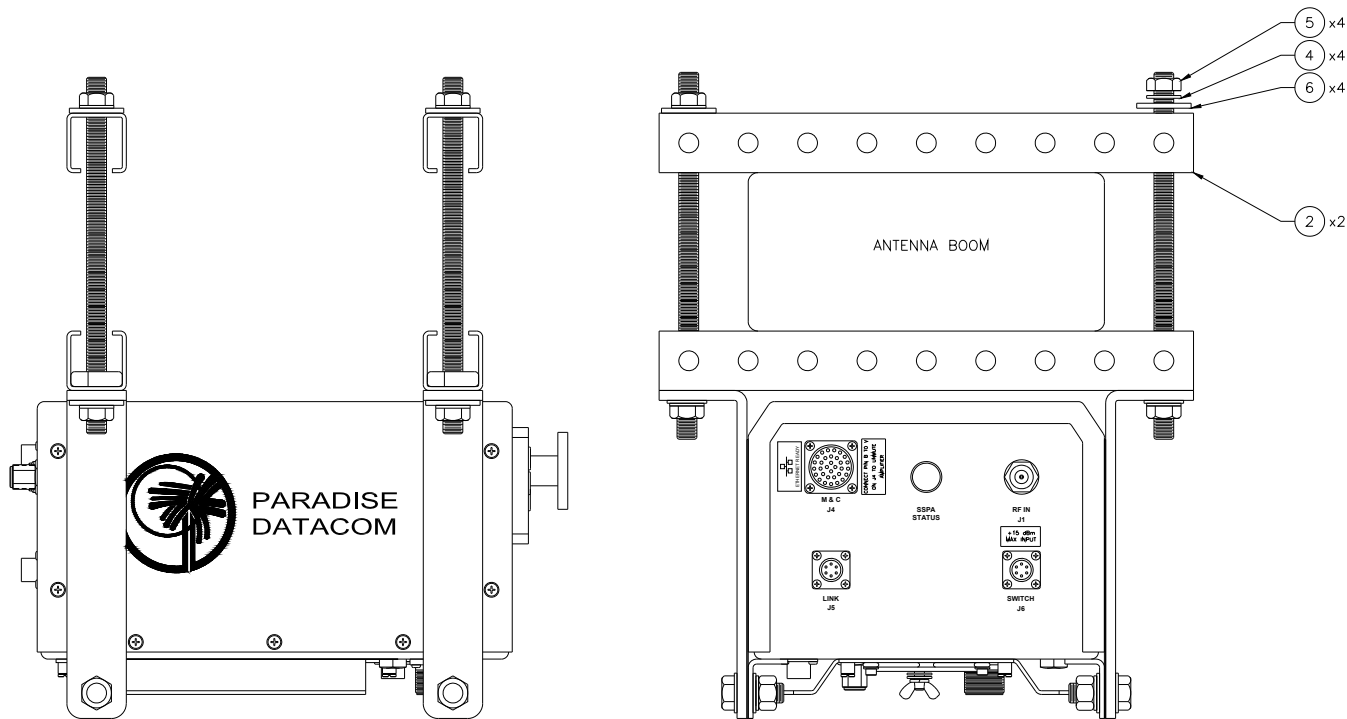
Figure 2-5: Mount Unit to Antenna Boom

5. Connect the signal input, output, communication cables and power to the Mini Compact Outdoor SSPA unit as directed elsewhere in this manual.

3.0 Introduction

The Mini Compact Outdoor SSPA is available with a standard Ethernet & RS232/485 interface. This section summarizes the connections to a remote computer for various remote communications. **Table 3-2** summarizes the hardware connections of Port J4 for all remote communication connections.

3.0.1 Remote Communications Connections

Units can be configured for either Ethernet (default IP or user-defined IP), RS-485, or RS-232 communications. The units cannot be used simultaneously with multiple communication protocols. The user must select one of the four formats. **Figures 3-1** through **3-4** show the proper configuration of J4 for each of the four communication formats.

	J4
Interface Select 0	e
Chassis Ground	V
TX Enable	B
10 BASE-T RX-	H
10 BASE-T RX+	J
10 BASE-T TX+	X
10 BASE-T TX-	W
DEFAULT IP ADDRESS: 192.168.0.9	J4
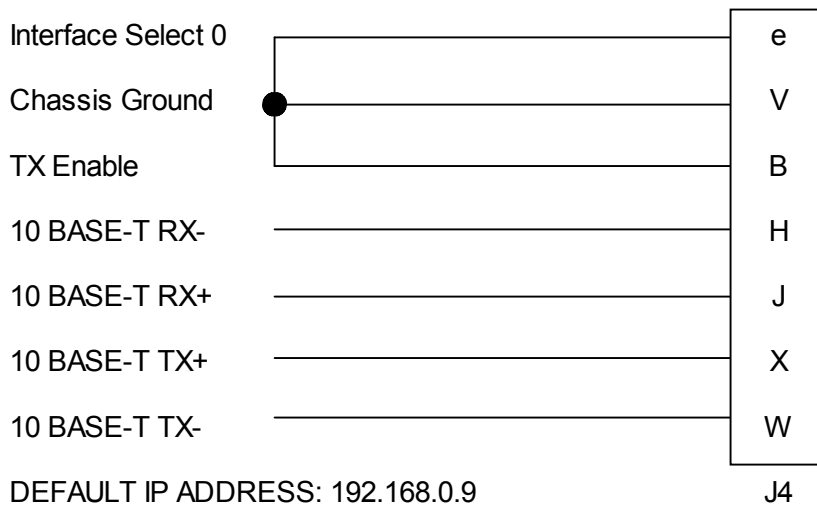
Figure 3-1: J4 Connections for Ethernet Communications, Default IP Address

	J4
Interface Select 1	j
Chassis Ground	V
TX Enable	B
10 BASE-T RX-	H
10 BASE-T RX+	J
10 BASE-T TX+	X
10 BASE-T TX-	W
USER-DEFINED IP ADDRESS	J4
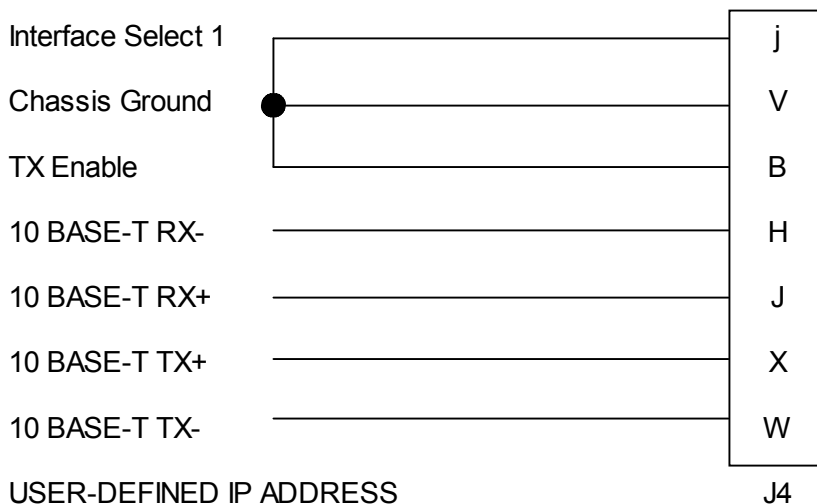
Figure 3-2: J4 Connections for Ethernet Communications, User-Defined IP Address

Figure 3-3: J4 Connections for RS-485 Communications

Chassis Ground — V
TX Enable — B
Interface Select 0 — e
Interface Select 1 — j
RS232/RS485 Select — D
Isolated Return for RS232/RS485 — d
RS485 (RX-) RS232 (RX) — F
RS485 (TX-) RS232 (TX) — E
RS485 (TX+) — T
RS485 (RX+) — U
J4

Chassis Ground — V
TX Enable — B
Interface Select 0 — e
Interface Select 1 — j
RS232/RS485 Select — D
Isolated Return for RS232/RS485 — d
RS232 (RX) — F
RS232 (TX) — E
J4

Figure 3-4: J4 Connections for RS-232 Communications

3.1 Quick Start Cables

For convenience all units ship with a 'Quick-Start' communications cable. This allows the user to immediately connect the amplifier to a PC and begin operation. Units ship with a Quick Start cable fitted with a 10-base T connector as shown in **Figure 3-5**.

PIN 1

L207755-2 REVA

P1

P2

e
GROUND   V   BLK   5
MUTE INPUT-CLOSURE TO GROUND   B

10 BASE-T TX-   W   ORG   6
10 BASE-T TX+   X   WHT/ORG   3
10 BASE-T RX-   H   GRN   2
10 BASE-T RX+   J   WHT/GRN   1
                 P1   P2

Figure 3-5: Ethernet Quick Start Cable, 207755 (Revision A and beyond)

Units may ship with a RS-232 Quick Start cable fitted with a DB9 connector. See **Figure 3-6**.


```
GROUND                              V    ━━━━BLK━━━━  5

RS 485 (RX-)  (RS 232 RX)           F        GRN      3
RS 485 (TX-)  (RS 232 TX)           E        RED      2
RS 232/RS 485 SELECT                D

MUTE INPUT-CLOSURE TO GROUND        B

                                    P1          P2
```
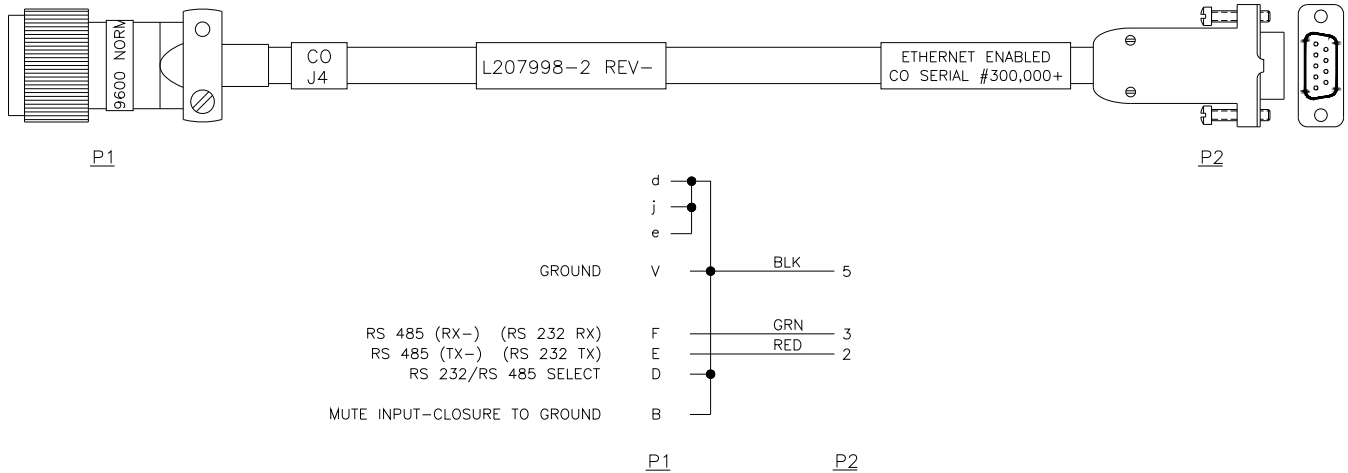
Figure 3-6: RS232 Quick Start Cable, 207988

3.2 Quick Start Operation

This section describes the necessary steps to communicate with a Mini Compact Outdoor SSPA using the Ethernet Quick Start cable and the Universal M&C Software. The Paradise Datacom Universal M&C Software is a free Windows-based application that can be downloaded from the company web site, www.paradisedata.com.

Both the Ethernet and Serial Quick Start Cables force the Mini Compact Outdoor SSPA into a known state. Once communication is established using these cables, all permanent settings must be saved to the unit. If changes are not saved, the unit will revert back to the state before the Quick Start cables were used.

3.2.1 Set PC Configuration

To set your Windows-based PC to remotely communicate with the Mini Compact Outdoor unit, perform the following steps.

If using Windows XP:

1. Open the PC's **Control Panel** (Start Menu → Settings → Control Panel);
2. Double-click on the **Network Connections** icon;
3. Right-click on the **Local Area Connection** icon and select *Properties*;
4. Select **Internet Protocol (TCP/IP)** and click on the *Properties* button;
5. Select "*Use the following IP address*" and enter the following information:
   IP address: 192.168.0.1
   Subnet mask: 255.255.255.0
6. Click the "*OK*" button and close out of all of the **Control Panel** windows.

If using Windows 7 or Windows Vista:

1. Click on the Windows icon in the lower left corner and select **Control Panel**;
2. Click on the **Network and Sharing Center** link;
3. Click on the **Local Area Connection** link;
4. Click on the *Properties* button;
5. Select **Internet Protocol Version 4 (TCP/IP v4)** and click on the *Properties* button;
6. Select "*Use the following IP address*" and enter the following information:
      IP address: 192.168.0.1
      Subnet mask: 255.255.255.0
6. Click the "*OK*" button and close out of all of the **Control Panel** windows.

3.2.2 Quick Start Ethernet Connection

The following steps outline how to quickly connect to your Compact Outdoor SSPA using the Ethernet Quick Start cable.

1. Unpack the amplifier and connect the RF Input and RF Output.
2. **Ensure the J1 RF Output port is properly terminated.**
3. Connect the AC input power to connector J7.
4. **When shipped from the factory, the Mini Compact Outdoor SSPA is set to start up muted.**
5. Connect the supplied "Quick-Start" Control Cable from Port J4 to the Ethernet port on your computer. This connection will unmute the amplifier. Review the cable schematic in **Figure 3-4**.
6. Launch the Windows-based Paradise Datacom Universal M&C Software.

NOTE: If the Mini Compact Outdoor unit is powered up with the Ethernet Quick Start Cable connected to Port J4, the following default conditions apply to the unit:
- *IPNET Interface*
- *Gateway: 192.168.0.1*
- *IP Address: 192.168.0.9*
- *Subnet Mask: 255.255.255.0*
- *Local Port: 1007*
- *IP Lock: 255.255.255.255*
- *Web password: paradise*
- *Read Community: public*
- *Write Community: private*
- *Amplifier is un-muted*

3.2.3 Quick Start RS-232 Connection

The following steps outline how to quickly connect to your Mini Compact Outdoor SSPA using the RS-232 Quick Start cable.

1. Unpack the amplifier and connect the RF Input and RF Output.
2. **Ensure the J1 RF Output port is properly terminated.**
3. Connect the AC input power to connector J7.
4. **When shipped from the factory, the Mini Compact Outdoor SSPA is set to start up muted.**
5. Connect the supplied "Quick-Start" Control Cable from Port J4 of the SSPA to one of the COM ports on your computer. This connection will unmute the amplifier. Review the cable schematic in **Figure 3-5**.
6. Launch the Windows-based Paradise Datacom Universal M&C Software.

NOTE: If the Mini Compact Outdoor unit is powered up with the RS-232 Quick Start Cable connected to Port J4, the following default conditions apply to the unit:
- *Serial Interface*
- *RS-232 Communication*
- *Baud rate: 9600*
- *Amplifier is un-muted*

3.3 Universal M&C Operation

1. Run the Paradise Datacom Universal Monitor and Control Program from the Programs Menu of your PC.
2. Select [Action] → [Add Unit] from the main menu of the Universal M&C Program and select [Mini Compact Outdoor SSPA] from the menu choices. See **Figure 3-7**.
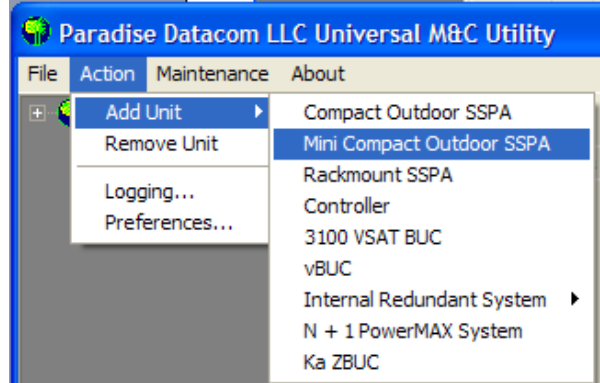
Figure 3-7: Universal M&C Add Unit menu

3. A new dialog window will open (see **Figure 3-8**). Enter the following information where applicable: Unit ID; if using a RS-232 Connection, the Serial Port and Baud Rate; or if using an Ethernet Connection, the unit's IP Address.
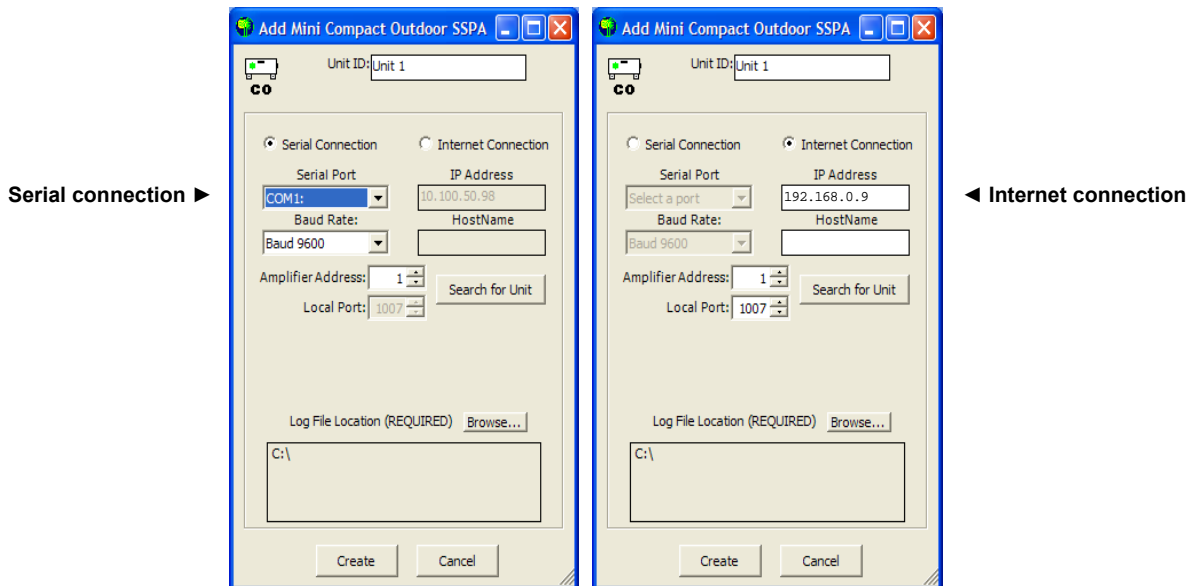
Figure 3-8: Add Compact Outdoor SSPA window, via Serial (left) or Internet (right)

4. Specify the unit's Address in the Amplifier Address box. If you don't know the address of the unit you may search for it. Be aware that this search feature is only useful when you have only one unit connected to your PC at a time.
5. If you wish to change the log file location, click on the [Browse] button and navigate to the desired location. See *Section 3.3.4* for more information about the log file.
6. Click on the [Create] button to generate the operation window for this unit.
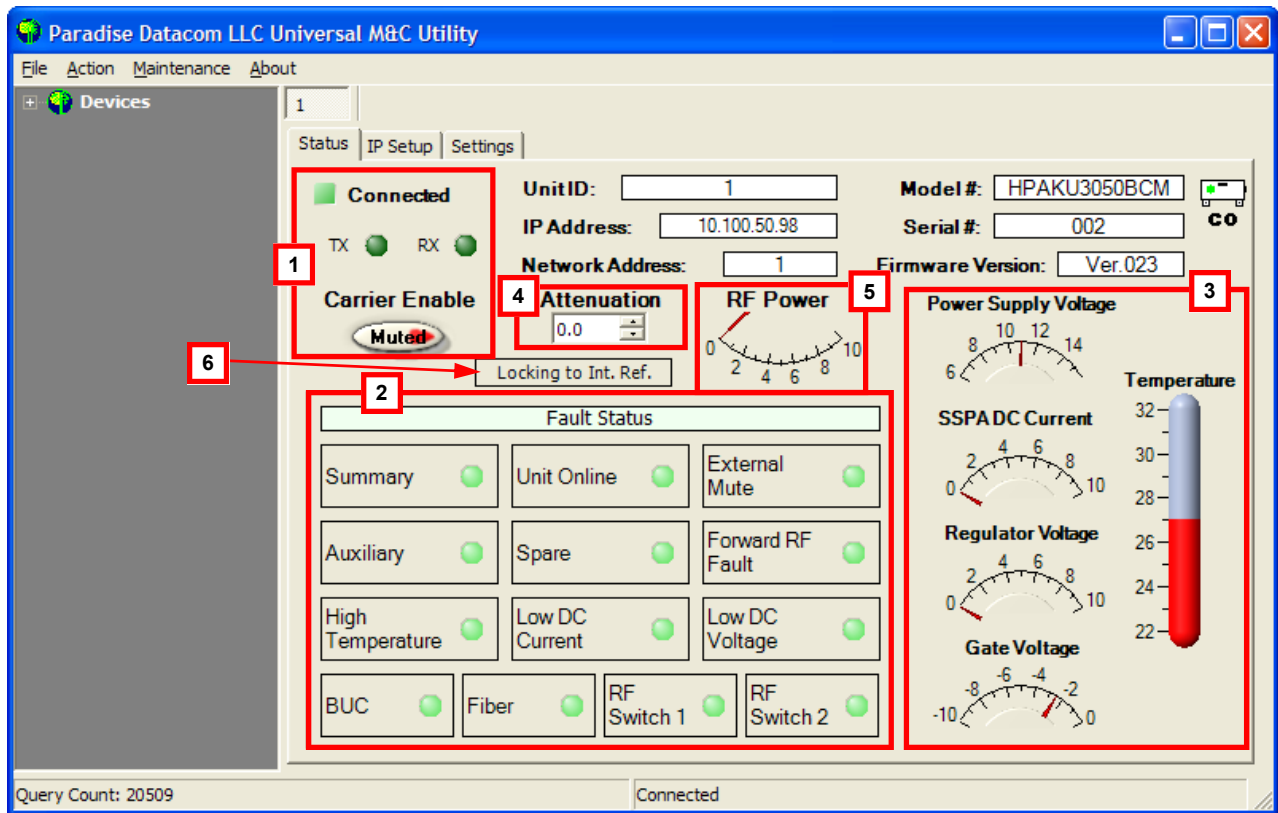
Figure 3-9: Universal M&C Status Window

3.3.1 Universal M&C Status Window

The Universal M&C Software will initialize and open to the Status Window, the main monitoring display. See **Figure 3-9**. The Status Window shows the the current conditions (or state) of the Compact Outdoor SSPA. In addition, the status screen allow the user to alter the Mute condition of the carrier and adjust the on-board Attenuator for gain control.

Upon connection with a unit, the M&C application obtains and displays the unit ID, the amplifier's model number and serial number. The SSPA module's firmware version number is also displayed here for convenience.

The unit's network address and serial COM or IP address are also listed, which can be helpful in optimizing serial communications.

3.3.1.1 Signal Indicators

Three rows of indicators show the connection status of the connected amplifier. Top-most is an indicator that displays a green square when Connected, or a red square when Disconnected. Immediately below are two indicators for the TX and RX paths. The third row displays the mute state (Carrier Enable). This is actually a toggle which allows the user to Enable or Mute the amplifier. See **Figure 3-9, Item [1]**.

3.3.1.2 Fault Status Indicators

The Fault Status frame in the lower left side of the Status Window contains a grid of SSPA fault indicators. See **Figure 3-9, Item [2]**. A green indicator signifies proper operation; red signifies a fault condition.

Summary Alarm: The Summary Alarm is simply a logical 'OR' of any of the alarm indicators.

Unit Online: The Unit Online indicator is relevant in redundant systems. If the unit is clear of faults and active, the indicator will be green. If the unit is offline or in standby mode, the indicator will be red.

External Mute Alarm: The External (Ext) Mute line gives an indication via the M&C screen that the SSPA has been externally muted by J4-Pin B. This external mute alarm can be configured to trigger a summary alarm if desired. The factory default is to signal a External Mute fault but no Summary Alarm.

Auxiliary & Spare Alarms: The Auxiliary and Spare Alarms are configurable from the Settings Window. See *Section 3.3.2*.

Forward RF Fault: The Forward RF Fault Alarm is configurable from the Settings Window. See *Section 3.3.2*.

High Temperature Alarm: The Temperature Fault indicator is factory preset to alarm at 80°C. The amplifier will continue to operate up to 90°C. Beyond 90°C the DC power will be interrupted to the SSPA module. This measure will protect the sensitive microwave transistors from catastrophic failure. The fans and monitor and control circuitry will continue to operate normally. This function has approximately a 5°C hysteresis window which will allow the amplifier to re-enable itself when the ambient temperature is reduced by 5°C. The Temperature Alarm is intended to warn the operator of possible fan problems and eventual amplifier shutdown.

Low DC Current Alarm: The Current Fault is factory preset to alarm if the SSPA module current falls below 60% of its nominal value.

Low DC Voltage Alarm: The Voltage Alarm is factory preset to alarm if the SSPA module current falls below 80% of its nominal value.

BUC Alarm: The BUC fault is only active in units that are supplied with an optional L-Band Block Up Converter module. If the Up Converter's phase locked local oscillator loses lock, a BUC alarm is set and the amplifier is muted so that spurious RF cannot be transmitted.

Fiber Alarm: The Fiber Alarm is configurable from the Settings Window. See *Section 3.3.2*.

RF Switch Alarms: The RF Switch 1 Alarm is only active if a 1:1 Redundant System has been configured in the M&C program. The RF Switch 2 Alarm is only active is a 1:2 Redundant System has been configured. These configuration are covered in Section 7, the Redundant System Concepts description.

3.3.1.3 Voltage, Current and Temperature Display

On the right side of the Status window there is a thermometer display that reports the present temperature of the amplifier. See **Figure 3-9, Item [3]**. A 20-30°C rise above ambient temperature is typical.

To the left of the thermometer display are several indicators that show various operating conditions of the Compact Outdoor Amplifier in real time. These indicators are helpful for any diagnostic procedures and consist of:

- Power Supply Voltage monitor
- SSPA DC Current monitor
- Regulator Voltage monitor
- Gate Voltage monitor

The Power Supply voltage indicator displays the primary 12 volt power supply output. SSPA DC Current is the total current drawn by the microwave transistors. Regulator Voltage is the DC voltage of the drain circuitry that feeds the GaAs transistors. The Gate Voltage indicator monitors the DC voltage of the gate circuitry of the microwave GaAs transistors. These indicators provide direct access to the active device operating characteristics.

3.3.1.4 Gain Adjustment

The Gain Attenuation Control is located above the Fault Condition Indicators and to the right of the Carrier Enable status. See **Figure 3-9, Item [4]**. The gain can be adjusted by setting the Attenuation Control. An Attenuation Control of 0 dB is the maximum gain (75 dB) setting on the amplifier. By setting the Attenuation Control to 20 dB; the gain is set to (55 dB). The Attenuation Control can be varied by entering the value into the text box, or by clicking on the up/down buttons.

3.3.1.5 RF Power Indicator

The RF Power indicator is the vertical meter in the central part of the Operation window. See **Figure 3-9, Item [5]**. This indicator reports the approximate output power of the amplifier. It uses the voltage from the RF Power Detector to determine a corresponding power level in dBm. The accuracy of the power indicator is ±1 dB at the mid-point of the specified band, with a single CW or QPSK carrier.

3.3.1.6 Reference Source

If the amplifier is equipped with a block up converter, the reference source will be indicated above the fault status window. See **Figure 3-9, Item [6]**.

3.3.2 Universal M&C Settings Window

Figure 3-10 shows the 'Settings' window of the Paradise Datacom Universal M&C Software. The 'Settings' window contains many of the global settings that are available in the SSPA.
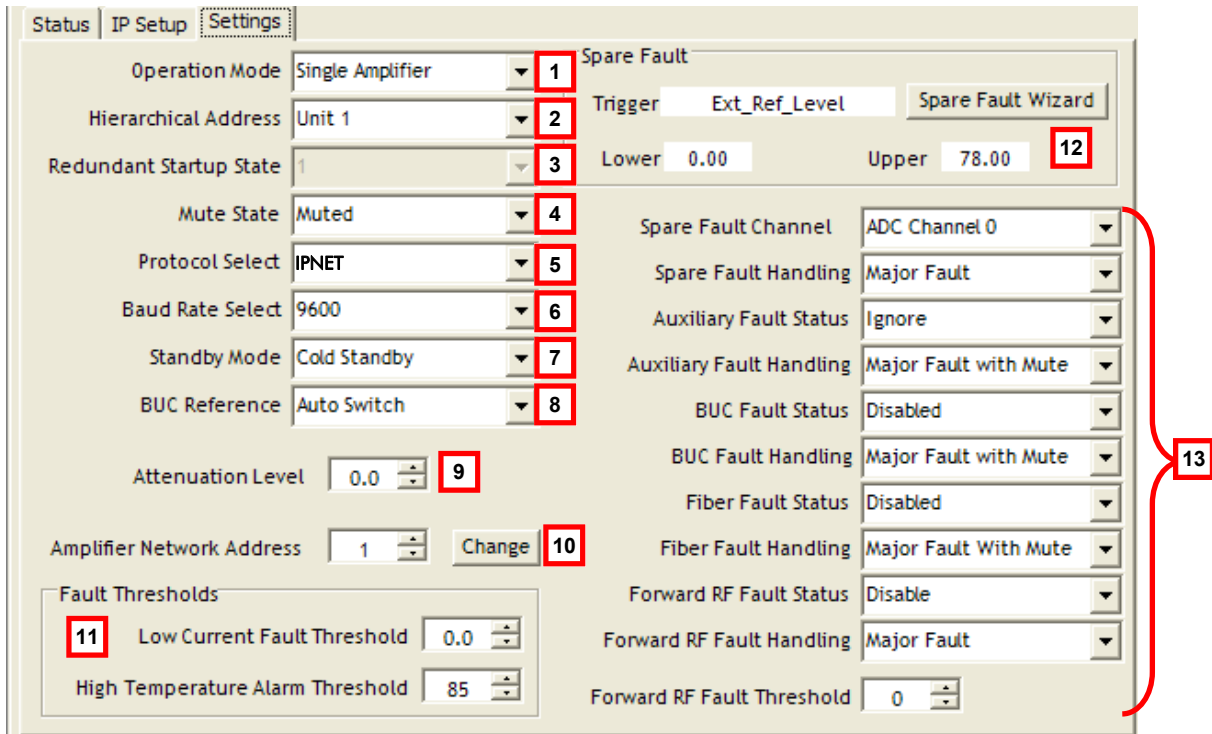
Figure 3-10: Universal M&C, Settings

Power Up Settings

The Mini Compact Outdoor amplifier will power up with the "last-state" settings before the unit was powered down. Whatever attenuation setting or mute state the amplifier was in when powered down will be the restored settings when the amplifier is powered back on.

[1] Operation Mode: Select between stand alone (single unit) or redundancy mode of operation.

[2] Hierarchical Address: Identifies each amplifier in a redundant system as HPA 1 or HPA 2.

[3] Redundant Startup State: Selects whether the unit should start up as the on-line amplifier or the standby amplifier.

[4] Mute State: Determines if the unit should start up muted (transmit disabled) or mute clear (transmit enabled).

[5] Protocol Select: Selects between Serial, IPNET or SNMP protocols. **You will be asked to verify that you wish to change the Protocol. Communication with the amplifier may be affected.**

[6] Baud Rate Select: Sets the baud rate of the unit. The supported baud rates include: 2400, 4800, 9600, 19200, and 38400 baud. The factory default baud

rate is 9600. **You will be asked to verify that you wish to change the Baud Rate. Communication with the amplifier may be affected.**

[7] Standby Mode: Selects between Hot and Cold standby mode for units in redundant systems.

[8] BUC Reference: Selects between an Internal or External reference for an optional block up coverter integrated with the unit, or allows the unit to Auto-switch between Internal and External reference.

[9] Attenuation Level: The Gain Adjustment of the unit is adjustable here, from 0 to 20 in 0.1 db steps.

[10] Amplifier Network Address: Sets a network address for the unit. Range is 0 to 255. **You will be asked to verify that you wish to change the Amplifier Network Address. Communication with the amplifier may be affected.**

[11] Fault Thresholds: Allows the user to set the limit for triggering the unit's Current Fault or High Temperature Fault.

> **Low Current Fault Threshold**: This setting is factory pre-set.
> **High Temperature Alarm Threshold**: Range is 0 to 125 °C.

[12] Fault Setup: This feature allows the user to set the Spare Fault Trigger using the Spare Fault Wizard.

Click on the Spare Fault Wizard button, which opens a new window. See **Figure 3-11**. Select between the following fault triggers: External Reference Level, LNB Current, External Mute, or None. Set the range of maximum and minimum thresholds that would trigger the selected fault, and configure the fault handling via a pull-down menu. Choose between Major Fault, Major Fault with Mute, and Minor Fault. Click [OK] to set the fault trigger for the Spare Fault.
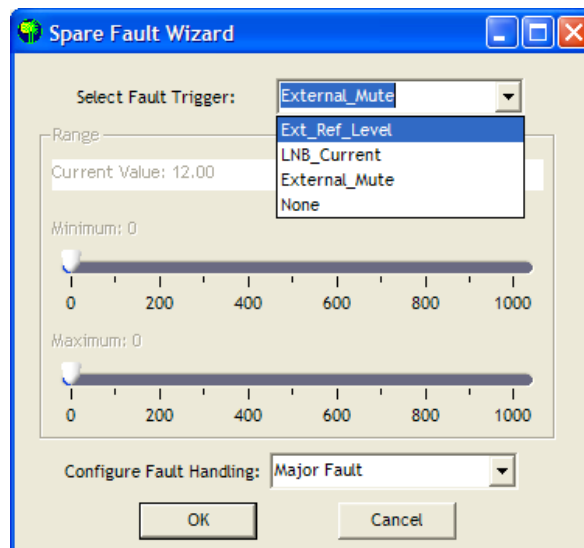
Figure 3-11: Spare Fault Wizard

[13] **Fault Setups**: The user may also adjust the Spare, Auxiliary, BUC, Fiber, and Forward RF Fault Status and Handling via the appropriate pull-down menus on the Settings Window.

> **[Type] Fault Handling:** Selects whether the associated fault should be a major or minor fault, and whether the fault should mute the unit. A minor fault will trigger a Spare/Auxiliary/BUC/Forward RF Fault alarm but not trigger a Summary Fault. A major fault will trigger both an Spare/ Auxiliary/BUC/Forward RF Fault and a Summary Fault.
> **[Type] Fault Status:** Determines if the associated fault input should be ignored or enabled (either Logic High or Logic Low for Auxiliary Fault or Fiber Fault).
> **Forward RF Threshold:** Allows the user to assign the threshold at which a Forward RF Fault will be triggered.

3.3.3 IP Setup

If the user wishes to set up the networked Mini Compact Outdoor SSPA with custom IP settings, the internal IP settings need to be modified. Click on the IP Setup Tab. See **Figure 3-12**.

- The SSPA will use the default settings until the unit is reset by removing its AC power. Unplug the Quick Start cable from the M&C connector. (**If the unit is restarted with the Quick Start cable connected, it will always come up with default IP settings**). Apply power to the SSPA. Re-plug the Quick Start cable into J4, and check connectivity with the custom IP settings.
- Make sure that the Protocol Select setting in the Settings tab of the Universal M&C is set to **IPNET**, as shown in **Figure 3-10**.
- If custom IP settings will be used in normal operation, do not use the Quick Start cable (207755) that was shipped with the unit. The user will need to construct an IP cable with connections to J4 as shown in **Figure 3-2**. In this configuration, the SSPA will always use the saved communication control settings rather than the default configuration.
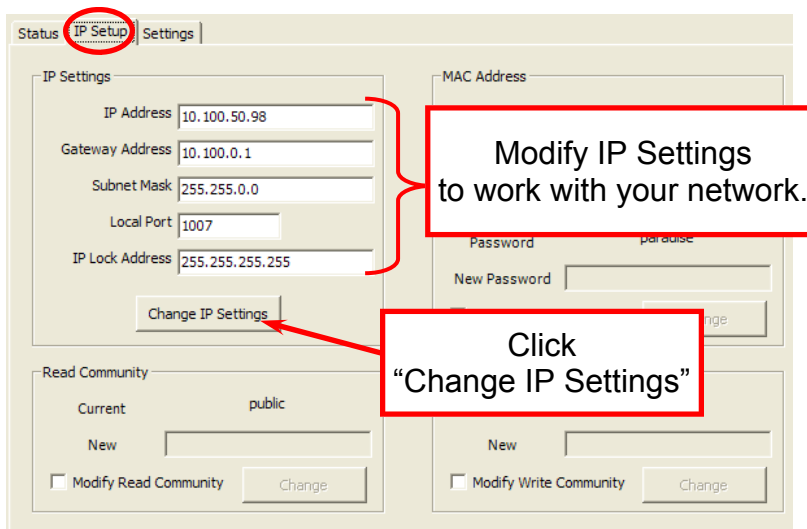
Figure 3-12: Universal M&C, IP Setup

3.3.4 Universal M&C Preferences

The user can adjust certain preferences of the Universal Monitor and Control Software. See **Figure 3-13**.
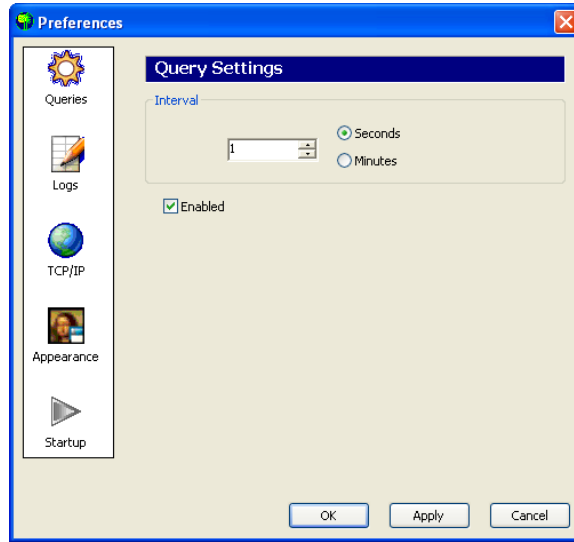
Figure 3-13: Preferences Window

Queries: Enable and adjust the interval that the software queries the unit. Note that if queries are disabled, there will be no communication with the unit at startup.

Logs: Enable and adjust the interval that the software writes to the log. The log location is determined during unit setup. Each entry catalogs the RF Power Level and Temperature of the unit. See **Figure 3-14** for an example of a log entry.
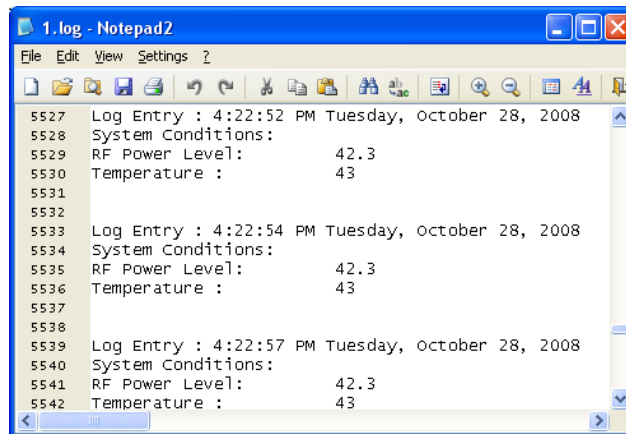
Figure 3-14: Example, Log entry

TCP/IP: Select the Local UDP Port (the software must be restarted to take effect). Note that each UDP address must be unique.

Appearance: Set the transparency of the M&C Windows.

Startup: Enable or disable auto-loading of the last device configuration.

3.4 Web-based M&C

The most basic method of communication with the Mini Compact Outdoor SSPA is via a web browser, which accesses the built-in web pages served from the amplifier's embedded web server. Supported web browsers include Internet Explorer version 6 or better, and Mozilla Firefox version 3.0.3 or better.

Once the host PC has been configured and connected to the amplifier using the Quick Start cable, the user may open a web browser page, select File → Open, and enter the IP address of the networked amplifier into the browser's address field. The default IP address is **192.168.0.9**. See **Figure 3-15**.
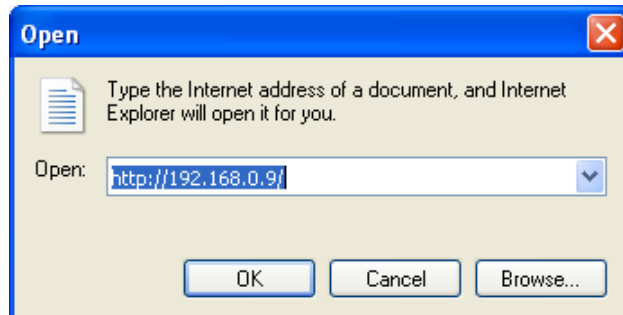
Figure 3-15: Enter IP address for Mini Compact Outdoor SSPA (default is 192.168.0.9)

> **Important! In order to use the web browser interface with a SSPA that has been assigned a custom IP address using the Universal M&C Software, make sure the IP port address is set to 1007.**

The initial page is the launch window, as seen in **Figure 3-16**. The Java-based web M&C applet will automatically load in the browser window.
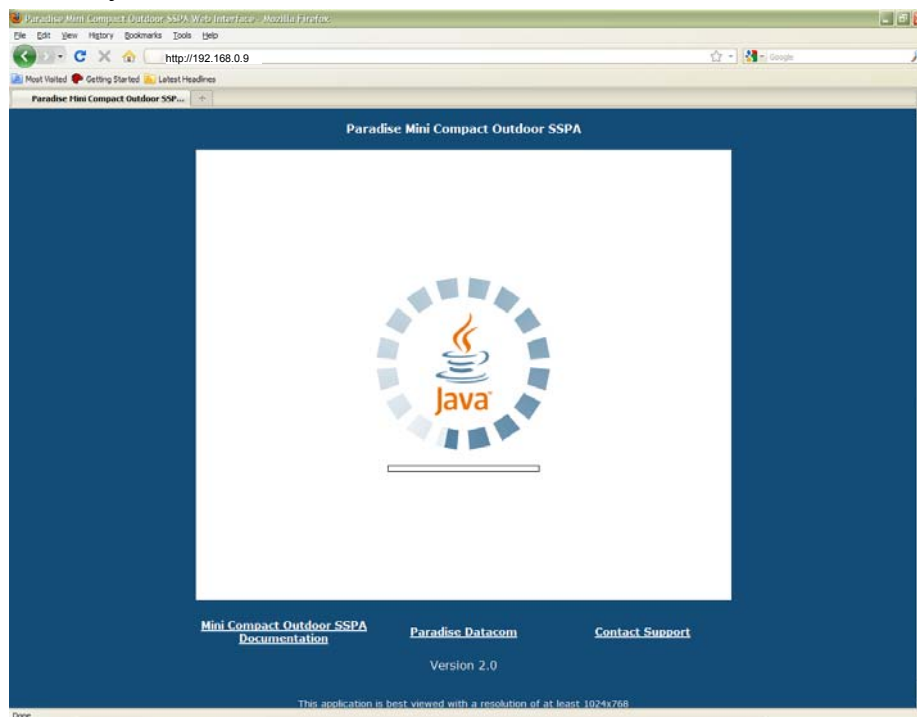
Figure 3-16: M&C Applet loading into browser window

As the applet loads, the user will be prompted to enter a password. The default password is **paradise** (see **Figure 3-17**), but the user may assign a new password using the web M&C or Paradise Datacom's Universal M&C Software. See *Section 3.3* for details on using the Universal M&C Software.
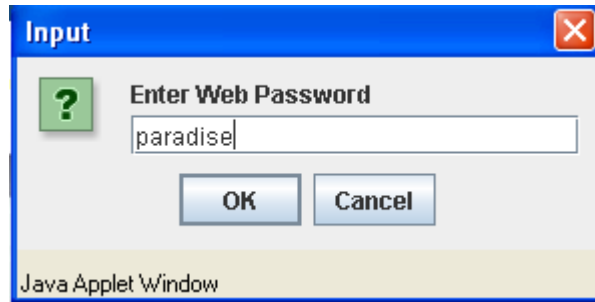
Figure 3-17: Enter password (default is "paradise")

3.4.1 Navigating the Web M&C

The SSPA Monitor and Control is performed via following the links on the web page. These links include Status and Faults, Communications Settings, General Settings and Fault Settings.

- **Status and Faults Window**: A view of critical SSPA operational parameters. See **Figure 3-18** for descriptions of some of the functions available in this window.

Figure 3-18: Status and Faults window descriptions
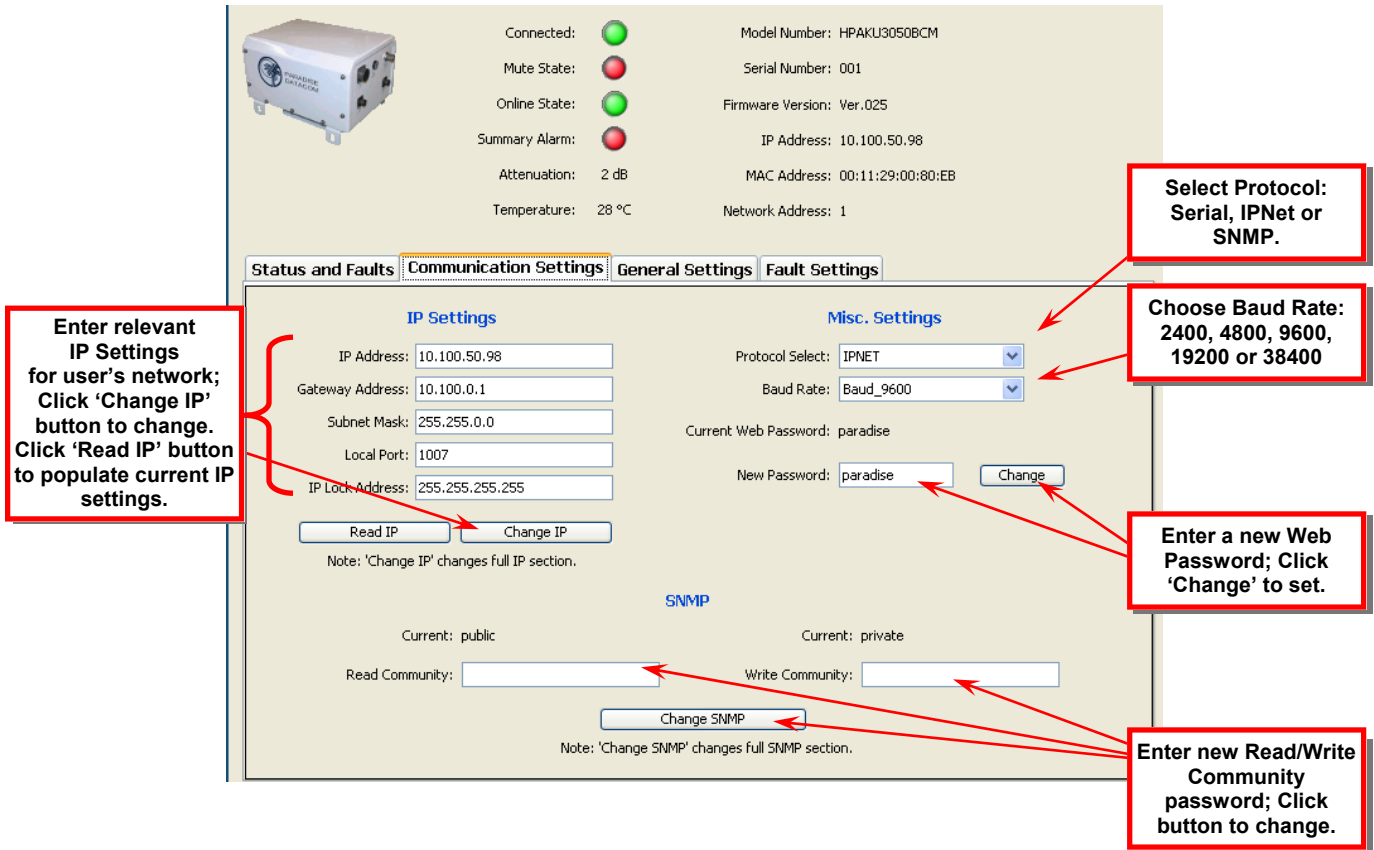
Figure 3-19: Communication Settings window descriptions

- **Communication Settings Window**: Read/Write listing of adjustable SSPA communication parameters. All options are selectable. To set a parameter, select the new value and click the "Change" button with the mouse pointer. See **Figure 3-19** for descriptions of the contents of the Status window.

The Communication Settings window displays the prevailing values of the following parameters:

- Selected Protocol
- Selected Baud Rate
- Current Web Password
- Current SNMP Read/Write Communities
- IP Address; Gateway Address; Subnet Mask; Local Port; IP Lock Address
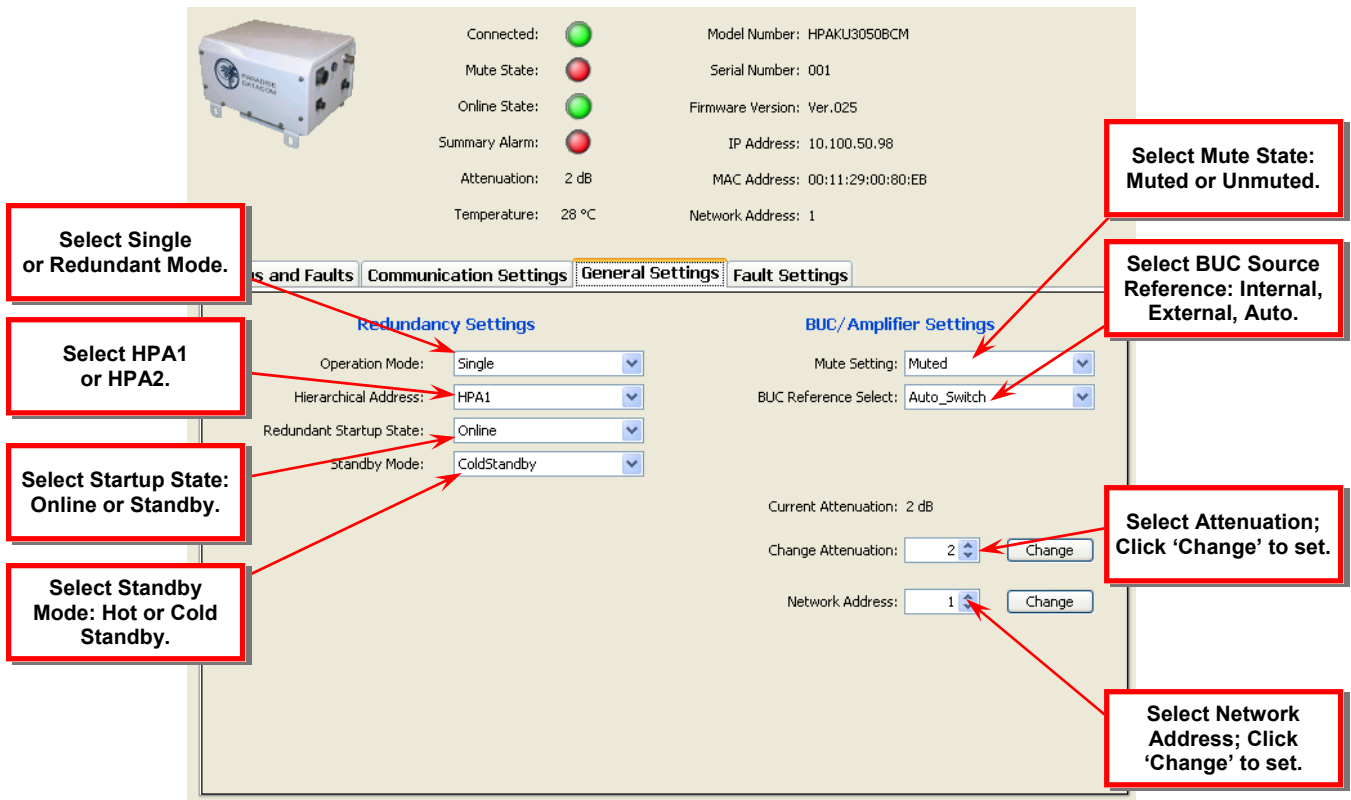
Figure 3-20: General Settings window descriptions

- **General Settings Window**: Displays the SSPA Redundancy and BUC/Amplifier Settings. See **Figure 3-20** for descriptions of the contents of the General Settings window.

  - Adjust Redundancy settings;
  - Mute/Unmute amplifier;
  - Adjust Attenuation;
  - Change Network Address;

Note: The Compact Outdoor SSPA initially starts up in the Muted state; Change the Mute Setting in the General Settings tab to enable Transmit RF.

Figure 3-21: Fault Settings window descriptions

- **Fault Settings Window**: This page allows the user to adjust the fault settings for the connected Compact Outdoor SSPA. Select to change the Fault Status and Handling parameters. Set the minimum/maximum values for the Spare Fault thresholds and click the "Confirm" button with the mouse pointer. Adjust the Forward RF Fault or High Temperature thresholds and click the "Confirm" button with the mouse pointer. See **Figure 3-21**.

4.0 Block Up Converter Overview

The Mini Compact Outdoor SSPA is available with various converter options, utilizing Paradise Datacom's integrated converter. The primary up converter option is offered in two C-Band configurations, two Ku-Band options, and one X-Band model. The BUC offers ultra low phase noise for applications where phase noise is an overriding factor. For specifications, see **Table 4-1**.

The type of BUC housed within your Mini Compact Outdoor SSPA is indicated by its model number, as shown in **Figure 4-1**. The example listed shows a 100W C-Band Mini Compact Outdoor SSPA with Internal Reference BUC. For a full description of this configurator, refer to the Mini Compact Outdoor SSPA specification sheet (208142).
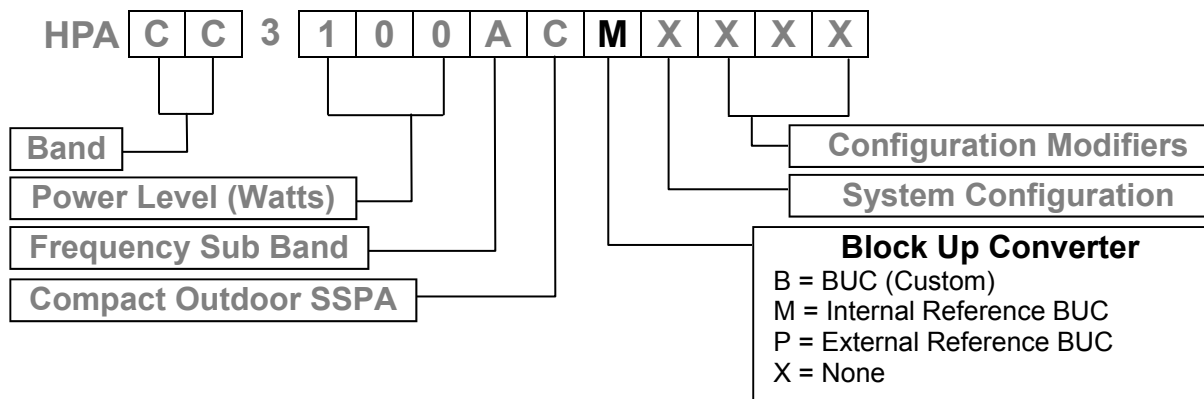
Figure 4-1: Configurator, Compact Outdoor SSPA, BUC Options

The block up converters are high performance frequency translation devices which provide excellent phase noise and spurious performance. The converter also supports FSK communications for remote M&C capability. The FSK is a 650 KHz signal that is multiplexed onto the L-Band input of the unit. See *Section 4.4* for more detail.

The converter utilizes Paradise Datacom's proprietary "Smart Reference Technology". Smart Reference Technology allows the system user to change reference frequency and power level or choose internal or external reference without requiring any system reconfiguration.

The schematic of **Figure 4-2** shows the electrical position of the block up converter.

It is important to remember the requirement of a reference oscillator when operating an SSPA with BUC (SSPB). If the reference is not present, the M&C will report a BUC alarm and the SSPA module will mute. This ensures that no spurious or 'off frequency' transmission could originate from the amplifier.

Block Up Converter Module

SSPA Module
55 - 75 dB Gain

L Band Input
Reference Input
Optional FSK

DeMux

Phase Locked
Local Oscillator

Optional Internal Reference

FSK

Optional FSK
Monitor & Control
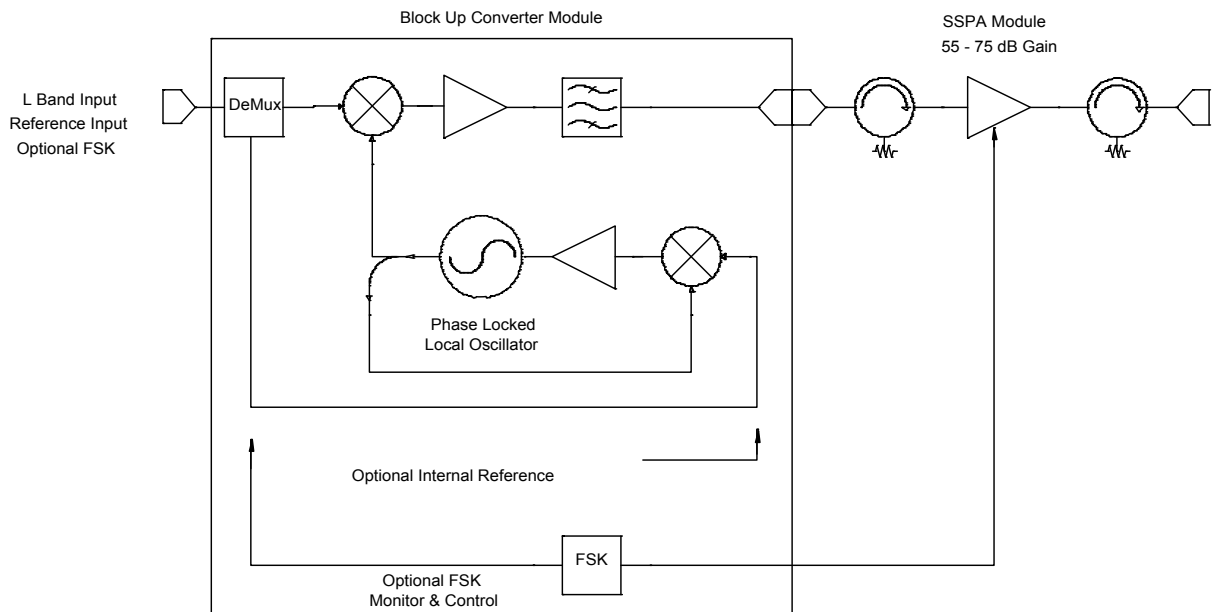
Figure 4-2: Compact Outdoor Block Diagram of BUC / SSPA System

Note: Unless the BUC has the built-in internal reference option, if there is an absence of a 10 MHz reference signal on the IFL input there will be no output signal from the SSPA.

4.1 Converter Features

This section describes the features available in the Paradise Datacom block up converter. The converter is available as an option for the Mini Compact Outdoor SSPA, and is available in two C-Band models, two Ku-Band models, and one X-Band model. **Table 4-1** shows the specifications for the respective models.

Table 4-1: BUC Frequency Specifications

Band	Model Number*	IF Input	LO Frequency	RF Output
C	RBCMATBXXXXXXXX	950 - 1525 MHz	4.900 GHz	5.850 - 6.425 GHz
C	RBCMBTBXXXXXXXX	950 - 1825 MHz	4.900 GHz	5.850 - 6.650 GHz
X	RBCMDTBXXXXXXXX	950 - 1450 MHz	6.950 GHz	7.900 - 8.400 GHz
Ku	RBCMFTBXXXXXXXX	950 - 1700 MHz	12.800 GHz	13.75 - 14.50 GHz
Ku	RBCMGTBXXXXXXXX	950 - 1450 MHz	13.050 GHz	14.00 - 14.50 GHz

* Listed model numbers indicate a required 10 MHz external reference.

4.2 Theory of Operation

The low gain block up converter has a P_{1dB} of 0dBm. This topology allows the system to be integrated with little impact on the general electrical specifications of the SSPA module.

The converter utilizes single up conversion from L-Band to the desired RF band. The local oscillator circuits are designed to maintain the lowest possible output phase noise. The frequency synthesizer utilizes industry leading technology which allows for phase noise performance previously unattainable in PLL design. Typical phase noise specifications are outlined in **Table 4-2**.

Table 4-2: BUC RF output phase noise specification

Offset	Guaranteed Maximum	C-Band (Typical)	X-Band (Typical)	Ku-Band (Typical)	Ka-Band (Typical)	Units
10 Hz	-30	-60	-60	-50	-60	dBc/Hz
100 Hz	-60	-80	-75	-65	-72	dBc/Hz
1 KHz	-70	-80	-75	-72	-75	dBc/Hz
10 KHz	-80	-85	-100	-90	-88	dBc/Hz
100 KHz	-90	-120	-110	-110	-112	dBc/Hz
1 MHz	-90	-125	-122	-120	-122	dBc/Hz

Band selectivity is accomplished using the most aggressive filtering possible while maintaining specified power and spurious performance.

4.3 Smart Reference Technology

Paradise Datacom's converters come standard with smart reference technology. Smart reference technology allows the system operator to change external system reference frequency without any system configuration required. The converter will automatically sense and lock to any one of the following system reference frequencies: 10 and 50 MHz. With the internal reference option installed the converter will operate with no external reference applied. In the event the system operator wishes to operate on external reference, the converter will automatically sense the presence of an external reference and switch to external reference mode. This setting is configurable in the monitor and control software. See *Section 3.3.2* for details.

External reference is applied to the converter via the L-Band input IFL and is routed to the frequency synthesizer using the built-in demux circuitry.

Notes:

1) **The external reference option requires the system operator to provide system reference to the BUC/SSPB. The system will not lock and will have no output without external reference applied.**
2) **Internal reference option allows for either internal or external reference operation.**

The 10 MHz crystal reference used in the internal reference of the converter has the following specifications:

Frequency Stability:	$\leq\pm1 \cdot 10^{-8}$ over the temperature range -40 to +90 °C
	$\leq\pm1 \cdot 10^{-9}$ aging per day
	$\leq\pm5 \cdot 10^{-8}$ aging per year
Warm up time:	20 minutes for better than $\leq\pm1 \cdot 10^{-8}$
Phase Noise:	10 Hz -120 dBc/Hz
	100 Hz -140 dBc/Hz
	1 KHz -145 dBc/Hz
	10 KHz -152 dBc/Hz
	100 KHz -155 dBc/Hz
Frequency Accuracy:	Factory preset to $\pm1 \cdot 10^{-8}$

4.4 FSK Monitor and Control

FSK Monitor and control comes standard with the converter. This allows the Mini Compact Outdoor SSPB to be fully and remotely monitored and controlled through the system's IFL. An embedded controller enables remote communication and fault detection via the IF input between the SSPA and a Paradise Datacom Evolution Series L-Band modem. This signal consists of a 650 KHz Frequency Shift Keyed carrier that is multiplexed onto the L-Band input IFL along with the external reference signal. The monitor and control functionality is explained in detail in *Section 8*.

The FSK input has a center frequency of 650 KHz with a ±5% tolerance. The FSK deviation is ±60 KHz, with +60 KHz being a "mark" and -60 KHz being a "space". The FSK input will work over an input power range of -5 to -15 dBm. The FSK characteristics are summarized below:

Frequency	650 kHz ± 5%
FSK Deviation	± 60 kHz nominal (+60 kHz mark)
Deviation Tolerance	± 50 kHz minimum, ± 70 kHz maximum
Locking Range	± 32.5 kHz
Input Level Range	-5 to -15 dBm
Start Tone Time	10 ms minimum

See Paradise Datacom document number 201410 for a full description of the VSAT BUC Protocol.

4.5 Typical System Configuration

This section shows the Compact Outdoor SSPB in a common system application. **Figure 4-3** shows the Compact Outdoor used with a Paradise Datacom Evolution Series PD25 modem.

Indoor Equipment   Outdoor Equipment

IFL Cable

RS485 M&C

IF: 950 - 1450 MHz (-30 to -20 dBm) at Compact Outdoor SSPB

Ref: 10 MHz (-5 dBm to +5 dBm) at Compact Outdoor SSPB
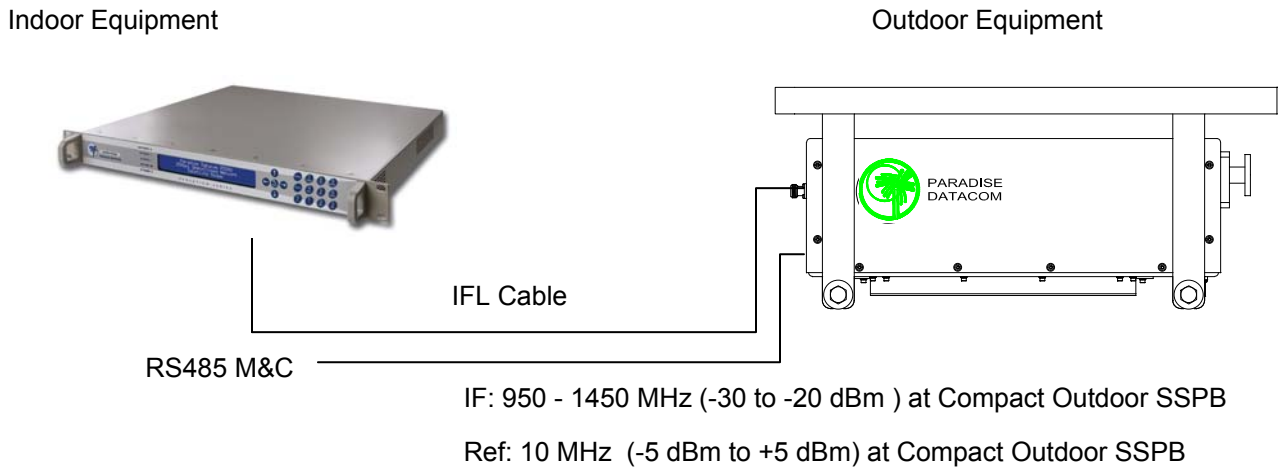
Figure 4-3: Mini Compact Outdoor SSPB with PD25 Evolution Modem

4.6 IFL Cable Considerations

Consideration should be given to using a high quality IFL between the indoor equipment and Compact Outdoor SSPB. The system designer must always consider the total cable loss for a given length and also the implications of the slope of attenuation across the 950 to 1450 MHz bandwidth. **Table 4-3** gives the approximate attenuation vs. frequency for a variety of cable types.

Table 4-3: Common Coaxial Cable Characteristics

Cable Type	Center Conductor DC Resistance per 1000 ft.	Outer Diameter (inches)	Attenuation at 950 MHz dB per 100 ft.	Attenuation at 1450 MHz dB per 100 ft.	Slope across band for 100 ft. cable (dB)	Slope across band for 300 ft. cable (dB)
RG-214	1.7	.425	7.8	11.3	3.5	10.5
Belden 8214	1.2	.403	6.8	9.2	2.4	7.2
Belden 7733	.9	.355	5.8	8.3	2.5	7.5
Belden 9914	1.2	.403	4.5	6.3	1.8	5.4
Belden 9913	.9	.403	4.2	5.6	1.4	4.2

It is recommended to use a quality grade of 50 ohm cable such as Belden 9913, 9914, or 7733. Check the manufacturer's technical data to make sure that the insulation is sufficient for the particular installation including the cable's temperature range. Also make sure the coaxial connector from the IFL cable to the Compact Outdoor input is wrapped with a weather sealing tape to prevent water intrusion into the coaxial cable.

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5.0 Introduction

This section describes some of the tests performed on production amplifiers before shipment. Where possible, Paradise Datacom LLC maintains computer automated RF test stations to ensure a high level of accuracy and consistency to production amplifier testing.

5.1 Standard tests

All Paradise Datacom Compact Outdoor amplifiers must meet rigid specifications and undergo the following tests. Copies of the final test data are shipped along with the unit and/ or system. **Figures 5-1** through **5-3** show examples of the final test data for a 140W C-Band Compact Outdoor amplifier with an integrated block up converter.

5.1.1 Swept Gain

The amplifier gain is swept over the operating frequency range under small signal conditions to confirm the minimum gain and gain flatness specifications. The entire Compact Outdoor amplifier is tested in a temperature chamber from -40 °C to +60 °C and the gain is recorded. See **Figure 5-1**, **Item [1]**.

Figure 5-1: Spurious and Gain Data

5.1.2 Spurious

Spurious signals are undesirable byproducts of amplifiers caused by nonlinearities within the amplifier and other system level components such as switch mode power supplies. These unwanted signals cause signal management problems in system applications. Out of band spurious signals cause interference to other pieces of equipment. See **Figure 5-1, Item [2]**.

5.1.3 Input Return Loss

The input return loss is measured in all production amplifiers. This is a measure of how closely the amplifier is matched to its characteristic impedance. The input impedance of the amplifier is a nominal 50Ω. See **Figure 5-2, Item [1]**.

5.1.4 Output Return Loss

The output return loss is measured in all production amplifiers. This is a measure of how closely the amplifier is matched to its characteristic impedance. The output impedance of the amplifier is matched to the waveguide complex impedance. See **Figure 5-2, Item [2]**.
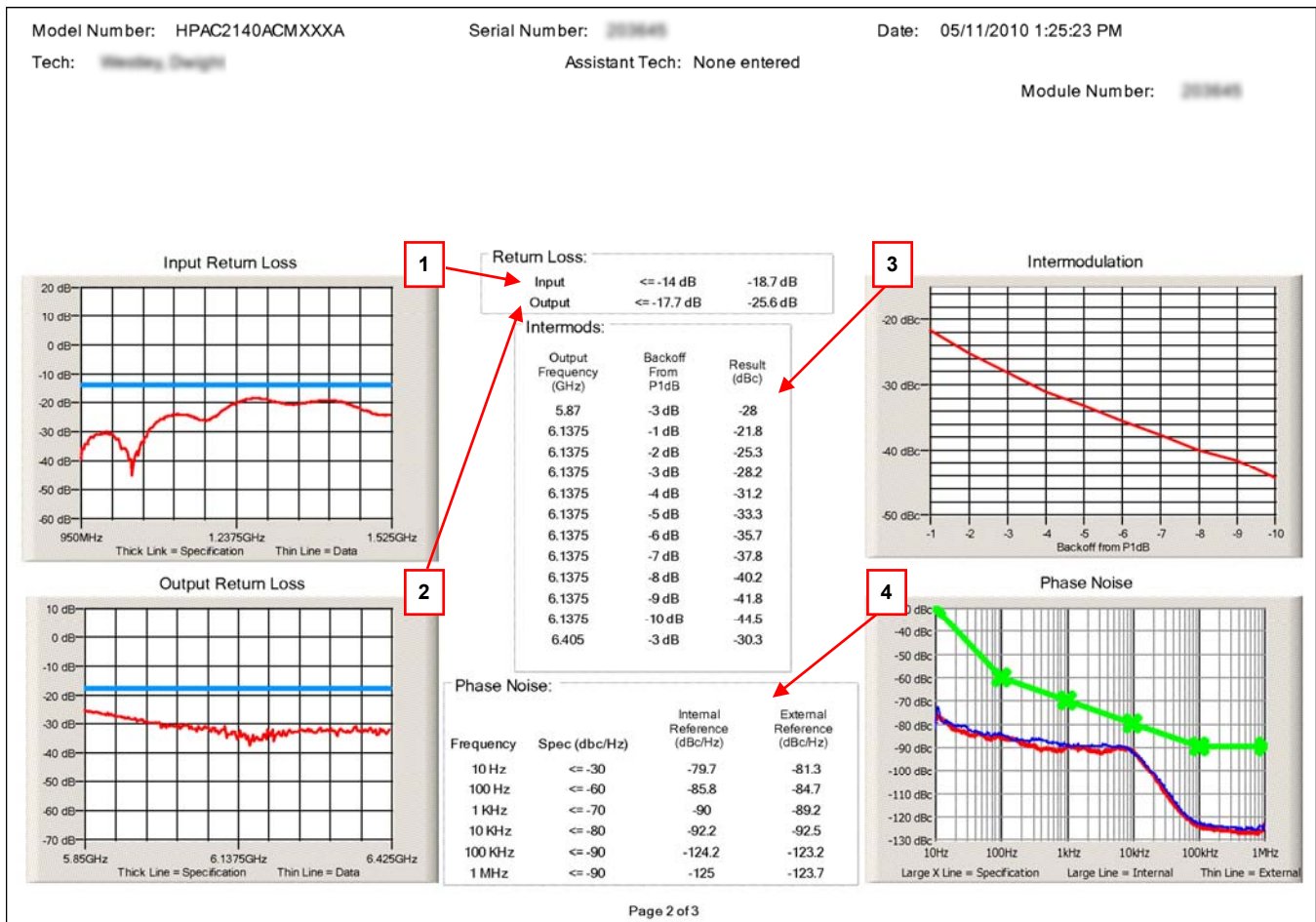
Figure 5-2: Return Loss, Intermodulation and Phase Noise Data

5.1.5 Intermodulation Distortion

Intermodulation distortion is one of the most important characteristics of a Solid State power amplifier system. Satellite communication systems must comply to certain distortion levels depending on the service involved. All production amplifiers are subjected to automated intermod testing. This is based on a standard two-tone intermod test in which the intermod level (IMD) is measured in dBc with respect to the main tones and the highest third order intermod products.

Satcom amplifiers are typically used in some 'back-off' condition. This is the operating point at which the composite output power is 'backed-off' from the amplifier's P_{1dB}, compression point. A curve of back-off vs. IMD level is especially useful in the selection of a power amplifier or determining the proper output power setting in a Satcom system.

Paradise Datacom recognizes the importance of this back-off characteristic and provides a plot of back-off vs. IMD from 1 dB to 10 dB back from the amplifier's compression point. **Figure 5-2, Item [3]**, shows a typical back-off curve from a production test set.

5.1.6 Power Requirements

This test measures the power requirements of the unit over the various voltages appropriate for the unit under test. See **Figure 5-3, Item [1]**.

Model Number: HPAC2140ACMXXXA   Serial Number: Date: 05/11/2010 1:25:23 PM

Tech: Assistant Tech: None entered

                                                                      Module Number:

Monitor and Control Connector — 4

Mute Closure to Gnd ☑	B	Current Alarm Open Collector ☑	J	RS485 / RS232 Select ☑	D
Aux Input Closure to Gnd ☑	P	Temp Alarm Open Collector ☑	X	RS485 RX- / RS232 In Serial RX Input ☑	F
Sum Alarm Form C Relay ☑	L,a,b	Gain Adjust Input, Analog Input ☑	A	RS485 TX- / RS232 Out Serial TX Output ☑	E
Aux Alarm Form C Relay ☑	N,Z,M	BUC Lock Alarm Open Collector ☑	f	RS485 TX+ Serial TX Output ☑	T
RF Detector Output ☑	R			RS485 RX+ Serial RX Input ☑	U
Aux Alarm Open Collector ☑	G	Amplifier Mute on Lock Alarm ☑		Signal Ground ☑	V

Reference Phase Lock — 5

☑ Ext. 5 MHz   ☑ Ext. 25 MHz
☑ Ext. 10 MHz   ☑ Ext. 50 MHz
☑ Ext. 20 MHz   ☑ Int. 10 MHz

Lowest Lock Level: 0 dBm
(10 MHz)

Output Power Detector

	Psat	4	V
	Psat - 5 dB:	2.7	V
	Psat - 10 dB:	1.2	V

Output Power, P1dB and Psat at 0 dB Attenuation — 3

Frequency	P1dB Spec	P1dB	M&C Power	Psat
5.85 GHz	>= 51 dBm	52 dBm	52.1 dBm	52.7 dBm
6.15 GHz	>= 51 dBm	52 dBm	52.2 dBm	52.6 dBm
6.425 GHz	>= 51 dBm	52.1 dBm	52.1 dBm	52.7 dBm

FSK Communications — 6

☑ FSK Successful

Sample Port — 2

5.85 GHz	-37.7 dBc
6.15 GHz	-37.5 dBc
6.425 GHz	-37.9 dBc

Power Requirements and Earth Ground — 1

	Input:	110 VAC	220 VAC	DC Voltage
	Range:	(90 - 135)	(180 - 265)	
Power Factor Correction:		N/A	0.965	
	Current:	N/A	4.76	N/A
	Wattage:	N/A	1013	N/A
	Earth Ground:	0.7 mA		

Unit Information

Input Frequency Range: 950 MHz to 1525   MHz
Local Oscillator Frequency: 4.9 GHz
Reference Input Power Range: -10 to +5 dBm
Frequency Accuracy: Specification ±130 Hz   Result +19 Hz

Output Sample Port

Page 3 of 3

Figure 5-3: M&C, Output Power, Ground, Phase Lock and Misc. Data

5.1.7 Earth Ground

This test measures the leakage current and verifies that each pin on J8 is connected correctly. See **Figure 5-3, Item [1]**.

5.1.8 Sample Port

The RF Sample Port is measured at discrete frequencies across the band and a calibration label is placed near the Type N connector on the bottom of the unit. The sample port is approximately -40 dB from the RF output level. A label with the exact coupling ratio is attached to the amplifier chassis. See **Figure 5-3, Item [2]**.

5.1.9 P_{1dB} and P_{sat}

The 1dB Gain Compression Point is measured at discrete frequencies across the band to characterize the output power over the operating frequency range. The P_{1dB} measurement is a guaranteed minimum specification.

As the input power increases, the output power limits to some maximum level. This is defined as the saturated output power or P_{sat}. The P_{sat} specification is a typical value and is not guaranteed. This is due to the variation that exists among microwave power semiconductors. The saturated output power is typically 0.5 dB to 1.0 dB above the P_{1dB} value. See **Figure 5-3, Item [3]**.

5.1.10 I/O Test

This test verifies that the unit has the correct wiring on the MS connectors by testing faults, communications, and redundancy. See **Figure 5-3, Item [4]**.

5.1.11 Ethernet

Tests Ethernet communication, web monitor and control, and assigns a MAC address to the unit.

5.2 Tests for units with integrated BUC

If the Compact Outdoor amplifier includes a block up converter (BUC), the following tests are included.

5.2.1 Reference Lock

This test checks the external/internal references (if equipped), as well as lowest locking level at 10 MHz. See **Figure 5-3, Item [5]**.

5.2.2 FSK

Verifies FSK communication with the BUC. See **Figure 5-3, Item [6]**.

5.2.3 Phase Noise

Tests phase noise using external and internal (if equipped) references. The unit is required to meet at each decade, as well as fall below the spec line determined by the decades. See **Figure 5-2, Item [4]**.

5.2.4 Microphonics

A spectrum analyzer is connected to the unit and is set to perform a max hold on the trace, . The unit is then tested as per our procedure.

5.3 Optional Tests

The following tests are performed on units at the request of the customer, usually to verify specific customer requirements.

5.3.1 Noise Figure

Using a noise figure meter, the unit is tested to verify it operates within specification.

5.3.2 Group Delay

The testing software measures the linear, parabolic, and ripple components to verify the unit is within specification.

5.3.3 AM/PM

The testing software measures the slope of the amplifier's insertion phase vs. output power.

5.3.4 Noise Power

Noise power is the total noise per bandwidth at the output of the unit when a signal is not present.

5.3.5 Harmonics

The testing software measures the 2nd and 3rd harmonics of the unit (as long as the frequency range is within the capabilities of the equipment).

6.0 Introduction

This section describes some of the standard maintenance practices that can be performed on the Mini Compact Outdoor Amplifier and tips to troubleshoot common customer issues.

6.1 Cooling System Maintenance

It is recommended that the cooling system be checked at least once per month. This involves visually inspecting the fan intakes to make sure that there is no obstructions over the intake. The Windows-based M&C program can be used to check the amplifier base plate temperature. The base plate temperature should normally not exceed a 20°C to 25°C rise above the current outside ambient temperature. If the base plate temperature exceeds this temperature rise, it is one indicator that the system's airflow requires maintenance.

The heatsink fins in the exhaust path can be visually inspected for excessive dirt and debris buildup. If it appears there is excessive debris in the heatsink; the fan tray can be removed for easy cleaning.

Failure to keep the fans and heatsink clear of debris will void your warranty.

6.2 Fan Removal and Heatsink Cleaning

It is recommended to remove prime AC power from the amplifier when the fan tray is being removed. However, if necessary, the fan tray can be removed while the amplifier is operating. Caution should be used to make sure that no clothing or fingers are caught in the fan blades. Simply remove the four screws from the fan tray and the fan assembly can be removed from the bottom of the amplifier assembly.

The fans are connected to their power source by weatherized in-line circular connectors. A replacement fan with connector can be provided for replacement. While the fan tray is removed, the heatsink fins can be cleaned by spraying compressed air throughout the finned area. A can of dust remover spray such as that which is found at a computer or electronics shop will work fine. All debris should be removed before installing the fan tray.

6.2.1 Fan Replacement

The Mini Compact Outdoor SSPA utilizes a two-fan air intake tray, and any maintenance requiring replacement of the fans should use fan kit L207853-1. This kit replaces the entire fan tray assembly.

6.3 Troubleshooting guide

The following section describes solutions for some of the most common issues with the operation of the Mini Compact Outdoor SSPA.

6.3.1 Unit doesn't power up

Cooling fans do not spin, and alarm LED lamps are off.

Possible causes: AC power is off; Unit is connected to an inadequate circuit breaker. Unit has no connection between chassis and earth ground or has inadequate earth ground.

Possible solutions: Check SSPA unit datasheet for AC power requirements. Provide the specified AC power for the unit. Re-check continuity between unit's chassis ground and earth ground. Earth ground connection is required for normal SSPA operation!

6.3.2 Unit powers on, LED lamp glows red

Possible causes: SSPA peripheral alarms (Auxiliary, Spare, Forward RF etc) are set as Major alarms. Summary Alarm is caused by external reference BUC module.

Possible solutions: Connect to the SSPA unit via the Universal M&C software and disable peripheral alarms. In the case where the unit is equipped with an externally referenced BUC, provide the specified reference signal to the SSPA IF input.

6.3.3 SSPA unit powers up, LED lamp glows green, but no RF output signal is present

Possible causes: The SSPA is muted by an external signal or by an internal setting. The input RF signal is too low. The input signal is out of band.

Possible solutions: Make sure the J4 connector has a jumper installed between pins B and V (refer to **Table 2-2**). Connect to the unit via the Universal M&C and set the Mute setting to Off. Check the input RF signal level and frequency. Make sure the signal properties are appropriate for the unit.

6.3.4 Cannot connect to SSPA through remote control interface

Possible causes: The SSPA remote control is set to a different interface setting. The interface cable is not wired properly or has a broken wire harness. A PC interface port malfunction. An incorrect version of the software is being used to control the unit. The selected SSPA protocol is no longer supported by the SSPA firmware. In the case of RS232 interface: the wire harness is using the Chassis ground rather then a Com ground pin. In case of IPNet or SNMP interface: PC ARP cache entry is set for different MAC/IP address pair.

Possible solutions:

a) In the case where SSPA communication settings have been accidentally set to a random configuration, establish a connection to the unit with a L207755 Quick Start cable in conjunction with the Universal M&C software (see *Section 3.2.2.2*). After establishing a communication link with the unit, adjust the following settings to the desired configuration: Serial Network address, Communication Interface, Baud rate (if Serial was set in in the Communication Interface), IP address, Subnet, Gateway, IP port and IP lock address (if IPNet or SNMP protocols were selected), Community Set and Community Get strings (if SNMP protocol was selected), web password (if IPNet was selected).

   Disconnect the Quick start cable, and cycle AC power to the unit with the custom cable harness plugged into the J4 M&C connector. Recheck custom control link.

b) In the case of a RS232 interface, make sure to use communication ground pin **d** from the J4 connector as the RS232 ground. The SSPA RS232 port is electrically isolated from chassis ground.

c) In the case of IPNet, use 10Base-T approved cables (CAT5, CAT6) to make a connection to the unit. Maximum cable length should not exceed 300 ft. Use **Table 2-2** as a wiring guideline. If an IP connection with custom IP addressing is desired, don't make any connection to interface selection pins j and e.

d) In the case of SNMP interface, make sure that the SNMP community strings match between the SNMP NMS software and the unit. Default values for these strings are: Public and Private. Connect to the unit via the Universal M&C to check or change string values.

e) In the case of IPNet or SNMP protocols, clear the PC ARP cache by issuing the following command in a Windows command line interface: **arp –d**.

f) Binary and Terminal protocols are no longer supported by Compact Outdoor units. Use the currently available interfaces instead.

6.3.5 The FSK link between a modem and the SSPB unit is not working

Possible cause: The unit is set to use a different address.

Possible solution: Set the SSPB address to 1. Reset AC power.

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7.0 Redundant System Concepts

The Mini Compact Outdoor Amplifier is capable of operating in a variety of redundant system configurations. These include 1:1 and 1:2 as well as 1:1 with L-Band Block Up Converters. The Mini Compact Outdoor Amplifier has a built-in 1:1 redundancy controller, allowing it to be used in 1:1 redundant systems without a separate external controller. When used in a 1:2 redundant system a separate RCP2-1200 controller is required.

7.1 1:1 Redundant Systems

The three most common forms of 1:1 redundant system are shown in **Figures 7-1** through **7-3**.

Figure 7-1 shows a standard 1:1 system in which the RF input is transmitted through a transfer switch along with the output. Using this configuration the standby amplifier carries no traffic and simply is terminated by a 50 ohm resistive load at its input and by a waveguide termination at its output.
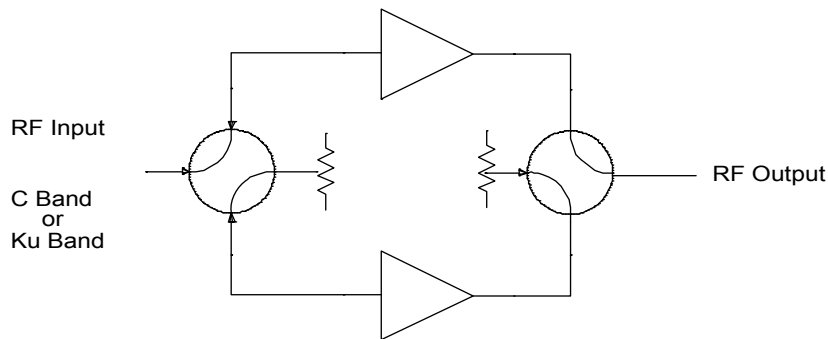
**Figure 7-1: Standard 1:1 Redundant System with input (coaxial) switch
and output (waveguide) switch**

With the system configured as in **Figure 7-2**, the RF input is passed through a microwave splitter. This keeps 'live' traffic on the standby amplifier and is useful for observing the traffic via the RF sample port on the standby amplifier.
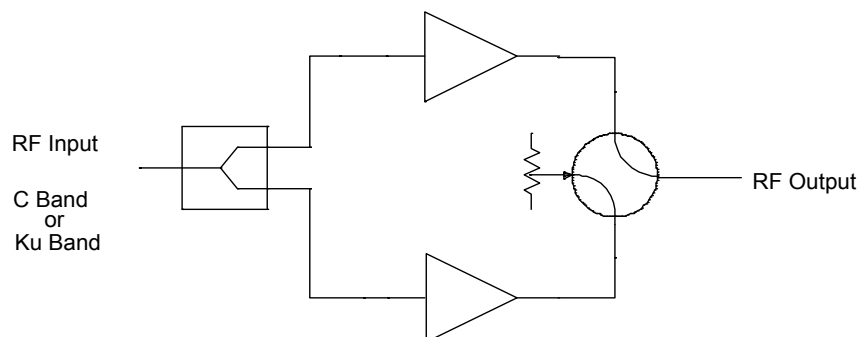
Figure 7-2: 1:1 Redundant System with input splitter substituted for input switch

The system shown in **Figure 7-3** uses the same concept of the power splitter on the RF input. In this case the Compact Outdoor amplifiers are equipped with L-Band block up converters. L-Band input amplifiers use phase locked oscillators as the local oscillator to the up converter. Such systems must use a splitter at the input instead of a switch so that the reference input is always available to the standby amplifier. If the reference signal is lost the standby amplifier would report a BUC (Block Up Converter) fault.
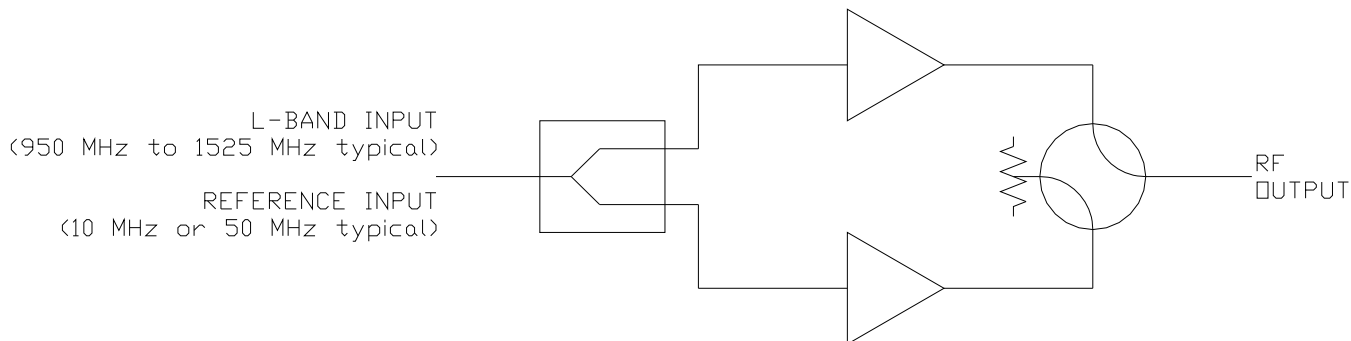
Figure 7-3: 1:1 Redundant System with L Band input

Care must be taken when selecting the splitter for an L-Band input system. The splitter must be a wide band design capable of passing the 10 MHz or 50 MHz reference signal along with the 950 MHz to 1525 MHz traffic input. The reference frequency power level must be at least -10 dBm into each Compact Outdoor Amplifier.

7.2 1:2 Redundant Systems

The Mini Compact Outdoor Amplifier can also be configured in 1:2 Redundant Systems. The major difference being that the amplifier's internal controller can not be used for system control. Instead a separate RCP2-1200 Redundant System controller is used to provide system control. The controller can be remotely located up to 500 ft. from the amplifiers. **Figure 7-4** shows a 1:2 Compact Outdoor Amplifier Redundant System.
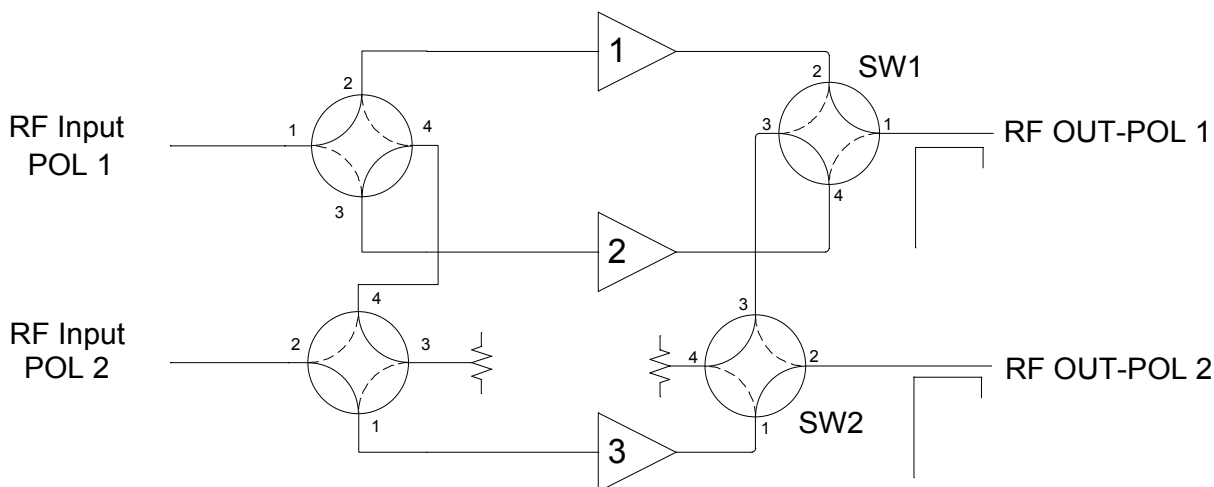
Figure 7-4: 1:2 Redundant System Block Diagram

8.0 Serial Protocol Overview

The Mini Compact Outdoor SSPA can be managed and controlled over a variety of remote control interfaces (see **Figure 8-1**).
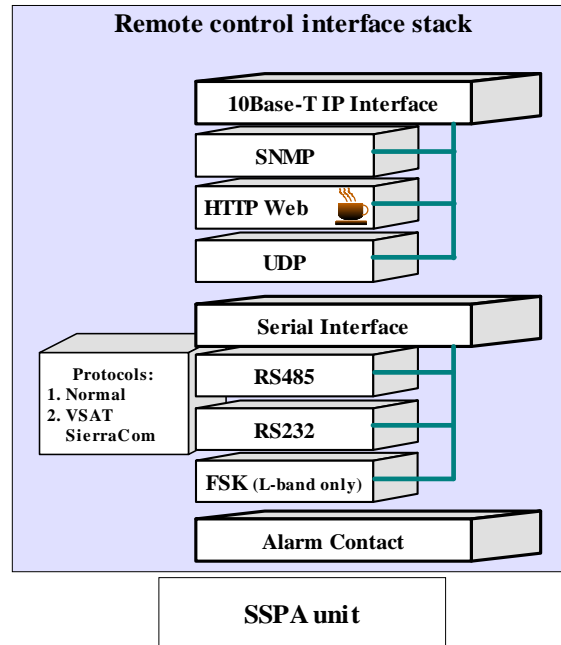
Figure 8-1: Compact Outdoor remote control interface stack

Serial interface can be selected between RS232/RS485, Ethernet 10Base-T or FSK over IFL input (FSK interface is available only on units with an optional L-Band block up converter). RS232/485 interface can be used in conjunction with Paradise CO SSPA serial protocol (aka Normal protocol) or Legacy Paradise VSAT BUC serial protocol (aka VSAT protocol). Serial protocol format is set at no parity, 8 bit with 1 stop bit. Baud rate is selectable.

> **Note: Binary and Terminal protocols used on previous generation units are no longer supported.**

The Ethernet interface provides access to the SSPA unit over SNMP V1 protocol or a combination of HTTP web page access and Normal serial protocol encapsulated in the UDP frame (aka IPNet). The Ethernet interface is fixed to the 10Base-T standard. Normally, straight-through Cat5 cable is used to connect the unit to a network hub, and crossover Cat5 is used to connect directly to a computer's Ethernet port.

> **Note: The supplied Quick Start cable is a crossover cable designed to connect the unit directly to a PC's NIC card. Some network hubs and switches are not equipped with an auto cable sense feature and may not work with this cable!**

The selected interface is controlled by a combination of internal SSPA settings and/or Interface control pins: Baud1 (Pin e) and Baud0 (Pin j) on the J4 M&C connector (See **Table 8-1**).

Table 8-1: Interface Selection

Baud0 (Pin j) state	Baud1 (Pin e) state	Selected interface
Open	Open	Interface selected by Internal SSPA settings
Closure to Chassis ground	Open	Interface is forced to Ethernet interface. IP address is fixed to 192.168.0.9. Protocol is forced to Normal (HTTP web supported)
Open	Closure to Chassis ground	Interface is forced to Ethernet interface. IP address is software selectable. Protocol is forced to Normal (HTTP web supported)
Closure to Chassis ground	Closure to Chassis ground	Interfaced is forced to 9600 Baud serial.

Note: The state of these pins is sensed by the SSPA unit only at power up! Changing the state of these pins during normal unit operation will not affect the selected type of interface.

FSK interface allows the selection of Normal and VSAT protocols.

Note: For proper FSK interface operation, the SSPA internal settings must be selected to 9600 Baud and Normal protocol. Do not make a connection to interface control pins Baud1 and Baud0!

Note: For maximum ESD protection of a SSPA's Serial interface internal circuit, the RS232/RS485 interface is isolated from the SSPA chassis ground. Serial interface has a separate interface ground pin (Pin d on the J4 connector). Connecting this pin to common ground will effectively disable the protection circuit and may cause interface failure.

All interface lines are equipped with transient suppression devices. Adding extra transient protection to communication lines is not required and may cause interface failure!

8.1 Serial communication

This section describes the normal communication protocol between the Mini CO SSPA and a host computer over RS232/RS485 serial interface. Serial port settings on the host computer must be configured for 8 bit data at no parity, with 1 stop bit. The baud rate should match the selected baud rate parameter on the SSPA unit.

Selection between the RS232 and RS485 interface depends on the state of pin D of the J4 M&C connector. Connect pins D and d to select RS232 interface. Otherwise SSPA will operate in RS485 mode.

The unit will only respond to properly formatted protocol packets. The basic communication packet is shown in **Figure 8-2**. It consists of a Header, Data, and Trailer sub-packet.

HEADER (4 bytes)	DATA (6-32 bytes)	TRAILER (1 byte)
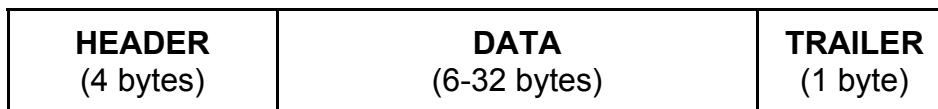
Figure 8-2: Basic Communication Packet

8.1.1 Header Packet

The Header packet is divided into 3 sub-packets which are the Frame Sync, Destination Address, and Source Address packets, as shown in **Figure 8-3**.

HEADER (4 bytes)	DATA (6-32 bytes)	TRAILER (1 byte)

Frame Sync (2 bytes) 0xAA55	Destination Address (1 byte)	Source Address (1 byte)
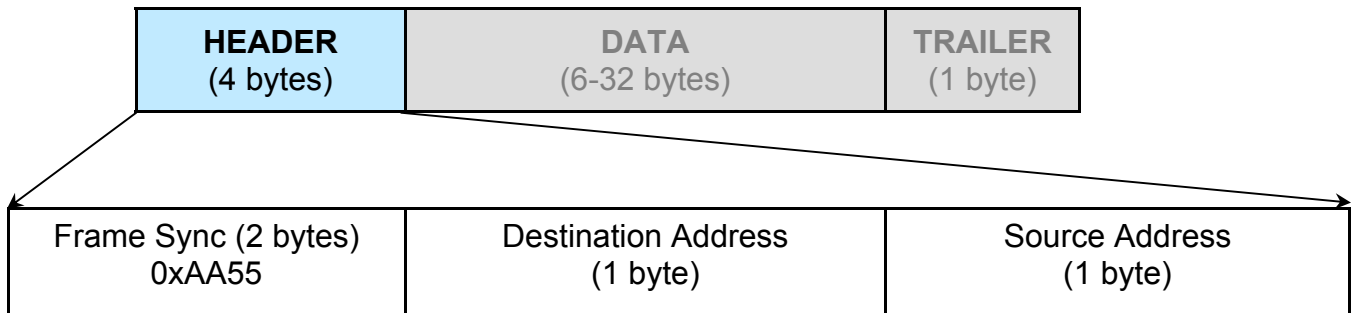
Figure 8-3: Header Sub-Packet

8.1.1.1 Frame Sync Word

The Frame Sync word is a two byte field that marks the beginning of a packet. This value is always 0xAA55. This field provides a means of designating a specific packet from others that may exist on the same network. It also provides a mechanism for a node to synchronize to a known point of transmission.

8.1.1.2 Destination Address

The destination address field specifies the node for which the packet is intended. It may be an individual or broadcast address. The broadcast address is 0xFF or 0xAA (see *Section 8.1.5 Multiple Device Access*). This is used when a packet of information is intended for several nodes on the network. The broadcast address can be used in a single device connection when the host needs to determine the address of the amplifier. The SSPA unit will reply with its unique address.

8.1.1.3 Source Address

The source address specifies the address of the node that is sending the packet. All unique addresses, except the broadcast address, are equal and can be assigned to individual units. The host computer must also have a unique network address.

8.1.2 Data Packet

The data sub-packet is comprised of 6 to 32 bytes of information. It is further divided into seven fields as shown in **Figure 8-4**. The first six fields comprise the command preamble while the last field is the actual data.

HEADER (4 bytes)	DATA (6-32 bytes)	TRAILER (1 byte)

COMMAND PREAMBLE						DATA FIELD
Protocol ID 1 Byte	Request ID 1 Byte	Command 1 Byte	Data Tag 1 Byte	Error Status / Data Address 1 Byte	Data Length 1 Byte	Command Data Sub Structure 0 - 26 Bytes
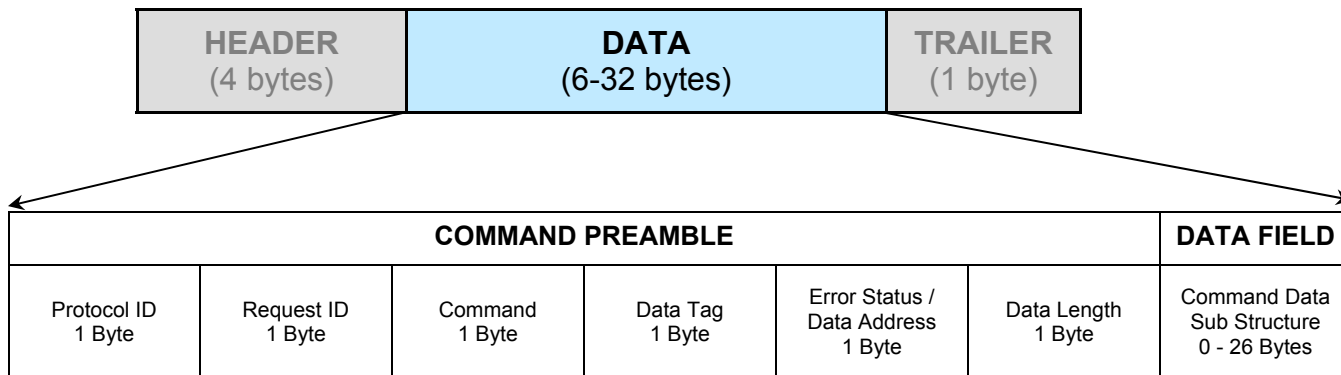
Figure 8-4: Data Sub-Packet

8.1.2.1 Protocol ID

This field provides backward compatibility with older generation equipment protocol. It should normally be set to zero. This field allows the unit to auto-detect other protocol versions, which may exist in the future.

8.1.2.2 Request ID

This is an application specific field. The amplifier will echo this byte back in the response frame without change. This byte serves as a request tracking feature.

8.1.2.3 Command

The SSPA protocol is a table based protocol. It allows the user to view and modify data tables located on the controlled device. Throughout the remainder of this description, "sender" will refer to the host PC, and "receiver" will refer to the SSPA unit.

Sender and receiver are limited to two commands and two command responses. The Get Request command issued by a command sender allows monitoring of existing conditions and parameters on the receiver. The Get Request frame should not have any bytes in the Data Filed and be no longer than 11 bytes.

The Response frame from the receiver will contain a Get Response designator in the Command field. If the receiver does not detect any errors in the Get Request frame, the requested data will be attached to the response frame. The length of the Get Response frame

varies by the amount of attached data bytes. It may contain 11+N bytes where N is the amount of requested data bytes from a particular table, specified in Data Length field.

The Set Request command allows the sender to actively change parameters for the receiver's internal configuration. The Set Request frame must contain a number of bytes in the Data Field as specified in Data length field. The frame size must be 11+N bytes, where N is the length of the attached data structure. The receiver will respond with a frame where the command field will be set to a Set Response designator. The frame length is equal to the Request frame. The byte value for each command is given in **Table 8-2**.

Table 8-2: Command Byte Values

Command Name	Command Byte Value
Set Request	0
Get Request	1
Set Response	2
Get Response	3

8.1.2.4 Data Tag

The SSPA internal structure is organized in several tables, all of which share similar functionality and internal resources. To access the various tables, the data tag must be specified in the request frame. The data associated with certain tags is read only. Therefore only the "Get" command request would be allowed to access these data tags. The SSPA will return an error on attempts to issue a "Set" request to a read-only table tag. Various tables may contain values formatted either in 1 or 2 bytes format. See **Table 8-3**.

Table 8-3: Data Tag Byte Values

Tag Name	Byte Value	Minimum valid length of Data Field	Description
System Tag Settings	0	1 byte	This tag allows accessing various system settings on remote unit. Host access status: Full Read/Write access. Settings can be modified at any time. Some settings may require hardware reset of the remote SSPA unit.
System Threshold Tag	1	2 bytes	This tag allows access to the critical unit thresholds. Host access status: Read Only.
System Conditions Tag	3	1 byte	This tag allows access to the unit's internal conditions flags, such as fault status or current system status. Host access status: Read only. This type of data cannot be set or modified remotely.
ADC Channels Access Tag	4	2 bytes	This tag allows access to the unit's internal Analog to Digital converter. Host access status: Read only. This type of data cannot be set or modified remotely.
Packet Wrapper	6	1 byte	Tag is not used in CO SSPA protocol.
Reserved	2	N/A	This tag is reserved and not used for CO SSPA applications.
Reserved	5	N/A	This tag is reserved for factory usage only.

8.1.2.5 Data Address / Error Status / Local Port Frame Length

This field is a tag extension byte and specifies the first table element of the tagged data. If the Data Length is more than 1 byte, then all subsequent data fields must be accessed starting from the specified address. For example, if the requestor wants to access the amplifier's unique network address, it should set data tag 0 (System settings tag) and data address 8 (see System Settings Details table). If the following Data Length field is more than 1, then all subsequent Settings will be accessed after the Unique Network Address.

Important! In the Response Frame Data Address filed replaced with the Error Status information. The various error codes are given in **Table 8-4**.

Table 8-4: Error Status Bytes

Error Code name	Byte Value	Possible Cause
No Errors	0	Normal Condition, no errors detected
Data Frame Too Big	1	Specified Data length is to big for respondent buffer to accept
No Such Data	2	Specified Data Address is out off bounds for this tag data
Bad Value	3	Specified value not suitable for this particular data type
Read Only	4	Originator tried to set a value which has read only status
Bad Checksum	5	Trailer checksum not matched to calculated checksum
Unrecognizable error	6	Error presented in originator frame, but respondent failed to recognize it. All data aborted.

8.1.2.6 Data Length

This byte value specifies the number of bytes attached in the Data Filed. For the Get command, it specifies the number of data bytes that have to be returned by the SSPA unit to a host PC in the Response frame. For Set commands, the value of this byte specifies the number of data fields to be accessed starting from the address specified in the Data Address byte. In general, the Data Length value plus the Data Address must not exceed the maximum data size particular tag.

8.1.2.7 Data Field

The actual data contained in the packet must be placed in this field. The "Get Request" type of command must not contain any Data Field. "Get Request" will be rejected if any data is present in the Data Field. Generally, the Bad Checksum error code will be added to the response from the unit. In case the data length is 2 bytes, each data word is placed in the frame with its least significant byte first. All data with length of 2 bytes must be represented as integer type with maximum value range from 32767 to (-32767).

8.1.3 Trailer Packet

The trailer component contains only one byte called the Frame Check Sequence. This field provides a checksum during packet transmission. See **Figure 8-5**.

HEADER (4 bytes)	DATA (6-32 bytes)	TRAILER (1 byte)

Frame Check
Checksum (1 byte)
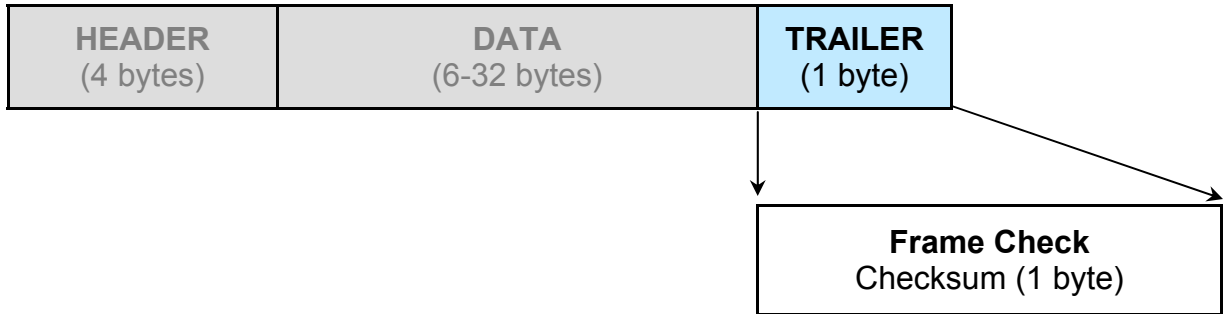
Figure 8-5: Trailer Sub-Packet

8.1.3.1 Frame Check

This value is computed as a function of the content of the destination address, source address and all Command Data Substructure bytes. In general, the sender formats a message frame, calculates the check sequence, appends it to the frame, then transmits the packet. Upon receipt, the destination node recalculates the check sequence and compares it to the check sequence embedded in the frame. If the check sequences are the same, the data was transmitted without error. Otherwise an error has occurred and some form of recovery should take place. In this case the amplifier will return a packet with the "Bad Checksum" error code set. Checksums are generated by summing the value of each byte in the packet while ignoring any carry bits.
A simple algorithm is given as:

```
Chksum=0
FOR byte_index=0 TO byte_index=packet_len-1
        Chksum=(chksum+BYTE[byte_index]) MOD 256
NEXT byte_index
```

8.1.4 Timing issues

There is no maximum specification on the inter-character spacing in messages. Bytes in messages to amplifier units may be spaced as far apart as you wish. The amplifier will respond as soon as it has collected enough bytes to determine the message.   Generally, there will be no spacing between characters in replies generated by units. The maximum length of the packet sent to the amplifier node should not exceed 64 bytes, including checksum and frame sync bytes. Inter-message spacing, must be provided for good data transmission. The minimum spacing should be 100 ms. This time is required for the controller to detect a "Line Cleared" condition with half duplex communications. Maximum controller respond time is 200 ms.

8.1.5 Serial Communications Protocol

Tables 8-5 through **8-9** describe the various values of the serial communications protocol.

Table 8-5: Request Frame Structure

Byte position	Byte Value (Hex)	Description
1	0xAA	Frame Sync 1
2	0x55	Frame Sync 2
3	Destination Address	-//-
4	Source Address	-//-
5	Protocol Version	Protocol compatibility hole, must be set to 0
6	Request ID	Service Byte
7	Command	0, Set Request; 1, Get Request
8	Data Tag	0, System Settings; 1, System Thresholds; 2, Temp. Sensor Settings; 3, Conditions; 4, ADC Data; 5, Raw NVRAM/RAM Data
9	Data Address	Setting number, Sensor command, EEPROM address
10	Data Length	Total length of the data, valid values 1-30
11+N	Data	Actual Data
11+N+1	Checksum	Dest. Address + Source Address + Protocol Version + Request ID + Command + Data Tag + Data Address + Data Length + Data

Table 8-6: Response Frame Structure

Byte position	Byte Value (Hex)	Description
1	0xAA	Frame Sync 1
2	0x55	Frame Sync 2
3	Destination Address	-//-
4	Source Address	-//-
5	Protocol Version	Protocol compatibility hole, must be set to 0
6	Request ID	Service Byte
7	Command	2, Set Response; 3, Get Response
8	Data Tag	0, System Settings; 1, System Thresholds; 2, Temp. Sensor Settings; 3, Conditions; 4, ADC Data; 5, Raw NVRAM/RAM Data
9	Error Status	0, No Errors; 1, Too Big; 2, No Such Data; 3, Bad Value; 4, Read Only; 5, Bad Checksum; 6, Unrecognized Error
10	Data Length	Total length of the data, valid values 1-30
11+N	Data	Actual Data
11+N+1	Checksum	Dest. Address + Source Address + Protocol Version + Request ID + Command + Data Tag + Data Address + Data Length + Data

Table 8-7: System Settings Data Values

Data Address	# Bytes	Description	Limits and Byte Values
1	1	System Operation Mode	Single Amplifier = 255 1:1 Redundant = 0
2	1	System Hierarchical Address	Unit 1= 0; Unit 2= 255
3	1	Unit Start Up State (in Redundancy)	On Line Amplifier = 255 Standby Amplifier = 0
4	1	Mute State	Mute Clear (Transmit Enable) = 255 Mute Set (Transmit Disable) = 0
5	1	Attenuation Level (dB down from maximum gain)	[1 bit for every 0.1 dB] 0 dB attenuation = 0 20 dB attenuation = 200
6	1	RESERVE	N/A
7	1	Amplifier Network Address	1 to 255
8	1	High Temperature Alarm Threshold	0 to 100 (in ^{o}C)
9	1	SSPA module Calibration Mode	Temperature Compensated = 255 (normal state) Tune Mode = 1 (Factory Use Only) Calibration Mode = 0 (Factory Use Only)
10	1	SSPA Spare Fault Status	Ignore Spare Fault = 255 Fault on value of window on ADC channel = 0 to 1 Fault on External Mute = 8
11	1	SSPA Spare Fault Handling	Minor Fault (no effect on Summary Fault) = 255 Major Fault (Triggers Summary Fault) = 0 Major Fault with Mute (Transmit Disabled) = 1
12	1	Auxiliary Fault Status	Disabled = 255 Fault High = 0 Fault Low = 1
13	1	Auxiliary Fault Handling	Minor Fault (no effect on Summary Fault) = 255 Major Fault (Triggers Summary Fault) = 0 Major Fault with Mute (Transmit Disabled) = 1
14	1	BUC Fault Status	Enabled = 0 Disabled = 255
15	1	BUC Fault Handling	Minor Fault (no effect on Summary Fault) = 255 Major Fault (Triggers Summary Fault) =0 Major Fault with Mute (Transmit Disabled) = 1
16	1	Protocol Select	Serial = 255 IPNET (Ethernet UDP, Web M&C) = 3 SNMP = 4
17	1	Baud Rate Select	9600 = 255 38400 = 0 19200 = 1 4800 = 2 2400 = 3
18	1	Fiber Optic Fault Status	Disabled = 255 Fault on Logic High = 0 Fault on Logic Low = 1
19	1	Fiber Optic Fault Handling	Minor Fault (no effect on Summary Fault) = 255 Major Fault (Triggers Summary Fault) =0 Major Fault with Mute (Transmit Disabled) = 1
20	1	Standby Mode	Hot standby=255; Cold standby=0
21	1	BUC Reference	Autoswitch = 0; External = 1; Internal = 2
22	1	Forward RF Fault Status	Disabled = 255 Low RF Fault Threshold = 0 RF Window @ 10% = 1 RF Window @ 15% = 2 High RF Threshold = 3

(continued)

Note: Data length must be at least two bytes to form integer with the lower byte sent first. If an odd number of bytes is received, the last byte will be saved as the lower byte of the integer and the upper part will be zero.

Table 8-7: System Settings Data Values (continued)

Data Address	# Bytes	Description	Limits and Byte Values
23	1	Forward RF Fault Handling	Minor Fault = 255 Major Fault = 0
24	1	Forward RF Fault Handling	0-80 dBm. Value used as Low, Window center point, or High Threshold, depending on Forward RF Fault status setting
25	1	Reserve	Reserve
26	1	Reserve	Reserve
27	1	Reserve	Reserve
28	1	Reserve	Reserve
29	1	IP Address Byte 1 (MSB)	Default IP Address = 192.168.0.9
30	1	IP Address Byte 2	Default IP Address = 192.168.0.9
31	1	IP Address Byte 3	Default IP Address = 192.168.0.9
32	1	IP Address Byte 4	Default IP Address = 192.168.0.9
33	1	IP Gateway Byte 1 (MSB)	Default Gateway = 192.168.0.1
34	1	IP Gateway Byte 2	Default Gateway = 192.168.0.1
35	1	IP Gateway Byte 3	Default Gateway = 192.168.0.1
36	1	IP Gateway Byte 4	Default Gateway = 192.168.0.1
37	1	Subnet Mask Byte 1 (MSB)	Default Subnet Mask = 255.255.255.0
38	1	Subnet Mask Byte 2)	Default Subnet Mask = 255.255.255.0
39	1	Subnet Mask Byte 3	Default Subnet Mask = 255.255.255.0
40	1	Subnet Mask Byte 4	Default Subnet Mask = 255.255.255.0
41	1	Receive IP Port Byte 1 (MSB)	Default Receive IP Port = 1007
42	1	Receive IP Port Byte 2	Default Receive IP Port = 1007
43	1	IP Lock Address Byte 1 (MSB)	Default IP Lock Address = 255.255.255.255 (Disabled)
44	1	IP Lock Address Byte 2	Default IP Lock Address = 255.255.255.255 (Disabled)
45	1	IP Lock Address Byte 3	Default IP Lock Address = 255.255.255.255 (Disabled)
46	1	IP Lock Address Byte 4	Default IP Lock Address = 255.255.255.255 (Disabled)

Table 8-8: System Threshold Data Values

Data Address	# Bytes	Description	Limits and valid values
1	2	Low Current Fault Threshold (Power Supply 2 Current)	Minimum value = 0 Maximum value = 1023
2	2	Spare Fault Window Lower Limit	Minimum value = 0 Maximum value = 1023
3	2	Spare Fault Window Upper Limit	Minimum value = 0 Maximum value = 1023
4	2	Low Current Fault Threshold (Power Supply 1 Current)	Minimum value = 0 Maximum value = 1023
5	2	Low Regulator Voltage Threshold (Power Supply 2 Voltage)	Minimum value = 0 Maximum value = 1023
6	2	Low Regulator Voltage Threshold (Power Supply 1 Voltage)	Minimum value = 0 Maximum value = 1023

Table 8-9: System Condition Addressing

Data Address	# Bytes	Description	Limits and valid values
1	2	Attenuation DAC value (Read Only in Temp Co Mode)	0 to 4095
2	2	Present Temperature	+/- 100
3	2	Fault, Mute, and State Conditions	2-Byte Value 0 fault clear; 1 fault set 0 mute clear; 1 mute set 0 standby state, 1 on line state 0 Ext. Ref, 1 Internal Ref **Lower Byte** Bit 0 = Summary Fault Bit 1 = High Temp Fault Bit 2 = Low DC Current Fault Bit 3 = Low DC Voltage Fault Bit 4 = External Mute Status Bit 5 = Internal Mute Status Bit 6 = Forward RF Fault Bit 7 = Reference Source **High Byte** Bit 0 = BUC Fault Bit 1 = Spare Fault Bit 2 = Auxiliary Fault Bit 3 = Fiber Fault Bit 4 = RF Switch Control 1 state Bit 5 = RF Switch Control 2 state Bit 6 = Reserved, Always 0 Bit 7 = Unit On Line State
4	2	Present Attenuation Level	1bit per 0.1 dB attenuation Low Byte: 0 to 150 High Byte: always 0
5	2	Present RF Power Level Output is dBm x 10	0 to 800
6	2	Total DC Current	20 Amp maximum 1 value = 0.1 Amp
7	2	PS2 Regulator DC Voltage	15 Volt maximum 1 value = 0.1 Volt
8	2	PS2 Voltage	15 Volt maximum 1 value = 0.1 Volt
9	2	Transistor Gate Voltage	0 to 10 volt range Use 2's compliment integer math 1 value = 0.1 Volt
10	2	PS1 DC Current	1Value = 0.1 Volt
11	2	PS1 Regulator DC Voltage	1Value = 0.1 Volt
12	2	PS1 Voltage	1Value = 0.1V
13	2	External Reference Level	0 to 1023
14	2	Baseplate Temperature	+/- 100
15	2	Tempco DAC value (Read Only in Temp Co Mode)	0 to 4095

Note: Data length must be at least two bytes to form integer with the lower byte sent first. If odd number of bytes is received, the last byte will be saved as the lower byte of the integer and upper part will be zero.

8.2 Ethernet Interface

8.2.1 Overview

The Mini CO SSPA supports several IP network protocols to provide a full featured remote M&C interface over an Ethernet LAN:

- IPNet protocol – redirection of standard Paradise Datacom LLC serial protocol over UDP transport layer protocol. This protocol is fully supported in Paradise Datacom's Universal M&C software.
- SNMPv1 protocol - protocol intended for integration into large corporate NMS architectures.

In order to utilize either of the protocols listed above, the relevant interface option has to be turned on. Refer to *Sections 8.2.2 IPNet interface* and *8.2.4.5 Configuring SSPA unit to work with SNMP protocol* for details.

Of course, standard IP level functions such as ICMP Ping and ARP are supported as well. There is currently no support for dynamic IP settings, all IP parameters.

8.2.2 IPNet Interface

8.2.2.1 General Concept

Satcom system integrators are recognizing the benefits of an Ethernet IP interface. These benefits include:

- Unsurpassed system integration capabilities;
- Widely available, inexpensive support equipment (network cable; network hubs);
- Ability to control equipment over Internet;
- Ease of use

Implementation of the raw Ethernet interface is not practical due to the limitations it places on M&C capabilities by the range of a particular LAN. It is more practical to use an Ethernet interface in conjunction with the standard OSI (Open System Interconnect) model to carry a stack of other protocols. In an OSI layered stack, an Ethernet interface can be represented as a Data Link layer. All upper layers are resolved through a set of IP protocols. In order to keep data bandwidth as low as possible (which is important when M&C functions are provided through a low-bandwidth service channel) the IP/UDP protocol set is used as the Network/ Transport layer protocol on Paradise Datacom SSPAs.

UDP (User Datagram Protocol) was chosen over TCP (Transmission Control Protocol) because it is connectionless; that is, no end-to-end connection is made between the SSPA unit and controlling workstation when datagrams (packets) are exchanged.

Paradise Datacom provides a Windows^{TM}-based control application to establish UDP-based Ethernet communication with the SSPA. The control application manages the exchange of datagrams to ensure error-free communication. An attractive benefit of UDP is that it requires

low overhead resulting in minimal impact to network performance. The control application sends a UDP request to SSPA unit and waits for response. The length of time the control application waits depends on how it is configured. If the timeout is reached and the control application has not heard back from the agent, it assumes the packet was lost and retransmits the request. The number of the retransmissions is user configurable.

The Paradise Datacom SSPA Ethernet IP interface can use UDP ports from 0 to 65553 for sending and receiving. The receiving port needs to be specified through the front panel menu. For sending, it will use the port from which the UDP request originated. Of course, it is up to the user to select an appropriate pair of ports that are not conflicting with standard IP services. Paradise Datacom recommends usage of ports 1038 and 1039. These ports are not assigned to any known application.

As an application layer protocol (which actually carries meaningful data), the standard SSPA serial protocol was selected. This protocol proves to be extremely flexible and efficient. It is also media independent and can be easily wrapped into another protocol data frame. An example of the UDP frame with encapsulated Paradise Datacom protocol frame is shown on **Figure 8-6**.

UDP Header (8 bytes)	SSPA Serial Protocol Frame (11+N Bytes, 0<N<128)	CRC 16 checksum

Figure 8-6: UDP Redirect Frame Example

A detailed OSI model for the RM SSPA M&C interface is represented in **Table 8-10**.

Table 8-10: OSI Model for Compact Outdoor SSPA Ethernet IP Interface

OSI Layer	Protocol	Notes
Application	Paradise Datacom CO SSPA Serial Protocol	Frame structure described in Section 8.0
Transport	UDP	Connectionless transport service. MTU on target PC must be set to accommodate largest SSPA Serial Protocol Frame. Set MTU to a value larger than 127 bytes.
Network	IP	ARP, RARP and ICMP Ping protocols supported by RM SSPA controllers. Static IP Address only, no DHCP support.
Data Link	Ethernet	10/100 Base-T Network
Physical	Standard CAT5 (CAT 6) Network Cable	Maximum node length 100 m

This set of Ethernet IP protocols is currently supported by Paradise Datacom Universal M&C package (Compact Outdoor SSPA). The software is supplied on CD with the unit, or can be downloaded by registered users from the company web site, http://www.paradisedata.com.

8.2.2.2 Setting IPNet interface

To set up the Compact Outdoor SSPA with custom IP parameters, the internal IP settings need to be modified by using Paradise Datacom's Universal M&C, version 4.4.3 or later. See *Section 3.3.3*.

8.2.2.3 Troubleshooting IP connectivity

Check IP connectivity to the SSPA unit. To do so on a Windows-based PC, open a Command Prompt window and type the following command: `PING 192.168.0.9`, then press the Enter key. If the unit is successfully found on the network, the request statistic will be displayed.

```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Ping 192.168.0.9

Pinging 192.168.0.9 with 32 bytes of data:

Reply from 192.168.0.9: bytes=32 time<1ms TTL=128
Reply from 192.168.0.9: bytes=32 time<1ms TTL=128
Reply from 192.168.0.9: bytes=32 time<1ms TTL=128
Reply from 192.168.0.9: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.9:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

If this step is successfully completed, a default Ethernet connection is set and ready to use.

If the unit does not answer on the ping command, check all hardware connections. Consult your network administrator for further details.

8.2.3 SNMP interface

SNMP-based management was initially targeted for TCP/IP routers and hosts. However, the SNMP-based management approach is inherently generic so that it can be used to manage many types of systems. This approach has become increasingly popular for remote management and control solutions for various SSPA systems.

Paradise Datacom devices with Ethernet interface support the most popular SNMPv1 format (SMIv1, RFC1155), SNMP Get, SNMP GetNext and SNMP Set commands. SNMP Traps are currently unsupported.

In order to utilize SNMP protocol, the user has to enable this feature through remote serial protocol. SNMP uses the UDP fixed port 161 for sending and receiving requests.

The definition of managed objects is described in the MIB. The MIB file is available for download from the Downloads section of the company web site, www.paradisedata.com.

The Paradise Datacom MIB is a table-based MIB, and is the same for all devices. The MIB table is designed to follow the same pattern as the tables for serial protocol. For additional information about OID values, refer to **Tables 8-11** to **8-13**.

The text values in the tables help automatic value parsing within NMS or make the values readable through an MIB browser. All text value OIDs follow the same pattern:

1. For settings or parameters with discreet values:
   SettingName'ValueName1=xxx, ….,ValueNamex=xxx
   Example: SystemMode'1:1=0,Dual 1:1 = 1,MSwitch=2,StandAlone=255

2. For settings or parameters with continuous values:
   SettingName'LowLimit..HighLimit
   Example: NetworkAddress'0..255

Note: See *Section 8.3* for a description of connecting to a Mini Compact Outdoor SSPA via a MIB Browser.

8.2.3.1 SNMP MIB tree

```
--paradiseDatacom(1.3.6.1.4.1.20712)
  |
  +--deviceINFO(1)
  | |
  | +-- r-n OctetString deviceID(1)
  | +-- rwn OctetString deviceLocation(2)
  | +-- r-n OctetString deviceRevision(3)
  | +-- r-n Enumeration deviceType(4)
  |
  +--devices(2)
    |
    +--paradiseDevice(1)
    | |
    | +--settings(1)
    | | |
    | | +--settingsEntry(1) [settingIndex]
    | |   |
    | |   +-- rwn Integer32   settingIndex(1)
    | |   +-- rwn Integer32   settingValue(2)
    | |   +-- r-n OctetString settingTextValue(3)
    | |
    | +--thresholds(2)
    | | |
    | | +--thresholdsEntry(1) [thresholdIndex]
    | |   |
    | |   +-- rwn Integer32   thresholdIndex(1)
    | |   +-- r-n Integer32   thresholdValue(2)
    | |   +-- r-n Enumeration thresholdStatus(3)
    | |   +-- r-n OctetString thresholdText(4)
    | |
    | +--conditions(3)
    |   |
    |   +--conditionsEntry(1) [conditionsIndex]
    |     |
    |     +-- rwn Integer32   conditionsIndex(1)
    |     +-- r-n Integer32   conditionsValue(2)
    |     +-- r-n Counter     conditionsEventCount(3)
    |     +-- r-n OctetString conditionsText(4)
    |
    +--paradiseDeviceA(2)
    |
    +--paradiseDeviceB(3)
    |
    +--paradiseDeviceC(4)
    |
    +--modem(5)
```

8.2.3.2 Description of MIB entities

deviceINFO - This field includes general device information.

deviceID - Octet string type; maximum length -60; field specifies device model and serial number; read only access; OID -1.3.6.1.4.1.20712.1.1

deviceLocation - Octet string type; maximum length 60; filed allow customer to store information about device physical location or any other textual information related to the device; read/write access; OID -1.3.6.1.4.1.20712.1.2

deviceRevision - Octet string type; maximum length 60; field specifies device firmware revision; read only access; OID -1.3.6.1.4.1.20712.1.3

deviceType - Enumeration, integer type; field allows simple detection of SNMP device type. Values: rmsspa(1), cosspa(2), rcp2fprc(3), rcp21000rm(4), rcp21000co(5), rcp21000rcp(6), buc(7), minicosspa(8); read/write access. Setting the ID to any other value will default type to cosspa. OID -1.3.6.1.4.1.20712.1.4

devices - This field is subdivided into 5 branches: paradiseDevice, paradiseDeviceA, paradiseDeviceB paradiseDeviceC and modem. paradiseDevice branch currently is used for all Paradise Datacom LLC SNMP enabled devices except Modems. See the Evolution Modem manual for specific MIB information. Branches for Devices A, B and C are reserved for future use.

paradiseDevice - Field contents tables hold specific device information: Settings, Thresholds and Conditions. All table formats follow a common pattern: Index, Value, TextValue. The threshold table has an additional column for parameter validation. The conditions table has an extra column for event counters.

The Index column provides general table indexing; the Value column presents the current value of the relevant parameter; the TextValue column provides information about parameter name, measurement units and limits.

Value "1" in the validation column of the thresholds table indicates that relevant parameter is valid under the current system configuration; value "2" indicates that parameter is invalid or "Not available".

The event counter column of the conditions table indicates how many times a value of a relevant parameter changed its state since system power-up.

settings - Table contents current device configuration and provides device management. For detailed settings table info for SNMP device see **Table 8-11** for deviceType = minicosspa. Read/write access for settingsValue column.

thresholds - Table provides information about device internal limits and subsystems info. For detailed table information refer to **Table 8-12**. Read only access.

conditions - Table contents device fault status information. Read only access. For detailed conditions table info see **Table 8-13**.

Table 8-11: Detailed Settings for Mini CO SSPA mode (Device Type=8)

settingIndex/settingValue	settingTextValue	Value OID	Description
1/INTEGER	SystemMode'1:1=0,Dual 1:1 = 1,MSwitch=2,StandAlone=255	1.3.6.1.4.1.20712.2.1.1.1.2.1	System Operation mode
2/INTEGER	SystemHierarchicalAddress'HPA1=0,HPA2=255	1.3.6.1.4.1.20712.2.1.1.1.2.2	System Hierarchical Address
3/INTEGER	CurrentState'UnitStandby=0,UnitOnline=255	1.3.6.1.4.1.20712.2.1.1.1.2.3	Unit Start Up State in Redundancy
4/INTEGER	Mute'On=0,Off=255	1.3.6.1.4.1.20712.2.1.1.1.2.4	Mute State
5/INTEGER	SSPAAttenuation(dBx10)'0..200	1.3.6.1.4.1.20712.2.1.1.1.2.5	Attenuation Level
6/INTEGER	Reserved'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.6	Field reserved for future use
7/INTEGER	NetworkAddress'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.7	Amplifier Network Address
8/INTEGER	HighTempAlarmThreshold(C)'0..100	1.3.6.1.4.1.20712.2.1.1.1.2.8	High Temperature Alarm Threshold
9/INTEGER	CalibrationMode'On=0,Off=255	1.3.6.1.4.1.20712.2.1.1.1.2.9	SSPA module Calibration Mode
10/INTEGER	SpareFaultCheck'ADCCh0-1=0..1,Ext.Mute=8,Ignore=255	1.3.6.1.4.1.20712.2.1.1.1.2.10	SSPA Spare Fault Status
11/INTEGER	SpareFaultAction'MajorFault=0,Fault+Mute=1,MinorFault=255	1.3.6.1.4.1.20712.2.1.1.1.2.11	SSPA Spare Fault Handling
12/INTEGER	AuxFaultCheck'LogicHigh=0,LogicLow=1,Ignore=255	1.3.6.1.4.1.20712.2.1.1.1.2.12	SSPA Auxiliary Fault Status
13/INTEGER	AuxFaultAction'MajorFault=0,Fault+Mute=1,MinorFault=255	1.3.6.1.4.1.20712.2.1.1.1.2.13	SSPA Auxiliary Fault Handling
14/INTEGER	BUCFaultCheck'Enable=0,Disable=255	1.3.6.1.4.1.20712.2.1.1.1.2.14	Block Up Converter Fault Status
15/INTEGER	BUCFaultAction'MajorFault=0,Fault+Mute=1,MinorFault=255	1.3.6.1.4.1.20712.2.1.1.1.2.15	Block Up Converter Fault Handling
16/INTEGER	ProtocolSelect'IPNET=3,SNMP=4,Serial=255	1.3.6.1.4.1.20712.2.1.1.1.2.16	Protocol Select
17/INTEGER	BaudRate'38400=255,19200=1,4800=2,2400=3,9600=255	1.3.6.1.4.1.20712.2.1.1.1.2.17	Baud Rate Select
18/INTEGER	FiberFaultCheck'LogicHigh=0,LogicLow=1,Ignore=255	1.3.6.1.4.1.20712.2.1.1.1.2.18	Fiber Converter Fault Status
19/INTEGER	Reserved'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.19	Fiber Converter Fault Handling
20/INTEGER	StandbyMode'ColdStandby=0,HotStandby=255	1.3.6.1.4.1.20712.2.1.1.1.2.20	Standby Mode
21/INTEGER	BUCReference'Autoswitch=0,External=1,Internal=2,NA=255	1.3.6.1.4.1.20712.2.1.1.1.2.21	BUC Reference
22/INTEGER	FwdRFCheck'LowRF=0,Window10%=1,Window15%=2,HighRF=3,Dis=255	1.3.6.1.4.1.20712.2.1.1.1.2.22	Type of forward RF fault
23/INTEGER	RFFaultAction'MajorFault=0,MinorFault=255	1.3.6.1.4.1.20712.2.1.1.1.2.23	Forward RF fault handling
24/INTEGER	FrwdRFFaultThreshold(dBm)'0..80	1.3.6.1.4.1.20712.2.1.1.1.2.24	Forward RF Fault threshold level in dBm
25/INTEGER	Reserved'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.25	Field reserved for future use
26/INTEGER	Reserved'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.26	Field reserved for future use
27/INTEGER	Reserved'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.27	Field reserved for future use
28/INTEGER	Reserved'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.28	Field reserved for future use

Table 8-11: Detailed Settings (continued from previous page)

settingIndex/ settingValue	settingTextValue	Value OID	Description
29/INTEGER	IPAddressByte1'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.29	Device IP address byte1 (MSB)
30/INTEGER	IPAddressByte2'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.30	Device IP address byte2
31/INTEGER	IPAddressByte3'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.31	Device IP address byte3
32/INTEGER	IPAddressByte4'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.32	Device IP address byte4 (LSB)
33/INTEGER	IPGateWayByte1'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.33	Device Gateway address byte1 (MSB)
34/INTEGER	IPGateWayByte2'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.34	Device Gateway address byte2
35/INTEGER	IPGateWayByte3'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.35	Device Gateway address byte3
36/INTEGER	IPGateWayByte4'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.36	Device Gateway address byte4 (LSB)
37/INTEGER	IPSubnetByte1'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.37	Device Subnet Mask byte1 (MSB)
38/INTEGER	IPSubnetByte2'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.38	Device Subnet Mask byte2
39/INTEGER	IPSubnetByte3'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.39	Device Subnet Mask byte3
40/INTEGER	IPSubnetByte4'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.40	Device Subnet Mask byte4 (LSB)
41/INTEGER	IPPortByte1'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.41	Device Port address byte1 (MSB) (required only for IPNet Interface)
42/INTEGER	IPPortByte2'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.42	Device Port address byte2 (LSB) (required only for IPNet Interface)
43/INTEGER	IPLockByte1'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.43	Device IP lock address byte1 (MSB) (required only for IPNet Interface)
44/INTEGER	IPLockByte2'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.44	Device IP lock address byte2 (required only for IPNet Interface)
45/INTEGER	IPLockByte3'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.45	Device IP lock address byte3 (required only for IPNet Interface)
46/INTEGER	IPLockByte4'0..255	1.3.6.1.4.1.20712.2.1.1.1.2.46	Device IP lock address byte4 (LSB) (required only for IPNet Interface)

Table 8-12: Detailed Thresholds

thresholdIndex/ thresholdValue	thresholdTextValue	Value OID	Description
1/INTEGER	LowCurrentThresholdPS2'0..1023	1.3.6.1.4.1.20712.2.1.2.1.2.1	Power Supply 2 Low DC Current alarm threshold (Amps x10)
2/INTEGER	SpareFaultLowLimitThreshold'0..1023	1.3.6.1.4.1.20712.2.1.2.1.2.2	Spare Fault alarm low threshold
3/INTEGER	SpareFaultHighLimitThreshold'0..1023	1.3.6.1.4.1.20712.2.1.2.1.2.3	Spare Fault alarm high threshold
4/INTEGER	LowCurrentThresholdPS1'0..1023	1.3.6.1.4.1.20712.2.1.2.1.2.4	Power Supply 1 Low DC current alarm threshold (Amps x10)
5/INTEGER	LowVoltageThresholdPS2'0..1023	1.3.6.1.4.1.20712.2.1.2.1.2.5	Power Supply 2 Low Regulator voltage alarm threshold (Volts x10)
6/INTEGER	LowVoltageThresholdPS1'0..1023	1.3.6.1.4.1.20712.2.1.2.1.2.6	Power Supply 1 Low Regulator voltage alarm threshold (Volts x10)

Table 8-13: Detailed Conditions

conditionIndex/ conditionValue	conditionTextValue	Value OID	Description
1/INTEGER	AttenDACCount'0..4095	1.3.6.1.4.1.20712.2.1.3.1.2.1	Attenuation DAC control output
2/INTEGER	SSPACoreTemperature(C)'-100..100	1.3.6.1.4.1.20712.2.1.3.1.2.2	SSPA core temperature
3/INTEGER	FaultStateAgregateValue'0-65535	1.3.6.1.4.1.20712.2.1.3.1.2.3	Aggregate Fault State of SSPA
4/INTEGER	SSPAAgregateAttenuation(dBx10)'0..200	1.3.6.1.4.1.20712.2.1.3.1.2.4	Current SSPA Attenuation Level
5/INTEGER	ForwardRFPower(dBmx10)'0..800	1.3.6.1.4.1.20712.2.1.3.1.2.5	Forward RF Forward output in dBm
6/INTEGER	SSPADCCurrent(Ampx10)'0..10000	1.3.6.1.4.1.20712.2.1.3.1.2.6	SSPA DC current consumption
7/INTEGER	PS2RegulatorVoltage(Voltx10)'0..600	1.3.6.1.4.1.20712.2.1.3.1.2.7	Power Supply 2 Regulator Output voltage
8/INTEGER	PS2Voltage(Voltx10)'0..600	1.3.6.1.4.1.20712.2.1.3.1.2.8	Power Supply 2 Voltage
9/INTEGER	GateVoltage(Voltx10)'0..200	1.3.6.1.4.1.20712.2.1.3.1.2.9	RF FET Bias Gate voltage
10/INTEGER	PS1DCCurrent(Ampx10)'0..10000	1.3.6.1.4.1.20712.2.1.3.1.2.10	Power Supply 1 Regulated DC current consumption
11/INTEGER	PS1RegulatorVoltage(Voltx10)'0..600	1.3.6.1.4.1.20712.2.1.3.1.2.11	Power Supply 1 Regulator Output voltage
12/INTEGER	PS1Voltage(Voltx10)'0..600	1.3.6.1.4.1.20712.2.1.3.1.2.12	Power Supply 1 Output Voltage
13/INTEGER	ExternalReferenceLevel'0..1023	1.3.6.1.4.1.20712.2.1.3.1.2.13	External Reference Level (If BUC is installed, if not present always 0)
14/INTEGER	BaseplateTemperature(C)'-100..100	1.3.6.1.4.1.20712.2.1.3.1.2.14	SSPA Base Plate temperature
15/INTEGER	TempcoDACCount'0..4095	1.3.6.1.4.1.20712.2.1.3.1.2.15	Tempcom DAC control output

8.3 M&C via SNMP

Set up the Mini Compact Outdoor SSPA with custom IP parameters by modifying the internal IP settings using Paradise Datacom's Universal M&C, version 4.4.3 or later. Use the default Read and Write Community settings, or check the boxes to modify them. See **Figure 8-7**.

The Protocol setting in the Settings tab of the Universal M&C needs to be set to SNMP, as shown in **Figure 8-8**.
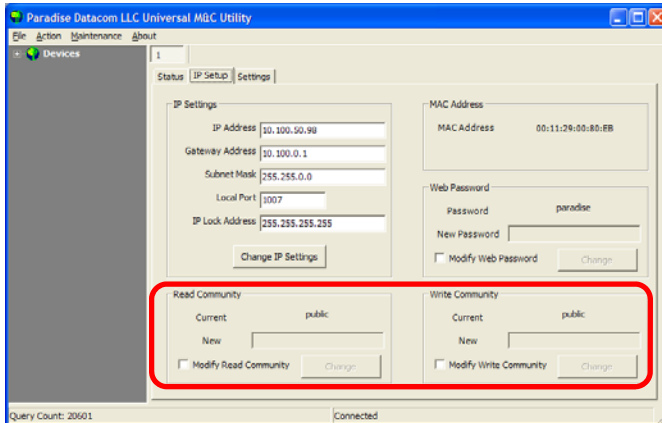

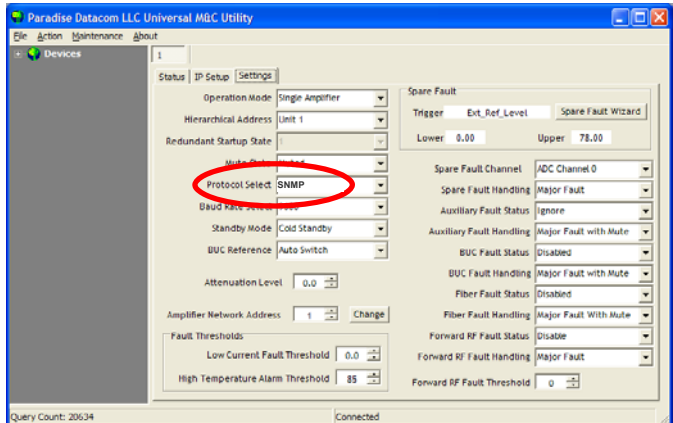**Figure 8-7: Universal M&C, IP Setup tab**   **Figure 8-8: Universal M&C, Settings tab**

After the desired IP address, Subnet mask and Gateway parameters have been set, the unit will still use its default parameters. To make the new parameters active, reset the Mini Compact Outdoor SSPA by removing its AC power. Unplug the Quick Start cable from the M&C connector. (**If the unit is restarted with the Quick Start cable connected, it will always come up with default IP settings**). Apply power to the SSPA. Re-plug the Quick Start cable into J4, and check connectivity with the custom IP settings.

If the custom IP settings will be used in normal operation, the user must construct an IP cable or modify the Quick Start cable by disconnecting the interface control pins (pins **j** and **e**, Baud Select 0 and Baud Select 1) from ground. In this configuration, the SSPA will always use the saved communication control settings rather then rolling back to the default configuration.

8.3.1 Connecting to a MIB browser

For a MIB browser application example, we will be using the freeware browser GetIf, version 2.3.1. Other browsers are available for download at http://www.snmplink.org/Tools.html.

1. Copy the provided Paradise Datacom LLC MIB file into the Getif Mibs subfolder.
2. Start the GetIf application.
3. Select the unit IP address and community strings in the relevant text boxes on the Parameters tab (**Figure 8-9**, Item 1) and click **Start** (**Figure 8-9**, Item 2).
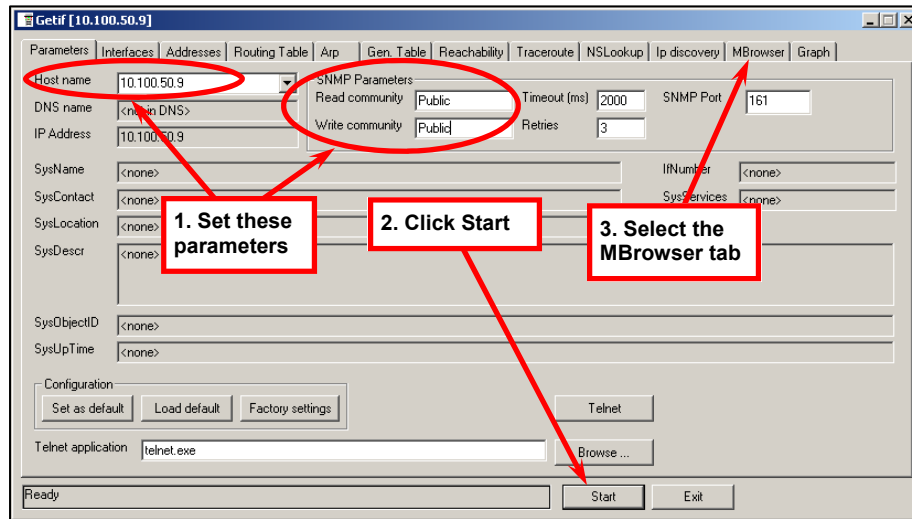4. Select the MIBBrowser tab (**Figure 8-9**, Item 3).

Figure 8-9: GetIF Application Parameters Tab

5. Click on the 'iso' main entity on the MIB tree (Figure 8-10, Item 1), and click **Start** (**Figure 8-10**, Item 2).
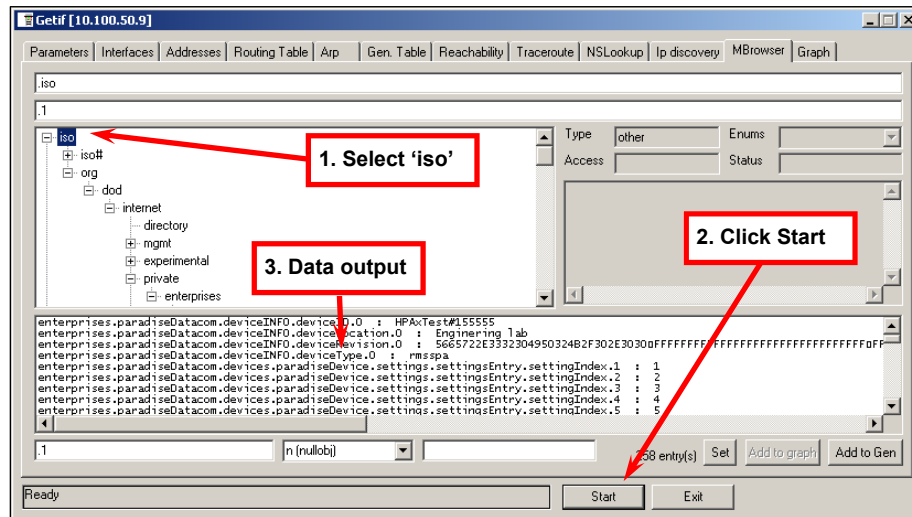6. Update data will be displayed in the output data box (**Figure 8-10**, Item 3).

Figure 8-10: Getif MBrowser window, with update data in output data box

The following pages comprise the documentation package for the Paradise Datacom Mini Compact Outdoor Solid State Power Amplifiers:

Drawing **208142**, Specification Sheet, HPA3-CO Mini
Drawing **208838**, Specification Sheet, HPA3-CO Mini, GaN

See the Paradise Datacom web site at http://www.paradisedata.com for the latest revision of these documents.

Also included are the Block Diagram, Schematic and Outline Drawing for the specific model ordered.