

## **Baby BUC Series**

### **L-Band Baby Block Up-converter (BUC)**



You have just received a Baby BUC (Block Up-Converter), a *cost-effective* product with no compromise on *quality* and *reliability*. This product should provide tireless performance in any reasonable operating environment. Note that this product is transmit only, and does not include a Block Down-Converter, which will have to be obtained separately.

We, at AnaCom, have taken great care to provide a convenient, easy-to-use product in a single package. Should a situation arise beyond the operator's control, just give us a telephone call. Many situations can be diagnosed and solved by AnaCom's trained customer-service personnel over the phone.

If you have any questions, require technical assistance or training please call AnaCom directly at (408) 519-2062 or FAX to us at (408) 519.2063. You can also send e-mail to techsupport@anacominc.com and one of our engineers will contact you.

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*Teflon*

*Duroid*

*INTELSAT*

# Operating Manual

for the

## Baby BUC series

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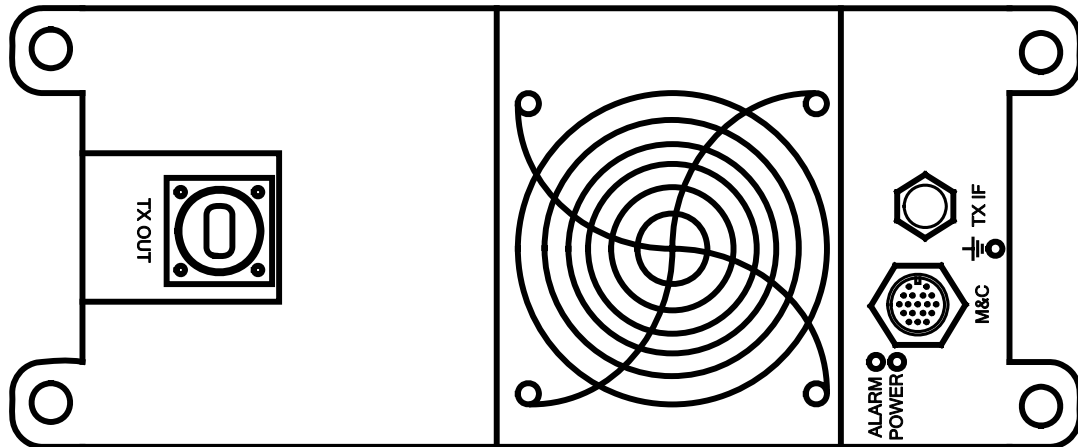
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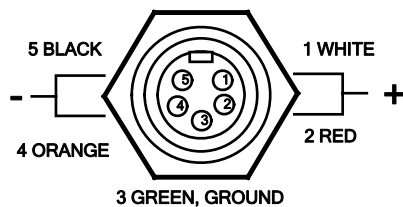
## Baby BUC Quick Start Guide

1. Mount your new compact BUC on the antenna.
2. Connect your PC serial port to the BUC's M&C connector, run DT.exe or Supervisor 2009 on the supplied CD, or your own software if you wish, and configure it to 1200bps, 8 data bits, no parity, 1 stop bit, CR/LF Off. Connection diagrams are in Appendix C of the manual.
3. Install a proper power connector on the included power cable. Plug this cable into the power connector on the side of the BUC, 48VDC if you ordered DC models, or 110 / 240VAC, 50/60Hz if you ordered AC models. Verify that the green LED on the transmitter is blinking, that indicating normal internal operation. The red LED must be OFF, because if illuminated, it indicates an alarm condition and requires attention. Refer to the ALARM command in Appendix A and B of the manual for details.
4. Configure transmit output power as TXGAIN nn ranges from:
 

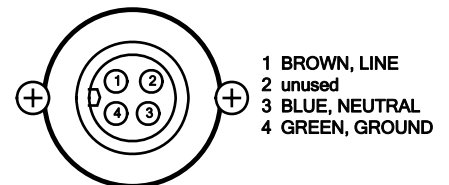
48 to 58 [2Ku]	51 to 61 [4Ku]
54 to 64 [8Ku]	57 to 67 [16Ku]
58 to 68 [20Ku]	59 to 69 [25Ku]
60 to 70 [32Ku]	61 to 71 [40Ku]
5. Enable the transmitter by type in TX ON. TX OFF will take the transmitter OFF air.



### DC POWER MODELS



### AC POWER MODELS



## Introduction

The Baby BUC series is designed for continuous outdoor duty in all types of environments. Ideally suited for SCPC, MCPC, DAMA, and VoIP applications. Designed to interface with any L-band modem, the Baby BUC may be used in a wide variety of communication networks.

The Ku-band Baby BUC family transmit in the 14 GHz frequency band.

Baby BUCs include an L-band up-converter and a solid-state power amplifier (PA), into a small, highly integrated outdoor package. The only cabling required to the indoor plant are the IF and power cables.

The Ku-band Baby BUC up-converts the modulator's L-band IF output to an RF signal in the 14 GHz range for transmission.

The Baby BUC includes an L-band to RF up-converter, a solid-state Power Amplifier (PA), optional M&C, and a universal A.C. power supply, all in a simple outdoor package.

The Power Amplifier (PA) uses Internally-Matched Field-Effect Transistors (IMFET) to achieve highly linear power and gain with minimal intermodulation distortion (IMD) products.

Baby BUCs use a wide input voltage (100 to 240VAC, 47 to 63Hz) switching power supply to develop the +13V used as the internal power source for the power amplifier. An internal circuit senses the input voltage range being used and automatically switches to the appropriate voltage mode. The AC input is connected via a 4-pin circular connector. DC power supplies such as 48V are optional.

Baby BUC can come equipped with an internal 10 MHz reference. If this option is not present, a 10 MHz reference signal supplied on the TX IF cable from the modulator will be required.

Shown in Figure 1 below is an Baby BUC.



*Figure 1 - Baby BUC*

		8W	10W	16W	20W	25W	30W	40W
<b>TRANSMIT CHARACTERISTICS</b>	1 dB COMPRESSION POINT (dBm)	39	40	42	43	44	45	46
	TX GAIN (Nominal ± 10 dB)	64	65	67	68	69	70	71
	TX GAIN RANGE	10 dB variable in 1 dB steps via M&C						
	TX LEVEL FLATNESS	6 dBp-p max / 500 MHz						
	TX GAIN OVER TEMPERATURE	+/- 2dB max						
	TX INPUT IF FREQUENCY	Ku = 1200 to 1700 MHz		Eku = 950 to 1450 MHz			SEKu 950 to 1,700 MHz	
	TX INPUT IF IMPEDANCE	50 ohms (75 ohms optional)						
	TX INPUT IF LEVEL	-25 dBm for rated output with nominal gain						
	TX OUTPUT FREQUENCY	Ku = 14.0 to 14.50 GHz		Eku = 13.75 to 14.25 GHz			SEKu = 13.75 to 14.50 GHz	
	TX PHASE NOISE	-60 dBc/Hz max @ 100Hz -90 dBc/Hz max @ 100KHz		-70 dBc/Hz max @ 1KHz -100 dBc/Hz max @ 1MHz			-80 dBc/Hz max @ 10KHz	
INTERMOD	-30 dBc max (2 carriers, each 9dB backoff from P1dB rating)							
SPURIOUS	-55 dBc max out of band							
<b>REFERENCE</b>	Requirements	Provided on TXIF line by L-band modem						
	FREQUENCY	10 MHz (sine-wave)						
	INPUT POWER	-5 to +5 dBm (at input port)						
	PHASE NOISE	-125 dBc/Hz max @ 100Hz -135 dBc/Hz max @ 1KHz -140 dBc/Hz max @ 10KHz						
	INTERNAL REFERENCE OPTION	10 <sup>-8</sup> over rated temperature						
<b>SYSTEM</b>	ALARM RELAYS	FORM C for Summary Alarm; Isolated						
	POWER	100 to 250 VAC; 47 to 63 Hz						
	M&C	Optional RS-232 / RS-485						
<b>ENVIRONMENTAL</b>	TEMPERATURE	-50 to +55°C operational -50 to +75°C storage						
	HUMIDITY	95% at 45C						
	ALTITUDE	10,000 ft (3,048 meters) max						
	RAIN	20 inches per hour						
	WIND	150 miles per hour						
	VIBRATION	1.0 g random operational, 2.5 g random survival						
SHOCK	10 g operational, 40 g survival							
<b>POWER &amp; DIMENSIONS</b>	TYPICAL POWER CONSUMPTION (VA)	111	121	189	208	256	266	372
	PRIME POWER RECOMMENDATION	220	250	380	400	500	500	750
	WEIGHT: 48V DC	15 lbs (7 kg)						
	110/220V AC	16 lbs (7 kg)						
BUC SIZE: 48V DC	13.3" x 6.3" x 7.4"							
110/220V AC	13.3" x 6.3" x 8.4"							

## Typical Operating Parameters - Baby BUC

## Installation



*Removal of any cover may jeopardize the weather seal, which may cause problems later.*

## Unpacking

Check to make sure that the Baby BUC has not suffered any damage in shipment. Compare contents of the crate to ensure items received match those listed on the packing slip. Retain all shipping containers for future use.

### *Tools and Test Equipment*

Have on-hand a standard electrician's tool kit and any tools listed in your antenna installation instructions.

## Safety Precautions

### *General*



*Observe normal safety precautions when operating this equipment.*

Ensure the Baby BUC is properly grounded. Do not rely on coaxial cable shields for the ground connection.

If the cover is removed from any ANACOM product, ensure that all:

- gaskets are intact and free of damage prior to reinstallation
- mounting screws are properly installed

Ensure all connectors are properly waterproofed.

### *Power Supply*

Confirm that AC Power is disconnected before removing the Baby BUC cover.

### *Transmitter*

Take adequate precautions to ensure the Baby BUC output does not transmit a signal until it has been properly connected and set up for authorized frequencies and power levels.



*Transmitter RF output power levels are adequate to cause blindness or other serious injury to body tissues. Use caution when working around the Block Up-Converter or antenna when the system is active.*

### ***Power Amplifier***

Be sure the Baby BUC TX OUT port is properly terminated prior to operation. Ensure all the correct waveguide gaskets are used to prevent water damage.

TO ENSURE PROTECTION OF PERSONNEL AND EQUIPMENT, USE CARE DURING ANTENNA INSTALLATION AND WHENEVER WORKING ON OR AROUND THE SYSTEM.

## **Site Considerations**

The installation requirements of any particular site are the responsibility of the system operator. AnaCom offers an optional installation mounting kit, that can be used at most sites. Contact AnaCom for details.

### ***Antenna***

The Baby BUC must be attached to some form of mounting structure which is usually the antenna feed boom or the antenna support structure. Specific mounting procedures will depend on the antenna used. The Baby BUC is designed to be mounted on most antennas. Locate and install the antenna according to the antenna manufacturer's instructions. Choose an area that is free of extraneous interference from motors and electronic equipment and has a clear line-of-sight from the antenna to the satellite.

Lightning arrestors should be used at the site to protect personnel and equipment. Size 3/0 or 4/0 stranded copper wire should be used to bond the Baby BUC to the antenna frame and to the lightning protection ground rod.

### ***Power Requirements***

The Baby BUC contains an internal universal AC power supply that supplies both the converter and PA internal subassemblies.

The Baby BUC requires 110 VAC or 220 VAC at 50 or 60 Hz, through a circuit breaker. The size of the circuit breaker depends on model. To assure uninterrupted service, some method of back-up AC power is recommended. Installing surge arrestors and AC power line filters will reduce voltage surges from the AC power input. Provide an isolation filter to clean up power line interference and/or voltage variations, as required.

NOTE: AC TRANSIENTS AND SURGES MAY CAUSE DATA TRANSMISSION ERRORS AND LOSS OF SYNCHRONIZATION IN THE BLOCK UP-CONVERTER SYNTHESIZERS AND/OR THE EXTERNAL MODEM EQUIPMENT.

## Baby BUC Mounting Considerations

The Baby BUC must be mounted such that:

1. Sufficient support is afforded the Block Up-Converter to minimize the effects of antenna sway in strong winds.
2. Air movement is possible across the heat sink fins.

NOTE: The length (and associated RF losses) of the interconnecting cables must be considered when determining the location of the Baby BUC.

## Baby BUC Mounting

The Baby BUC is designed for mounting in any position.

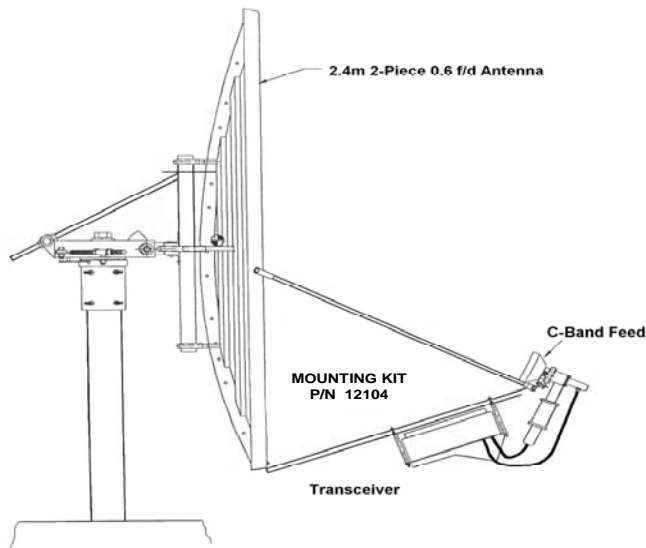


Figure 2 - Typical BUC Mounting

When mounting the Baby BUC, allow enough room to adjust the antenna's azimuth and elevation. Throughout installation and during any polarization, azimuth, or elevation adjustment, ensure the cables and waveguide are not crimped or pinched.

### Grounding

Electrical bonding (grounding) of the Baby BUC is required to prevent possible damage from lightning or other induced electrical surges.

The BUC is provided with both an M3, and a #8 ground point. It is recommended that 000 AWG minimum copper wire or copper braid be used to bond this unit to the earth ground (grounding rod) using the most direct (shortest) route possible.

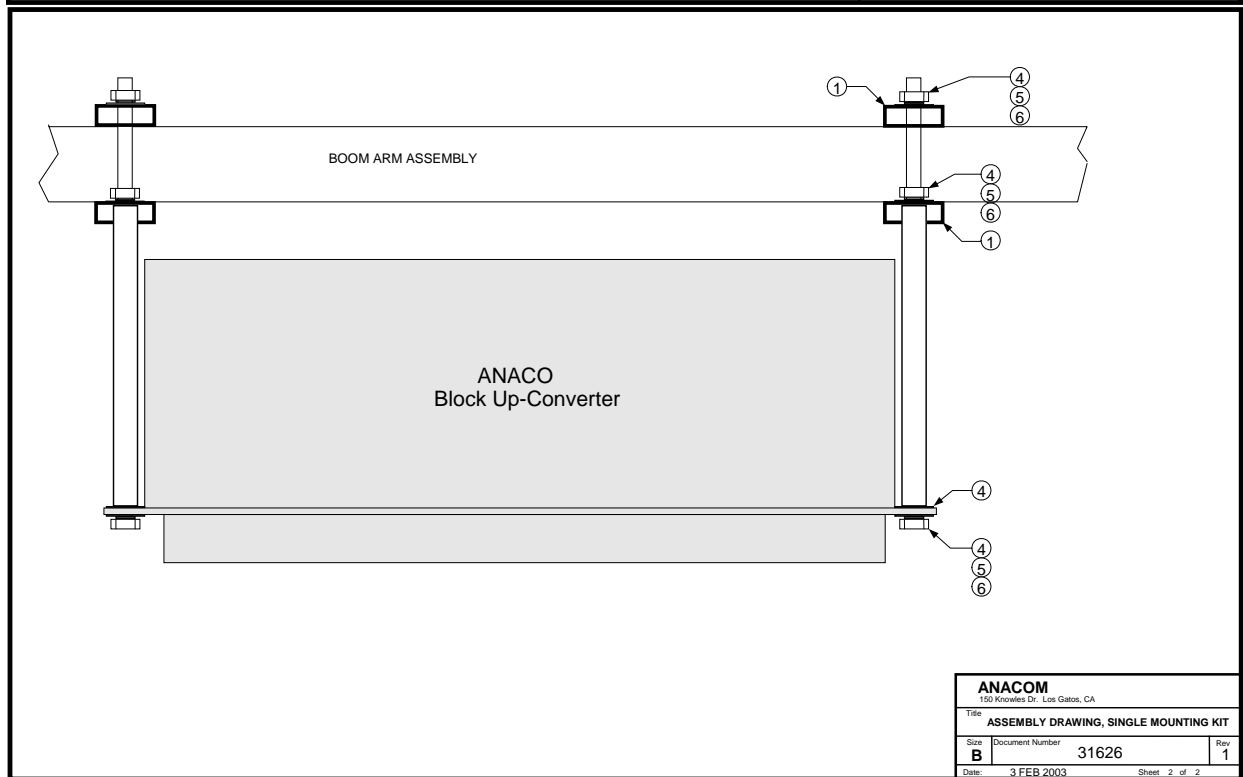
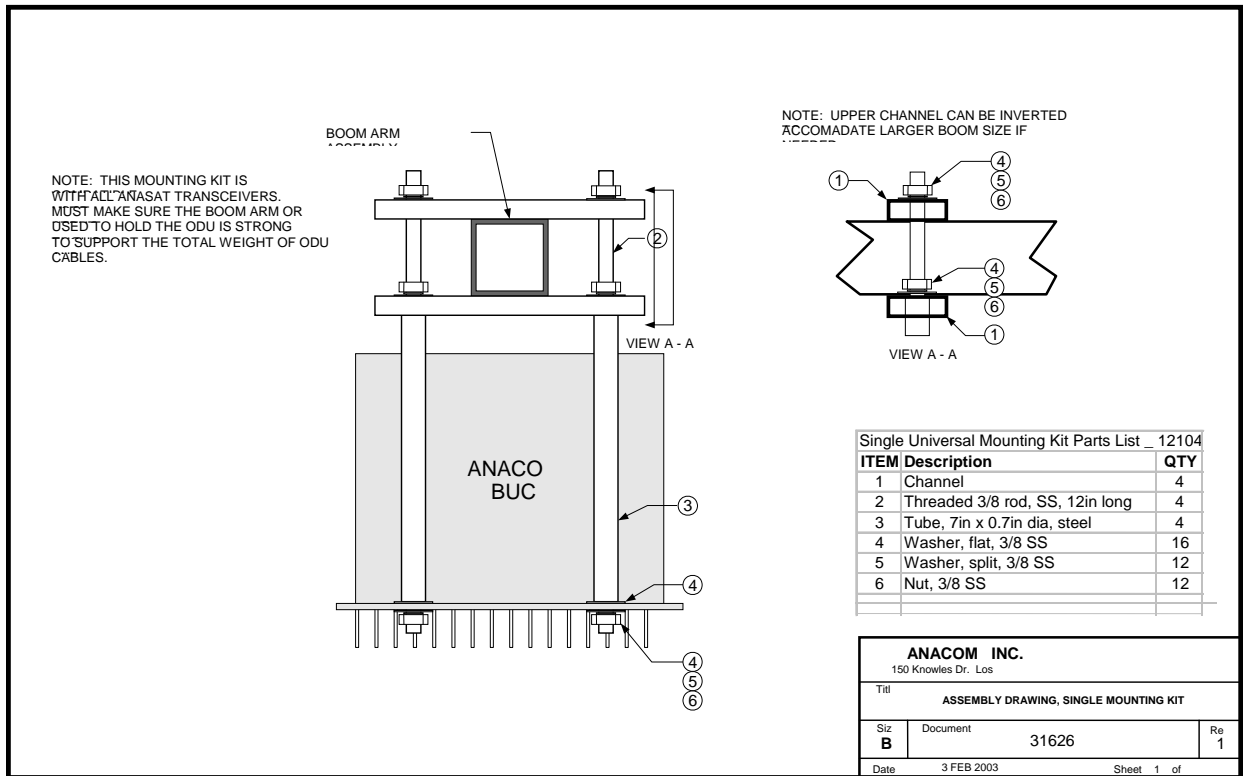


Figure 3 - Front and Side Views of Mounted BUC

## Cable and Waveguide Connections

### *Cabling Requirements*

Local regulations may require that cables in occupied buildings be installed in steel conduit. Local government agencies may waive this requirement for the use of Plenum cables, which are standard cables entirely encased in solid Teflon. Check the codes in your area.

NOTE: EQUIPMENT OUTAGES DUE TO FAULTY CABLE MATERIALS OR INSTALLATION ARE NOT COVERED BY YOUR WARRANTY.

### **1. AC Power**

Attach the AC input cable to the 4-pin connector on the Block Up-Converter, shown in Figure 4. Run the AC cable to the power source *but do not attach*. The supplied power cable has a four-pin weather-tight circular connector attached to one end. The other end is terminated with flying leads. Attach the proper AC power connector for your location to the other end of this cable as shown in Figure 5.

**Color code:**

**Brown.....AC Hot power lead**

**Blue.....AC Neutral power lead**

**Green/Yellow.....Ground**



*Figure 4 - AC Power Connection*

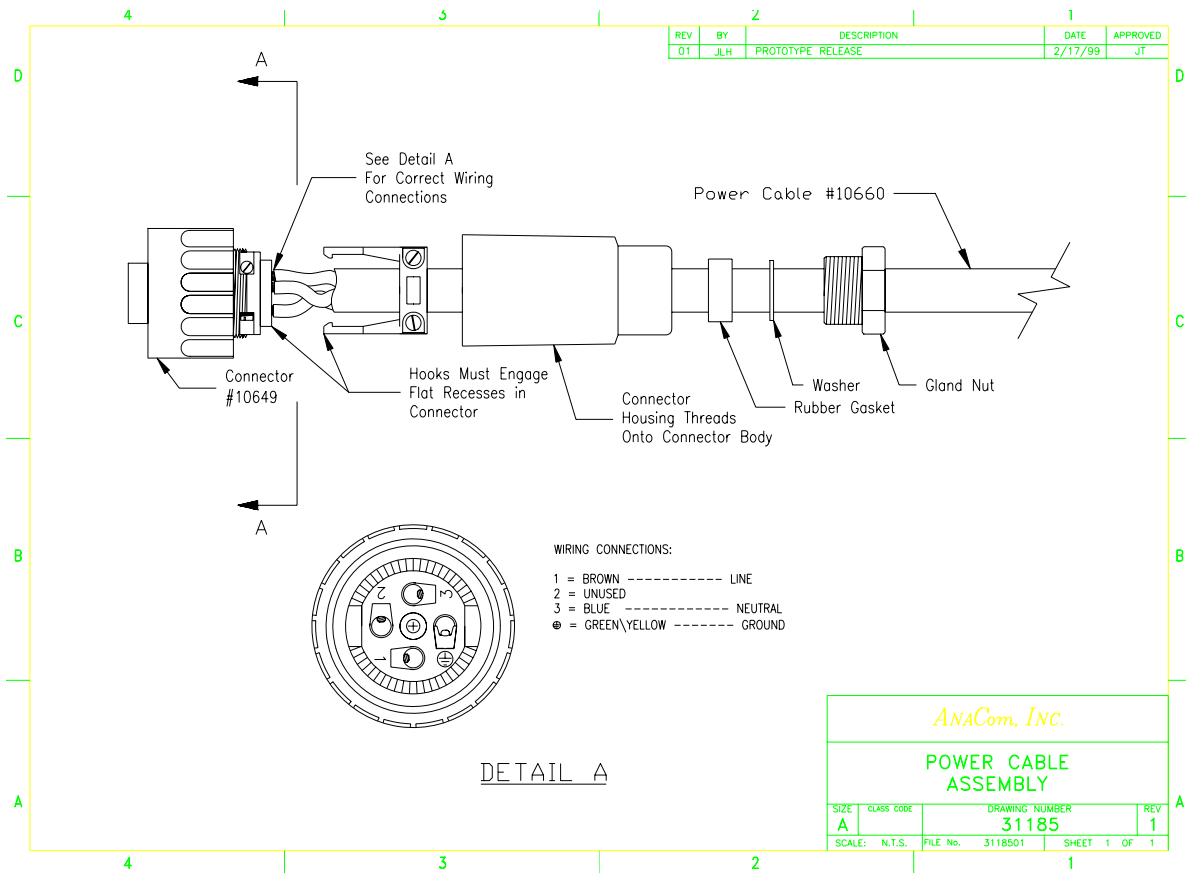


Figure 5 - Diagram of AC power cable

### 1. Transmitter Feed

If using a BUC with an N-type connector output, connect a section of coax between the OMT transmit port and the BUC's transmit port.

If using a BUC with a waveguide flange output port, connect a section of waveguide between the OMT transmit port and the BUC's transmit output, TX OUT. A waveguide should be attached to the antenna feed per manufacturer's instructions. Ensure a gasket is fitted at each flange and that the connections are weather-tight.

### 3. L-Band Modem

Attach a coaxial cable with male N-connectors between the Block Up-Converter's TX IF input and the modulator IF OUTPUT. Make sure that the connections are weather-tight.

If the BUC was ordered without an internal 10 MHz reference, then the L-Band modem is required to provide, in addition to the L-Band IF signal, a 10 MHz reference signal. See **Typical Operating Parameters** for the requirements of the reference source. Note that the accuracy and transmitted phase noise is directly dependent on the external reference. Be sure the IFL cable is well shielded from external interference.

## *Final Check*

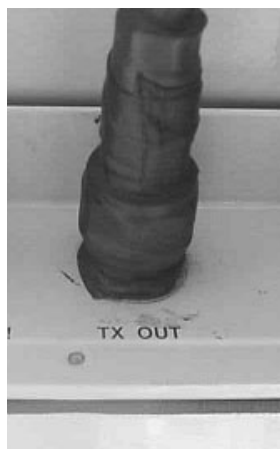
Recheck all bolts and cabling.

After all other connections have been made (TX IF, TX output, and grounding), connect the AC power cord to an active outlet.

## *Water Resistance Wrap*

The application of moisture-resistant wrap (*mastic tape*) to all connectors is recommended to prevent water entry and resultant water damage. See Figure 6. Apply the mastic tape as follows:

1. Ensure that all connectors are tight.
2. Pre-cut the mastic tape to the desired size.
3. Center the tape on the connector to be sealed and wrap the tape tightly around the connector. Squeeze the tape tightly and ensure that both ends of the tape have formed around the connector and the cable.
4. Apply the mastic tape to all connectors that may be exposed to moisture.



*Figure 6 - Mastic Tape Application*

## Operation

After the Baby BUC hardware is mounted and verified, the antenna must be aimed toward the desired satellite. Follow the antenna/mount manufacturer's instructions, using coordinates provided by the satellite operator. Do not transmit until you have received authorization from the satellite network operation center, and a transmit power level from its engineering staff.



*Baby BUC will produce RF output power the moment a modulator is connected and provides input.*

### *Frequency Programming*

Transmit operating frequency for standard C-Band frequencies is calculated with the following formula:

$$f_{TX} = TX\ IF_{IN} + 4900\ \text{MHz} \quad (\text{where } TX\ IF_{IN} \text{ ranges over } 950\ \text{MHz to } 1750\ \text{MHz})$$

Transmit operating frequency for standard Ku-Band frequencies is calculated with the following formula:

$$f_{TX} = TX\ IF_{IN} + 12800\ \text{MHz} \quad (\text{where } TX\ IF_{IN} \text{ ranges over } 950\ \text{MHz to } 1700\ \text{MHz})$$

### *Antenna Adjustment*



*Do not transmit while adjusting the antenna position.*

Follow the antenna manufacturer's instructions for antenna position adjustment. For final alignment, contact the satellite operator and get the correct polarization, azimuth, and elevation of the satellite and also confirm the desired transponder is operational.

### *Transmit Power Adjustment*

Maintaining proper output power is vital for maximizing signal-to-noise ratios over the radio path. Low power levels produce noisy signals; excessive power robs downlink strength from other stations sharing the transponder.

Adjust the modulator output level to attain the desired output power level. Use a calibrated watt meter on the output of the Block Up-Converter for this task.

When transmitting multiple carriers, run the output power with an output level back-off sufficient to meet the spectral density mask requirements.

**Caution:** It is recommended that the Block Up-Converter PA not be driven into saturation for long periods of time.

## Maintenance

Baby BUCs are designed for a minimum of maintenance. Periodic scheduled maintenance is not required. Replacement of the weatherized fan after 7 years is recommended however.

## Fan Replacement

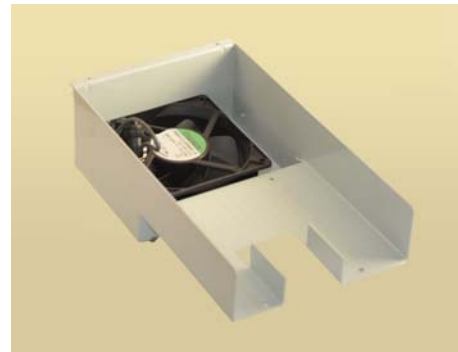


*The ducted fan shroud should NEVER be removed from the ODU while AC power is connected to the ODU. Disconnect AC power before replacing fan.*

Some units come with a weatherized fan and ducted fan shroud assembly that is attached to the PA heatsink, and is outside the block up-converter enclosure. It is fairly easy to remove the shroud from the heatsink in order to replace the fan.



*Figure 7 - Fan shroud removed from ODU*



*Figure 8 - Underside of fan shroud*

The fan comes with a cable and three-prong connector. After the housing has been removed the heatsink, the old fan can be unplugged from the block up-converter heatsink and then removed from the shroud. A replacement fan available from AnaCom, Inc., can then be mounted on the shroud and it's connector plugged into the receptacle on the heatsink. The shroud can then be re-attached to the heatsink using the original screws.



*Figure 9 - Integrated fan and cable assembly*

## Alarm Relay Closure Option

If this option is installed, a mechanical relay is used in the Baby BUC for alarm indication. The red LED mounted on the Baby BUC is illuminated whenever a problem exists and the relay has closed.

The alarm relay has normally closed contacts, so it defaults to the alarm state when power is off.

### Monitored Values

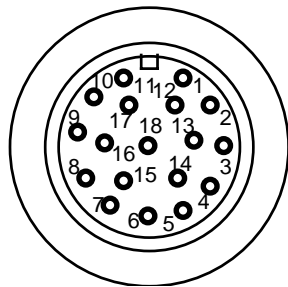
The following internal points are monitored and can result in Alarm closure if out of range:

- PA temperature
- -5V DC supply (used as a bias voltage in the power amp stages)
- Each individual PA power supply
- Main +13V DC supply
- Synthesizer Lock detect
- Cooling fan failure (on units equipped with a fan)

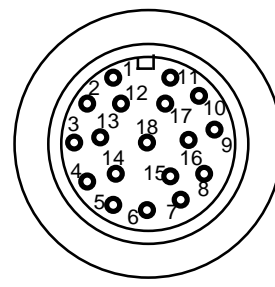
### 18-Pin Circular Weathertight Connector

An 18-pin circular connector is used for monitoring the alarm C-Form relay. Only some of the pins are used, but the same connector is used to maintain consistency with the protection switch used in the AnaSat<sup>®</sup> product line. If the optional M&C serial port function is installed, see the AnaSat user manual for pin definitions and serial control commands.

Note dimple next to Pin 1



*Cable End View*



*Cable Wire View*

Pin	Signal	Description
4	NO	Alarm Normally Open
5	NC	Alarm Normally Closed
6	C	Alarm Common
7	P13V	+13V CD Power (powers protection switch)
13	Mute	Ground to turn off the TX output
18	Ground	

The *Cable End View* refers to looking into the end of the connecting cable; the *Cable Wire View* refers to looking into the connector on the BUC.

## LIMITED WARRANTY

If this product should fail due to defects in materials or workmanship, AnaCom, Inc., will, at its sole option, repair or replace it with new or rebuilt parts free of charge for a period of two (2) years from the date of shipment from the AnaCom factory. This warranty covers only failures due to defects in materials and workmanship that occurs during the period of the warranty. It does not cover damage that occurs during shipment, failure caused by operation of the product outside the published electrical or environmental specifications, or malfunctions caused by misuse of the product. Expendable components are not covered under this warranty.

In order for the customer to exercise their rights to repairs under the warranty, the customer must first contact AnaCom to obtain a repair authorization number (RMA). If it is necessary to return the product for repair, the customer is responsible for paying the cost of shipping it to AnaCom. AnaCom will pay the cost of shipping the product back to the customer when the repairs are completed. All import duties, customs fees, taxes of any kind, or any related fees are the sole responsibility of the customer.

Spare parts, repairs, or replacements are warranted to be free from defects in material or workmanship for ninety (90) days or the remainder of the limited warranty period, whichever is longer.

There are no express or implied warranties except as listed above. In no event shall AnaCom be liable for special, incidental, or consequential damages arising from the use of this product, or arising out of any breach of this warranty. All express and implied warranties, including the warranties of merchantability and fitness for a particular purpose, are limited to the applicable warranty period set forth above. No employee or representative of AnaCom is authorized to modify this warranty or AnaCom's standard warranty for any product.

Non-warranty repair service is available from AnaCom for a nominal charge. Non-warranty repair service can be obtained by contacting AnaCom and requesting a return authorization number (RMA), as described above. The customer is responsible for paying the cost of the shipping to and from AnaCom for any non-warranty repairs. Non-warranty repair service will be available for any AnaCom product for a minimum of five years from the date of its first shipment from AnaCom's factory.