Norsat International Inc.

Operator Manual

ATOM Ku GaN 20/40/80W BUC&SSPA

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Operator's Manual

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Technical Support

This manual provides engineers with information necessary to operate the applicable system. Technical support is available from Norsat.

Norsat International Inc.
Attn: Technical Support
110 – 4020 Viking Way
Richmond, BC
Main: 1 (604) 821-2800
Support: 1 800 644 4562
sat.support@norsat.com

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1. Introduction

1.1 OVERVIEW

This operator's manual applies to all ATOM SSPAs and BUCs with the following marketing numbers:

ATOMBKUGxxx (020/040/080W)

ATOMSKUGxxx (020/040/080W)

1.1.1 BUC - Block Up Converter and Amplifier

If this unit is a BUC, the IF input signal is upconverted to Ku-Band RF frequencies and then amplified to the specified power.

1.1.2 SSPA – Solid State Power Amplifier

If this unit is a SSPA, the RF input signal is amplified to the specified power.

1.2 FEATURES

1.2.1 Inputs and Outputs

Table 1-1: Input and Outputs

	20W / 40W / 80W
Input Type	Female N-Type Connector (BUC)
Output Type	Waveguide WR75 (Standard) Waveguide WR62 (Wide Band Option) *Adaptors are available to convert output type to SMA, TNC, or N-Type connectors. Please contact Norsat for more information.)*

1.2.2 Electrical Interface

- M&C Connector – a ten-pin connector is used to interface with a host computer. See Section 2.3 J2 – Monitor and Control Interface for detailed description of the pinouts.
- Ethernet Connector – a six-pin connector is used to update the firmware and communicate with the BUC/SSPA through the web-based ATOMControl interface. See Section 2.4 J3 – Ethernet port for detailed description of pinouts.
- Power Connector – DC Units use a four-pin connector to provide power to the ATOM. See Section 2.6 J4 – DC Power for detailed description of pinouts.
- Ground Terminal – a #10-32 screw is used to ground the chassis during use.

1.3 Absolute Maximum Ratings

Table 1-2 Absolute maximum Ratings

Parameter	Rating
IF/RF Input Power	BUC: -10dBm (Digital Attenuator set to 0dB) SSPA: 0dBm
RF Output Power	ATOMBKU020 / ATOMSKU020: 43dBm ATOMBKU040 / ATOMSKU040: 46dBm ATOMBKU080 / ATOMSKU080: 49dBm
DC Input Voltage	+56V
DC Input Current	ATOMBKU020 / ATOMSKU020: 5.5A ATOMBKU040 / ATOMSKU040: 10.5A ATOMBKU080 / ATOMSKU080: 20A
Mute Control Voltage	+5V
Baseplate Temperature	75 °C

1.4 Cautions and Warnings

WARNING	
	**Leakage Current** The ATOM may exhibit high leakage current during use. Ensure that the ground terminal is grounded according to local electrical codes prior to powering on the ATOM.

WARNING	
	**RF Radiation Hazard** The ATOM emits high power RF energy which is harmful to the human body. Do not operate ATOM unless the RF output flange is either terminated in an RF load (100W min) or connected to the feed of a terminal. Do not obstruct the RF output or feed output with any body part.

WARNING	
	**Do not allow equipment to be standing in water.** While the BUC/SSPA is designed to be used outdoors, the equipment is not designed to operate in standing water. Failure to follow this precaution could result in electric shock and injury to persons.

CAUTION	
	Do not allow any items to fall into the unit from the waveguide opening.

CAUTION	
	Apply voltage to the AC/DC input connector only as specified in the original configuration of this unit. Application of a voltage outside the specified range may cause the unit to become damaged or non-functional.

2. Interface Control

2.1 Introduction

The unit has four connectors on the input side of the housing and one waveguide port on the output side. The interface for these connectors is detailed in this document.

On the input side, there are the following connectors:

- J1 – IF or RF Input; N-Type Jack
- J2 – Ten-pin circular shell size 12 Amphenol connector for M&C (RS232/RS485)
- J3 – Six-pin circular shell size 10 Amphenol connector for Ethernet
- J4 – Four-pin circular shell size 12 Amphenol DC power connector
- J6 – Ground terminal

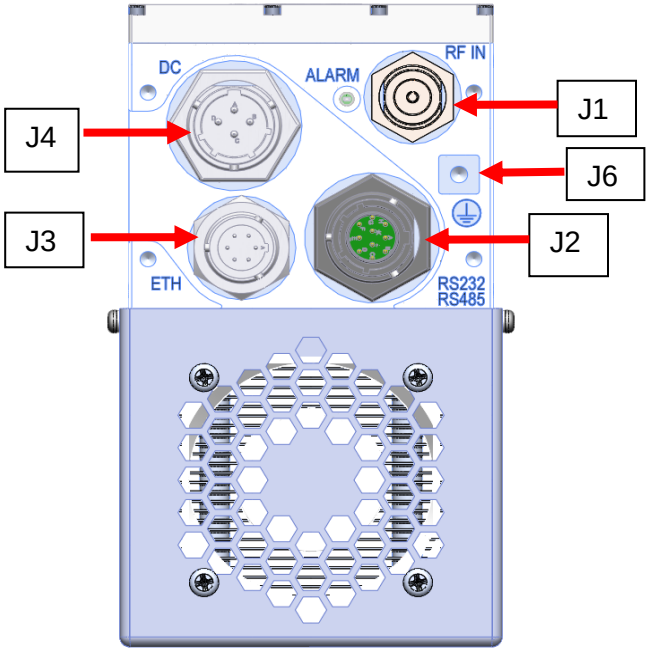

Figure 2-1: Input Connections for ATOM Ku GaN BUC Unit
(N-Type Jack Shown)

On the output side, there is one connector:

- J5 – WR75 waveguide RF output
- J5 Option: WR62 waveguide RF output for wide band

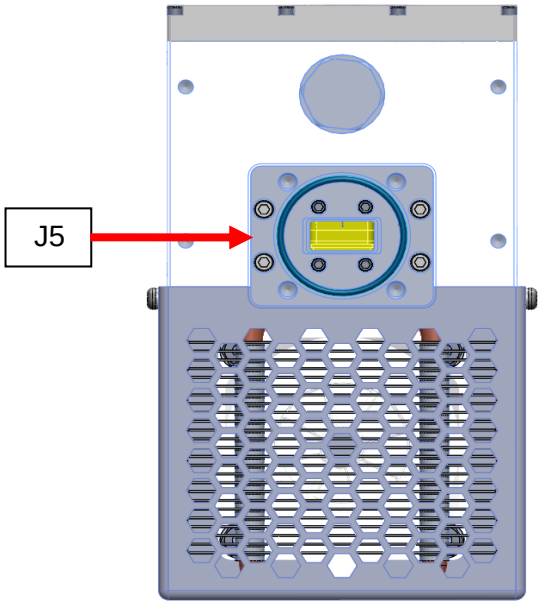

Figure 2-2: Standard Waveguide WR75 Output for ATOM Ku GaN Unit

2.2 J1 – IF/RF Inputs

2.2.1 BUC

The IF input is a 50 ohm type-N connector. The input is to be applied here (950-1700 MHz for Extended Band; 950-1450 MHz for Standard Band). Also, the 10 MHz signal input is diplexed onto this line. Therefore, the IF signal and 10 MHz reference are both traveling on this line.

The IF input has a digital attenuator integrated, which allows the user to reduce BUC's gain level and increase maximum IF input power. Default attenuation is set to 0dB, see **Table 2-6: Command Summary** for more information about getting and setting attenuation values.

The power level of input IF signal should not exceed the absolute maximum rating in **Table 1-2**. The connector is DC-blocked. Do not exceed +/- 50VDC on this port.

The 10-MHz signal should be accurate within +/- 1ppm, otherwise the BUC may have difficulty phase locking to it. The 10-MHz should be free of sideband spurs, particularly close-in (under 100 kHz), as these may also cause failure to lock. Power level of the 10 MHz reference signal should be in +/-5 dBm.

2.2.2 SSPA

In the SSPA-only configuration, this is the RF input. It is a precision type-N connector, with performance to 18GHz. No 10 MHz reference is required for SSPA-only operation.

2.3 J2 – Monitor and Control Interface

The M&C interface is used to control the unit with a host computer. All on-board sensors are accessed through this interface. Use of this connection is optional. Each ATOM is supplied with a mating connector for the M&C interface.

2.3.1 Monitor and Control Interface Pinout

The M&C interface is a ten-pin miniature circular connector. This connector is a MIL-C-26482 Series 1 receptacle, shell size 12, 10 pin (Amphenol® part number 58-533723-10P). A mating connector is Amphenol® part number PT06E-12-10S-476. A range of compatible part numbers for the mating connector may be used to add options to the plug such as right-angle, stress relief clamp, metal color/finish, etc. Please contact the connector manufacturer for more information and/or refer to Amphenol® catalog 12-070.

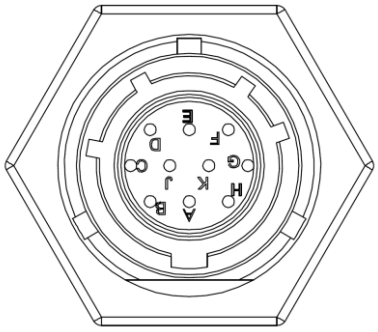

Figure 2-3: J2 M&C Connector Pin Arrangement

Table 2-1 summarizes the various pinout for the 20-40-80W ATOM Ku GaN.

Table 2-1: J2 Pinouts for ATOM Configurations

Connector Pin	Standard Configuration	Connector Pin	Standard Configuration
A	RS-485 Rx-	**F**	RS-232 Rx
B	RS-485 Rx+	**G**	GND
C	RS-485 Tx+	**H**	Open
D	Mute	**J**	RS-485 Tx-
E	RS-232 Tx	**K**	Open

Ground Pin(s): Pin G

Ground/shield for Ethernet, RS-485, RS-232 & Mute signals. This is internally connected to the case ground. Do not exceed 100mA.

Mute Control: Pin D

This pin controls the hardware mute state of the ATOM. When muted, the power transistors are turned off, reducing power consumption and providing an RF output noise close to the thermal noise floor.

The operation of this pin is fully configurable through the M&C Interface. Pin D can be biased with either an internal Pull-Down (to 0V) or an internal Pull-Up (to 4V). Pin D is also configurable to be either active high (3-5V on Pin D will mute the unit) or active low (0-0.8V on Pin D will mute the unit). All voltages are relative to Pin G or the Case Ground.

Because of the configurable pull-down / pull-up resistor, the unit can be configured to be active (i.e. not muted) when Pin D is left floating. Therefore, it is possible to operate the unit with no connection pin D.

The ATOM mute control behavior is shown below in **Table 2-2**. Note that the ATOM may be factory ordered with alternate configurations, so the Default configuration shown in the table is not reflective of all ATOM units.

Table 2-2: ATOM Mute Control Behavior

Configuration	Mute Line Polarity	Mute Line Bias	Sample Input 1	Sample Mute State 1	Sample Input 2	Sample Mute State 2	Sample Input 3	Sample Mute State 3
Default	0V = Unmute	Pull-Down	0V	Unmuted	5V	Muted	Floating	Unmuted
Sample 1	0V = Unmute	Pull-Up	0V	Unmuted	5V	Muted	Floating	Muted
Sample 2	5V = Unmute	Pull-Down	0V	Muted	5V	Unmuted	Floating	Muted
Sample 3	5V = Unmute	Pull-Up	0V	Muted	5V	Unmuted	Floating	Unmuted

Note that the ATOM mute state can also be controlled through the M&C interface. The software mute setting takes priority over the hardware pin. Refer to Section 2.7 for details.

RS-485 Port: Pins A, B, C, J, G

These five pins form a standard four-wire RS-485 serial port, with Rx+, Rx-, Tx+, Tx-, and serial port ground. Since communication with the ATOM is only half duplex, it is possible to deploy the ATOM on a two-wire RS-485 network by connecting the Tx+ & Rx+ and Tx- & Rx- wires together.

Tx+ and Tx- are the differential pair which carries a signal from the host computer to the unit. Rx+ and Rx- are the differential pair which carries a signal from the unit to the host computer. Connect these to the host computer RS-485 port accordingly.

RS-232 Port: Pins E, F, & G

These pins form a standard RS-232 serial port. Pin F carries a signal from the host computer to the unit and Pin E carries a signal from the unit to the host computer. Pin G must be connected to the ground pin on the host computer.

2.4 J3 – Ethernet Port

ETHERNET PORT PINOUT

The Ethernet port is a six-pin circular connector. The connector is a MIL-C-26482 Series1 receptable, shell size 10, 6 pin (Amphenol® part number 58-533722 -06P). A mating connector is Amphenol® part number PT06E-10-6S-476. A range of compatible part numbers for the mating connector may be used to add options to the plug such as right-angle, stress relief clamp, metal color/finish, etc. Please contact the connector manufacturer for more information and/or refer to Amphenol® catalog 12-070.

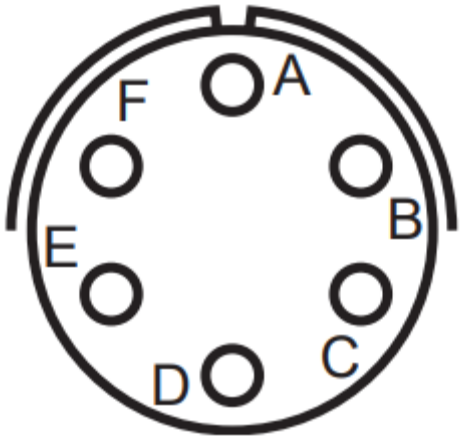

Figure 2-4: J3 Ethernet Connector Pin Arrangement

Table 2-3: J3 Pinouts for Ethernet Port

Connector Pin	Standard Configuration
A	Ethernet Tx-
B	Ethernet Tx+
C	Open
D	Ethernet Rx+
E	Ground
F	Ethernet Rx-

2.5 Performing firmware update

Performing firmware update using *Kermit* client by *Ethernet interface* is recommended for firmware versions 2.0.0 or later. For firmware versions older than 2.0.0, use *serial port connection* with *ATOMControl* software.

***ATOMControl** is a program designed for monitoring and controlling Norsat's ATOM Series of BUCs and SSPAs. This software and user manual are available on the Norsat ATOM Series website.*

***Caution:** Always back up the settings of the BUC or SSPA before updating firmware using the latest version of ATOMControl software. Refer to ATOMControl User Manual for how to back up and restore device settings to and from an ATOM configuration file.*

2.5.1 Firmware Update Using Kermit Client by Ethernet

Firmware version 2.0.0 and later running on the BUC or SSPA support firmware update by *Ethernet* interface using *Kermit* client software. ***Tera Term*** and ***HyperTerminal*** are recommended as clients for updating firmware on the BUC or SSPA.

The following illustrates how to configure ***Tera Term*** for firmware image upload. Configuring and operating other Kermit clients are similar.

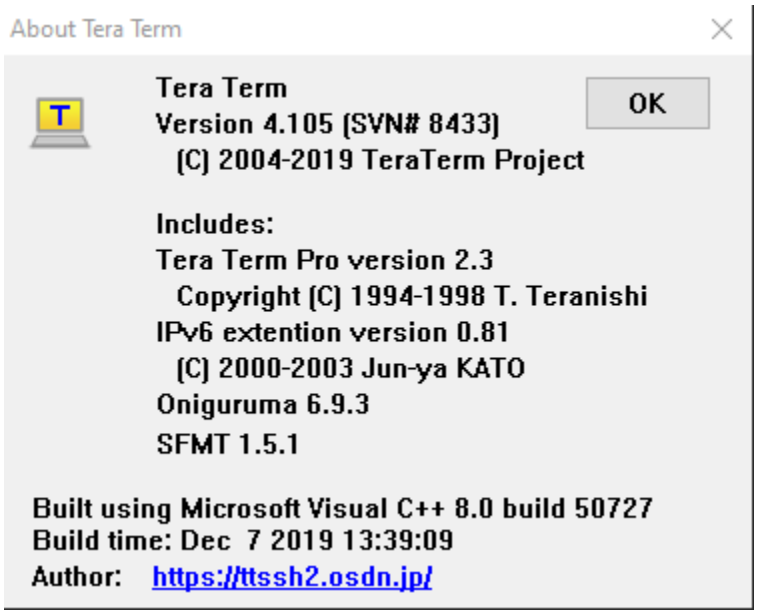

Figure 2-5: Tera Term Client for Firmware Image Upload

Run the ***Tera Term*** software. Select *New Connection* from the menu to configure the target for uploading files.

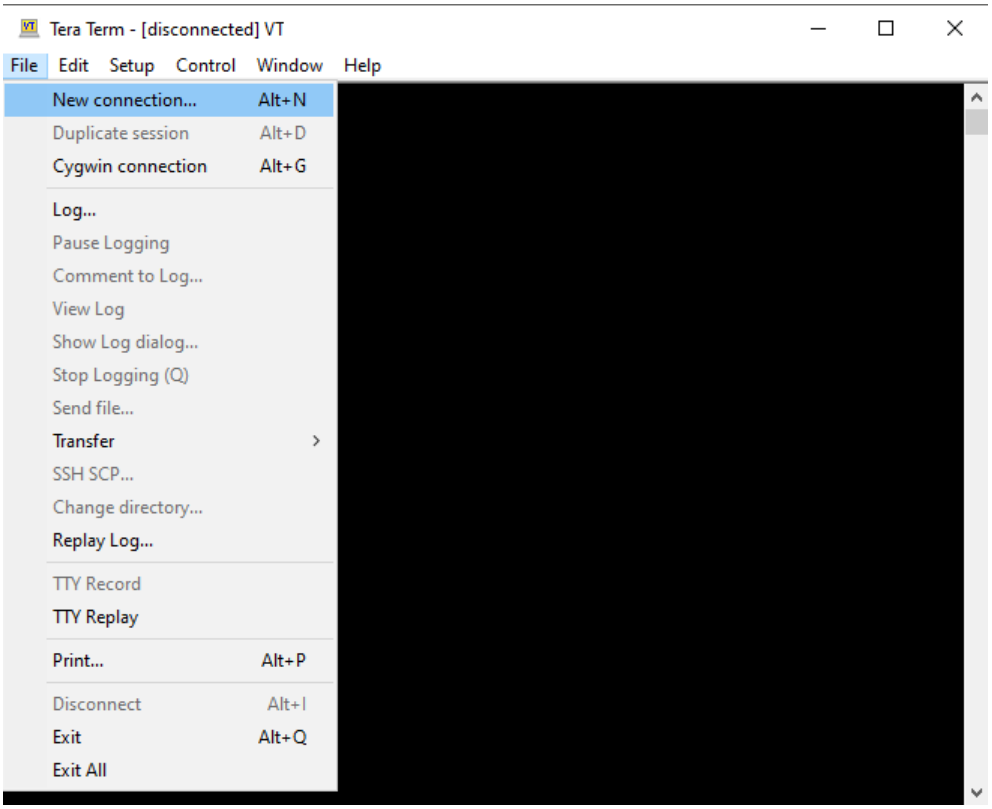

Figure 2-6: Configuring a New Kermit Target for Tera Term Client

The *New Connection* dialog appears. Select *TCP/IP*, fill in *Host IP* and *TCP Port#* as 1649, and select *Other* for Service. Proceed with *OK*.

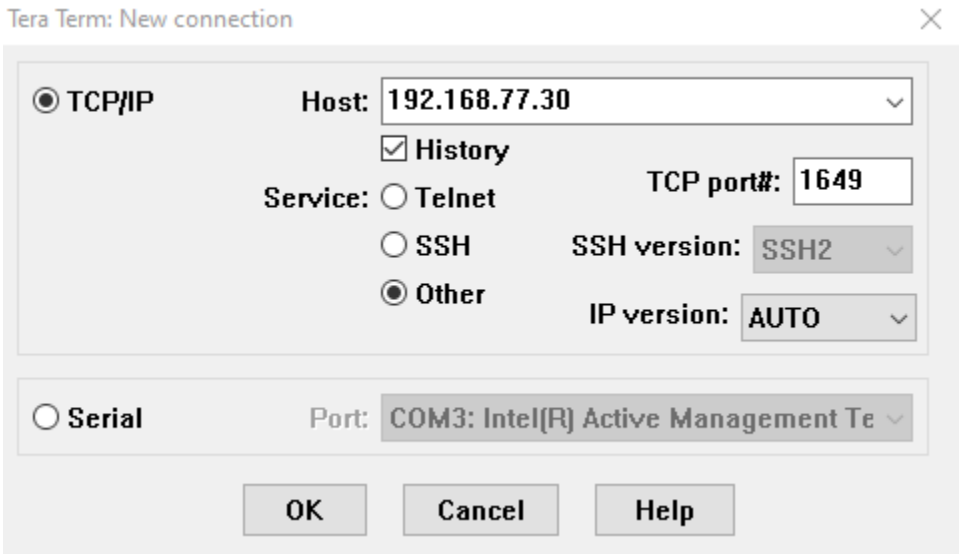

Figure 2-7: Configuring Host, Port, and Service for Tera Term Client

Tera Term is now ready for transferring firmware file to the BUC or SSPA. In the menu, select *Transfer*, *Kermit* and *Send*.

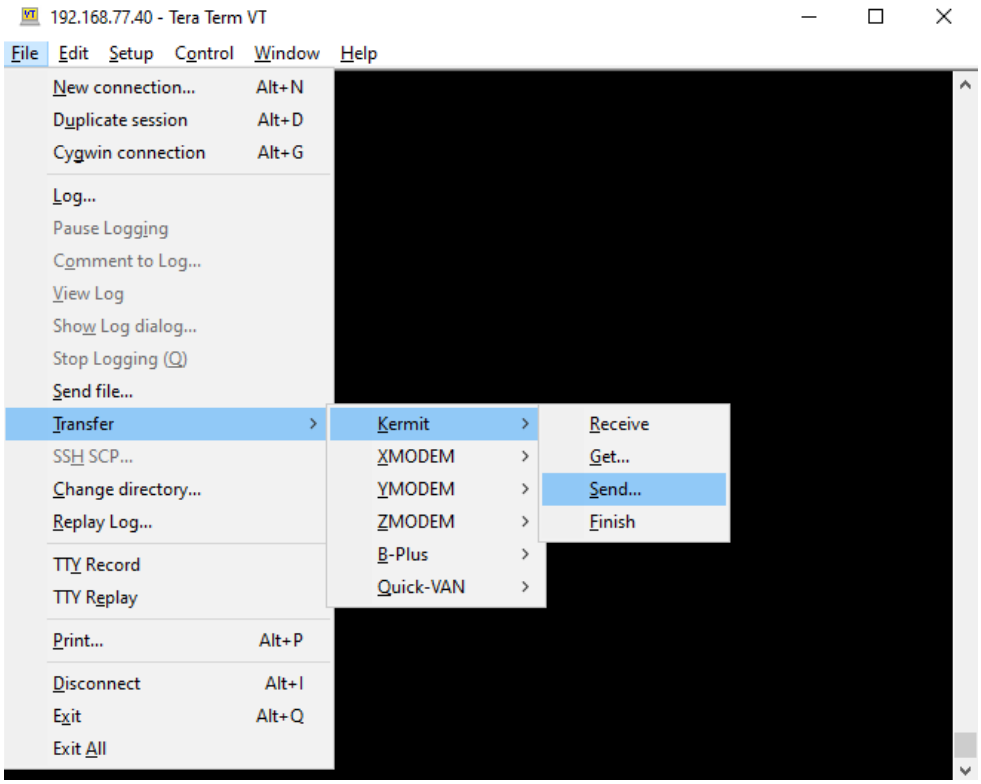

Figure 2-8: Initiate Kermit File Send to the Target ATOM Device

A file selection dialog appears. Locate an official version of ATOM firmware image file. Official ATOM firmware image file name has the format ATOM_KUGAN_FW_APPL_<version>.fwa.

Caution! Uploading a file that is not an official ATOM firmware image will render the ATOM device inoperable on power cycle! Ensure to select an official ATOM firmware image file with <.fwa> extension before sending. Always select an image file for a newer version of ATOM firmware. Contact customer service if you wish to downgrade firmware version.

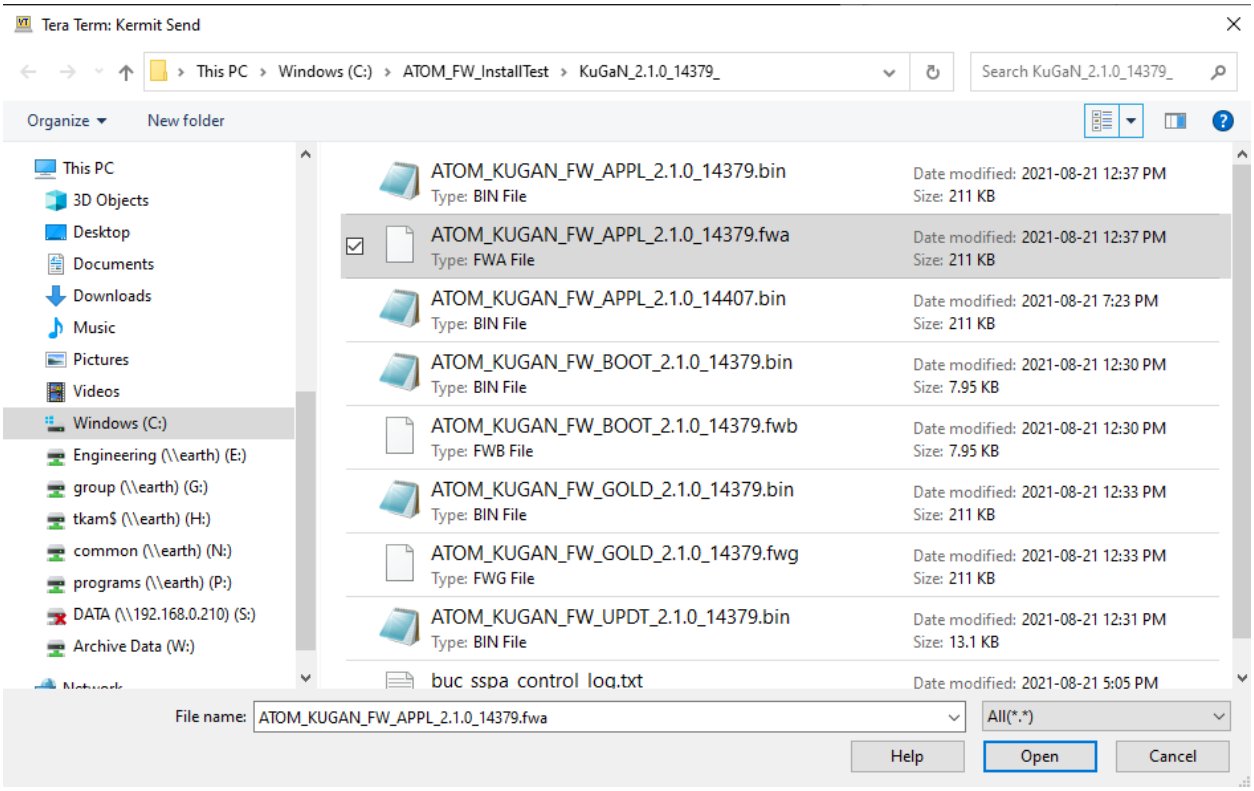

Figure 2-9: Selecting ATOM Firmware Image File for Upload to the Target ATOM Device

Select the *Open* or *Send* button. ***Tera Term*** will proceed with the firmware image upload to the ATOM device.

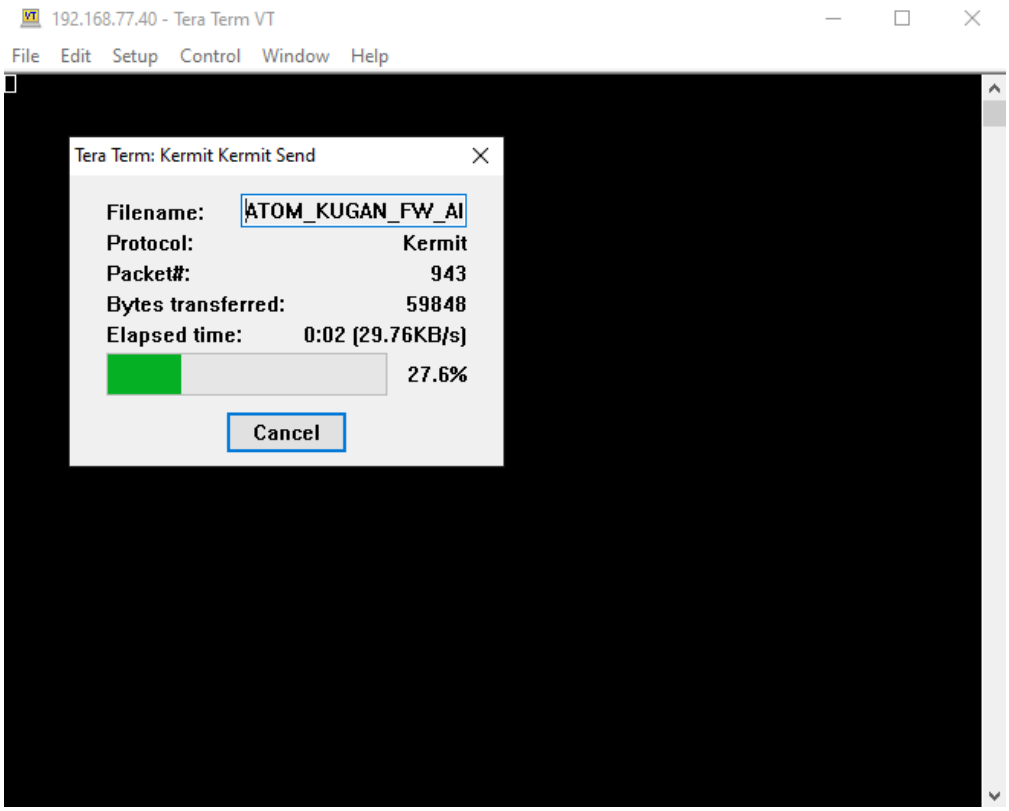

Figure 2-10: Kermit File Transfer in Progress

The transfer dialog closes when the transfer has completed. Power cycle the BUC or SSPA and wait 10 seconds for the new firmware to initiate and start. Verify the firmware version and restore the device setting using the latest version of *ATOMControl* software.

2.5.2 Firmware Update Using *ATOMControl* by Serial Port

When supported by the firmware on the BUC or SSPA, through the M&C interface or Ethernet port, the FW update tab contains controls for performing a firmware update. All the firmware versions will be displayed once the BUC is communicated with ***ATOMControl*** and being initialized.

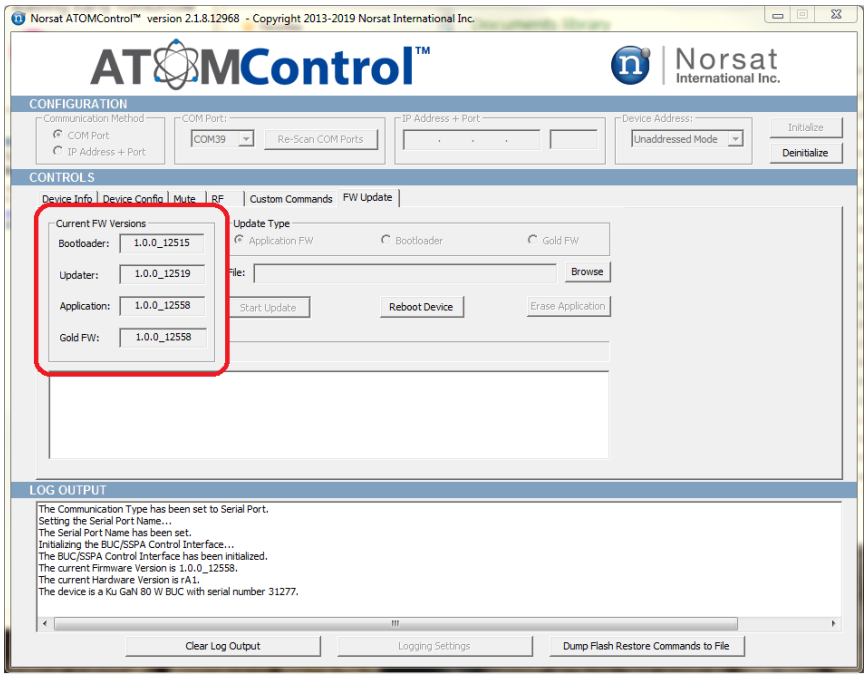

Figure 2-11: Firmware Version from ATOMControl FW Update Tab

Click the Browse button to show the find the Image File Selection Dialog.

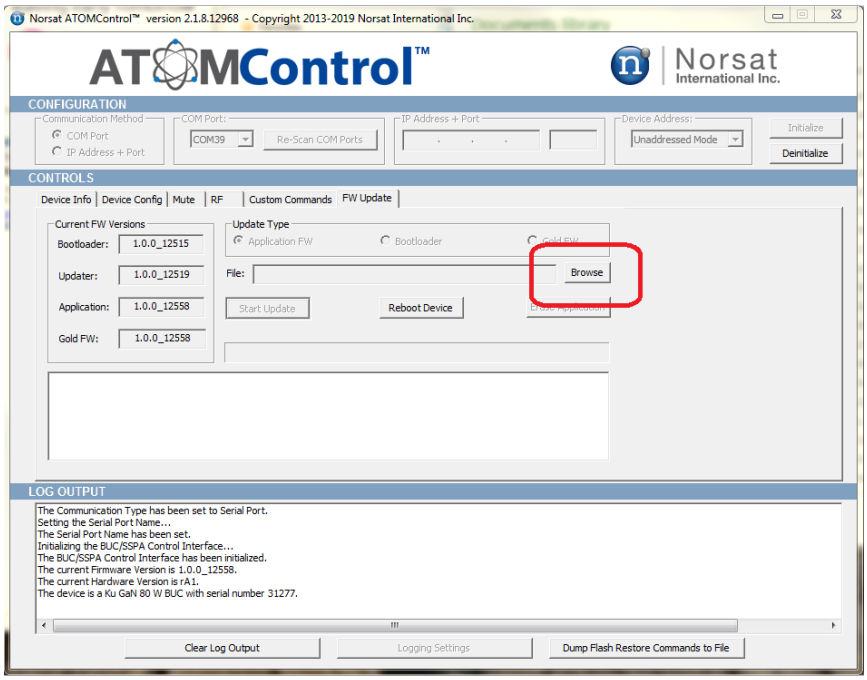

Figure 2-12: FW Image Browse Function

Select the firmware image file from the Image File Selection Dialog for updating on the ATOM Ku GaN device. Click Open to confirm the selection.

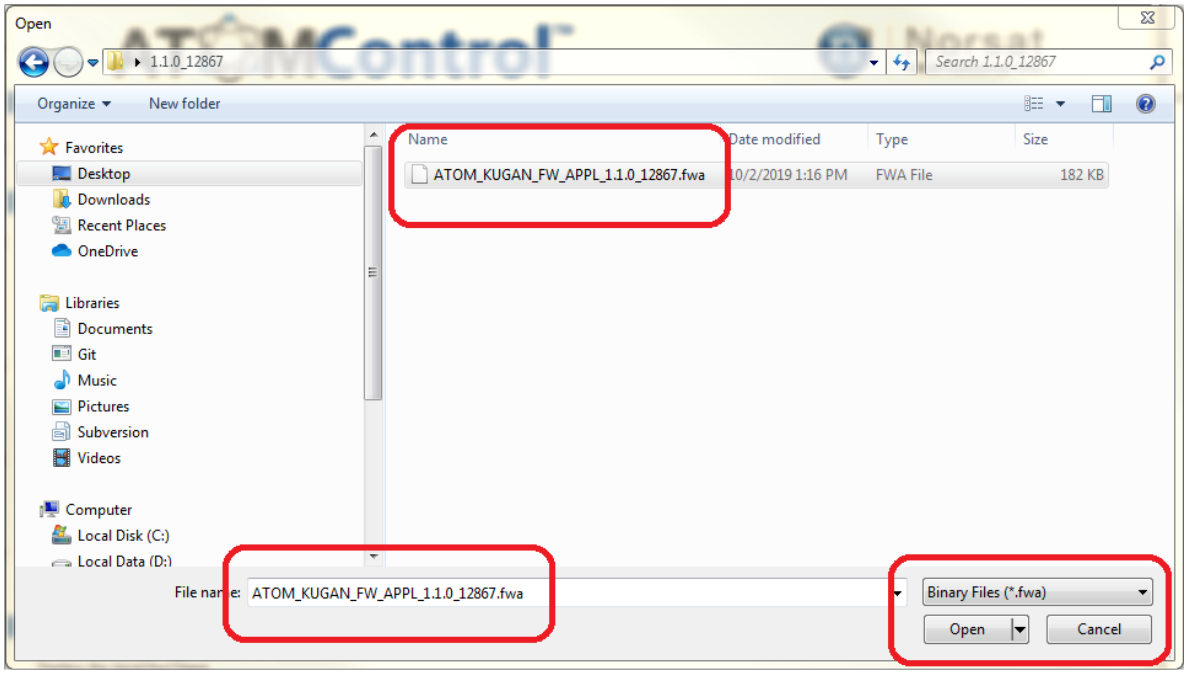

Figure 2-13: Image File Selection Dialog

Figure 2-14: Image File Confirmation and Start Update Function shows the confirmation of the selected firmware image file and the availability of the Start Update function. Click the Start Update button to start the firmware update process.

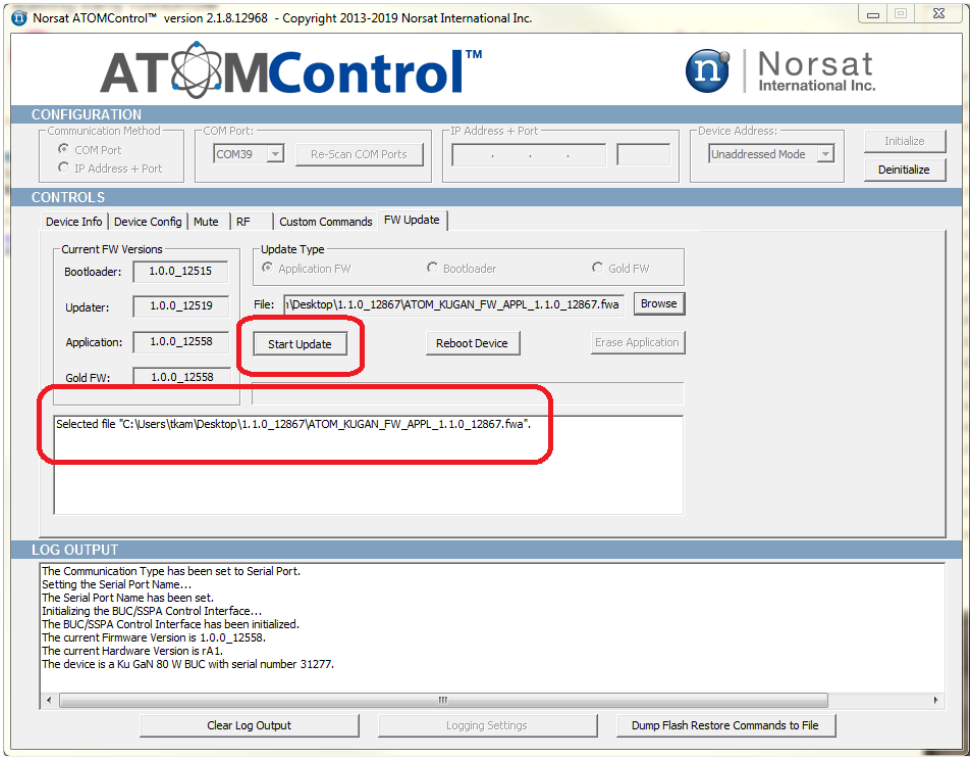

Figure 2-14: Image File Confirmation and Start Update Function

Figure 2-15: Progress Bar Indicates Firmware Update Progress shows the firmware update is in progress. firmware update process takes about one minute. Do not switch off the ATOM-series device while firmware update is in progress.

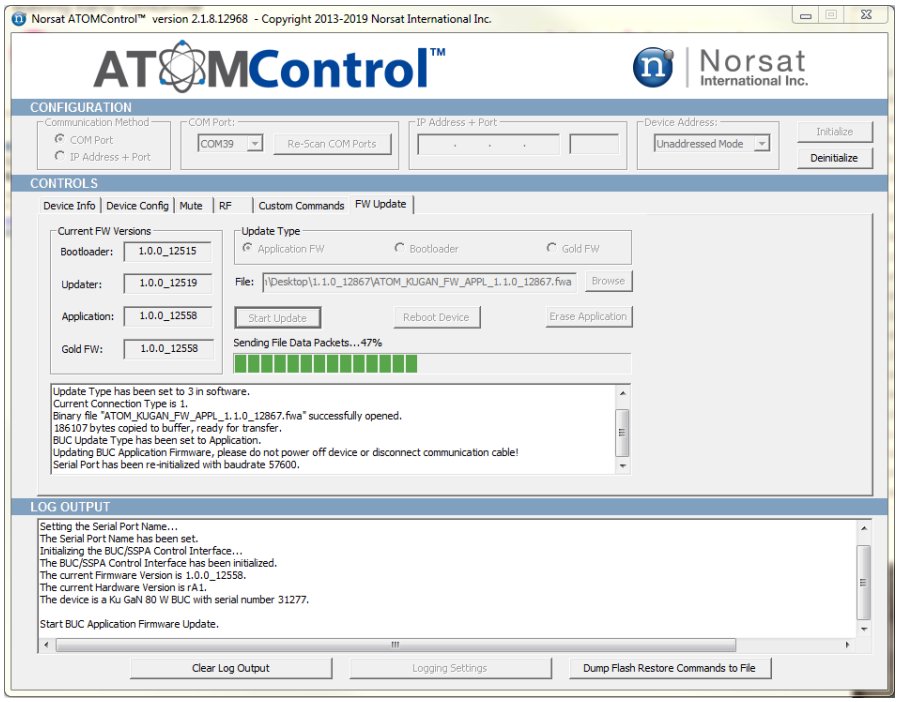

Figure 2-15: Progress Bar Indicates Firmware Update Progress

When the firmware update process is complete, the Atom device automatically resets and reconnect to ATOMControl. The status shows the new version of the firmware is running on the ATOM device.

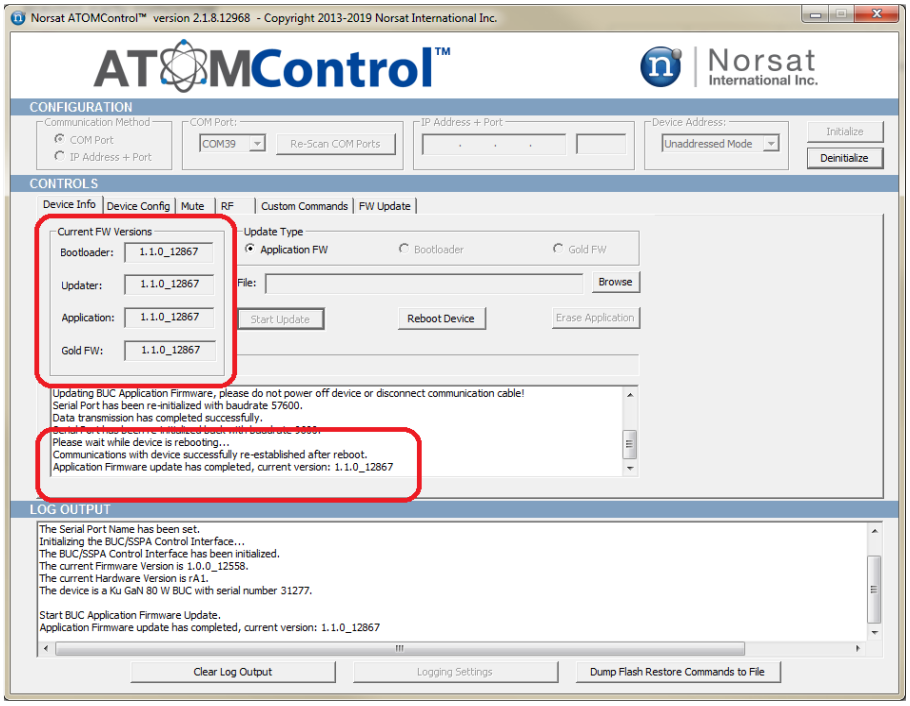

Figure 2-16: Confirmation of Updated Firmware Version

Restore the device setting using the latest version of *ATOMControl* software.

2.6 J4 – DC Power

ATOM Ku GaN power input typically requires +18V to +56V DC power. Refer to specific configuration of the unit for the exact voltage range. Each ATOM is supplied with a mating connector for the power interface.

Power is supplied through a four-pin type cylindrical connector. Two pins are used to deliver the positive connection and two pins are used for the negative connection to reduce resistance. The negative connection is internally connected to chassis ground. The negative power connection may alternatively be applied directly to the ground screw terminal on the aluminum housing.

2.6.1 Connector Type

The J4 connector for the DC input is a four-pin miniature circular connector. This connector is a MIL-C-26482 Series 1 receptacle, shell size 12, 4 pin (Amphenol® 58-533723-04P). The connector is a receptacle with pins and requires the mating connector to be a plug with sockets (e.g Amphenol® PT06E-12-4S-476). A range of plug-compatible mating connectors may be used to add options to the plug such as right-angle, stress relief clamp, metal color/finish, etc. Please contact the connector manufacturer for more information and/or refer to the Amphenol® catalog 12-070.

2.6.2 DC Unit J3 Connector Pinouts

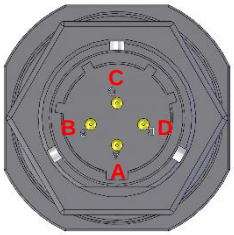

Figure 2-17: DC Unit J4 Connector Pinout

Table 2-4: DC Unit J4 Connector Pinout

Pin	Name
A	V-/Ground
B	V+
C	V+
D	V-/Ground

For the DC input, the positive terminals are pins B/C and the negative terminals are pins A/D. Pins A and D are connected to case ground internally; pins B and C are connected internally. It is recommended to apply the supply voltage evenly to both pairs of pins to evenly share the current among both sets of wires/pins.

The internal capacitance between the V+ and V- terminals is approximately 120 microfarads.

2.7 Serial Port Software Interface

Communications to and from the serial interface is character based. To setup serial port, use any standard “Terminal” program with setup parameters, bits per second: 9600, data bits:8, parity: none, stop bits:1, flow control: none.

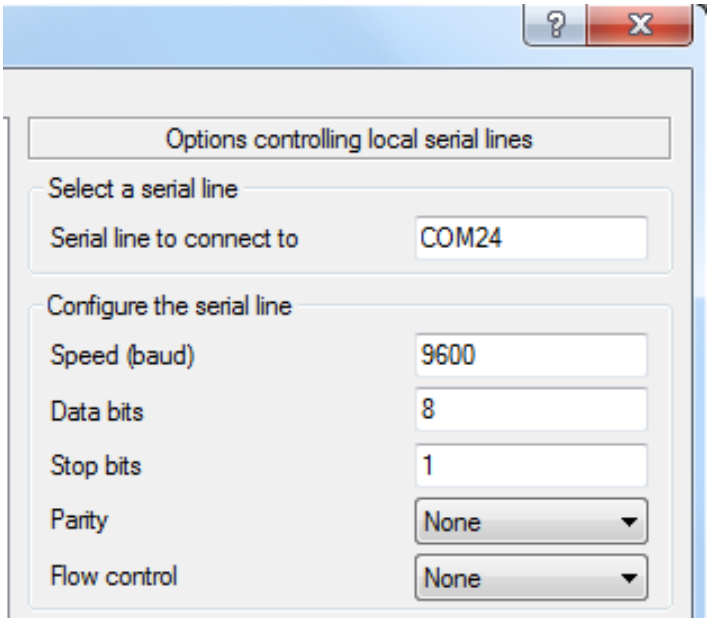

Figure 2-18: Setup Serial Port

2.7.1 Controller Responses

The unit will only generate messages in response to a command. Each command received will result in a single message reply, which may simply be an Acknowledge message.

In general, command responses are returned immediately, though the precise command-response delay varies slightly based on the specific command.

2.7.2 Message Definitions

getident

This command returns the part number, software revision and serial number of the unit.

```
getident
ok pn BUC-KuG80W swver A 2.0.0_13603 sn 22378
```

getstatus

This command instructs the unit to respond with fault flag, forward power and temperature.

```
getstatus
ok fault 0 fwdpwr +47.3 revpwr +39.2 temp 46 unmutetime 308
```

- A “0” after “fault” indicates no faults. A “1” indicates a fault. Use command “getfaults” to determine what fault exists.
- “fwdpwr” is RF Forward Power in dBm. Values are provided with 0.1dBm resolution.
- “revpwr” is RF Reverse Power in dBm. Values are provided with 0.1dBm resolution.
- Temperature is in degrees C. The temperature scale is from –40 to 125 C, with approximately +/- 2 degrees C accuracy.
- Unmute Time in ticks since the device was last muted.

getfaults

This command obtains fault information from the ATOM device, including over temperature fault, PLL fault, power fault, and IF-over-input fault.

For “overtemp”, “PLL”, “power”, and “overinput” faults, a value of 0 means no fault of the specific type has occurred and a value of 1 indicates a fault has occurred.

The “mute” status is controlled by mute-on-fault setting. When mute-on-fault is active, and the device is physically muted, a value of “0” indicates that the muting was not caused by a fault. A value of “1” indicates that the muting was caused by a fault. When mute-on-fault is inactive, “mute” status always shows a value of “0”.

```
getfaults
ok power 0 pll 0 overtemp 0 mute 0 overinput 0
```

getmuteonfault

This command obtains mute-on-fault setting from the ATOM device. Refer to Table 2-6 for more details.

setmuteonfault

This command configures mute-on-fault setting for the ATOM device. When set to on, the device mutes when any fault occurred. Refer to Table 2-6 for more details.

resettempfault

This command manually clears the Over Temperature Fault for the ATOM device if the current System Temperature comes between the device’s temperature Trip Point and Reset Point. This command is ignored and returns “err” if the current System Temperature is between the device’s temperature Trip Point and Reset Point. By default, Over Temperature fault is automatically cleared when the System Temperature drops below the device’s Temperature Reset Point.

There are no comparable commands to clear PLL and Power faults, as they are not manually resettable because they reflect hardware conditions. The device automatically clears these faults when the hardware conditions change.

setmute

This command sets the software mute state of the unit. If the command code is 1, the amplifier will be muted. If the command code is 0, the amplifier mute will be controlled as shown in Section Mute Logic. The mute state can be monitored by examining the MUTE code in the "getfaults" message.

To mute the device

```
setmute cmd 1
ok
```

To unmute the device

```
setmute cmd 0
ok
```

getdat

This command obtains the Input Digital Attenuator information from the ATOM device. The returned value ranges from 0 to 63 for ½ dB step attenuation. **Table 2-5** shows the actual attenuation for (½ dB step) based on the returned value. This command applies only to BUCs, not SSPAs.

Table 2-5 DAT Value vs. Attenuation in dB

DAT Value	Attenuation in dB	DAT Value	Attenuation in dB	DAT Value	Attenuation in dB	DAT Value	Attenuation in dB	DAT Value	Attenuation in dB
0	0.0	13	6.5	26	13.0	39	19.5	52	26.0
1	0.5	14	7.0	27	13.5	40	20.0	53	26.5
2	1.0	15	7.5	28	14.0	41	20.5	54	27.0
3	1.5	16	8.0	29	14.5	42	21.0	55	27.5
4	2.0	17	8.5	30	15.0	43	21.5	56	28.0
5	2.5	18	9.0	31	15.5	44	22.0	57	28.5
6	3.0	19	9.5	32	16.0	45	22.5	58	29.0
7	3.5	20	10.0	33	16.5	46	23.0	59	29.5
8	4.0	21	10.5	34	17.0	47	23.5	60	30.0
9	4.5	22	11.0	35	17.5	48	24.0	61	30.5
10	5.0	23	11.5	36	18.0	49	24.5	62	31.0
11	5.5	24	12.0	37	18.5	50	25.0	63	31.5
12	6.0	25	12.5	38	19.0	51	25.5		

```
getdat
ok value 23
```

setdat

This command specifies the Input Digital Attenuation value for the ATOM device. Valid values range from 0 to 63 for ½ dB step attenuation. Maximum attenuation is 31.5dB. This command applies only to BUCs, not SSPAs.

```
setdat value 42
ok
```

2.7.3 Command Response

The CLI operates on a command response format. Each time a command is entered, a response will be displayed. If a command executed correctly, an “ok” along with potential parameters and values will be displayed. Otherwise, “err” will be displayed along with a description of the error.

The potential errors that may be displayed are:

- Invalid Command – The command was not recognized
- Invalid Parameter – The parameter was not recognized
- Invalid Value – The value was invalid for the command/parameter
- Missing Parameter – A required parameter was not provided

Each command response will have the following format:

```
<CR><LF><msg><CR><LF>
```

where msg is as described above and in the command summary and example tables below. Note that a response is enveloped by leading and trailing <CR><LF> characters. <CR> denotes a Carriage Return character, and <LF> denotes a Line Feed character.

The following table lists the synopsis of some useful commands. See “ATOM Communication Protocol for Ku 20-40-80W SAT-7540” for other commands.

Table 2-6: Command Summary

Command	Param-Value Pairs	Response Format (Enveloping <CR><LF> characters shown)
getident	None	<CR><LF>ok pn <Part Name> swver <A/G> <Firmware Version> sn <Serial Number><CR><LF> where: <part#> = unit part number <A/G> = firmware image prefix (A or G) The device flash contains two firmware images A – primary image is running G – backup image is running <swver#> = firmware version of the running primary or backup image <serial#> = unit serial number
getstatus	None	<CR><LF>ok fault <Fault Status> fwdpwr <RF Forward Power> revpwr <RF Reverse Power> temp <Device Temperature> unmutetime <Running Unmute Time><CR><LF> where: <Fault Status> = 0 (no fault) or 1 (fault condition occurred) <RF Forward Power> = forward RF power in dBm <RF Reverse Power> = reverse RF power in dBm <RF Device Temperature> = system temperature in C <Running Unmute Time> = unit of time unmute since the last mute
getfaults	None	<CR><LF>ok power <Power Fault> pll <PLL Fault> overtemp <Over Temperature Fault> mute <Mute Status> overinput <Over Input Fault><CR><LF> where: <Power Fault> = 0 (power ok) or 1 (power issue) <PLL Fault> = 0 (pll ok) or 1 (error – pll loss of lock) <Over Temperature Fault> = 0 (temp ok) or 1 (error - over temp condition exists) <Mute Status> = 0 (unit unmuted) or 1 (unit muted) <Over Input Fault> = 0 (input voltage ok) or 1 (input voltage too high)
resettempfault	None	<CR><LF>ok<CR><LF> <CR><LF>err<CR><LF> (when system temperature is above trip point)
setmute	**cmd** (0|1) 0 = unmute 1 = mute	<CR><LF>ok<CR><LF>

Command	Param-Value Pairs	Response Format (Enveloping <CR><LF> characters shown)
getmuteonfault	None	<CR><LF>ok value <Mute On Fault><CR><LF> where: <Mute on Fault>= 1 (the device is automatically mute itself if a fault is detected) or 0 (the device is not mute automatically)
setmuteonfault	**value** (0|1) 0 = off 1 = on	<CR><LF>ok<CR><LF>
getdat	None	<CR><LF>ok value <DAT Value><CR><LF>
setdat	**value** (0 to 63)	<CR><LF>ok<CR><LF>

2.7.4 Mute Logic

The unit will be muted when any of the following conditions exist:

1. A software mute command is issued through the serial interface.
2. A mute command/signal is issued through the discrete SHUTDOWN line (Pin D of J2).
3. A fault condition exists.

For mute priorities, software precedes over faults and hardware, and faults precedes over hardware.

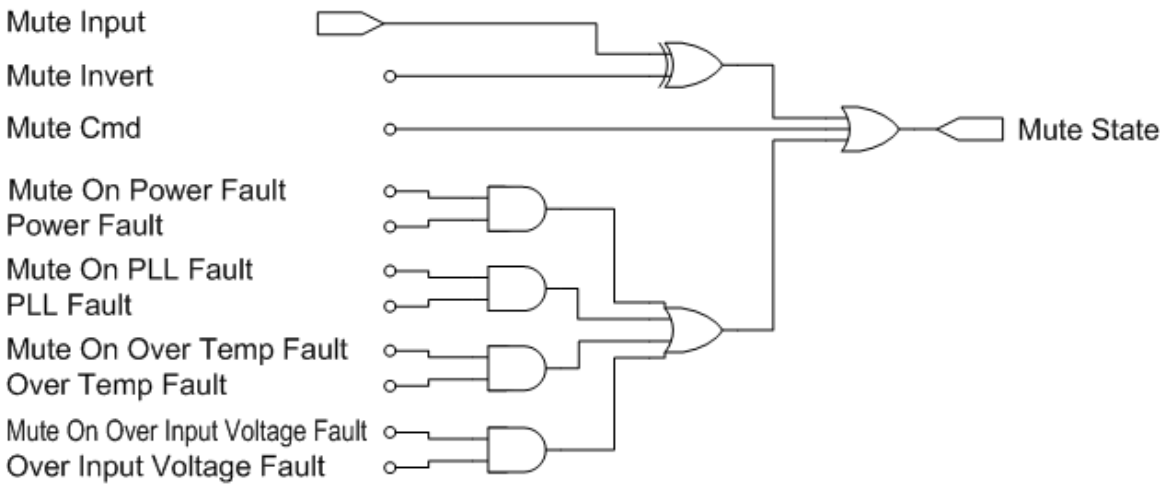

Figure 2-19: The Mute Logic Diagram

2.8 Ethernet Interface (ATOMControl™ Web Interface & ATOM SNMP Agent)

On units equipped with the Ethernet function, an integrated HTTP Web Server allows the user to access a web-based version of the ATOMControl software to control the unit. To access this application, an Ethernet connection to the ATOM-Series device must be established. Currently, the Ku GaN firmware was tested compatible on Google Chrome (Version 80), Firefox (Version 74), and Microsoft Edge (Version 80), but not Microsoft Internet Explorer. An integrated SNMP(v1) agent can be interfaced by the same Ethernet connection to allow NMS monitoring using a NMS/SNMP server or MIB browser.

Note: *In the commands and responses below, <CR> denotes a Carriage Return character, and <LF> denotes a Line Feed character.*

2.8.1 Default IP Address

The default IP Address for the ATOMControl unit is ***192.168.77.30*** and default the subnet mask is ***255.255.255.0***. Ensure the computer's IP Address is on the same logical network and subnet as the ATOM unit (e.g. 192.168.77.XXX, where XXX is any number *except* "30").

2.8.2 Changing the ATOM-Series Device's IP Address

The Ethernet settings for an ATOM-series device can be changed using the device's Command Line Interface. Ensure that a serial connection has been made to the device (refer to Figure 2-12 Setup Serial Port for details), and then use a terminal program or Norsat's ATOMControl software to send the appropriate command(s) to the device. If a valid value is provided to the device, the device's network services will be restarted automatically; no additional action will be required to have the new settings take effect.

To change the device's IP Address:

```
setip ip <IP Address><CR>
```

where **IP Address** is the new IP Address to use for the device.

Example command and corresponding response:

```
setip ip 192.168.77.100<CR>
<CR><LF>ok<CR><LF>
```

To change the device's Subnet Mask:

```
setip mask <Subnet Mask><CR>
```

where **Subnet Mask** is the new Subnet Mask to use for the device.

Example command and corresponding response:

```
setip mask 255.255.255.0<CR>
<CR><LF>ok<CR><LF>
```

To change the device's Gateway Address:

```
setip gw <Gateway Address><CR>
```

where **Gateway Address** is the new Gateway Address to use for the device.

Example command and corresponding response:

```
setip gw 192.168.77.1<CR>
<CR><LF>ok<CR><LF>
```

2.8.3 Recovering the ATOM-Series Device's IP Address

If the ATOM-series device's IP Address, Subnet Mask, or Gateway Address is lost, each of the settings can be recovered using the device's Command Line Interface. Ensure that a serial connection has been made to the device (refer to Figure 2-12 Setup Serial Port for details), and then use a terminal program or Norsat's ATOMControl software to send the appropriate command to the device.

To get the device's Ethernet settings:

```
getip<CR>
```

The corresponding response

```
<CR><LF>ok ip <IP Address> mask <Subnet Mask> gw <Gateway Address><CR><LF>
```

where **IP Address** is the device's IP Address, **Subnet Mask** is the device's Subnet Mask, and **Gateway Address** is the device's Gateway Address.

Example command and corresponding response:

```
getip<CR>
<CR><LF>ok ip 192.168.77.100 mask 255.255.255.0 gw 192.168.77.1<CR><LF>
```

2.8.4 Accessing ATOMControl™ Web Interface

The ATOMControl™ Web Interface is accessible through any web browser such as Mozilla Firefox (recommended), Google Chrome (recommended), or Microsoft Edge. To access the web interface, launch the web browser and type in the IP Address for the ATOM:

http://192.168.77.30/

A simplified version of the ATOMControl software will load in the browser window.

2.8.5 Using ATOMControl™ Web Interface

The Web Interface use and operation is similar to the ATOMControl interface. Web interface contains a subset of ATOMControl functionalities. Refer to the ATOMControl Software Manual for instructions on how to use the web interface (Norsat document number INS001219).

2.8.6 Accessing ATOM SNMP Agent

The integrated SNMP(v1) agent is accessible through standard default SNMP-service and trap ports of 161 and 162, respectively, using any NMS/SNMP servers and MIB browsers.

2.8.7 Configuring ATOM SNMP Agent

The SNMP(v1) agent settings for an ATOM-series device can be reviewed or changed using the device's Command Line Interface. Ensure that a serial connection has been made to the device (refer to Figure 2-12 Setup Serial Port for details), and then use a terminal program or Norsat's ATOMControl software to send the appropriate command(s) to the device.

The default SNMP settings are as follows:

SNMP-service port:	161
SNMP-trap port:	162
SNMP read/write community:	public
SNMP manager IP address:	192.168.77.255
SNMP traps on fault:	enabled

Value 255 of the 4th part of the manager IP address means to broadcast traps on the 192.168.77 subnet and allow any host in the subnet to access the SNMP agent.

To obtain status for, and enable/disable SNMP-service and trap:

Enabling SNMP-service allows the SNMP server to access ATOM device's data using Walk, Get and Set. Enabling SNMP-trap service also allows the SNMP server to receive traps generated by the ATOM device's SNMP agent due to a fault or alarm detected on the device.

```
getsnmp<CR>                    (obtain SNMP-service running status)
getsnmptrap<CR>                (obtain SNMP-trap running status)
setsnmp enable 0|1<CR>         ("0|1" means 0 or 1)
setsnmptrap enable 0|1 cycle n<CR>
```

where enable value of 1 turns the service on, and 0 turns it off for setsnmp and setsnmptrap; 1 for running and 0 for not running for getsnmp and getsnmptrap.

Using setsnmptrap, trap can be configured as send-once or send-repeat using the <cycle> value <n>. Set value to 0 for send-once on each fault occurrence. Set to >0 for the trap service to periodically sends the same trap until the fault cleared. The cycle value is the number of ticks between resends. Default cycle value is 0 (for send-once).

The SNMP-trap service sends trap messages to the trap catcher of the NMS or MIB browser whenever a fault occurs. When the fault cleared, it follows up with a “fault cleared” trap message. “Fault cleared” messages are always send-once regardless of <cycle> value setting.

When SNMP enable is set to 0, also inhibits SNMP-trap functionalities. Setting SNMP-trap enable to 0 does not inhibit SNMP-service functionalities.

To obtain and change SNMP-service and trap ports:

```
getport<CR>                    (obtain a list of IP port designations)
setport snmp <port#><CR>       (port 161 is highly recommended)
```

where port# for the SNMP-service port is a value between 161 and 169

```
setport snmptrap <port#><CR>   (port 162 is highly recommended)
```

where port# for the SNMP-trap port is a value between 161 and 169

SNMP service port and trap port cannot be the same value

Set the NMS or MIB browser to the same SNMP ports to access the ATOM SNMP data and traps. All NMS and MIB browsers use port 161 as SNMP port and 162 as trap port by default.

Example commands and corresponding responses:

```
setport snmp 165<CR>
<CR><LF>ok<CR><LF>

setport snmptrap 166<CR>
<CR><LF>ok<CR><LF>

setport snmp 166<CR>
<CR><LF>err Inconsistent Values<CR><LF>

getport<CR>
<CR><LF>ok snmp 165 snmptrap 166<CR><LF>
```

To obtain and change SNMP read and write community:

```
getsnmpcommunity<CR>           (obtain current community string)
setsnmpcommunity value <string><CR>
```

where the SNMP community string is between 4 and 10 characters

SNMP agent uses the same community string for both read and write

Set the NMS/SNMP server to the same community string to access the Atom SNMP agent.

Example commands and corresponding responses:

```
setsnmpcommunity value AtomBUC<CR>
<CR><LF>ok<CR><LF>
```

```
getsnmpcommunity<CR>
<CR><LF>ok community AtomBUC<CR><LF>
```

To obtain and change SNMP Manager IP:

To respond to SNMP requests and send out traps, the ATOM SNMP agent needs to know where the NMS or MIB browser is running. This destination is the SNMP Manager IP.

```
getsnmpmgrip<CR>              (obtain current SNMP manager IP address)
setsnmpmgrip IP <IP Address><CR>
```

where the SNMP Manager IP address is the IP Address of the NMS or MIB browser running on

SNMP Manager IP address can be set for subnet access and trap broadcast, or for a specific host

Set the Manager IP address to that of the specific NMS or MIB browser, or to that of the same subnet of the NMS or MIB browser.

Example commands and corresponding responses:

Set to that of the specific NMS or MIB browser having host IP address of 192.168.77.100

```
setsnmpmgrip IP 192.168.77.100<CR>
<CR><LF>ok<CR><LF>
```

Set to access by any host and *broadcast* traps in the same subnet of the NMS or MIB browser

```
setsnmpmgrip IP 192.168.77.255<CR>
<CR><LF>ok<CR><LF>

getsnmpmgrip<CR>
<CR><LF>ok ip 192.168.77.255<CR><LF>
```

To obtain and change SNMP trap-on-fault settings:

The SNMP trap-on-fault setting enables or disables the generation of traps from the ATOM SNMP agent when faults or alarms are detected on the ATOM device.

```
getsnmptraponfault<CR>        (obtain current trap-on-fault setting)
setsnmptraponfault all|overtemp|pll|power|overinput 0|1<CR>
```

where 1 turns the option on, and 0 turns the option off

“overtemp”	- sends traps when an over-temperature fault is detected on the ATOM device
“pll”	- sends traps when PLL lock is lost on the ATOM device
“power”	- sends traps when irregularities associated with power is detected on the ATOM device
“overinput”	- sends traps when an over-input fault from the IF is detected on the ATOM device
“all”	- sends traps when any one or more of the above faults is detected on the ATOM device

To receive traps associated with trap-on-fault, ensure that SNMP-trap service is enabled.

Example commands and corresponding responses:

```
getsnmptrapoonfault<CR>
<CR><LF>ok overtemp 1 pll 1 power 1 overinput 1<CR><LF>

setsnmptraponfault overtemp 0 power 0<CR>
<CR><LF>ok<CR><LF>

getsnmptrapoonfault<CR>
<CR><LF>ok overtemp 0 pll 1 power 0 overinput 1<CR><LF>

setsnmptraponfault all 0<CR>
<CR><LF>ok<CR><LF>

getsnmptrapoonfault<CR>
<CR><LF>ok overtemp 0 pll 0 power 0 overinput 0<CR><LF>

setsnmptraponfault all 1<CR>
<CR><LF>ok<CR><LF>

getsnmptrapoonfault<CR>
<CR><LF>ok overtemp 1 pll 1 power 1 overinput 1<CR><LF>
```

2.9 J5 – RF output

The RF output port is a standard WR75 or WR62 square waveguide flange. Specify which flange is to be installed at time of order. The waveguide flange has a groove for an O-ring seal, which is highly recommended to keep moisture out of the unit.

Also, for outdoor installations, after bolting the waveguide-to-waveguide connection, it is recommended to add RTV silicone compound as a sealant around the entire perimeter of the joint where the flanges meet. This will provide extra protection against water ingress at the flange-to-flange interface.

The unit is supplied with screws (four 6-32x3/8"); it is the user's responsibility to ensure that the appropriate screw length is used. There should be at least 4 threads of engagement (0.1") with the holes in the waveguide flange.

The waveguide output port should not be relied upon to act as a mechanical support for the unit. Refer to **Appendix A** for the size and position of the ATOM mounting holes.

2.10 Ground Connection

The unit is supplied with a #10-32 screw and internal tooth lock washers for grounding purposes. It is highly recommended that the unit be grounded according to national and local electrical codes before use.

2.11 Fault Indicator / LED

Description of Operation

Norsat Ku GaN 20W, 40W and 80W are equipped in a general-purpose Status LED signal. This signal is intended to give a visual aid of the status of the device.

Modes of Operation

The Status LED in the Front Panel of the devices will show three different statuses: **STARTING, FAULT, and NO FAULTS.**

Starting with No Faults Status

The Status LED will flash once for a lapse of approximately one second every time the power of the device in recycled to OFF and set back to ON. If no fault is detected in the device at the Power Up, the LED will go to OFF afterwards settling in that state.

Fault and No Faults

In the event of a **PLL Fault,** an **Over Input Fault,** a **Power Fault,** or an **Over Temperature Fault**, the Status LED will turn on independently of whether the MUTE STATE of the device is UNMUTED or MUTED due Hardware or Software. If the cause of the fault disappears the Status LED will turn OFF until any of the Faults shows again independently of the MUTE STATE.

3. Misc. Info

3.1 ATOM Installation

3.1.1 Mounting

Depending on the configuration, an ATOM Ku GaN can weigh up to 2.30kg (5.06lbs). When choosing an installation location, ensure the mounting brackets are capable of supporting the unit weight. Norsat recommends that the unit is supported using at least four of the mounting holes on two opposing sides (four holes per side). The waveguide output port (J5) must not be used to physically support the unit.

Refer to **Appendix A** for the size and position of the ATOM mounting holes.

3.1.2 Outdoor Use

The ATOM is designed for use in an outdoor environment and is sealed to prevent water ingress. Ensure the waveguide and/or feed connected to J5 are also sealed with gaskets to prevent water ingress.

3.2 Fans & Baseplate Cooling

The standard ATOM configuration employs an integrated radiator and IP55 fans to cool the unit. A minimum clearance of 1 inch must be maintained around the air intake and exhaust during use. The fans are a field replaceable assembly; contact Norsat for details on replacement kits. If the unit is deployed inside a radome, ensure there is adequate cooling to remove heat and prevent the unit from overheating.

The ATOM is also available with a flat base in place of the radiators and fans. It is the user's responsibility to ensure that the external cooling plate can efficiently dissipating heat produced by the unit. Please contact Norsat for cooling requirement specifications.

3.3 Accessories

Each ATOM unit shipped with mating connectors for both M&C Port and the Power Port connectors as well as hardware for the waveguide flange and ground terminal. No hardware is provided to mount the unit.

A range of optional accessories such as pre-built power cables, M&C test cables, and M&C signal adaptors are also available; please contact Norsat for details.

3.4 General Specifications

Table 3-1 summarizes general specifications applicable to most 20/40/80W ATOM Ku GaN units. Please refer to the specific ATOM datasheet available on the Norsat website for complete unit specifications.

Table 3-1: General 20-40-80W ATOM Ku GaN Specifications

Parameter	Specifications		
RF Power Output	20W* (43dBm*)	40W* (46dBm*)	80W* (49dBm*)
Gain	65 dB typ., 60 dB min., 70 dB max. **		
Operating Temperature with fans	-40°C to +60°C		
Storage Temperature	-50°C to +80°C		
Thermal Shutdown Temperature (internal report)	82°C ±3°C		
Dimension (L x W x H)	164 mm x 94 mm x 156 mm (6.45 in x 3.70 in x6.15 in)		
Weight	2.24kg (4.94lbs) **	2.26kg (4.98lbs)**	2.30kg (5.06lbs) **
Input Voltage (DC)	+18 to +56 VDC		
Power Consumption, DC BUC unit with fan (BUC)	105W max.	195W max.	370W max.

* Frequency dependent
** Configuration dependent

3.5 Standard Warranty

Norsat International Incorporated warrants that its equipment shall be free from defects in material or workmanship for a period of one (1) year from the ship date, unless otherwise stated in the Offer Terms and Conditions. The warranty does not cover units that have:

- been damaged through improper use or physical damage (e.g. dropped units)
- been modified, altered, or repaired by the user
- the security label(s) removed or damaged
- the serial number label removed or altered

To obtain warranty repair service, please contact Norsat **Technical Support** for any warranty claims.

Appendix A Mechanical Drawings

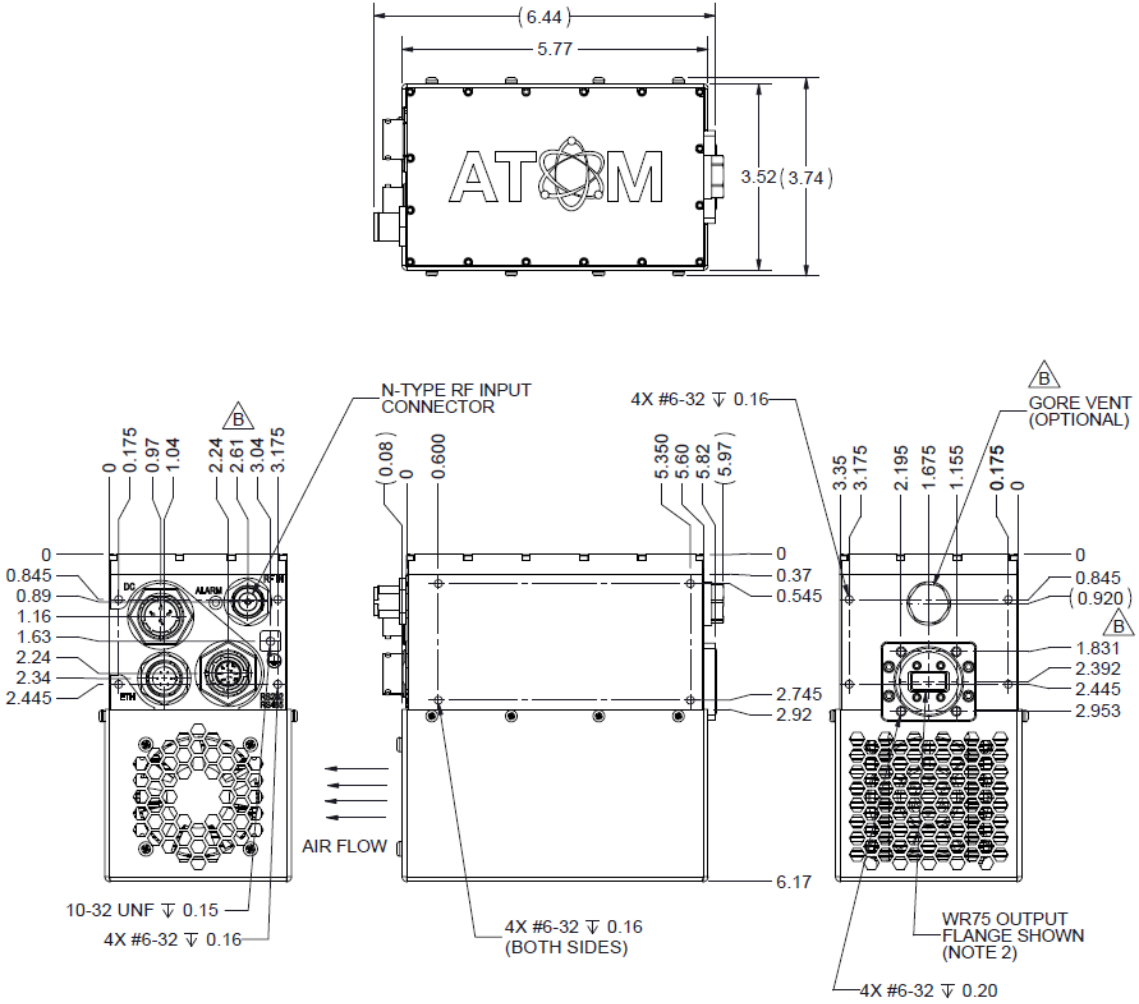

Figure A-1: 20-40-80W Ku GaN BUC/SSPA, Fan Cooled

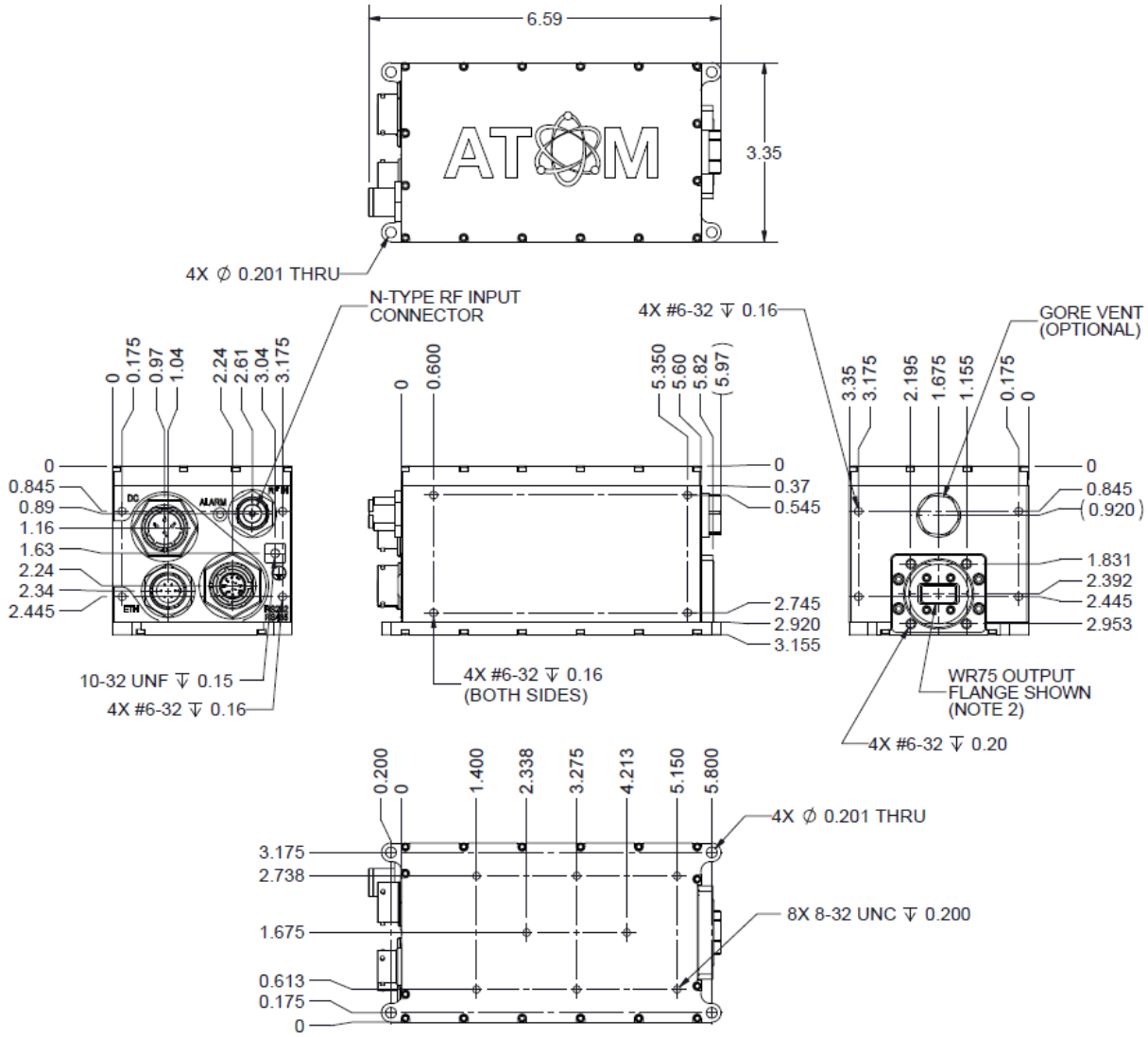

Figure A-2: 20-40-80W Ku GaN BUC/SSPA, Baseplate Cooled

Appendix B Acronyms and Abbreviations

The following is a list of acronyms and abbreviations referenced in this document.

Table B-1: Acronyms and Abbreviations

Acronym	Definition
BUC	Block Upconverter
AMP	Amplifier
C	Celsius
<CR>	Carriage Return character (ASCII)
dBm	Decibel-milliwatts
DC	Direct Current
ESD	Electrostatic Discharge
freq	Frequency
GHz	Gigahertz
GND	Ground
IF	Intermediate Frequency
kHz	kilohertz
<LF>	Line Feed character (ASCII)
M&C	Monitor and Control
MHz	Megahertz
mm	Millimeter
N/A	Not Applicable
ppm	Pulses per minute
RF	Radio Frequency
RX	Receive
SSPA	Solid State Power Amplifier
TX	Transmit
V	Volt
VDC	Volts Direct Current

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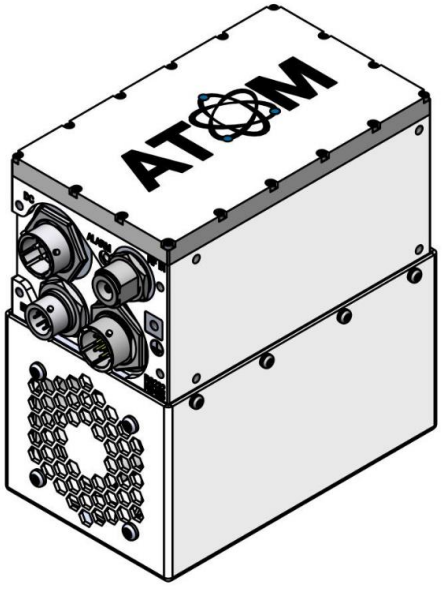

ABOUT NORSAT

Norsat International Inc., founded in 1977, is a leading provider of innovative communication solutions that enable the transmission of data, audio and video for remote and challenging applications. Norsat's products and services include customizable satellite components, portable satellite terminals, maritime solutions and satellite networks. The company's products and services are used extensively by telecommunications services providers, emergency services and homeland security agencies, military organizations, health care providers and Fortune 1000 companies.

110 – 4020 Viking Way | Richmond | British Columbia | Canada

V6V 2L4 | support@norsat.com

www.norsat.com