Ku-Band 400 W BUC

USER MANUAL

Model: LCBUC-13750-14500-400

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CONTENTS

1 Overview....1
2 Product Description....1
2.1 Ku-Band 400 W BUC....1
3 Safety Precautions....3
3.1 Handling Abnormal Conditions....4
4 Specifications and Interfaces....4
4.1 Specifications....4
4.2 Outline....5
4.3 Front-Panel Interfaces and Status Indicator....6
5 Installation....7
6 Operating Procedure....7
6.1 Preparation....7
6.2 Power-On and Operation....8
7 Cabling....13
8 Troubleshooting....13
9 Transportation and Storage....14
10 Miscellaneous....15

1 Overview

This manual specifies the installation, operation and maintenance requirements for the Ku-band 400 W BUC (Block Up-Converter). It is intended for technical personnel and system engineers responsible for the operation, commissioning and maintenance of the equipment at satellite communication earth stations.

Read this manual in full before operating the equipment and retain it for future reference. The specifications given in this manual are standard product ratings; where a project-specific specification is supplied with the contract, that specification takes precedence.

2 Product Description

2.1 Ku-Band 400 W BUC

The Ku-band 400 W BUC comprises the following functional modules: the up-converter module, the driver module, the final power amplifier module (GaN-based), the AC/DC power supply module, the coupled detection unit and the monitor and control (M&C) unit.

The equipment accepts an external IF drive signal, up-converts it to the Ku band (13.75 GHz to 14.5 GHz) with a 12.8 GHz local oscillator, and delivers 400 W of saturated RF power to the antenna after power amplification.

Critical internal assemblies are hermetically sealed to provide effective process protection for the bare GaN dies and improve long-term reliability. Forced-air cooling keeps the power devices operating stably over long periods.

Built-in output power detection provides continuous monitoring of the output signal level. An internal 10 MHz reference is provided, with automatic switchover to an external 10 MHz reference. The host PC can switch the equipment on and off and query operating parameters such as current, voltage, temperature and output power over Gigabit Ethernet (RJ45) or RS485.

Main features:

(1) Compact and lightweight;

(2) Ethernet / RS485 control;

(3) Dual-colour LED status indication with fault localisation: a steady green LED indicates normal operation, while the number of red LED flashes identifies the specific alarm category, allowing rapid on-site diagnosis;

(4) Built-in control and protection circuits;

(5) Automatic switching between the internal and external reference.

2.2 LED Status Indicator

The unit is fitted with one dual-colour LED status indicator (green and red) that provides a visual indication of equipment status. It cannot be switched off by commands or by any other means.

Indicator: Green LED

When the power switch is turned on, the red LED lights first. Over the following 10 seconds the unit verifies, step by step, the operation of the internal circuit blocks (power supply, local oscillator, temperature sensing, IF and RF sections, etc.). When all blocks are operating correctly, the green LED lights and the unit enters the transmit state. Under normal conditions the green LED remains on continuously.

Indicator: Red LED

In the event of an abnormal condition the red LED flashes; the number of flashes identifies the alarm category, as listed in Table 2-1.

Table 2-1 Red LED flash codes

LED flash pattern	Status
Red LED on 500 ms / off 500 ms; 2 flashes, 1 s interval	LAN open command not sent
Red LED on 500 ms / off 500 ms; 3 flashes, 1 s interval	Reference alarm
Red LED on 500 ms / off 500 ms; 4 flashes, 1 s interval	Input voltage alarm
Red LED on 500 ms / off 500 ms; 5 flashes, 1 s interval	Negative supply alarm
Red LED on 500 ms / off 500 ms; 6 flashes, 1 s interval	Over-temperature alarm

LED flash pattern	Status
Red LED on 500 ms / off 500 ms; 7 flashes, 1 s interval	Internal amplifier module serial output alarm

Note: In special cases where two or more alarms occur simultaneously, the status indicator presents only one of them.

Example: If the LAN open command has not been sent and no reference is connected, the red LED flashes twice at 1 s intervals. Sending the open command through the external interface and confirming that the equipment is in the ON state changes the indication to three flashes at 1 s intervals; once the reference fault is cleared, the green LED lights continuously.

The alarm definitions in this section follow those of the same equipment series; the specific alarm categories for this model are subject to the software version actually supplied.

3 Safety Precautions

ESD sensitive — This equipment contains electrostatic-discharge-sensitive devices. Observe ESD precautions throughout all handling operations.

High voltage — Hazardous voltages are present inside the equipment. Do not remove the cover or carry out internal repairs while the equipment is energised. Servicing must be performed by qualified personnel.

Input overdrive protection — Keep the IF input level between -20 dBm and -10 dBm; the maximum permissible input power is given in the specifications. Levels above the limit may cause permanent damage. Verify that the IF input level is within the specified range before applying power.

Pre-power inspection — Before applying power, make sure that all RF cables, attenuators and antennas are securely connected to the designated ports, to avoid equipment damage and personal injury.

Compliance — Read and strictly observe all safety, operating and maintenance requirements given in this manual.

Table 3-1 Hazard warnings

DANGER / Electric shock hazard	DANGER / Electric shock hazard / Do not open. Hazardous voltages are present inside the equipment; there are no user-serviceable parts. / Unauthorised servicing voids the warranty.
WARNING This equipment delivers high RF power. With the amplifier ON, never look into an open waveguide or connect an unmatched load to the output port. Before enabling RF, confirm that the output is terminated in a matched load or antenna system.	

3.1 Handling Abnormal Conditions

If an abnormal condition occurs during operation, proceed as follows:

(1) Remove the RF input signal first, then switch off the power supply;

(2) Take emergency measures to prevent further loss and protect the site;

(3) Record the fault details (photographs, video, etc.);

(4) Contact the equipment supplier promptly.

4 Specifications and Interfaces

4.1 Specifications

Table 4-1 Ku-band 400 W BUC specifications

Parameter	Specification
RF performance	
IF input frequency	950–1700 MHz
IF input power	-20 to -10 dBm
RF output frequency	13750–14500 MHz
LO frequency	12.8 GHz
External reference frequency	10 MHz (internal/external auto-switching)
RF output power @PSAT	400 W
Gain adjustment range	0–20 dB adjustable, 0.5 dB step
Input return loss (S11)	-10 dB
Power supply	
Power consumption	1800 W
Operating voltage	89–264 V AC, 47–63 Hz (220 V nominal)
Monitoring and control	
Control interfaces	Ethernet (RJ45), RS485
Control functions	RF on/off, attenuation setting, network parameter setting
Status reporting	Output power, attenuation, module temperature, module current, supply voltage

Parameter	Specification
Automatic protection	Over-temperature, over-current, output overdrive, reflection (output VSWR too high)
Interfaces	
IF input / external reference	SMA, female (IF and 10 MHz reference share one port)
RF output	BJ120, FBP120 square sealed flange
AC interface	MS3112E12-3S, #3 pin aerospace connector
Control interface	MS3112E14-19P, #19 pin aerospace connector (Ethernet and RS485)
Mechanical	
Dimensions (L × W × H)	350 × 230 × 200 mm [13.78 × 9.05 × 7.87 in]
Weight	20 kg [44 lbs] (typ)
Cooling	Forced air cooling
Environmental (design to meet)	
Operating temperature	-20 to 50 °C
Non-operating temperature	-25 to 65 °C
Relative humidity (non-condensing)	95 %

Table 4-2 Absolute maximum ratings

Parameter	Rating
Input RF drive level without damage	+10 dBm
Maximum load VSWR @ POUT = 400 W	5:1 @ all load phase & amplitude continuous
Thermal overload	85 °C ± 5 °C shutdown

4.2 Outline

The outline of the equipment and the positions of its interfaces are shown in Figure 4-1; dimensions are in mm. Refer to the mechanical drawing supplied with the contract for detailed dimensions.

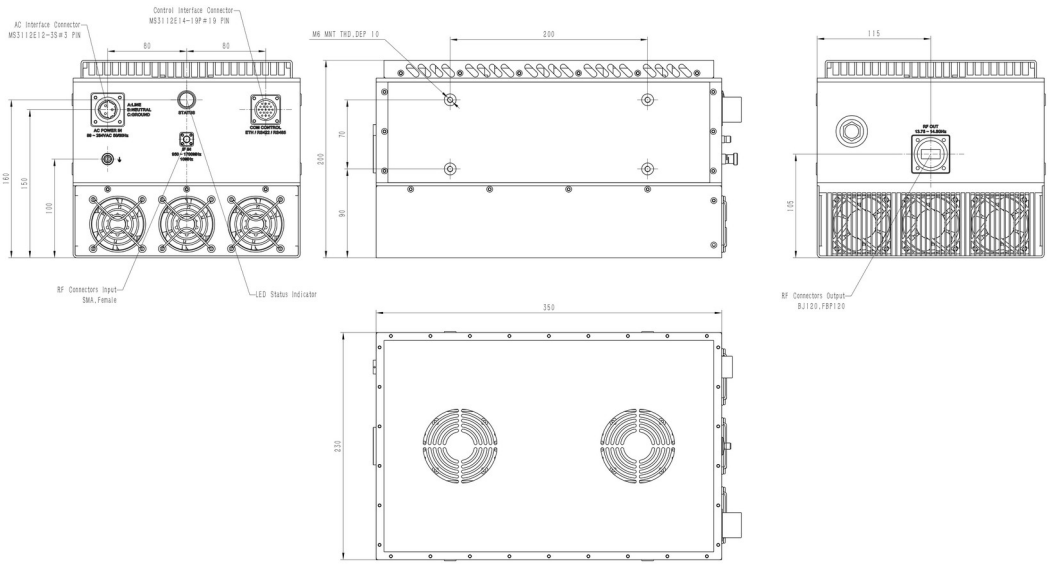


Figure 4-1 Outline and interface locations (dimensions in mm)

4.3 Front-Panel Interfaces and Status Indicator

Table 4-3 Interface and indicator definitions

No.	Interface	Silkscreen marking	Description	Connector type
1	AC input	AC 220V 50Hz	AC mains input	MS3112E12-3S, #3 pin aerospace connector
2	RF output	RF OUT 13.75-14.5GHz	Ku-band RF output	BJ120, FBP120 square sealed flange
3	IF / reference input	IF IN 950-1700MHz / 10M IN	IF input and 10 MHz reference (shared port)	SMA, female
4	LAN	LAN (Ethernet)	Ethernet control port	RJ45
5	Control interface	CONTROL	Ethernet and RS485 control signals, fault and transmit indication (pins listed in Table 4-4)	MS3112E14-19P, #19 pin aerospace connector
6	Protective earth	Earth symbol	Protective earthing; connect to the antenna system and the station earth busbar	Grounding stud
7	Status indicator	LED status indicator	Power-on, RF-on and alarm status indication	—

Table 4-4 Control interface pin assignment (MS3112E14-19P)

Pin	Signal	Description
T	TX+	Transmitting end of local differential signal for Ethernet
M	TX-	Transmitting end of local differential signal for Ethernet
A	RX+	Receiving end of local differential signal for Ethernet
L	RX-	Receiving end of local differential signal for Ethernet
V	EARTH	Case ground
U	Fault	Fault monitoring and alarm
B	TX-EN	Transmit indication
K	TX_GND	Signal ground
R	RS485-A	RS485 differential TX/RX terminals
S	RS485-B	RS485 differential TX/RX terminals

5 Installation

The equipment weighs approximately 20 kg; lifting or rack mounting requires at least two persons. Verify that the bracket, mast or rack has adequate load-bearing capacity.

Leave at least 100 mm of free space around the equipment. Do not obstruct the front-panel fan intake or the cooling duct.

For outdoor installation, mount the waveguide flange and waterproof connectors securely and seal all connections against weather exposure.

Connect the protective earth terminal to the antenna system and the station earth busbar. The earth resistance must comply with local lightning-protection regulations.

6 Operating Procedure

6.1 Preparation

(1) Before using the equipment, check that the enclosure surface is intact, the external markings are legible and the cover screws are tight;

(2) After the visual inspection, connect the equipment to the system correctly and verify input/output impedance matching;

(3) Before powering up the equipment, confirm that the power cable, control cable and RF input/output connections are correct. Never switch on with the output open-circuited.

6.2 Power-On and Operation

6.2.1 Web Communication Setup and Connection

The amplifier has a built-in HTTP web server, through which the amplifier IP address can be configured and equipment information viewed. The factory default network settings are:

IP address: 192.168.1.4

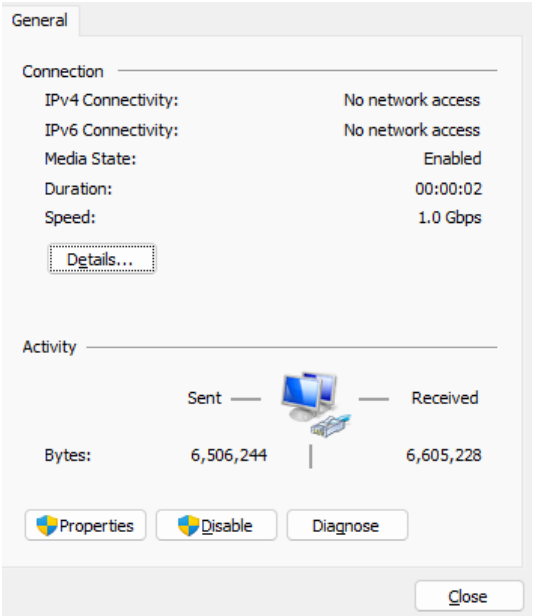
Subnet mask: 255.255.255.0

Gateway: 192.168.1.1

This initial address can be used to set up a minimal local network; reconfigure the network parameters of the amplifier as required.

Configure the host PC as follows (Windows example):

Go to Control Panel → Network and Sharing Center → Local Area Connection, click Properties, double-click Internet Protocol Version 4 (TCP/IPv4), select Use the following IP address, and set the host PC to an address in the same subnet as the equipment (the host address must not duplicate the equipment address). Click OK to complete the setup.



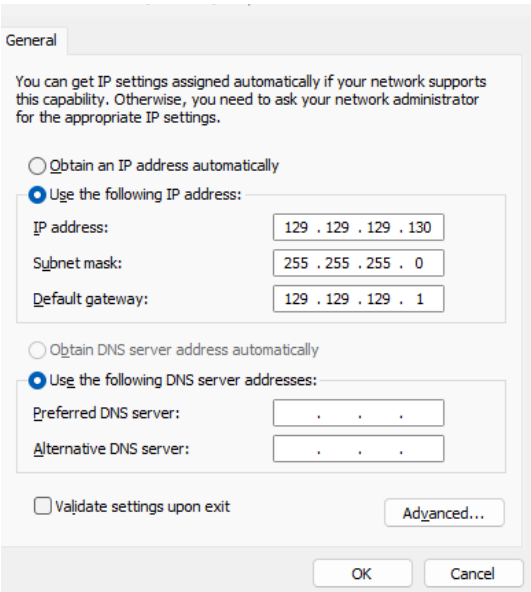


Figure 6-1 Local connection status and TCP/IPv4 settings (static IP in the same subnet)

6.2.2 Web Interface Overview

The equipment hosts an HTTP service; enter the equipment IP address in a browser address bar to open the web interface.

The interface provides the following two functional pages:

(1) Status Monitor page: displays live operating parameters (read-only);

(2) BUC ParaSet page: sets attenuation, transmit control and network parameters.

Four tabs are provided at the top of the interface: Status Monitor, BUC Info, BUC ParaSet and SNMP ParaSet. This manual describes the Status Monitor and BUC ParaSet pages.

6.2.3 Status Monitor Page

The Status Monitor page displays the current operating status of the equipment. It is read-only and provides no parameter setting functions. The displayed items are listed in Table 6-1.



Figure 6-2 Web interface — Status Monitor page

Table 6-1 Items displayed on the Status Monitor page

Item	Description	Unit	Display
GAIN	Equipment gain	dB	—
Power	Live output power	dBm	Real-time
Temperature	Module temperature	°C	Real-time
Current	Module current	A	Real-time
ATTENUATION	Current attenuation	dB	Real-time

6.2.4 BUC ParaSet Page

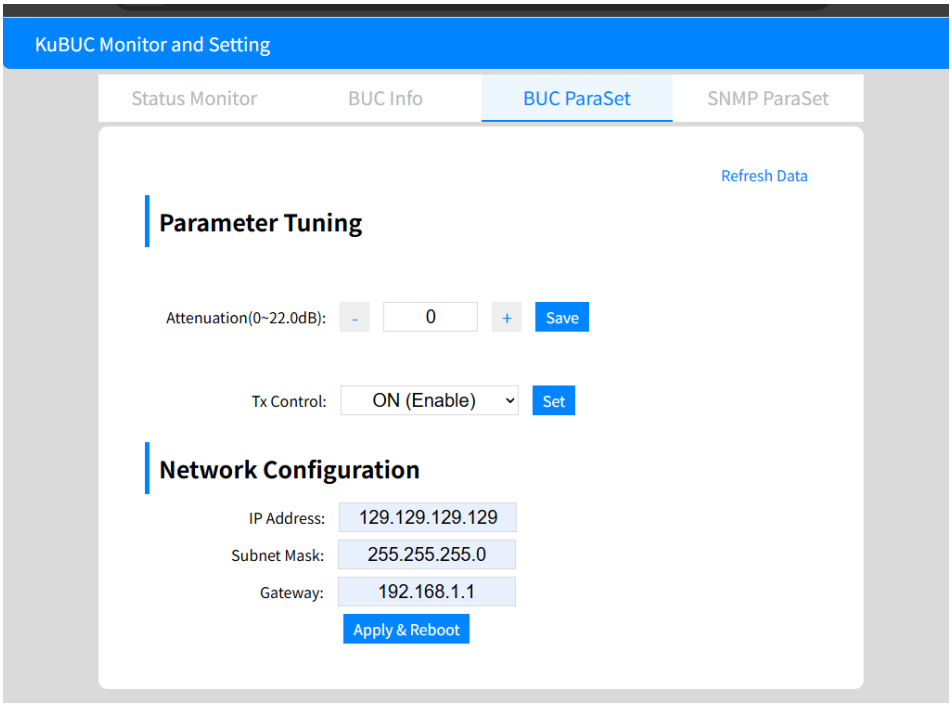


Figure 6-3 Web interface — BUC ParaSet page

The BUC ParaSet page is used for remote parameter configuration. After changing a value, click the button on the right of the same row to apply it. The parameters are described in Table 6-2.

Table 6-2 BUC ParaSet page parameters

Parameter	Setting range	Description
Attenuation	0–20 dB in 0.5 dB steps	Gain attenuation; the higher the value, the lower the output power
Tx Control	ON / OFF	Amplifier module on/off
IP Address	Valid IPv4 address	Sets the equipment IP address
Subnet Mask	Valid subnet mask	Factory default 255.255.255.0
Gateway	Valid gateway address	Factory default 192.168.1.1

The valid attenuation range is 0–20 dB in 0.5 dB steps. Out-of-range entries are clamped to the limits, and entries that are not multiples of 0.5 dB are rounded to the nearest step.

The interface may display an attenuation scale of 0–22.0 dB. Set attenuation within the supported 0–20 dB range.

After entering the IP address, subnet mask and gateway, click Apply & Reboot on the right of the same row to apply all three parameters. The

equipment restarts automatically once the network parameters take effect, interrupting the current page connection; set the host PC IP address to the same subnet as the equipment and access the new address again.

If the equipment becomes unreachable because of incorrect network settings, first try the factory address 192.168.1.4; if it is still unreachable, restore the factory network parameters as described in section 6.2.6.

6.2.5 Operating Precautions

Never switch on with the RF output open-circuited. The output must always be terminated in a matched load or antenna system.

Set the attenuation before enabling RF. Increasing attenuation lowers the output power and improves linearity margin; when reducing attenuation, monitor the output power on the Status Monitor page and adjust it in steps.

Keep the IF input level between -20 dBm and -10 dBm. Even with the amplifier switched off, input levels above +10 dBm may still permanently damage the input stage.

If the external 10 MHz reference is lost, the equipment automatically switches to the internal reference and the output frequency accuracy then depends on the internal reference. Verify that the reference status is normal before transmission.

6.2.6 Recovery from Communication Failures

Before using network communication, connect the equipment to the host PC with a network cable.

The host PC and the equipment must be on the same subnet and able to ping each other.

If the web service is unreachable, clear the browser cache and retry; if the problem persists, contact technical support.

If communication fails, check the network cable connection and confirm that the equipment is powered up.

After the equipment restarts or the network parameters are changed, confirm that the host PC IP address is on the same subnet as the equipment, then access the new address.

If the page opens but parameters do not refresh, press F5 to force a reload; if data is still unavailable, power-cycle the equipment and retry.

7 Cabling

Before cabling, visually inspect all connectors for damaged or receded pins.

Continuity-test all cables before installation to verify correct electrical connections.

Connect in the order AC input → RF output waveguide → IF/reference input → LAN/control interface, and check that the protective earthing stud is reliably earthed before applying power.

For outdoor installation, fit a waterproof connector at the RF output flange and seal all connections.

8 Troubleshooting

Various faults may occur during operation and commissioning. Table 8-1 lists common symptoms, probable causes and inspection methods.

Table 8-1 Common faults, causes and remedies

No.	Symptom	Probable cause	Remedy
1	Fan not running after power-on	Supply voltage fluctuation / loose power cable / power supply module fault / fan fault	Check the supply circuit / reconnect the AC cable / replace the power supply module / replace the fan
2	RF cannot be enabled	Tx Control not set to ON / loose control cable / M&C module fault	Set Tx Control to ON on the ParaSet page / reconnect the control cable / replace the M&C module
3	Gain decreased	Attenuation set too high / driver module fault / final module fault	Check the ATTENUATION value / replace the driver module / replace the final module
4	Output power decreased	Driver module fault / final module fault / excessive output VSWR	Replace the driver module / replace the final module / check the VSWR of the waveguide and antenna feeder

No.	Symptom	Probable cause	Remedy
5	No RF output	Amplifier not enabled / no IF input / reference not locked / protection tripped	Check the transmit control status and status indicator / check the IF signal and 10 MHz reference / check the protection status
6	VSWR / reflected power alarm	Poor waveguide connection / antenna feeder fault / output open or short	Switch off and inspect the BJ120 connection and waterproof connector / measure the antenna feeder VSWR
7	Web page unreachable	Incorrect IP setting / network cable not connected / host PC and equipment on different subnets	Check the LAN connection / verify the IP address and subnet mask / try the factory address 192.168.1.4
8	Parameter download failed	Communication interrupted / equipment restarting / parameter out of range	Reload the page and check the link / wait for the restart to complete and retry / verify attenuation 0–20 dB and IP format
9	Page opens but data does not refresh	Communication interrupted / page cache error / equipment restart	Press F5 to reload / clear the browser cache / power-cycle the equipment and retry

Work through the items in the table above in order. If the fault cannot be cleared, contact the manufacturer's service personnel.

9 Transportation and Storage

Storage conditions shall meet the general requirements for communication equipment. During long-term storage (more than 6 months from the packing date), energise the equipment for 4 hours at room temperature every 6 months.

Environmental control: protect against moisture, mould and rodents; ventilate periodically. Relative humidity not greater than 95% (non-condensing).

Securing during transport: secure the equipment firmly during transport, preferably in its original packaging.

Hazardous materials: do not transport together with flammable, explosive or corrosive goods.

Stacking: place heavy or bulky items on the lower layers; stack neatly and securely, no more than three layers.

10 Miscellaneous

If the faults described above occur during use, use the listed probable causes as a basis for preliminary analysis and take the corresponding corrective action. If the equipment still does not operate correctly after repair, contact the manufacturer for further assistance.

Specifications are subject to change without notice. Where a project-specific specification is supplied with the contract, that specification takes precedence.