



# **ABE25KX and ABD25KX**

**25 W P1dB Extended Ku-Band BUC**

## **Preliminary USER MANUAL**



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**Scope**

This document covers the installation, operation, and maintenance of the ABE25KX BUC. It contains information intended for engineers, technicians and operators working with the block up converter.

To make inquiries, or to report errors of fact or omission in this document, please contact **Actox Corporation** at toll free 866-888-6087.

## INTRODUCTION

The ABE25KX (ABD25KX) is a reliable, high quality, cost efficient stand-alone block up converter. The application for this block up converter is Ku-Band VSAT communication in an outdoor environment. This line of superior products, engineered using state of the art Gallium Nitride (GAN) technology, and is characterized by unparalleled durability and dependability.

This is the smallest and lightest 25W L-To Ku-Band Block Up Converter and is designed to be mounted on the feed horn. The unit is ideal for portable and mobile applications. Double – L.O. feature makes unit universal for Ku-Band requirements. This unit can be powered either with 18-78 VDC or 80 and 240 VAC and consumes less than 190W.

### **KEY FEATURES**

- **13.75-14.50 GHz**
- **950 to 1,700 MHz**
- **Smallest package size and weight**
- **Double L.O. (electronically and manually switchable 12.80 and 13.05GHz)**
- **Auto-ranging 36-58 VDC or 80-240 VAC power options**
- **Low power consumption**
- **Digital temperature compensation**
- **L.O. lock and amplifier LED**
- **M&C – combined RS-232/485/FSK(standard)**
- **Three-year warranty**
- **RoHS compliant**

*ABE25KX – 25W Ku-Band BUC monitors and controls numerous parameters and has features that make installation and use of the BUC simpler and enhance system performance.*

## Receiving and Inspection

The block up converter is designed to function outdoors and will arrive in a standard shipping container. Immediately upon receipt of the block up converter, check the packing slip against the actual equipment you have received. Inspect the shipping containers exteriors for visible damage incurred during shipping.

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### CAUTION!

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*Handle the block up converter with extreme care. Excessive shock may damage block up converter's delicate internal components.*

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Using the supplied packing list, verify that all items have been received and undamaged during shipment. Verify that all items are complete. If there are any omissions or evidence of improper packaging, please notify **Actox Corporation** immediately.

### *Equipment Damage or Loss*

**Actox Corporation** is not responsible for damage or loss of equipment during transit. For further information, contact the responsible transport carrier.

When declaring equipment as damaged during transit, preserve the original shipping cartons to facilitate inspection reporting.

### *Return of Equipment*

When returning equipment to **Actox Corporation** for repair or replacement:

1. Identify, in writing, the condition of the equipment,
2. Refer to the Invoice, Purchase Order and the date the equipment was received.

Notify **Actox Corporation** RMA department of the equipment condition and obtain a Return Material Authorization (RMA) number and shipping instructions.

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### NOTE

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*Do not return any equipment without an RMA number. This is important for prompt, efficient handling of the returned equipment and of the associated complaint.*

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## Preparing for Installation

Before attempting to install or use the block up converter, we recommend that you first familiarize yourself with the product by reading through this manual. Understanding the operation of the system will reduce the possibility of incorrect installation, thereby causing damage or injury to yourself or others.

*The block up converter **must** be installed in accordance with the conditions and recommendations contained in the following sections.*

### ***Safety Precautions***

Carelessness or mishandling of the block up converter may damage the unit causing serious injury to yourself or others. Please adhere to the following:

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#### **WARNING!!**

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*If your unit is equipped with an AC power cord and plug, do not tamper with, or attempt to reconfigure, the cord or plug supplied with the unit, as this can:*

- ◆ *result in personal injury*
- ◆ *void the warranty*
- ◆ *Cause damage to the units or related equipment.*

# INSTALLATION AND OVERVIEW

## *General Description*

This section describes the installation and theory of operation of the block up converter.

ABE25KX is powered by +18~+72 VDC via IF cable or MS connector

ABD25KX is powered by 80~240 VAC via MS connector power sources.

It will amplify an input signal from an L-Band RF source up to a power level of 25 Watts P1dB CW in Ku-Band.

The block up converter can be used as a stand-alone unit or in a redundant configuration.

## *Specifications*

Table 1 summarizes the specifications of the ABE25KX BUC. For mechanical specifications, refer to the outline drawing, Appendix 1.

## *General Considerations*

The block up converter shall meet all specifications over full bandwidth and under all environmental conditions when terminated with a load of VSWR at 1.5:1 unless otherwise specified. All RF specifications shall be met within five minutes after applying power, except gain flatness, which shall be met after a warm-up period of ten minutes. During the warm-up period, the block up converter shall not exhibit any alarm or require an RF mute input signal to reset any alarm/fault latches.

## *Securing the block up converter*

Align the block up converter output waveguide flange with the mating flange of the antenna feeder waveguide. Using the O-ring and hardware provided, connect the antenna feeder waveguide. Torque the flange screws to 16 inch-pounds (1.8 N-m). Attach the proper cables for waveguide for IF input, AC power and M&C if equipped to the corresponding connectors of the block up converter.

*The cylindrical connectors are labeled clearly and have different pin layouts. It is impossible to incorrectly install the mating connectors.*

## Installing the Block-Up Converter

### *Tools and Test Equipment*

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

### *Site Considerations*

The BUC is designed to mount on the antenna. Locate and install the antenna according to instructions supplied by the antenna manufacturer. Choose an area that is free of extraneous interference from motors and electrical 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.

### *Preparation*

#### *Mounting Considerations:*

Optional Mounting Brackets are available that will facilitate mounting for most antennas.

The ODU must be mounted such that:

- Sufficient support is afforded to the BUC, the LNB and the Power supply to minimize the effects of antenna sway in strong winds.
- Air movement across the heat fins is possible.
- The fan of the BUC should be facing the ground when mounted.
- The fan intake and exhausts are free from any obstruction.
- The length of the Power supply cables is taken into consideration in determining the mounting location of the power supply.

*Throughout installation and during any polarization, azimuth or elevation adjustment, ensure that cables and waveguide are not crimped or pinched.*

**LED Indication**

Orange	L.O. 13.05GHz
Green	L.O. 12.80GHz
Green	Power OK
Red	Alarm, SSPA OUT muted, Not enough input

**Connectors' Pin Assignment**

Connector	Type	Pin #	Signal	Parameter
J1 "IF IN"	N/F-type female	N/A	IF Input 10 MHz Ref. IN	-0 dBm, max $\pm 5$ dBm
J2 "RF OUT"	WR-75	N/A	RF Output	46.0 dBm min.
J3 "AC POWER IN"	MS3102A-10SL-4P 2 pin male	A	Line In (AC)	80-240 VAC Use screw and nuts for ground
		B	Common	
J4 "M&C Interface"	PT02E12-10P-027 10 pin male	A	Rx+ In	RS-485
		B	Rx- In	
		C	Tx+ Out	
		D	Tx- Out	
		E	Detector	0 - 875 mV (25W) 1360 mV (25W)
		F	Alarm Out	Low when alarm
		G	GND	
		H	Mute In	Muted when Low
		J	Rx In	RS-232
		K	Tx Out	RS-232

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## NOTE

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### ***10MHz Reference***

The BUC must receive a stable external 10MHz reference provided by a stable signal source such as a signal generator, satellite modem or injected externally with a Bias T (for example, ABT6ARN/ABT6ARF manufactured by Actox Corporation) or a similar bias T type.

Please make sure to check the sticker on the BUC for the appropriate power source before any power connections are performed.

- **Powered via MS or IF Universal 38-56VDC**

A universal powered unit is powered through a 2-pin MS mating connector (which is included with the BUC) or IF input by an external minimum 300W 48VDC power supply source.

- **Powered via only MS 38-56VDC**

MS only powered unit uses a 2-pin MS mating connector (which is included with the BUC) with 48VDC external power source with at least 300W.

- **Powered via AC 80-240VAC**

The AC only powered unit has a 2-pin AC connector (which is included with the BUC) and this unit must have its own dedicated power AC plug in power source. Ground screw is located on the BUC and should be properly marked.

### ***Setting the L.O.***

Switchable L.O. is mechanically changed by unscrewing the L.O. screw and pressing it in with any small object such as toothpick. If the BUC is equipped with M&C interface, the L.O. could be switching electronically with the appropriate M&C command.

#### **L.O. Status LED**

Orange	Standard LO 13.05 GHz
Green	Extended LO 12.80 GHz

### ***Setting the TX and RX Frequencies***

*All transmit and receive frequencies are set in the modem.*

*For a direct connection to an L-band modem follow the manufacturer's instructions on setting the transmit and receive frequencies.*

**Ensure that it is safe to transmit prior to enabling the transmission.**

## Recommended Test Equipment

The following equipment or equivalent is recommended for installation and system alignment:

### Equipment Type

Spectrum Analyzer	HP8563E
Digital Voltmeter	Fluke 8050
Adapter Waveguide to coax	C or Ku-band
RF cables	With calibrated insertion loss up to 15GHz
40 dB attenuator	High Power to match HPA output.

Assortment of cables, connectors and adapters (calibrated up to 15 GHz)

*Ensure that the BUC TX output power is disabled to prevent accidental transmission interference with adjacent satellites or transponders before attempting to align or performing any other operation involving the ODU. Before attempting any system change, carefully evaluate the possible effects of the transmitted signal.*

*Table 1 Specifications*

<b>TECHNICAL SPECIFICATIONS</b>		
<b>RF frequency</b>	<b>L.O. 13.05 GHz</b> <b>L.O. 12.80 GHz</b>	14.00 to 14.50 GHz 13.75 to 14.50 GHz
<b>Local oscillator</b>		13.05 GHz and 12.80 GHz
<b>IF frequency</b>		950 to 1,700 MHz
<b>Output power @ P1dB min over temp.</b>		25W (+44 dBm min)
<b>IF connector</b>		N-type or F-type
<b>Power supply</b> <b>ABE25KX - auto-ranging and auto-detected</b> <b>ABD25KX - auto-ranging</b>		190W max +18~+72 VDC via IF cable or MS connector 80~240 VAC via MS connector
<b>Output interface</b>		WR-75 Grooved
<b>Gain variation</b> <b>over 40 MHz</b> <b>over 500 MHz</b> <b>Over operating temperature</b>		0.8 dB p_p 1.4 dB p_p 0.75 dB p_p @ fixed frequency
<b>Third order intermod @ 3dB below P1dB</b>		-24 dBc, typ at 3 dB total back-off from P1dB
<b>Spurious within the Rx band</b>		-119dBm/Hz max @ 10.95 to 12.75GHz
<b>Spurious within the Tx band @ P1db and below</b>		-55dBc max @ 13.75 to 14.5GHz
<b>Spurious within the Rx band at P1db and below</b>		-73dBm max @ 10.95 to 12.75GHz
<b>L.O. leakage level at P1dB and below</b>		-25dBm
<b>Gain</b>		70 dB Min., 73 dB nominal
<b>Requirement for external reference</b>		via IF cable
frequency		10 MHz (sine-wave)
input power		-5 to +5 dBm @ input port
<b>Phase noise</b>		-55 dBc/Hz max. @ 10 Hz -65 dBc/Hz max. @ 100 Hz -75 dBc/Hz max. @ 1 kHz -85 dBc/Hz max. @ 10 kHz -95 dBc/Hz max. @ 100 kHz
<b>Noise figure</b>		20 dB max
<b>Input V.S.W.R.</b>		2 : 1 max
<b>Output V.S.W.R.</b>		2 : 1 max.
<b>Mute</b>		Shut off the BUC in case of L.O. unlocked
<b>Input interface</b> <b>ABD25KX/ ABD25KX</b> <b>ABE25KXF/ ABE25KXF</b>		50 Ohm (N-type IF in) 75 Ohm (F-type IF in)
<b>Status LED</b>  <b>RED</b> <b>GREEN</b> <b>ORANGE</b> <b>GREEN</b>		Summary alarm All OK Standard LO 13.05 GHz Extended LO 12.80 GHz
<b>Temperature range (ambient)</b> operating storage		-45 deg C to +55 deg C -60 deg C to +75 deg C
<b>Dimensions &amp; housing</b>		270 (L) x 120 (W) x 120 (H) mm 10.63" (L) x 4.72" (W) x 4.72" (H)
<b>Weight</b>		3.8 kg (8.4 lbs) max

## ***Connections and Mounting Hardware***

The IF input connection requires a coaxial cable with an F or N type connector. The RF output requires a waveguide with a WR-75 flat flange. An O-ring shall be used to seal the waveguide connection.

## ***Assembly and Installation***

Use the information in this section as a guide to assemble and install the block up converter. The specified humidity is up to 100% during operation. However, installation should be carried out in dry conditions, free of salt spray or excessive humidity. This will eliminate the possibility of moisture and other foreign substances from entering the output waveguide flange.

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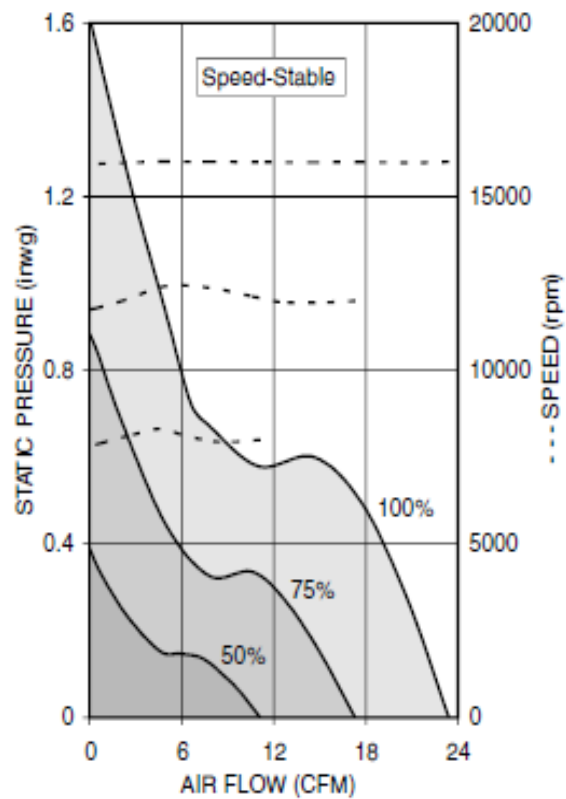
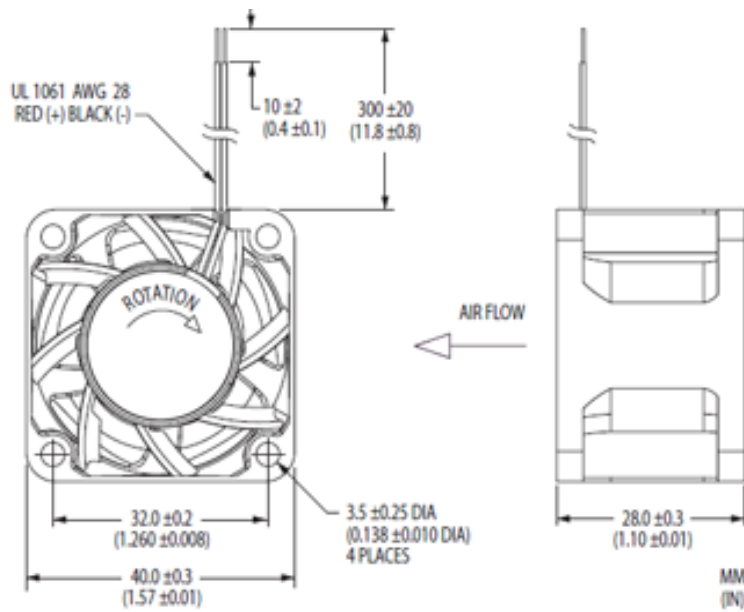
### **CAUTION!**

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*Only authorized technical personnel should perform the Installation and proper electrical hookups of the block up converter.*

*The block up converter is designed to operate in an outdoor environment and is waterproof when mounted in the correct orientation. The block up converter contains high flow-rate fans (24 CFM) for cooling the block up converter. These fans function continuously during the operation. To provide a sufficient airflow, the block up converter should be mounted with a minimum clearance of 3 inches on all four sides and the bottom. Adequate cooling for the block up converter will provide years of top performance.*

## High Flow Fan Characteristics



## ***Functional Overview***

### ***General***

This section describes the block up converter functions in detail. The functional overview explains the RF amplification, monitor & control and power distribution.

### ***IF/RF Conversion and Amplification***

The IF Input requires a signal with a 10MHz reference, and 36-58VDC or 80- 240VAC power source. L-Band signal enters the BUC by a coaxial cable, converted to Ku-Band by the BUC and goes through an internal isolator and reject filter, which provides a good VSWR at the input and minimizes spurious on receive band 10.95-12.75GHz. Under normal operation, the RF amplifier will amplify the RF Input signal level up to a power level of 44 dBm 25 Watts CW P1dB minimum.

To achieve the rated output power of the RF Amplifier, provide the necessary gain and low insertion loss. The amplified signal is transmitted through the output waveguide section to a satellite up-link system.

### ***Monitor and Control (standard)***

The block up converter may have a RS-485 and RS-232 serial interface. With this standard option the block up converter can communicate to the indoor unit or redundancy control block up converter via RS-485 or RS-232.

The control system can provide the following M&C functions:

- BUC Alarm (via RS-485/RS-232): when an input BUC within the block up converter system current draw is below 0.3A, a BUC alarm signal will be transmitted via the RS-485/RS-232 serial interface.
- Mute Control (via RS-485/RS-232)
- Mute Control (via hardware line): TTL high level signal will mute a block up converter
- Output Power Monitoring: 15 dB dynamic range (via RS-485/RS-232)
- Base Plate Temperature Monitoring (via RS-485/RS-232)

## Operation

It shall be performed by authorized personnel prior to maintenance and/or repair.

### *Procedure*

Verify that the installation procedure described was completed. A complete physical check of the customer's system is suggested.

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### **WARNING!**

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*The output power available at the output waveguide flange is extremely hazardous. Under **no circumstances** should block up converter be operated without the waveguide feed or a high power load attached. Do not operate this equipment in the presence of flammable gases or fumes. Failure to observe this precaution will result in personal injury. Safe and careful installation of this block up converter will eliminate the possibility of accidents and provide years of top performance.*

Verify the antenna feed waveguide connection is properly done before the block up converter is energized.

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### **NOTE**

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*The block up converter can withstand any source or load VSWR. However, the block up converter will meet all specification requirements only if the source/load VSWR is sufficient. Normal operation is not possible if the antenna feeder VSWR is greater than 1.5:1.*

Turn ON the power and allow a warm up period of twenty minutes before operating the block up converter. This will assure stable gain and power. The block up converter can function with a coupler when a direct measurement of the output power is made.

## Maintenance

This section contains information on how to maintain, troubleshoot and repair the block up converter. The block up converter is extremely reliable, requiring very little preventive maintenance, or repair. Should there be a malfunction, this section also contains technical information to help diagnose basic failures.

### *Preventive Maintenance*

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#### **WARNING!**

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*Shut down the block up converter before disassembly and remove all cables and connectors. Failure to observe this precaution may result in personal injury or death. This includes the removal of any RF power originating from other system components.*

When the block up converter is in the **hot stand-by mode** in a redundant system, switch it to the operation mode at least once every three months. Make sure the fan is running while in operation mode.

When the block up converter is in the **cold stand-by mode** in a redundant system, switch it to the operation mode at least once every three months. Make sure the fan is running while in operation mode.

### ***Block up converter Cooling System Preventive Maintenance***

Preventive maintenance is limited to checking the performance of the block up converter cooling system. No electrical or mechanical adjustments are required for normal operation.

The fan is the least reliable item in the block up converter. Wearing of the fan bearings will cause the RPM to drop and will create a higher than average heat-sink temperature. It is recommended to replace the fan after 3 years of operation.

## ***Performance Check***

Verify the system is properly set up. The power output at 1 dB compression shall be measured for evaluating the performance of the block up converter.

It is recommended to measure the following parameters for ensuring that the block up converter is in good working condition:

- Gain and Gain flatness
- RF load VSWR and RF source VSWR
- Two-Tone Inter-modulation Distortion
- Return Loss at connectors of the block up converter

Using a Source and an IF input signal level within the small signal region of the block up converter, measure the power level at connectors IF or MS connector. Plot the swept response on a test data sheet. From the plot, determine gain and gain flatness.

Plot the swept return loss for both the IF Input and RF Output signals on a test data sheet. From the plot determine the return loss.

From the output power measurements determine P1dB. Record value on a test data sheet.

Measure the Two-tone Inter-modulation Suppression using two equal signals separated by 5 MHz. Record value on test data sheet.

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## **WARNING!!**

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*Cable connection and disconnection shall be done carefully to avoid physical damage to the cables and connectors, which may cause intermittent problems in the future.*

<b>Symptom</b>	<b>Action</b>
Fails performance test	Check power source, RF source, cabling and connectors. Check LED indicators for status and if the light is red contact Actox Corporation. If we are not able to assist you remotely, return block up converter to Actox Corporation after RMA number has been issued.

## ***Out-of Warranty Repair***

A non-warranty and out-of-warranty repair service is available from Actox Corporation for a nominal charge. The customer is responsible for paying the cost of shipping the BUC both to and from Actox Corporation for these repairs.

## **Appendix 1**

### ***Mechanical Drawing (Coming Soon)***

## Appendix 2

### *Spare Parts*

The following sheet can be copied and used as a fax form to order the required spare parts.  
Please make sure to include all identifying information to facilitate the processing of your order.  
The order may be sent via email to the following address.

Fax: 1-866-888-6087

Email: mark\_moore@actox.com

For additional information, please contact our customer service department at:  
(619)906-8893 or 1-866-888-6087

<b>Actox Corporation</b> <i>designers and manufacturers of telecom &amp; wireless products</i>				
<b>Spare Parts Order Form</b>		<b>ABD25KX/ABE25KX Ext. Ku-Band BUC</b>		
<b>From:</b>				
<b>Place By:</b>		<b>Signature:</b>		
<b>Telephone:</b>				
<b>Fax</b>		<b>Email:</b>		
<b>Part Description</b>	<b>Part Number</b>	<b>Quantity</b>	<b>Unit Price*</b>	<b>Line Total*</b>

**Fax to: Customer Service 1-866-888-6087**

## Appendix 3

## M&amp;C Commands

Reply	Packet format	Explanation	Interpretation	Examples
<b>ACK (Acknowledge)</b>	7E FX E0 ZZ 7F	Acknowledge that the received packet was properly processed.	X = Device address of the packet source device. ZZ = CRC.	1) reply: 7E FF E0 E0 7F (ACK reply sent from the BUC)
<b>NACK (Not Acknowledge)</b>	7E FX F1 YY ZZ 7F	Indicate that a problem was encountered with the received packet.	X = Device address of the packet source device. YY = Error code (03 = Incorrect CRC 18 = Unrecognized command 30 = Set command attempted on a restricted database element) ZZ = CRC.	1) reply: 7E FF F1 03 F2 7F (NACK reply sent from the BUC for an invalid CRC) 2) reply: 7E FF F1 18 E9 7F (NACK reply sent from the BUC for an unrecognized command).

Command	Packet format	Explanation	Possible replies	Interpretation	Examples
<b>Get Device Temperature</b>	7E FF 02 06 06 02 7F	Query device for current temperature	<b>Update Device Temp:</b> 7E FF 84 06 06 TT TT ZZ 7F	TT TT = Device temp in °C + 273. ZZ = CRC.	1) cmd: 7E FF 02 06 06 02 7F reply: 7E FF 84 06 06 01 02 87 7F (Temp = 0x0102 = 0d258 – 273 = -15°C) 2) cmd: 7E FF 02 06 06 02 7F  reply: 7E FF 84 06 06 01 34 B1 7F (Temp = 0x0134 = 0d308 – 273 = +35°C)
<b>Get Power Supply Temperature</b>	7E FF 02 06 07 03 7F	Query device for current power supply temperature	<b>Update Device PS Temp:</b> 7E FF 84 06 07 TT TT ZZ 7F	TT TT = PS temp in °C + 273. ZZ = CRC	1) cmd: 7E FF 02 06 07 03 7F reply: 7E FF 84 06 07 01 02 86 7F (Temp = 0x0102 = 0d258 – 273 = -15°C) 2) cmd: 7E FF 02 06 07 03 7F reply: 7E FF 84 06 07 01 34 B0 7F (Temp = 0x0134 = 0d308 – 273 = +35°C)
<b>Get Output Power</b>	7E FF 02 17 FF EA 7F	Query device for current output power	<b>Update Output Power:</b> 7E FF 84 17 FF PP PP ZZ 7F	PP PP = Output power in 10 x dBm. ZZ = CRC.	1) cmd: 7E FF 02 17 FF EA 7F reply: 7E FF 84 17 FF 01 2C 41 7F (Power = 0x012C = 0d300 = 30.0dBm.) 2) cmd: 7E FF 02 17 FF EA 7F  reply: 7E FF 84 17 FF 01 A0 CD 7F (Power = 0x01A0 = 0d416 = 41.6dBm.)
<b>Get Gain</b>	7E FF 02 18 FF E4 7F	Query device for current gain. Note: value is depending of attenuation settings.	<b>Update Gain:</b> 7E FF 84 18 FF GG GG ZZ 7F	GG GG = Gain in 10 x dB. ZZ = CRC.	1) cmd: 7E FF 02 18 FF E5 7F reply: 7E FF 84 18 FF 02 8A 69 7F (Gain = 0x028A = 0d650 = 65.0dB.) 2) cmd: 7E FF 02 18 FF E5 7F reply: 7E FF 84 18 FF 01 F9 F7 7F (Gain = 0x01F9 = 0d505 = 50.5dB.)
<b>Get Attenuation</b>	7E FF 02 18 FE E4 7F	Query device for current attenuation	<b>Update Attenuation:</b> 7E FF 84 18 FE GG GG ZZ 7F	AA AA = Attenuation in 10 x dB. ZZ = CRC.	1) cmd: 7E FF 02 18 FE E4 7F reply: 7E FF 84 18 FE 00 C8 AA 7F (Atten = 0x00C8 = 0d200 = 20.0dB.) 2) cmd: 7E FF 02 18 FE E4 7F  reply: 7E FF 84 18 FE 00 69 0B 7F (Atten = 0x0069 = 0d105 = 10.5dB.)
<b>Get Low Power Alarm Threshold</b>	7E FF 02 10 10 02 7F	Query device for current low power alarm threshold	<b>Update Low Power Alarm Threshold:</b> 7E FF 84 10 10 TT TT ZZ 7F	TT TT = low power threshold in 10 x dBm. ZZ = CRC. Note: zero value means low power alarm disabled	1) cmd: 7E FF 02 10 10 02 7F reply: 7E FF 84 10 10 01 AE 2B 7F (Thresh = 0x01AE = 0d430 = 43.0dBm.) 2) cmd: 7E FF 02 10 10 02 7F reply: 7E FF 84 10 10 00 00 84 7F (Thresh = 0x0000 = 0d00 = alarm is disabled.)
<b>Get Power Supply Voltage</b>	7E FF 02 06 10 14 7F	Query device for power supply voltage	<b>Update PS Voltage:</b> 7E FF 84 17 FF PP PP ZZ 7F	VV VV = PS voltage in 10 x V. ZZ = CRC.	1) cmd: 7E FF 02 06 10 14 7F reply: 7E FF 84 06 10 01 2C BF 7F (Power = 0x0064 = 0d100 = 10.0V.) 2) cmd: 7E FF 02 06 10 14 7F  reply: 7E FF 84 06 10 00 63 F1 7F (Power = 0x0063 = 0d99 = 9.9V.)

Command	Packet format	Explanation	Possible replies	Interpretation	Examples
<b>Get Power Supply Current</b>	7E FF 02 06 11 15 7F	Query device for power supply current	<b>Update PS Current :</b> 7E FF 84 06 11 PP PP ZZ 7F	CC CC = PS current in 10 x A. ZZ = CRC.	1) cmd: 7E FF 02 06 11 15 7F reply: 7E FF 84 06 11 00 AD 3E 7F (Power = 0x00AD = 0d173 = 17.3A.) 2) cmd: 7E FF 02 06 11 15 7F reply: 7E FF 84 06 11 00 97 04 7F (Power = 0x0097 = 0d151 = 15.1A.)
<b>Get Mute Status</b>	7E FF 02 06 01 05 7F	Query device for mute status	<b>Update Mute Status:</b> 7E FF 84 06 01 00 MM ZZ 7F	MM = Mute status (0 = enabled; 1 = muted). ZZ = CRC.	1) cmd: 7E FF 02 06 01 05 7F reply: 7E FF 84 06 01 00 00 83 7F (Device is enabled.) 2) cmd: 7E FF 02 06 01 05 7F reply: 7E FF 84 06 01 00 01 82 7F (Device is muted.)
<b>Get Device Address</b>	7E FF 02 03 04 05 7F	Query for device address	<b>Update device address:</b> 7E FF 84 03 04 00 XX ZZ 7F	XX = Device address. ZZ = CRC.	1) cmd: 7E FF 02 03 04 05 7F reply: 7E FF 84 03 04 00 0A 89 7F (Device address = 0xA) 2) cmd: 7E FF 02 03 04 05 7F reply: 7E FF 84 03 04 00 0E 8D 7F (Device address = 0xE)
<b>Get Over Temperature Alarm</b>	7E FF 02 00 02 00 7F	Query device for over temperature alarm	<b>Update over temperature alarm:</b> 7E FF 84 00 02 00 XX ZZ 7F	XX = Alarm state (0 = no alarm; 1 = alarm). ZZ = CRC.	1) cmd: 7E FF 02 00 02 00 7F reply: 7E FF 84 00 02 00 01 87 7F (Over temp alarm is raised) 2) cmd: 7E FF 02 00 02 00 7F reply: 7E FF 84 00 02 00 00 86 7F (Over temp alarm is clear)
<b>Get Low Power Alarm</b>	7E FF 02 00 05 07 7F	Query device for low power alarm	<b>Update low power alarm:</b> 7E FF 84 00 05 00 XX ZZ 7F	XX = Alarm state (0 = no alarm; 1 = alarm). ZZ = CRC.	1) cmd: 7E FF 02 00 05 07 7F reply: 7E FF 84 00 05 00 01 80 7F (Low power alarm is raised) 2) cmd: 7E FF 02 00 05 07 7F reply: 7E FF 84 00 05 00 00 81 7F (Low power alarm is clear)
<b>Get Summary Alarm</b>	7E FF 02 00 0F 0D 7F	Query device for summary alarm	<b>Update summary alarm:</b> 7E FF 84 00 0F 00 XX ZZ 7F	XX = Alarm state (0 = no alarm; 1 = alarm). ZZ = CRC.	1) cmd: 7E FF 02 00 0F 0D 7F reply: 7E FF 84 00 0F 00 01 8A 7F (Summary alarm is raised) 2) cmd: 7E FF 02 00 0F 0D 7F reply: 7E FF 84 00 0F 00 00 8B 7F (Summary alarm is clear)

Command	Packet format	Explanation	Possible replies	Interpretation	Examples
<b>Set Mute Control</b>	7E FF 14 13 01 00 MM ZZ 7F	Mute / Unmute the device.	<b>ACK</b> <b>NACK</b>	MM = Mute control (1 = Mute; 0 = enable). ZZ = CRC	1) cmd: 7E FF 14 13 01 00 01 07 7F reply: ACK (Mute device) 2) cmd: 7E FF 14 13 01 00 00 06 7F reply: ACK (Enable device)
<b>Set Attenuation</b>	7E FF 14 18 FE AA AA ZZ 7F	Set internal attenuator value Note: value is internally rounded with 0.5dB discrete, value range is 0-20 dB.	<b>ACK</b> <b>NACK</b>	AA AA = Attenuation in 10 x dB. ZZ = CRC.	1) cmd: 7E FF 14 18 FE 00 C8 3A 7F reply: ACK (Set attenuator to 20.0dB = 0d200 = 0x00C8) 2) cmd: 7E FF 14 18 FE 00 69 9B 7F reply: ACK (Set attenuator to 10.5 dB = 0d105 = 0x0069)
<b>Set Low Power Alarm Threshold</b>	7E FF 14 10 10 TT TT ZZ 7F	Set low power alarm threshold Note: zero value means low power alarm disabled	<b>ACK</b> <b>NACK</b>	TT TT = Low power threshold in 10 x dBm. ZZ = CRC.	1) cmd: 7E FF 14 10 10 00 C8 DC 7F reply: ACK (Set threshold to 43.0dB = 0d430 = 0x01AE) 2) cmd: 7E FF 14 10 10 00 00 14 7F reply: ACK (Set threshold to 0.0 dB = 0d00 = 0x0000) – alarm disabled
<b>Set Device Address</b>	7E FF 14 03 04 00 XX ZZ 7F	Set device address Note: (0 ≤ address ≤ 0xE)	<b>ACK</b> <b>NACK</b>	XX = Device address. ZZ = CRC.	1) cmd: 7E FF 14 03 04 00 0A 19 7F reply: ACK (Set device address to 0xA) 2) cmd: 7E FF 14 03 04 00 0E 1D 7F reply: ACK (Set device address to 0xE)