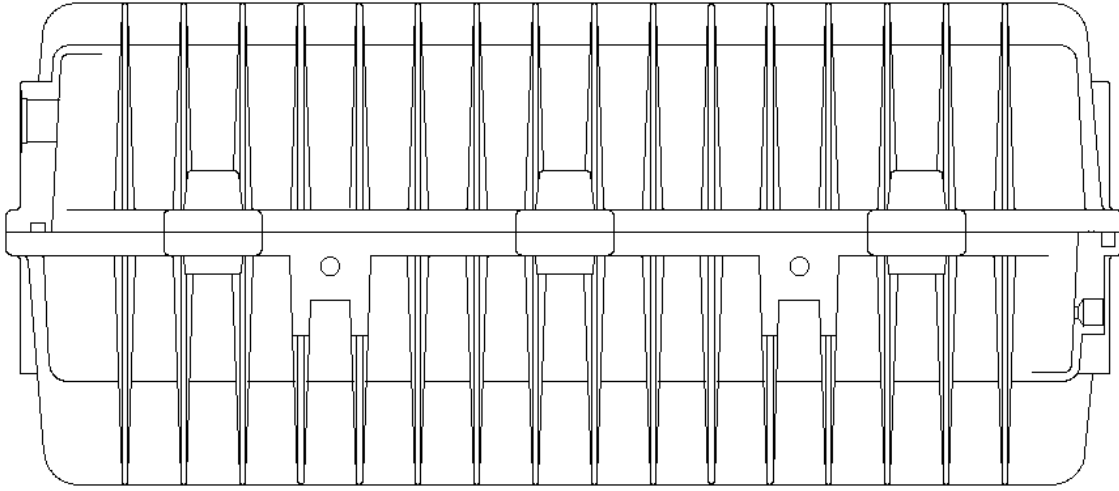


LBDG-250-DC-6183-1

Strand Mount DOCSIS 3.0 Gateway With DC Power Output

Installation Guide



IMPORTANT SAFETY AND INSTALLATION WARNINGS

WARNING: DO NOT ATTEMPT TO SERVICE THIS PRODUCT YOURSELF AS OPENING OR REMOVING COVERS MAY EXPOSE YOU TO DANGEROUS VOLTAGES OR OTHER HAZARDS. REFER ALL SERVICING TO QUALIFIED SERVICE PERSONNEL.

MOUNTING:

Mount this product only as described in the installation instructions, otherwise it may fall causing serious personal injury and/or damage to the device. Use only the brackets supplied with the product. Do not use attachments not recommended for this product as they may cause hazards.

SERVICING:

Remove power from this device and refer servicing to qualified personnel under the following conditions:

1. If the inside of the station has been exposed to rain or water.
2. If the station does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions as an improper adjustment may result in damage and will often require extensive work by a qualified technician to restore the unit to its normal operation.
3. If the unit has been dropped or the chassis has been damaged.
4. If the unit exhibits a distinct change in performance.

REPLACEMENT PARTS:

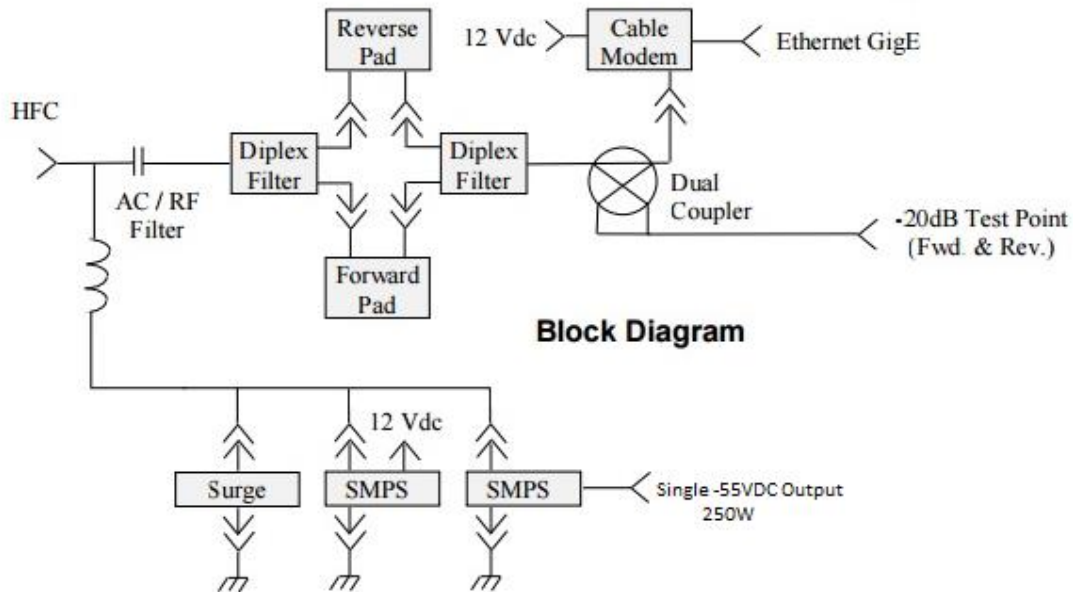
When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or parts that have the same characteristics as the original part. Unauthorized substitutions may result in fire, electric shock or other hazards.

SERVICE DEPOT:

Canada: Lindsay Broadband Inc.,
2035 Fisher Dr., R.R. #5
Peterborough, Ontario K9J 6X6
(705) 742-1350

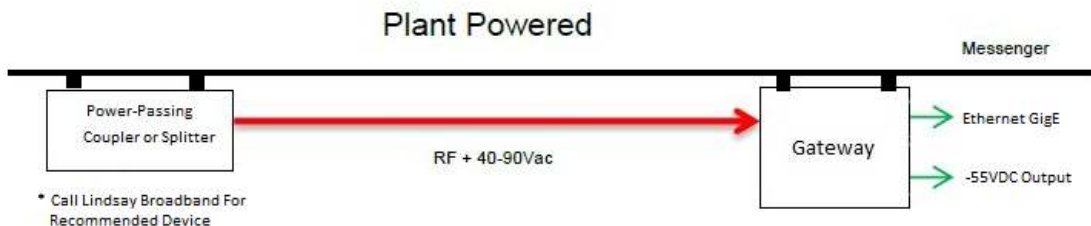
1.1 Introduction

This manual is written to help service personnel understand and install the Lindsay LBDG-250-DC-6183-1 DOCSIS 3.0 Gateway with DC Power Output. This first section gives a block diagram and a full product description. The remaining sections provide component identification diagrams, installation instructions, and specifications.



1.2 General Description

This DOCSIS 3.0 Gateway uses the HFC network to power and backhaul IP based devices. It can be connected to the HFC network through a power-passing coupler or splitter. One heavy gauge cable is used to deliver DC power to an external device. A total load of 250W is supported. The cable modem is configured in the standard fashion using your DOCSIS provisioning software.



1.3 Housing

A rugged die cast aluminum housing with a clamshell design is used. Externally, the housing has installation mounts and four connectors:

- A 5/8-24 threaded bushing for KS type connection to the HFC network.
- A type F test point connector. Signal levels read at this connector are -20dB relative to the cable modem F port.
- A weather-tight Ethernet port (RJ45 jack) for connection to a device.
- A weather-tight bayonet style connector for power delivery.

Dual gaskets provide for -100dB EMI isolation and an airtight seal to 15 PSI.

The housing can be strand mounted. An optional hardware kit for wall, mast or pedestal mounting is available.

The station size is approximately 406 x 228 x 165mm (16 x 9 x 6.5”), not including connectors. Its weight is around 5.1 Kg (11.2 Lbs.).

1.4 Major Components

Internally, the housing bottom contains the HFC interface board and DOCSIS 3.0 cable modem.

The +12V_{DC} & -55V_{DC} power supplies are housed in the lid. These are high efficiency switch mode power supplies. Filtering to prevent the switching regulator noise from reaching the AC and DC lines is provided.

The lid interconnects to the housing base with a power cable wiring harness.

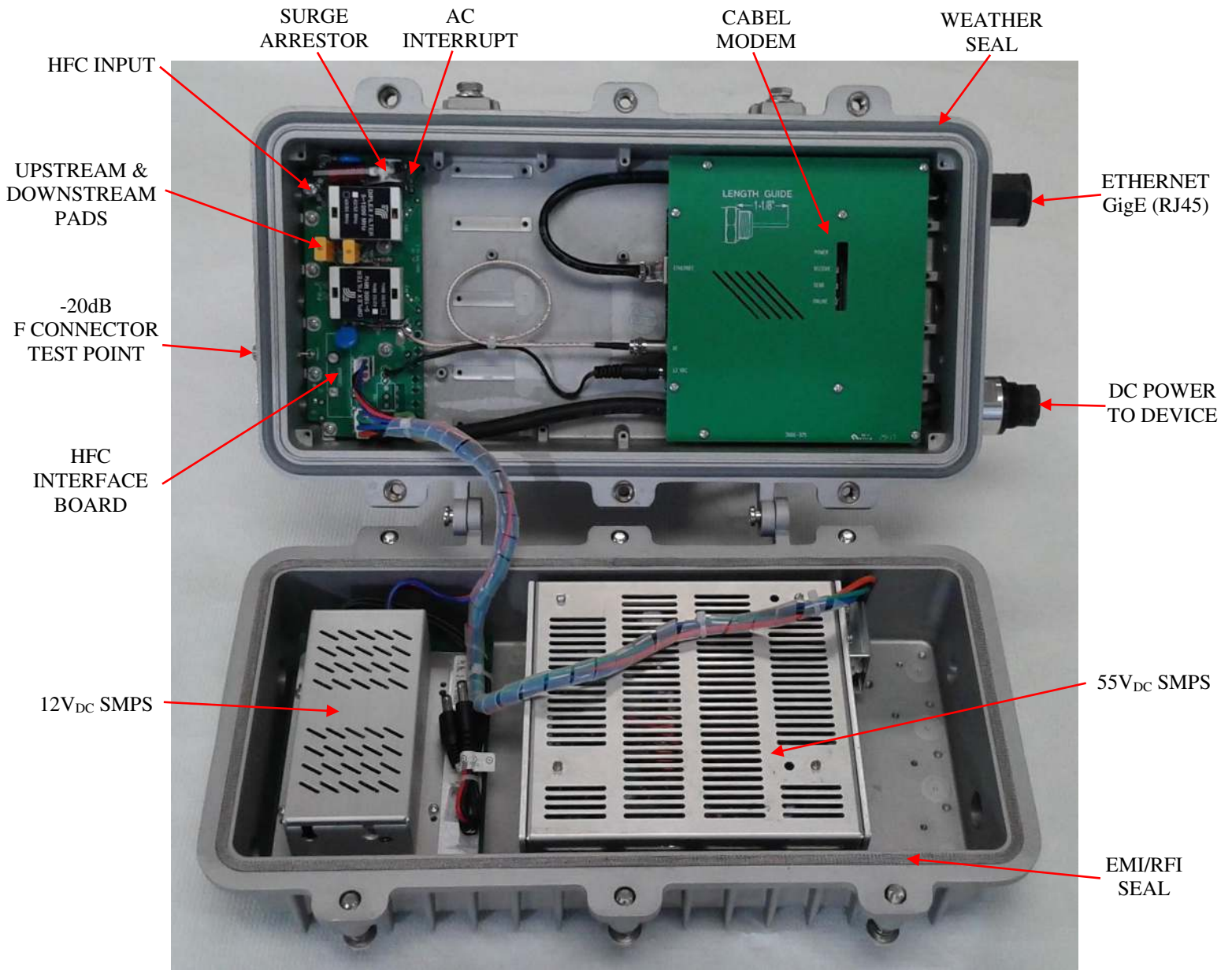
1.5 Interface Board

The interface circuit board, which is located in the housing base, provides the interface to the HFC network. The following features are provided:

- An AC/RF filter is used to separate the AC power from the RF carriers.
- Sockets for the separate padding of forward and reverse DOCSIS signals.
- A Test Point provides -20dB coupling of forward and reverse power at the cable modem port.

- Plug-in SVP type surge protection.
- Socket for optional solid state, crowbar type surge protection.
- A power-interrupt to disconnect AC power.

SECTION 2 COMPONENTS IDENTIFICACION



SECTION 3 INSTALLATION

Installation of the LBDG-250-DC-6183-1 DOCSIS 3.0 Gateway is similar to the installation of a line extender or any other piece of CATV equipment. The DOCSIS Gateway can be connected to a power-passing coupler or splitter. Call Lindsay Broadband for the recommended power insertion device for your application.

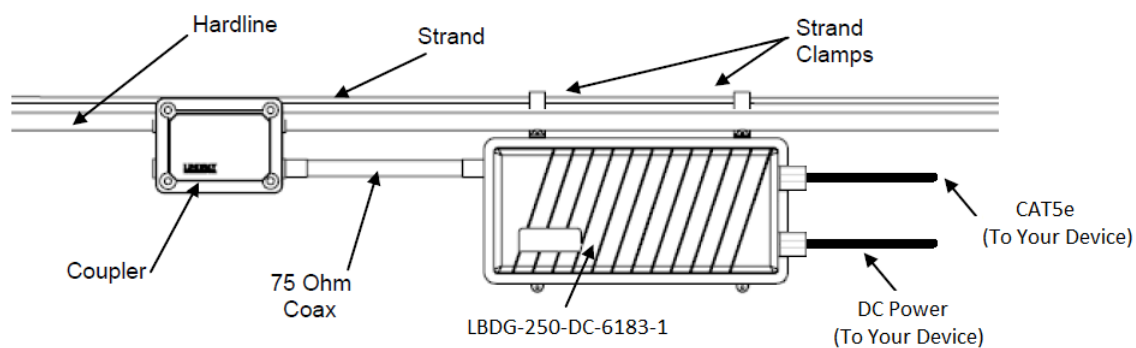
3.1 Pre-Installation

Upon receipt of the LBDG-250-DC-6183-1, inspect the carton for any external damage. If damage is present, inspect the Gateway exterior for damage. Report any apparent damage to the shipping agent and the Lindsay Broadband sales office.

Pad values can be determined ahead of time. The loss of the HFC interface board should be accounted for when calculating pad values. There is -4dB of loss in the reverse direction and -5dB of loss in the forward direction. The forward pad should be selected such that the power incident on the cable modem is 0dBmV (+5dBmV at the Gateway KS connection). For best return path S/N, the reverse pad should be selected so as to have the cable modem operate near its maximum output level (+50 to +52dBmV).

The cable modem can be provisioned ahead of time using the MAC address located on the label on the exterior of the Gateway lid.

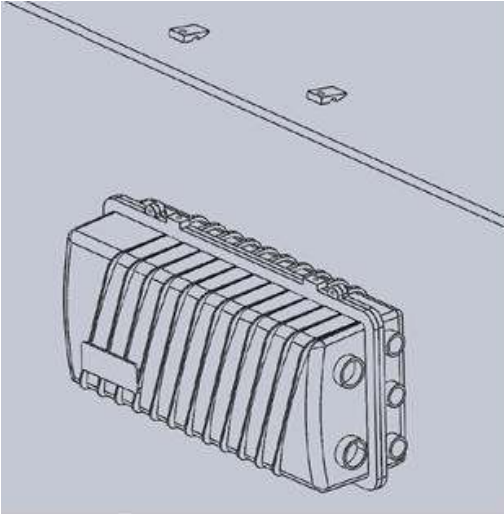
A 1/2" wrench is needed for both the strand clamp and housing bolts.



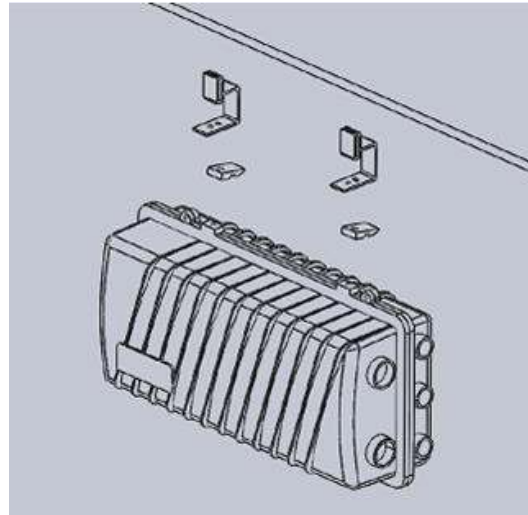
Installation Overview

3.2 Installation Diagrams

Strand Mount



Strand Mount
with Hanger Brackets



3.3 Power Requirements

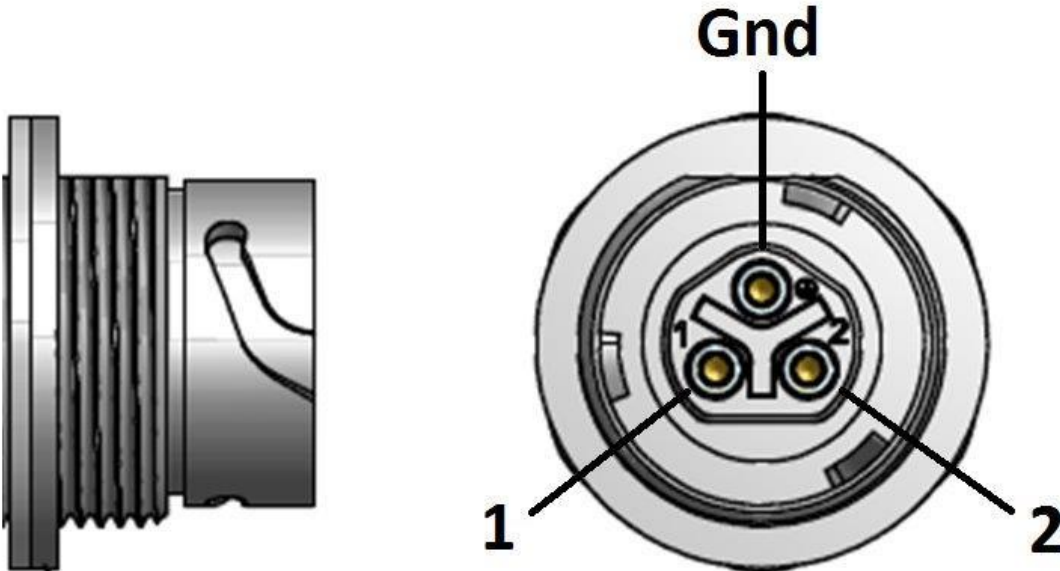
The DOCSIS 3.0 Gateway can be connected to any power-passing coupler or splitter. The following formula can be used to calculate the current draw for your installation:

$$I = \frac{10 + (1.39 * P)}{V}$$

Where:

- I = Current draw in Amps
- V = Line Voltage in Volts
- P = Total output power draw in Watts

3.4 Output Receptacle Wiring



The diagram illustrates the wiring for a DC output receptacle. On the left is a side view of the receptacle showing its threaded body and a locking ring. On the right is a top-down view of the internal terminal block. Three terminals are visible: a central terminal labeled 'Gnd' (Ground) and two side terminals labeled '1' and '2'. Terminal '1' is connected to a black wire, and terminal '2' is connected to a white wire.

Pin	Function	Connected Wire
Gnd	Chassis	Green
1	-48VDC	Black
2	Return	White

Output Receptacle Wiring (DC)

3.5 Installation

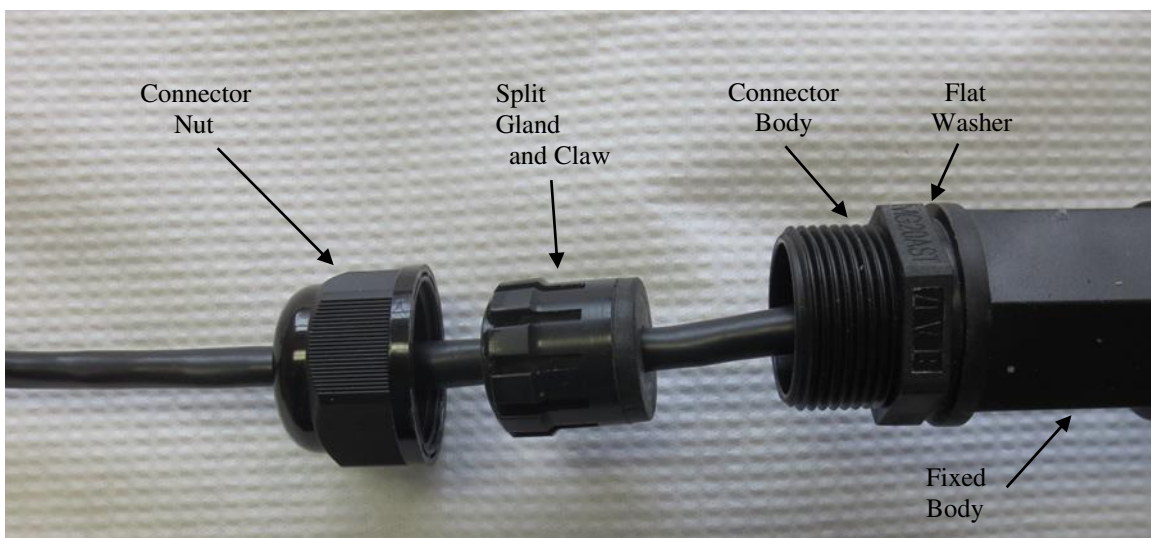
1. Pull the AC interrupt in the power-passing coupler or splitter.
2. Using the diagrams in this section as a guide, mount the Gateway at its final location. If using hanger brackets, the existing strand clamps should be left in place to act as spacers allowing the same bolts to be used.
3. Using your KS connector at the Gateway end, make a coaxial connection to your HFC network at the power-passing coupler or splitter.
4. Replace the 0dB upstream and downstream pads with the pad values that were calculated during pre-installation.
5. Connect the output DC power cable between the LBDG-250-DC-6183-1 and the device to be powered.
6. Re-install the AC interrupt. The indicator LED's on the cable modem will indicate start-up, discovery and provisioning. (Refer to the cable modem installation guide for more information.)
7. The forward and reverse RF levels at the cable modem can be measured at the single test point. Readings are -20dB below the levels seen at the cable modem. Adjust pad values as required.
8. (Optional) Silicone Grease can be applied to the exposed part of the O-ring before swinging the lid back into place. This will reduce any tendency of the O-ring to stick to the lid and ensure a weather-tight seal. To be clear, use Silicone Grease, not Silicone Sealant, nor any other type of grease.
9. If the EMI gasket has any frayed or loose ends, tuck them back into the channel and close the lid while ensuring that the wire harness does not interfere with the base and lid sealing surfaces.
9. Using a torque wrench with a ½" socket, tighten the lid bolts gradually, alternating diagonally to avoid stress or warp on the housing sealing surfaces. The lid bolts should be tightened to the specified 17ftLb or 24Nm torque to ensure that the EMI specification is met. The required torque is easily met by using the box end of a combination wrench, but cannot be reached using a nut driver.
10. Install your shielded, pre-terminated, outdoor CAT-5e cable as shown in Section 3.6.

11. Tape all connections to reduce moisture intake.

3.6 Ethernet Cable Installation

The external RJ45 connector on the Lindsay LBDG-250-DC-6183-1 Gateway provides an IP68 weather-tight connection. A cable that is pre-terminated with an RJ45 connector can be used. No tools are required.

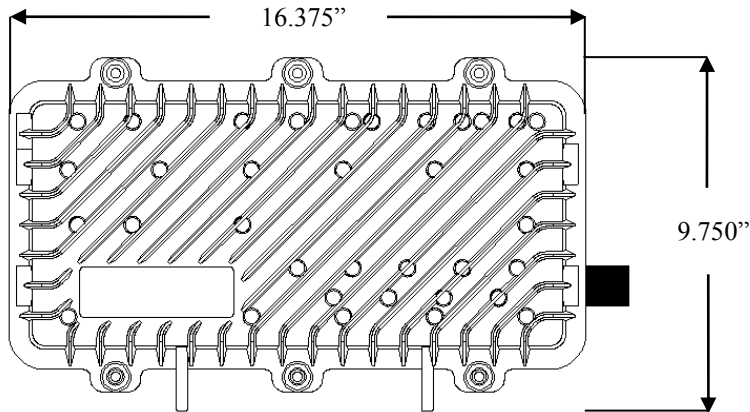
1. The parts kit (P/N 3501-288) for the connector contains two glands. The smaller gland is suitable for cables ranging in diameter from 4mm to 6.6mm ($\frac{5}{32}$ " - $\frac{1}{4}$ "). The larger gland is suitable for cables ranging from 6mm to 10mm ($\frac{1}{4}$ " - $\frac{3}{8}$ "). The smaller gland is recommended for cables that are $\frac{1}{4}$ " in diameter.
2. Thread the connector body from the parts kit into the fixed body already installed in the Gateway. Keep tightening until the flat washer just starts to compress and bulge outward. This can be done by hand, or with a wrench however, a light touch is required.
3. Slide the pre-terminated Ethernet cable through the Connector Nut. Apply the gland and claw, placing the cable through the split in each piece.
4. Push the terminated cable into the fixed body. There should be a positive click as the RJ45 connector mates with the jack.
5. Push the gland and claw into the connector body. Then, while pushing the cable toward the housing, tighten the connector nut. The nut is tight when the gland can be observed to compress around the cable and bulge slightly.



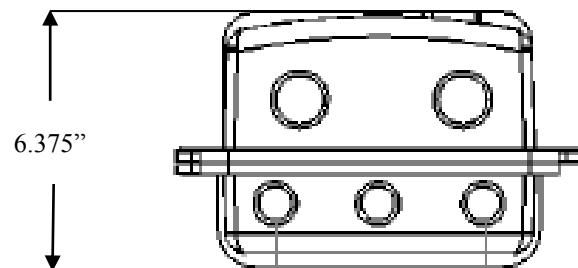
SECTION 4 LBDG-250-DC-6183-1 HOUSING

4.1 Housing Dimensions

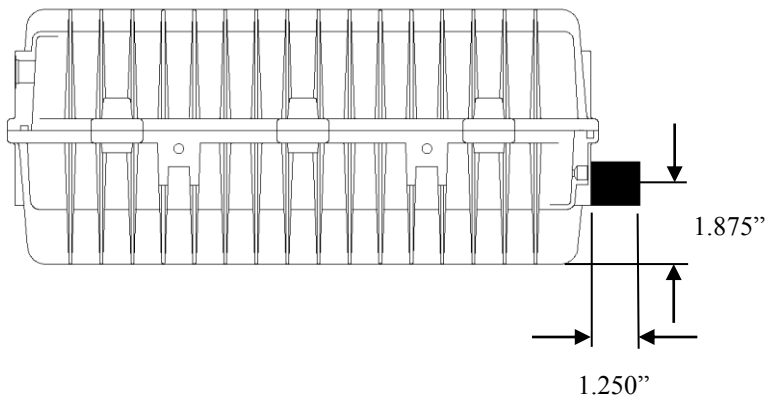
TOP VIEW



RIGHT END SIDE VIEW



SIDE VIEW FROM HINGE



4.2 Table of Specifications

Lindsay LBDG-250-DC-6183-1 Gateway with DC Power Supply Specifications		
Cable Modem		
Band Plans	DOCSIS (Annex B)	
Network Configuration and Management	TFTP, SNMP (V1, V2c, V3), Telnet, HTTP	
Input Impedance	75 Ω	
Privacy	BPI+	
Downstream Modulation	64 or 256 QAM	
RF Input Sensitivity ⁽¹⁾	Modem F Port	+15 to -15dBmV (-10dBmV for 256 QAM)
	Housing 5/8" Port	+20 to -10dBmV (-5dBmV for 256 QAM)
Upstream Modulation	QPSK and 8, 16, 32, 64 or 128 QAM	
Maximum Upstream Data Rate	131.072 Mbps (4 Channels)/32.768 Mbps (Single Channel): @ 128 QAM at 6.4MHz	
Max. Transmit Power (ATDMA QAM 64) ⁽¹⁾	Modem F Port	+54dBmV (+45 to +51dBmV Recommended)
	Housing 5/8" Port	+49dBmV (+40 to +46dBmV Recommended)
HFC		
Return Loss		-16dB (Min.) With 75 Ω Termination
		-10dB (Min.) When Terminated By Modem
Insertion Loss ⁽¹⁾		Downstream: -5dB (\pm 1dB)
		Upstream: -4dB (\pm 1dB)
Test Point		-20dB Relative to Cable Modem RF Port
Pad Type		JPX, Separate Forward and Reverse
Temperature Range		-40 to +60 $^{\circ}$ C (-40 $^{\circ}$ F to +140 $^{\circ}$ F)
EMI Isolation		100dB (5 to 1000MHz)
Surge Withstand (HFC)		ANSI-IEEE C62.41 Category B3 (6KV) (Gas Tube or Solid-State Crowbar)
Input Powering		40 to 90V _{AC} (Pseudo Sine)
Output Power		
Output Power		250W (Fully-Isolated)
Output Voltage		-55.8V _{DC} (\pm 2%)
Efficiency		90%
Power Factor		0.8
Ethernet		
Throughput		10/100/1000Mbps
Reach		100 meters
Interface		RJ45
Physical		
Dimensions		406 x 228 x 165mm (16 x 9 x 6.5")
Weight		5.1 Kg (11.2Lbs)
Ingress Protection		IP68 (15 PSI for 10 Seconds)

Notes:

(1) Levels reported by modem management interfaces reference the modem F port.

Levels at the Gateway KS port incorporate the internal -5dB loss of the HFC Interface.