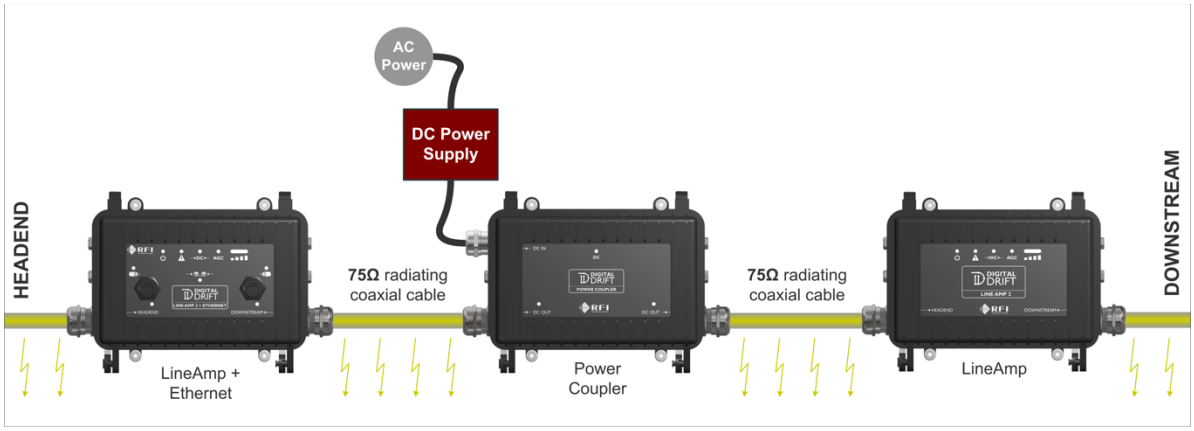
Line Amplifier 2 – VHF, 75 Ohm

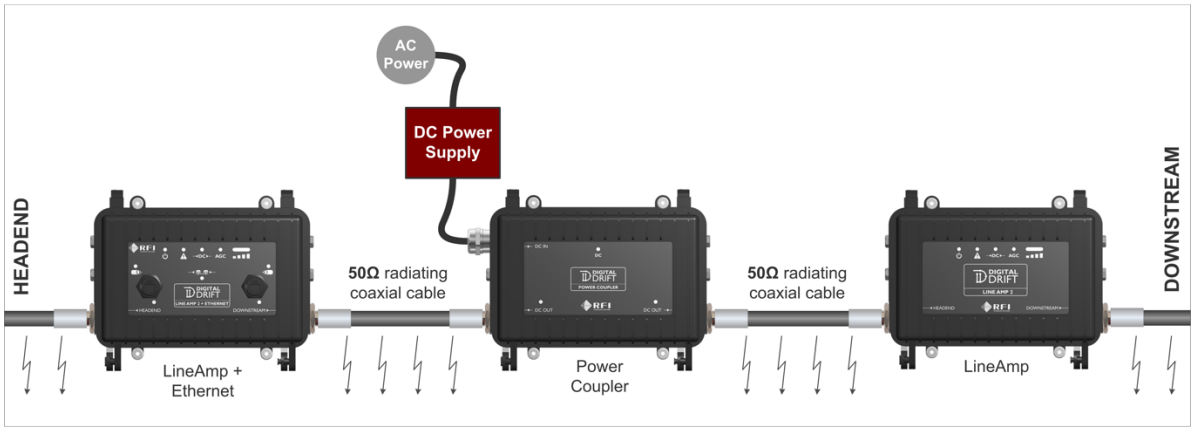
Installation sheet

DDLFS-LA2-V75

System overview

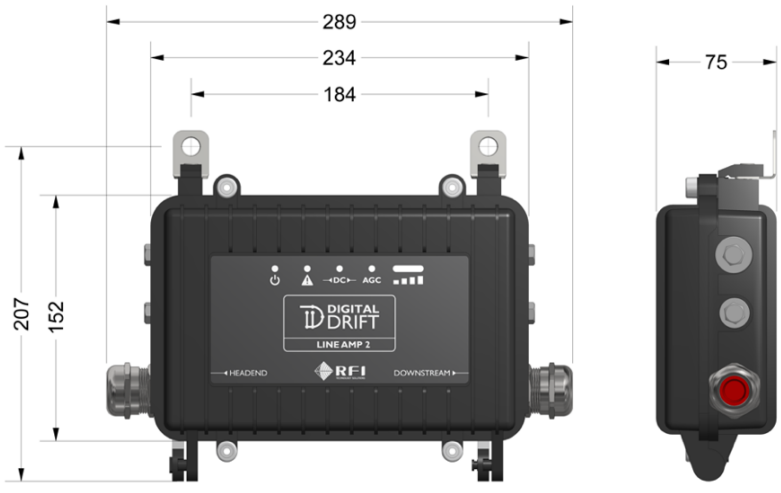
The Line Amplifier is a component of the Digital Drift Leaky Feeder System. Example inter-connections of the system's components are illustrated below. The first example uses traditional yellow 75Ω VHF leaky feeder cable, while the second example uses broadband 50Ω leaky feeder cable.





Mounting

- Two stainless steel mounting brackets are included in the carton and can be attached to the mounting blocks on the top of the device using an M5 Hex Key.
- After the mounting brackets are attached, the device looks as shown below.
- Each mounting bracket has an 11mm diameter hole for attaching the device to a wall.

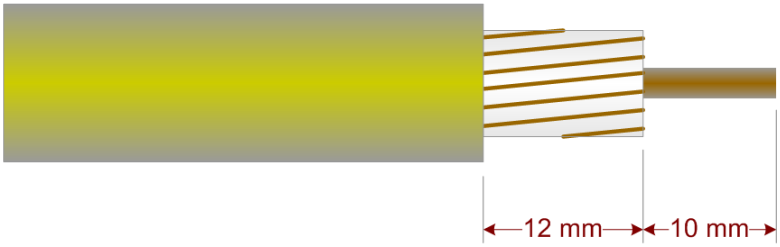


Opening the lid

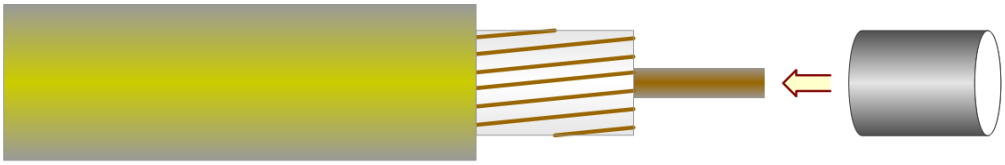
- The coaxial cable connections can only be made when the lid is open.
- To do so, loosen the four Hex Screws on the face of the lid using an M5 Hex Key. Only loosen the screws far enough to release the lid from the base – ensure that these screws stay captive in the lid.

Connecting the radiating coaxial cable (75Ω)

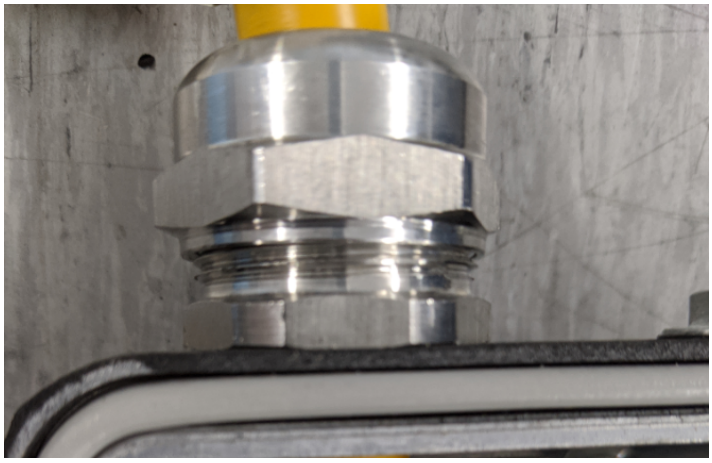
- Ensure the lid is open (described above).
- Strip the coaxial cable end to the dimensions shown below.



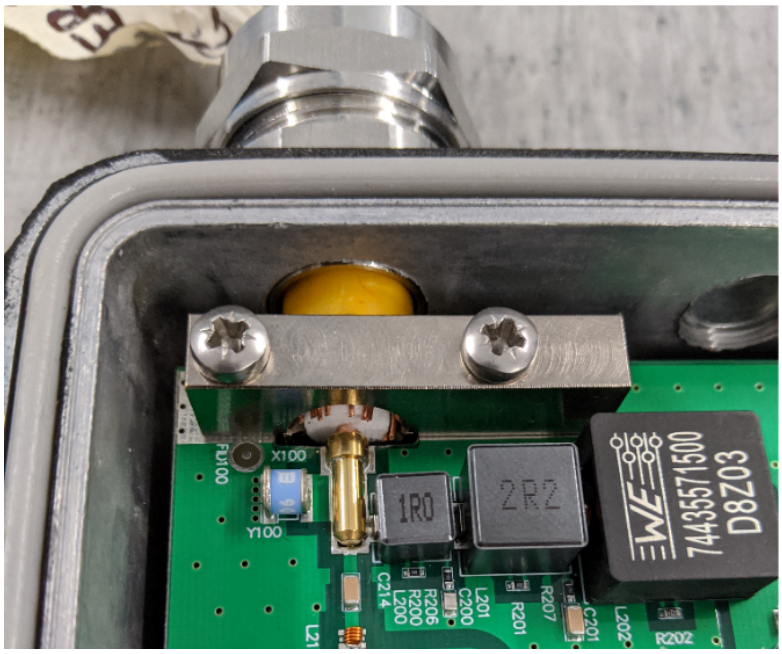
- Insert the sleeve (supplied in the carton) under the copper strands.



- Insert the prepared cable end through the loosened M25 cable gland and into the board, ensuring that:
  - The outer strands all sit under the saddle clamp.
  - The centre conductor is fully seated in the gold pin receptacle on the PCB.
- Tighten the external cable gland, as this provides the cable strain relief.

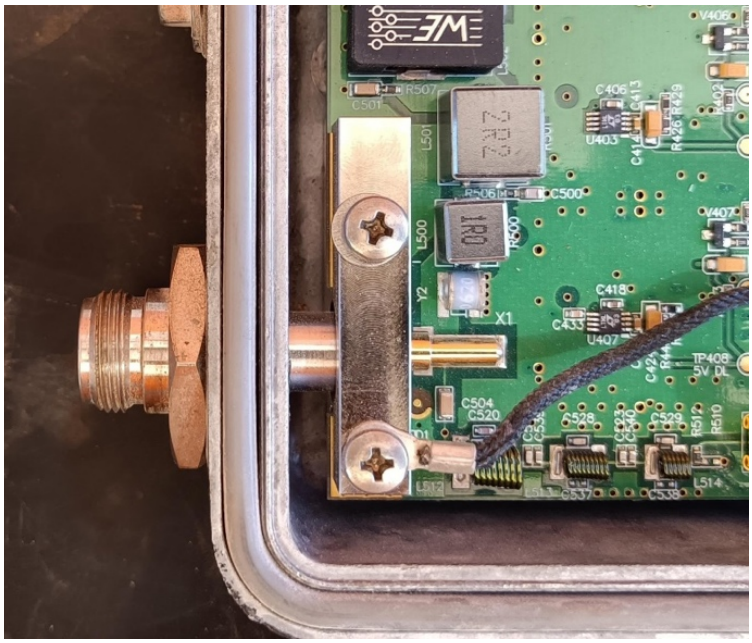


- Tighten the internal saddle clamp onto the outer strands.



Connecting the radiating coaxial cable (50Ω)

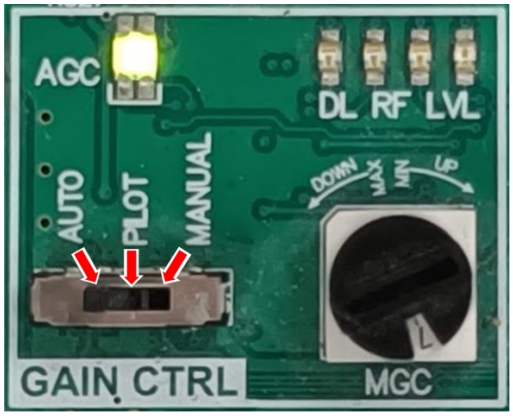
- Ensure the lid is open (described above).
- Remove the cable glands from the left-side and right-side coaxial ports.
- Install N-type female 50Ω adapters (part number DDLFS-NF50-ADPTR) into the left-side and right-side coaxial ports.
- Tighten the internal saddle clamps onto the body of each N-type female 50Ω adapter.



- Fit off the radiating cable with conventional N-type male 50Ω connectors to connect the cable to the line amplifier.

Setting the gain control mode

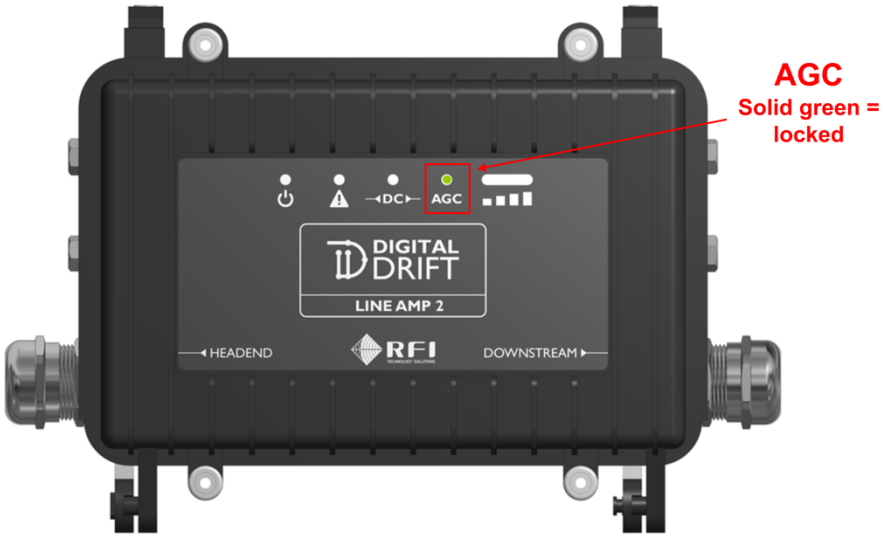
- Ensure the lid is open (described above).
- The line amplifier offers three choices for the gain control algorithm:
  - **AUTO:** Beacon packets sent from the Head End's Gain Management Controller (GMC) are decoded and the beacon's received signal strength is used to adjust the amplifier gain. This method does not require a Continuous Wave (CW) pilot signal at the Head End.
  - **PILOT:** The composite RF signal power arriving at the device in the downlink direction is fed to a learning algorithm, which estimates the long-term composite signal level, averaged across all radio channels used on the site. This method requires a Continuous Wave (CW) pilot signal at the Head End.
  - **MANUAL:** The gain is set by the position of the rotary dial labelled as **MGC**, with position **0** = 10 dB gain, position **F** = 25 dB gain, and each clockwise step adding 1 dB gain.
- When setting up the radio system headend, the site designer must decide whether line amplifiers are intended to work in **PILOT** mode or **AUTO** mode. Consult the radio site designer to know what position the gain control mode switch should be set to.



- **NOTE:** Manual gain control mode is not recommended for use in a production environment.

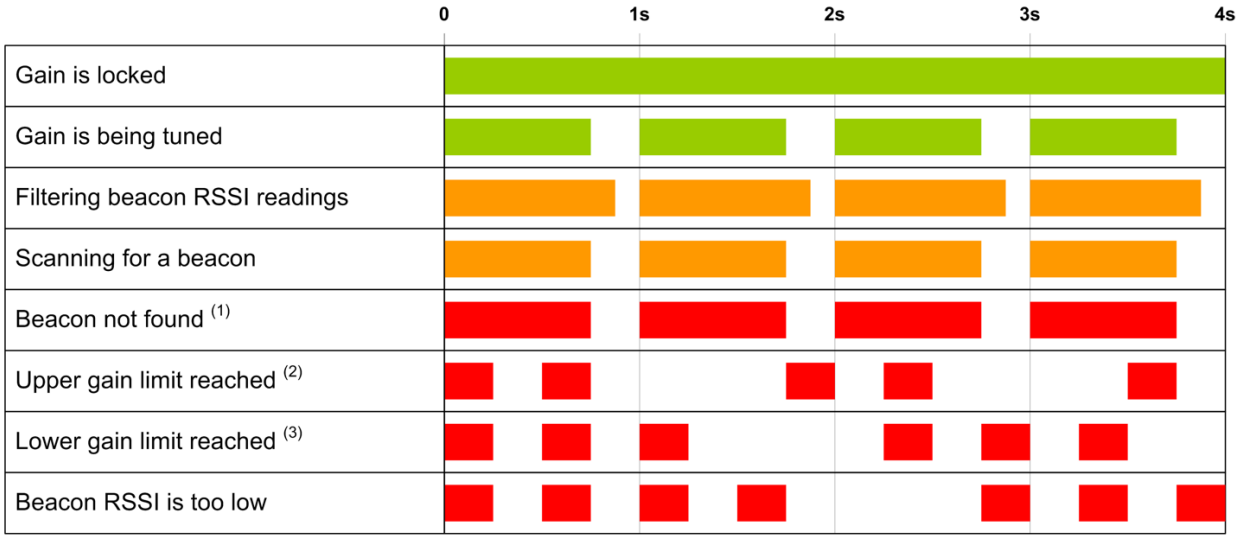
Verifying the gain setting

- When operating in the **PILOT** or **AUTO** gain control modes, the algorithm learns the optimal value for each line amplifier based on continual analysis of the signals arriving at its ports.
- When the algorithm has locked onto the optimal gain level, the Auto Gain Control (AGC) indicator on the front panel displays as solid green.

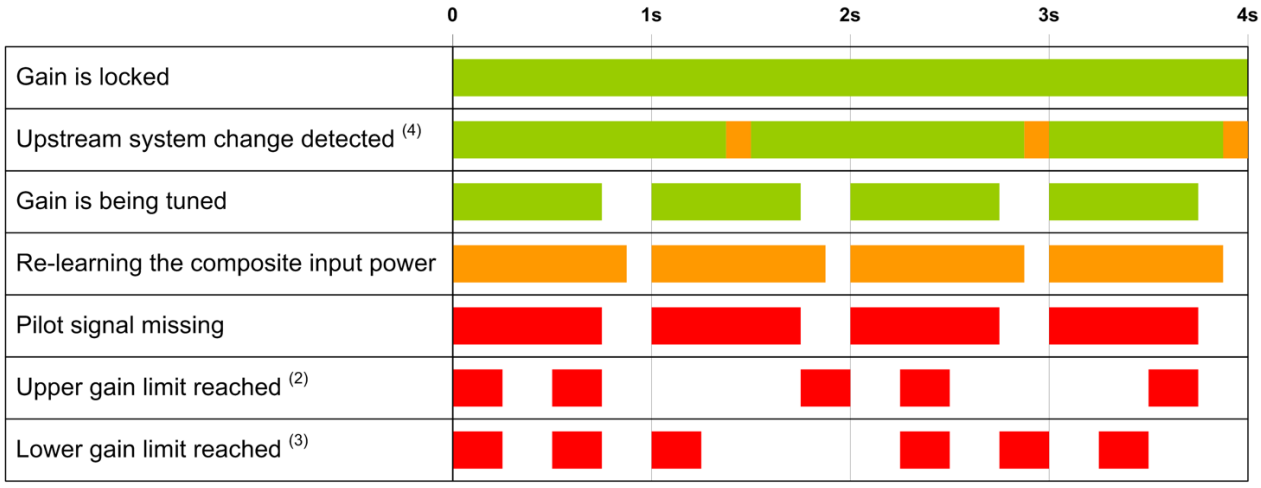


- If the line amplifier spacing is incorrect, or the required control signals are not present on the leaky feeder cable, the gain control algorithm will fail to achieve the locked status. In such a situation the AGC indicator pattern can be used to diagnose the cause.
- **NOTES:**
  - AGC indicator patterns differ slightly between **AUTO** and **PILOT** modes *(illustrated below)*.
  - When the gain control mode switch is set to the **AUTO** position and all channels have been scanned without finding the beacon signal, the algorithm falls back to **PILOT** mode. The beacon scanning continues in the background, and the algorithm is restored to **AUTO** mode when the beacon is found.

AGC indicator patterns for the AUTO gain control algorithm:



AGC indicator patterns for the PILOT gain control algorithm:



Explanatory Notes:

(1) The beacon was not found after scanning all the beacon search frequencies.

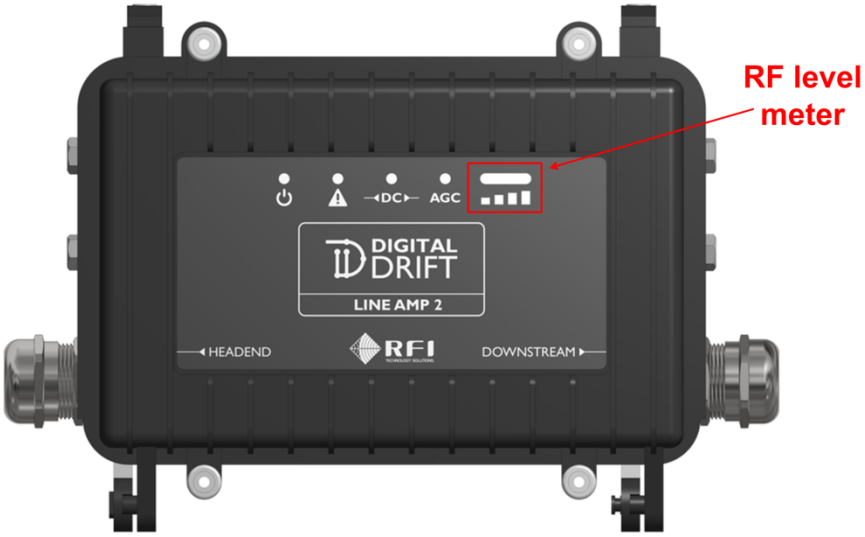
(2) This line amplifier is too far from the preceding one.

(3) This line amplifier is too close to the preceding one.

(4) The incoming composite power has changed substantially, waiting to see if the change persists.

Verifying the 2-way radio signal level

- The RF level meter on the front panel provides live feedback of the radio signal power, as measured in the VHF band, heading out of the DOWNSTREAM port.



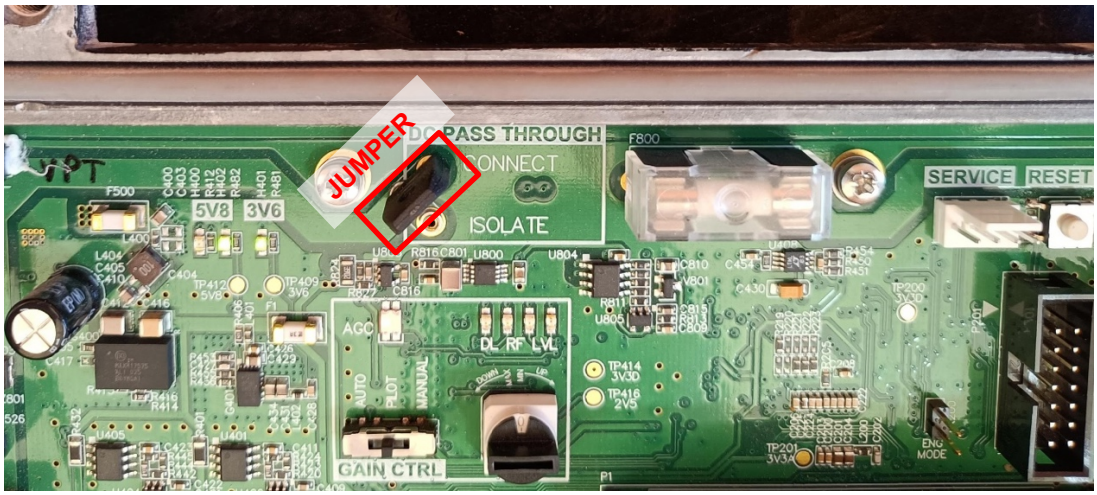
- The number of indicators illuminated on the RF level meter increases with RF signal power, as illustrated below.

	Downlink RF power level	Meaning
○ ○ ○ ○	< -1.5 dBm	Radio signal is not present
● ○ ○ ○	-1.5 to +2.0 dBm	Radio signal is present and within the amplifier's operating range. The target number of lights is site specific.
● ● ○ ○	+2.0 to +5.5 dBm	
● ● ● ○	+5.5 to +9.0 dBm	
● ● ● ●	+9.0 to +10.0 dBm	
FLASHING	> +10.0 dBm	Radio signal level is too high. The "gain limiter" is active to prevent damage to the amplifier.

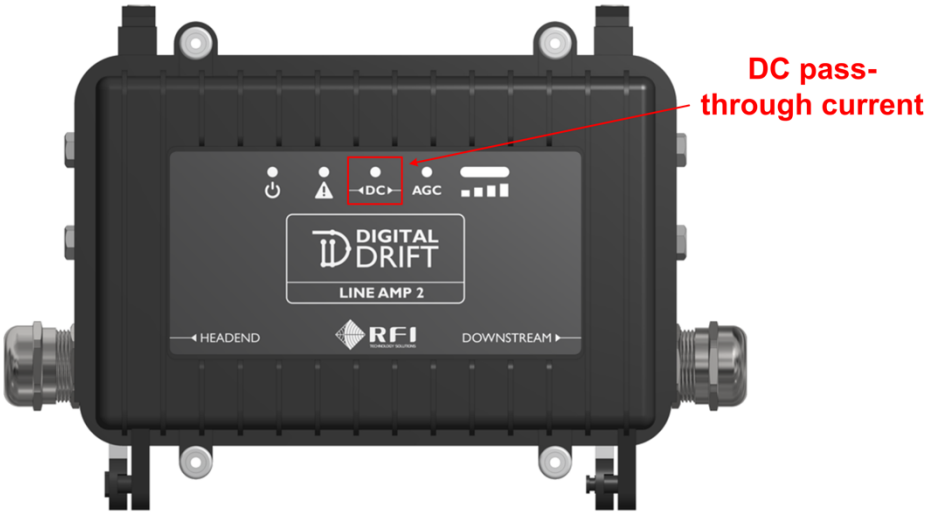
- When a radio channel is keyed up, the level on the meter will usually increase, and when the channel ceases activity, the level on the meter drops back. Observing this RF level meter while a channel is keyed up and down is a convenient way to verify the 2-way radio system is operational.
- **NOTE:** The RF level meter measures the composite RF power from 145.0 to 157.5 MHz, it is not measuring the per-channel RF power.

Setting the DC pass-through mode

- An internal jumper is used to control whether DC current flows across the line amplifier.
- The jumper has two positions:
  - **CONNECT:** Up to 8 A can flow across the line amplifier.
  - **ISOLATE:** Current is blocked from flowing across the line amplifier. The device will be powered from the highest voltage present at its left-side or right-side coaxial port.



- The DC indicator on the front panel has the following behaviour:
  - **OFF:** No current is flowing across the line amplifier.
  - **GREEN:** Current is flowing across the line amplifier, between 0 A and 4 A.
  - **ORANGE:** Current is flowing across the line amplifier, between 4 A and 8 A.
  - **RED:** Greater than 8 A is flowing across the line amplifier.



Isolate the headend and downstream signals

The signals travelling on a radiating coaxial cable leak out of it. For reliable system operation, it is critical that the signals travelling on the **HEADEND** cable and the **DOWNSTREAM** cable are not able to leak into each other. Four cabling scenarios that should not be used are illustrated below left, along with the recommended cabling, below right.

Bad cabling practice	Recommended solution