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Pedal Box Guide
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In today's market, there are a high number of bias controlled pedal boxes that you can buy meaning it can be quite daunting when coming to choose the right unit for you!

This guide is designed to help you choose the right pedal box set up for your requirements and will also help you in many areas of how to install the pedal system in a safe manner.

In this guide we will cover the following:

1. What a bias pedal system?
2. Choosing the right Pedal box for your application
3. Pedal Boxes and ABS Systems
4. Pedal Ratios
5. Fitting the obp Pedal box
6. Master Cylinder Set Up
7. Bias Bar Set Up
8. Fitting your throttle cable
9. Installing a handbrake with a pedal box

**** Due to the nature and function of a pedal box, we always heavily advise that a professional mechanic or race car preperation company is used when installing a pedal box. ****

A high-quality bias pedal box is a must for any serious competition race car. Most car brakes systems, even when fitted with ABS, use a vacuum servo to increase the pedal force and help with braking, however in competition race car, this is often not up to the job, and you get an inconsistent brake pedal due to heat build-up and general wear and tear. Also, on most standard brake systems, the master cylinder is typically only one unit that splits the braking effort to each brake within only one cylinder, this means that break bias is effectively set and although an inline adjuster valve can be fitted to change the bias. This is not ideal or as ultimately effective as a bias / balance pedal box setup.

A bias controlled pedal box system firstly removes the vacuum servo that can give the inconsistent brake pedal and the pedal force from the brake pedal is connected directly to the brake cylinders. Therefore, this is no longer a reliance on a vacuum from the engine to help with braking force.

This means the pressure you give when braking, is the exact pressure the brakes will work with allowing you to feel what the brakes are doing. The bias pedal system also allows you to control the ratio of braking by using a dual cylinder set up rather than a single cylinder like most standard cars. By having a dual cylinder set up, you have one master cylinder going towards the front brakes and one master cylinder going through to the rear. You can adjust the ratio of this braking by using a bias / balance bar giving the driver complete control over the finer braking efforts between the front and rear brakes to help suit your driving style and weather conditions. For example, typically in the dry you would want the front brakes doing most the braking whereas in the wet conditions you would adjust the braking effort more towards the rear.

2. Choosing the Right Pedal Box for you.

One of most common questions we get with pedal boxes is "Which pedal box is best for me?". Due to today's market, are so many pedal boxes on the market that can make this process quite daunting but in reality, it is a fairly simple answer and the majority of the time it is down to the space available in your cockpit.

When choosing a pedal box, the questions that we always ask are:

1. Is it a Floor Mounted or a Top Mounted system you need?
2. Do you require the master cylinders at the rear of the box in the engine bay (bulkhead fit) or in front of the pedals (Cockpit fit)?
3. Do you need all 3 pedals (throttle, brake, and clutch)? If so, what clutch are you running, cable or hydraulic?

By knowing the answers to these questions, this will enable you to find the exact product you need. Of course, there are several benefits to either of those options. For example, if you do not have much roon in the engine bay, then a cockpit fit is ideal.

You may also need to take into consideration whether your throttle pedal is controlled by Drive by Wire or a mechanical cable. Our obp Pedal Systems are all Cable operated as stock, however they are compatible with linear potentiometers.

Pedal Box Examples

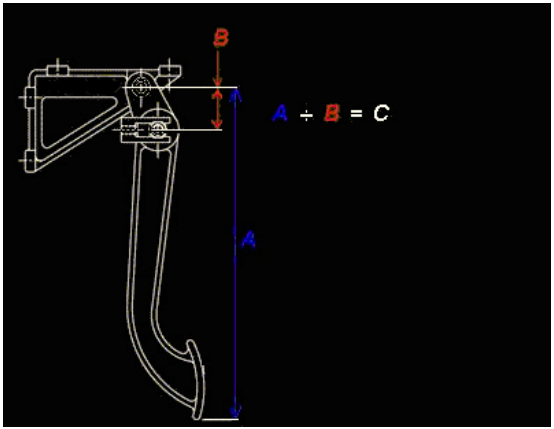
With a standard manufacture ABS System, the bias pedal box will not work correctly.

The main problem with using a bias pedal box with a standard manufacturers system is that one of the main reasons for fitting a bias pedal box is to give you more control over the front and rear brakes and a cars ABS system works to prevent your wheels from locking up under braking. T

herefore a standard cars ABS isn't programmed to allow both the adjustment front to rear of the brake balance because as it senses the wheel 'lock up' it would try to move the pressure of the brake to the other wheens to prevent the locking and therefore acting against your bias set up.

4. Pedal Ratios

Pedal ratios tell you how much force you apply to the pedal is multiplied and transferred to the master cylinder which can dictate how far the pedal travels. This is an important part of the pedal box so you can fully understand how much force you need to stop a moving vehicle safely.



Measure the distance from the centre of the pedal pad (A) to the centre of the pivot point.

Measure the distance between the pedal pivot point and the centre of the master cylinder push rod. (B)

Then divide A by B to give you the result.

For example, if dimension A is 300mm and the dimension B is 50mm then the Ratio would be 6:1.

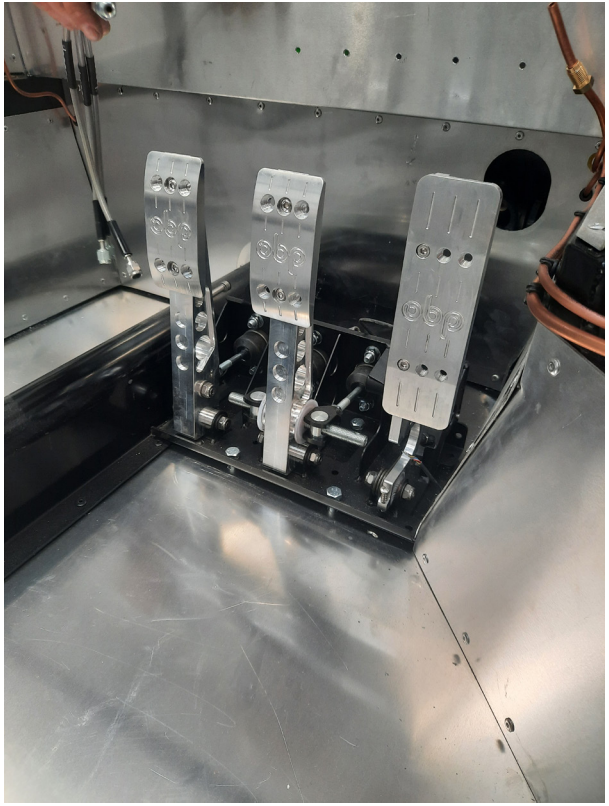
A benefit of the obp pedal boxes is that the pedal ratio is adjustable as you move the pedal pad up and down.

5. Fitting the obp Pedal Box

**** WE HIGHLY RECOMMEND THAT AN EXPERT IS USED TO FIT THE PEDAL SYSTEMS SUCH AS RACE CAR PREPERATION COMPANY. IS IT CRUCIAL THE PEDAL SYSTEM IS INSTALLED CORRECTLY****

When bolting the pedal box in place, make sure to use high tensile bolts and large washers to spread the force load when the brake is applied. NEVER use riv-nuts or similar fixings when mounting a pedal box!

When fitting a universal pedal box, which the majority of obp systems are, then extra care is needed when deciding where and how to mount the pedal box. First you need to ensure the box is mounted to a strong and secure surface and that the all the mounting positions on the pedal box are used. It is advised that if you are fitting a bulkhead fit pedal box remotely and away from the bulkhead itself, that the bulkhead replacement is used to act as this. This is important as a bulkhead fit pedal box is specifically designed to be used up against the bulkhead as this offers support to the force of braking. It is also important to check your race regulations whether they allow the brake bias bar to be used whilst the car is in use.



It is advisable to fit the master cylinders to the pedal box assembly before installing the pedal box in the vehicle, this makes it much easier to do! The normal bore sizes for the master cylinders would be

0.625" for the Front Brakes
0.700" for the Rear Brakes
0.750" for the Clutch

The front brakes use a smaller bore master cylinder so that they will also have slightly more pressure when the bias bar is in the 50/50 position. Of course, some vehicles can have a slightly unique set up where you may need to have a larger bore cylinder for the front brakes and then a smaller bore for the rear brakes.

When understanding bore sizes on the cylinders, it is important to remember that the smaller the bore of the cylinder, the more pressure you will get. It could be tempting to use a 0.625" if that is the case however with a smaller bore master cylinder, the brake pedal will require more travel to displace the fluid. For example, a 6 POT Calliper needs more brake fluid than say a 4 POT calliper. Therefore, having a larger bore going to the 6 POT calliper is more advantageous as you can move more fluid in one given press of the pedal.

So, a key thing to remember when looking at the master cylinder sizes is:

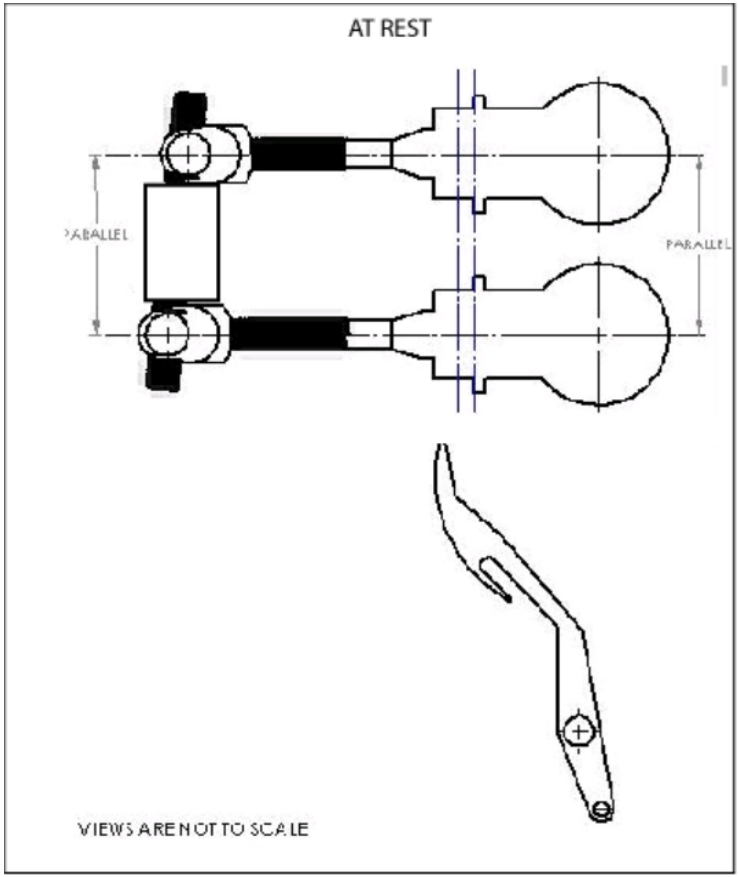
The smaller the bore, the more pressure you have but softer the pedal.
The higher the bore, the less pressure you have but harder the pedal.

The Inlet on the master cylinder is 7/16-20 UNF
The Outlet on the master cylinder is 3/8-24 UNF
The Push Rod standard length is 84mm x 5/16-24 UNF Thread

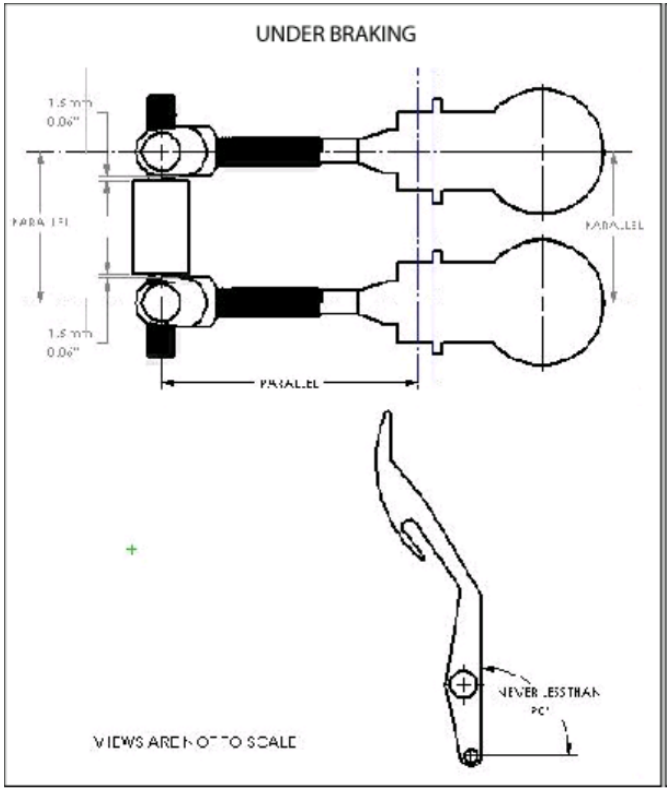
7. Setting Up the obp Balance Bar

The function of a bias bar is to allow the adjustment of brake line pressure distribution between two master cylinders. This is accomplished through moving the bias bar pivot towards one master cylinder pushrod or the other. If the pivot is perfectly centred between the pushrods, the force applied to each master cylinder will be equal. This is known as the "neutral position" of the bias adjuster. If the pivot is moved closer to one pushrod or the other, then the master cylinders will receive differential pressures (proportional to the distance between the bias bar pivot point and master cylinder centre lines). This adjustment gives the driver control over the braking characteristics of the car, and to alter those characteristics to account for changes in fuel load, track conditions and handling characteristics of the car.

The balance bar is one of the most overlooked, and least understood, components of almost any race car. As with all aspects of race car assembly and preparation, careful attention to the geometry of the balance bar and brake pedal will yield great benefits. To start, we need to look at the proper installation of the bias bar adjuster.



First, we must ensure that the bias bar pivot bearing is free to move within the pedal tube. Often this tube becomes distorted during installation. If this is the case, then the tube may be honed, until the bearing slides smoothly from one end of the tube to the other. The tube must be clean and may be lubricated with a light oil or dry Teflon spray.



With the clevises set on the adjuster each clevis and the bias tube should be no more than 1.5mm air gap is achieved. This prevents the bias bar from shifting while on the track, and altering in an unpredictable manner, the brake bias of the car. With the bias bar connected to the master cylinders, and brake lines connected, the brakes should be bled. It is critical that front and rear brake circuits be bled simultaneously. This will allow both master cylinders to use their full travel and prevent binding the bias adjuster (the fluid reservoir must always be located above the level of the bleed screws).

With the pedal tube and clevises squared away, we now look at master cylinder pushrod length. The key is to set up the bias adjuster so that it is perpendicular to the master cylinder centre lines with the brake pedal under compression. Typically, this means that the front master cylinder pushrod will be 3mm-5mm longer than the rear master cylinder pushrod at rest. This is because the front braking circuit has a larger fluid volume, due to the larger piston diameters in the front callipers. As a result, the front master cylinder requires a higher feed rate than does the rear. If the pushrod length is equal front and rear, then the feed rate of the rear master cylinder is too high relative to the front. The result in this case is the rear circuit “hitting” before the front. With the pushrod lengths adjusted properly, the bias bar will be square under compression and the front and rear circuits will “hit” approximately at the same time.

Adjusting the Balance Bar

The bias bar (often known as balance bar) is an adjustable lever that pivots on a spherical bearing and is required when using a pedal box assembly consisting of two separate master cylinders for the front and rear brakes. When the balance bar is centred, it pushes equally on both master cylinders creating equal pressure, given that the master cylinders are the same size bore. When adjusted as far as possible towards either cylinder, it will push approximately twice as hard on that given cylinder.

To set the balance bar up, thread the master cylinder pushrod through their respective clevis' to obtain the desired position. Threading one pushrod into its respective clevis means threading the other one out the same amount. Sometimes this will lead to a 'cocked' balance bar when the pedal is in a relaxed position (see Figure 2 – no pedal effort). This is acceptable if each cylinder pushrod is completely free of pressure when the pedal is relaxed.

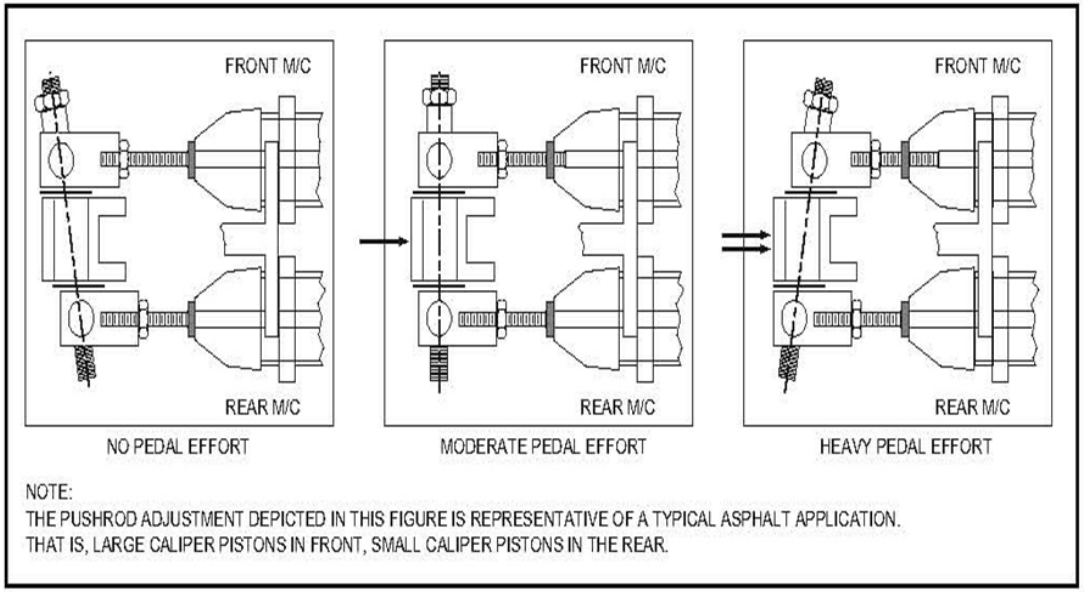


Figure 2. Balance bar lever adjustment

*Note, the pushrod adjustment shown in the figure is representative of a typical asphalt application. That is large calliper pistons in front and small calliper pistons in the rear.

It is important that the operation of the balance bar functions without interference by over adjustment. This can occur when a clevis jams against the side of the pedal or the lever (bolt) hits the pedal bore during any point of the pedal travel as shown in figure 3.

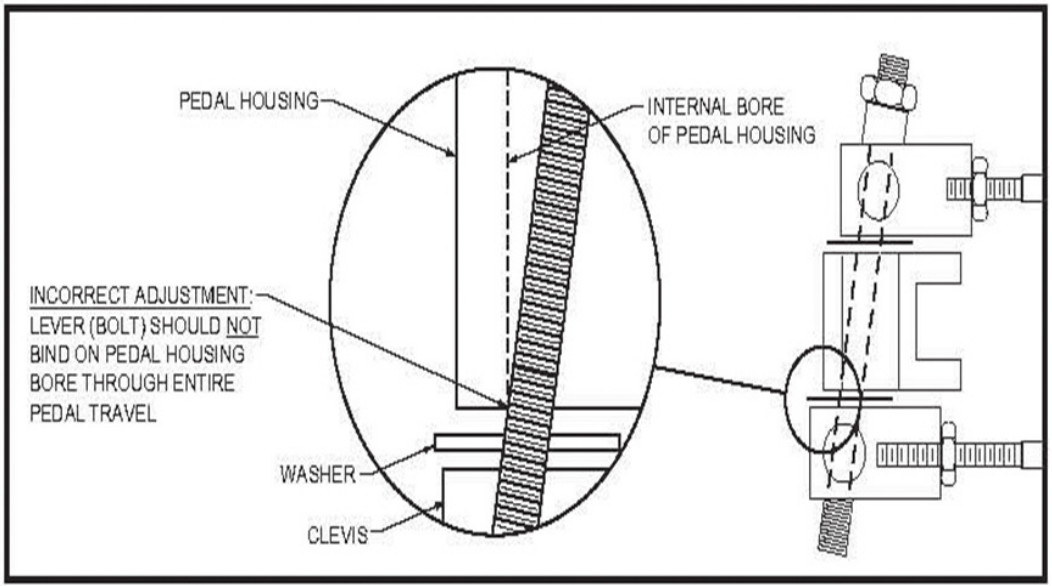


Figure 3. Balance bar lever interference

Lever movement should be unimpeded throughout pedal travel. In the neutral position, clevises should have between 2mm to 4mm total clearance between the side of the pedal. Make sure that the master cylinder pushrods remain true in relationship to the cylinder during entire pedal travel; pushrods should not be pushing master cylinder pistons at an angle. See Figure 4.

NOTE: In its non-depressed position, the pedal and balance bar should allow the pushrod of the master cylinders to fully return. This can be checked by feeling pushrods for very slight movement, not loose movement.

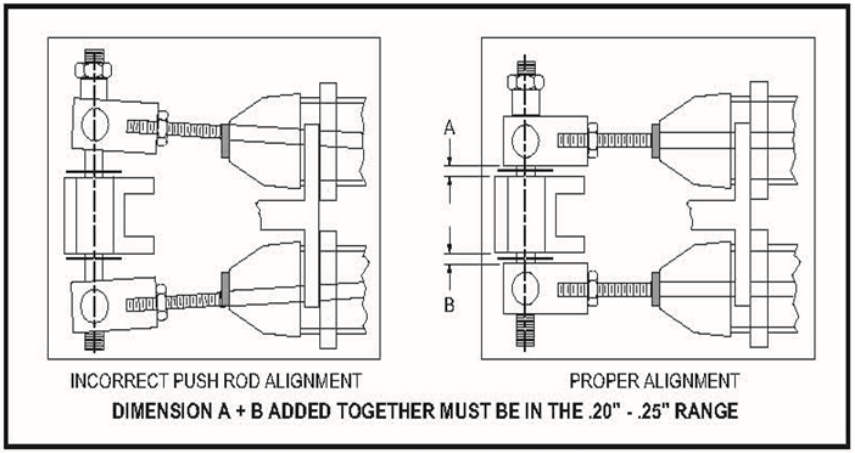


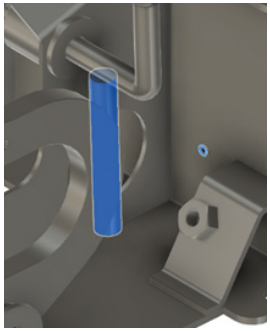
Figure 4. Example of pushrod alignment

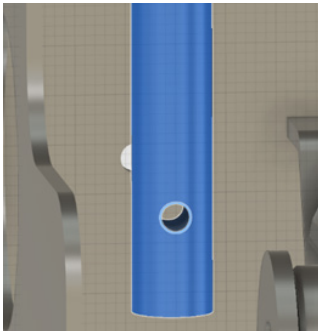
8. Fitting the Throttle Cable

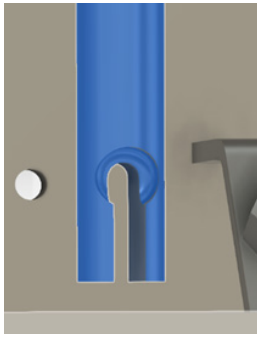
You may notice on the obp Pedal boxes that the throttle pedal linkages are blank and there isn't anywhere obvious to put your cable. This is because as you know, there are so many different styles or throttle cable ends and sizes and for our engineering team to cater for them all would just be nearly impossible! Therefore, as a universal product, it is something that can be done upon installation. Below is a small guide that helps explain what to do to make this happen.

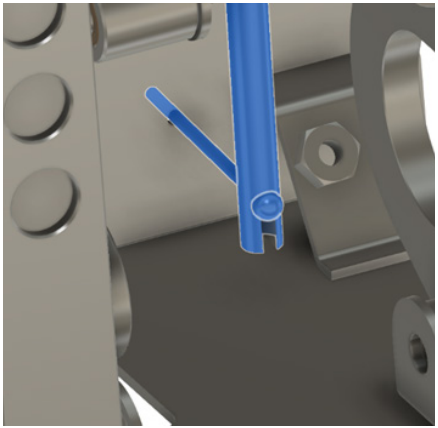
The pedal box shown in the images are of our popular floor mounted bulkhead fit system where the cable is designed to come through the rear. We acknowledge that this is not the same for all pedal boxes however the process is the same for all the pedal boxes available from our store. The cable we are showing is also a nipple end cable.

- Firstly, remove the throttle pedal from the box and dot punch where you would like to install the cable.
- Drill a hole the size of the nipple ¾ of the way through the pedal end.
- Now cut a slot in the pedal so the slot joins the hole.
- Slot the ball of the cable into the drilled hole
- Pull the cable through so the ball is in the hole and the cable is in the slot.
- You may need to drill an entry hole for the cable fit through on the box to securely fit the cable outer sleeve.









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