

# **The DG Coupler Installation/User Manual**

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# The DG Coupler Installation/User Manual

## ***What is the DG Coupler?***

It's a small box that connects to your DG and makes a signal that is compatible with the Navaid AP-1 autopilot. Now your AP-1 can hold a heading as well as track a navigation signal.

## ***What kind of DG do I need?***

You'll need a 52D54 or a King NSD-360 autopilot directional gyro. These gyros are air-driven DG with a heading bug. The 52D54 has an autopilot pickoff that operates at 5000Hz. Call Century Instruments, Wichita, Kansas for their latest price on the 52D54 gyro.

## ***Installation Instructions***

### Physical installation

Mount the DG Coupler behind the panel where it is protected from extreme heat or cold. Use the supplied Velcro self-adhesive material to attach the box. Be sure to tie the harness to the aircraft with the supplied wire ties so that the harness does not pull on the DG Coupler after installation.

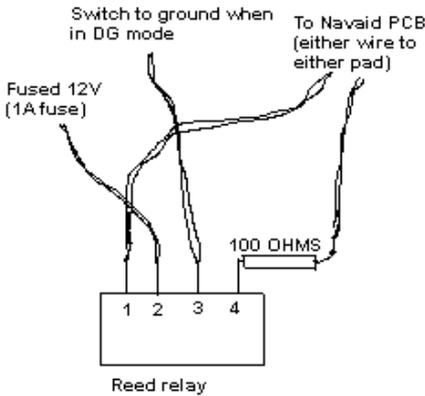
You will need to access the DG Coupler adjustment pots while flying during the initial calibration. Rotate these pots by using a small screwdriver inserted through the holes in the rear of the DG Coupler case. Plan on enough length in the wiring harness so that you can make these one-time adjustments.

Hints on getting the Velcro to stick permanently:

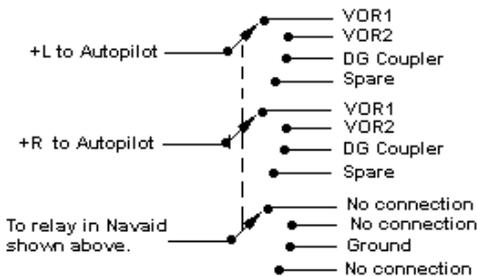
- Clean all dirt, oil and grease from both surfaces. Use alcohol or solvent. Wait for the solvent to evaporate.
- Press the Velcro in place securely.
- Wait 24 hours for the adhesive to cure before putting any weight on the Velcro

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## Navaid AP-1 Modification



### Navaid internal detail



### Typical 3-pole, 4-position switch

Figure 1

The relay shown at in figure 1 is a Hamlin HE3621A1210. The relay assembly is supplied with the DG Coupler kit, so this diagram is for reference only. The Hamlin is a nominal 12V relay with a transient suppression diode built-in. You can simply tuck it into the available space between the two Navaid printed circuit boards. You'll have to

notch or drill the Navaid case to let out the wire that needs to be selectively grounded. The 12V wire can be connected to a 12V source inside the Navaid case.

Figure 2 below shows where to hook up the wires.

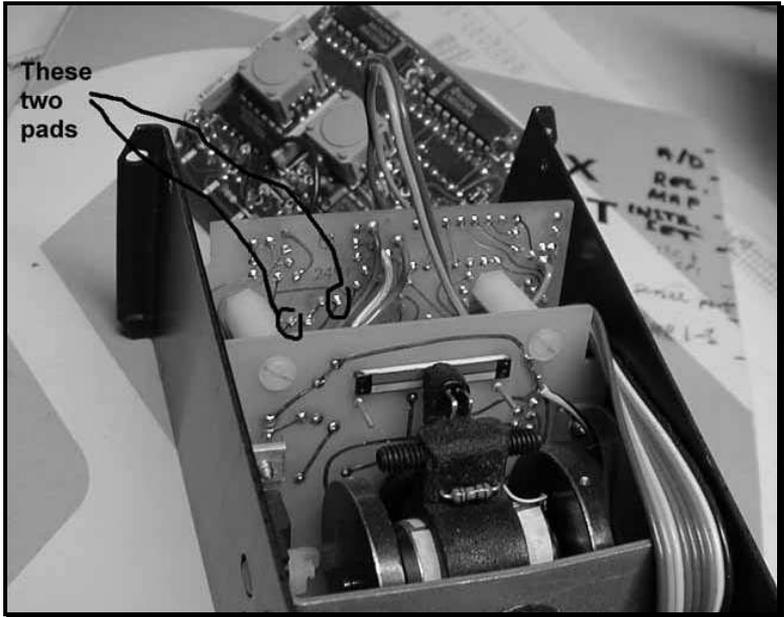


Figure 2

## Wiring

Four wires in an overall shield go between the DG Coupler and the DG. See Table II and Figure 3 below. The connector for the DG is not part of the kit but can be supplied by Porcine Associates if necessary.

Two wires in an overall shield go between the DG Coupler and autopilot source select switch. Connect the shield to ground at the DG Coupler end only. The signal to the autopilot is differential, so you will need to switch both wires if you have more than one autopilot source in your aircraft. There is an additional control wire that is also switched, so the

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switch itself must have three poles, two for the navigation signals and one for the Navaid control wire. See Figure 1 above for the diagram of a switch installation.

Typical sources are VOR1, VOR2, LORAN, GPS, etc. If you only have two sources (such as the DG Coupler and a GPS receiver), you can use a simple 3-pole 2-position toggle switch. If you have 3 or more sources you will have to use a 3 pole rotary switch with the appropriate number of positions. Radio Shack has these parts. Make sure you use a switch suitable for *dry circuits*. A dry circuit switch is one that is designed for very low voltages and currents. They typically have gold or silver plated contacts.

Connect the power to a fused source and the ground to aircraft ground. The DG Coupler consumes only about 50ma, so can be put on the same circuit as your autopilot.

<b><i>Pin</i></b>	<b><i>Description</i></b>
1, 6	Aircraft ground (both pins are connected internally)
2	Aircraft power (+14V)
3	+L to autopilot
4	Signal input (from DG)
5	Excitation output (to DG)
7	+R to autopilot
8	Signal input return (from DG)
9	Excitation output return (to DG)

Table 1  
DG Coupler chassis connector pin out

<b><i>DG Coupler connector pin</i></b>	<b><i>DG connector pin</i></b>	<b><i>Description</i></b>
6	H	Connect overall shield here
4	A	Signal input (from DG)
8	B	Signal input return (from DG)
5	E	Excitation output (to DG)
9	D	Excitation output return (to DG)

Table II  
Cable, DG Coupler to DG

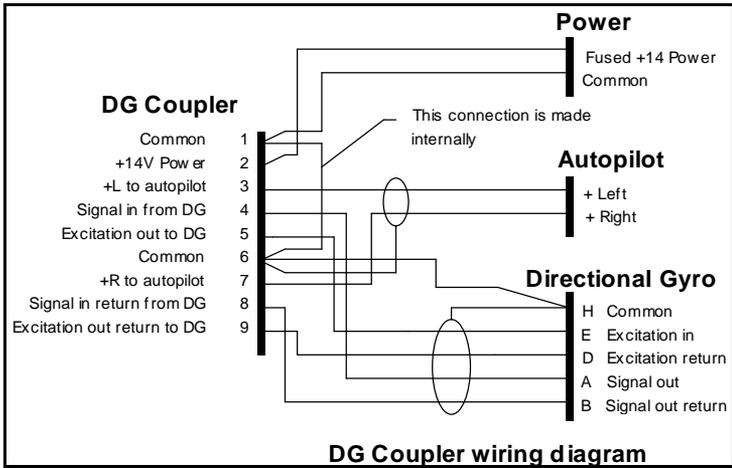


Figure 3

### DG mating connector

This is a five-pin circular connector. One supplier is Wire-pro, Inc. Their part number is 126-223. This part includes the connector, the shell, strain relief and locking device. The Wire-pro connector is available from Porcine Associates in small quantities.

### Installation Checkout

After the DG Coupler is installed and connected to your autopilot, do the following procedure to ensure correct operation.

#### Setup

- Turn on your autopilot and the DG Coupler.
- Select the DG Coupler as your autopilot source. Enable course mode in your autopilot. Use the autopilot mode that you normally use to follow a VOR.

Center the heading bug.

It doesn't matter what heading is selected. The autopilot will respond to

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the position of the bug relative to the mark at the top of the DG.

Your autopilot should center your ailerons, or move your ailerons very slowly one way or the other.

Move the bug about 10 degrees to the *left* of center.

The autopilot should now know that it needs to turn left to get back to the correct heading. Your ailerons should move down on the right and up on the left to start a left turn.

Move the bug to about 10 degrees to the *right* of center.

The autopilot should now know that it needs to turn right to get back to the correct heading. Your ailerons should move up on the right and down on the left to start a right turn.

There are three possible results of the above tests:

### **The ailerons moved correctly.**

Congratulations on a successful installation!

### **The ailerons moved in the wrong direction.**

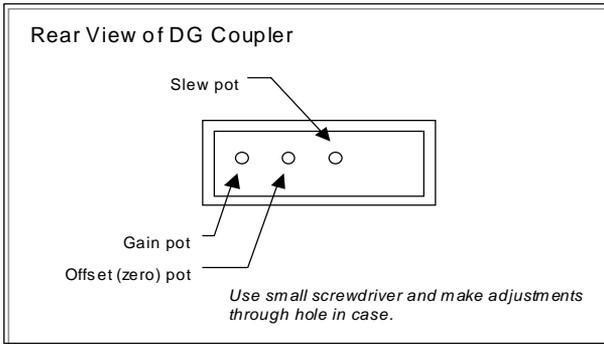
The +L and +R output from the DG Coupler are reversed where they connect to the autopilot. Reverse the wires and try again.

### **The autopilot did not respond to the heading bug at all.**

This can be more complicated. Refer to the troubleshooting section below.

## **Calibration**

You will need to do the calibration while flying. It will be very helpful to have a helper to do the adjustments.



### 1. Initial conditions

Start with the slew pot fully counter-clockwise. This will remove any contribution of the slew pot when you adjust the gain.

### 2. Use the offset pot to center the heading bug over the desired heading.

This pot sets the zero through the system. Use it to make your desired heading lie under the heading bug when you fly.

### 3. Use the gain pot to trim the system when on heading.

If the gain is too high your aircraft will oscillate around the heading. This is very obvious! Your airplane will continuously bank back and forth around the heading. Turn down the gain.

If the gain is too low your aircraft will be very lazy in acquiring the heading, and once acquired it will feel like it is only loosely connected to the heading. Turn up the gain.

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4. Use the slew pot to set how fast your aircraft turns when you set a new heading under the bug.

Once the zero and the gain are satisfactory, use the slew pot to set how much bank your autopilot uses when you make a large change in the heading bug. This may be a compromise between taking too long to turn to the new heading and banking too dramatically when you change the bug. Note that you turn this control clockwise to decrease the slew.

### ***Using the DG Coupler***

#### Normal procedure

- Set the heading bug on the desired heading.
- Turn your aircraft so that the heading is within a few degrees of the selected heading
- Turn on your autopilot and select the DG Coupler as your autopilot course source.
- Relax!

### ***Troubleshooting***

First double-check all the harnesses and wiring. 90% of the time after the trouble is found you will see that it could have been found visually if you only looked carefully.

You will need a voltmeter that has a 300mVDC or less scale. The output of the DG Coupler is  $0V \pm 150mV$ . This voltage appears between the +L and +R wires leading from the DG Coupler to the autopilot. The voltage from either wire to ground will be about 2.5V.

Connect your voltmeter across the +L and +R wires. Select the 300mVDC scale. Connect the DG coupler to the DG and turn on the DG Coupler.

Turn the slew pot all the way counter-clockwise and the gain pot all the way clockwise. You should be able to swing the voltmeter from +150mV through 0V to -150mV by moving the heading bug from about 20° left of heading to 20° right of heading.

If you can do this and yet the autopilot is not responding to the DG Coupler, it means that the signal from the Coupler is not reaching the autopilot. Check the connections carefully. If possible, check for the  $0V\pm 150mV$  at the autopilot after all the connectors and switches.

If you cannot get  $0V\pm 150mV$  from the DG Coupler, make the following checks:

- Is the Coupler powered? There should be +12V applied to pin 2 and ground applied to pin 1 or 6.
- Disconnect the +L and +R wires from autopilot. Can the Coupler now make the  $0V\pm 150mV$ ? If so, is the autopilot course input shorted?
- Double-check the wiring between the Coupler and the DG. Unplug the harness from the back of the DG. Make a fixture by connecting one end of a 100-ohm resistor to a speaker (any speaker will do). Connect the free end of the resistor to pin E and the free terminal on the speaker to pin D. It should make a lot of noise when the DG coupler is turned on.

If you still cannot find the problem, call for technical support at Porcine Associates.

### **Contact us**

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