©Johnson Outdoors 2021

PowerDrive Models

(There are separate manuals specifically relating to CoPilot, i-Pilot, and i-Pilot Link.)

Click on blue Case to jump to the linked discussion/resolution:

©Johnson Outdoors 2021

PowerDrive Models

(There are separate manuals specifically relating to CoPilot, i-Pilot, and i-Pilot Link.)

Case I. Motor fails to steer left or right.

NOTE: All PowerDrive motors are designed to be stored in the stowed (horizontal) position rather than the deployed/run (vertical) position. Stowing the motor to place it in the horizontal position allows water/condensation to drain out the weep/breather hole. Failure to properly stow the motor will allow water to collect inside the drive housing. This may result in the steering motor rusting, sticking, failing to run causing the loss of all steering functions. Prior to any subsequent testing we would advise that the drive housing be direct tested by disconnecting the drive housing leads and applying 12-volts to verify clockwise and counter clockwise rotation. (See **Step 2B** below.)

For PowerDrive models (units without a Compass Control Board in the control box):

Step 1. Check for proper voltage and polarity. Visually check to see that all wires are attached to proper control board terminals. Consult appropriate wiring diagram for the model and board being tested. Check for any corroded connections. Clean / rewire, if necessary.

Step 2. Check motor with the appropriate known good test foot pedal or test the original foot pedal by performing *Foot Pedal PCB Test Procedure* (see **pages 5-8** for the appropriate pedal and test procedure).

A. If test pedal properly steers motor or if the original pedal tests bad as outlined on **pages 5-8**, then original foot pedal is faulty. On Legacy footpedal models, disassemble faulty pedal to inspect if actuators are properly making contact on foot pedal board. Visually inspect foot pedal control board for collapsed / burnt dome switches. Replace foot pedal board, if necessary.

A-1. If dome switches are burnt in Legacy footpedal, check steering housing for short between either of the steering housing wires and the metal portion of the steering housing itself. To do this, use a V.O.M. to check for continuity between the steering housing lead and a screw on the underside of the steering housing.

A-2. If a short is found, disassemble the steering housing and insulate the wire terminals at the steering housing's servo motor to correct the shorted condition.

A-3. Reassemble the steering housing and again check for shorts.

B. If test pedal does not properly steer motor or if original pedal tests okay as outlined on **pages 5-8**, then if you have not already done so, test the steering housing by connecting 12-volt power source directly to the steering housing leads. If steering housing does not steer, open steering housing. Inspect servo motor for rust/water intrusion and drive gears for binding/lack of lubrication. Service steering housing or replace components to correct malfunction, as needed. If necessary, re-lubricate the bushing and sleeve contact surfaces with synthetic grease (Minn Kota p/n 3397709).

For AutoPilot models (units with a Compass Control Board in the control box):

Step 1. Check to ensure proper voltage and polarity at battery. (Low voltage may cause steering issues.) Inspect all battery connections, trolling motor plug (if installed), and any butt splice connections in battery leadwire for corrosion and security. Visually check to see that all wires are attached proper control board terminals. Consult the appropriate wiring diagram for the model and board being tested. Clean / rewire, if necessary.

Step 2. Check motor with the appropriate known good test foot pedal *or* test the pedal by performing *Foot Pedal PCB Test Procedure* (see **pages 5-8** for the appropriate pedal and test procedure).

A. If test pedal properly steers motor or if the original pedal tests bad, the original foot pedal is faulty. Disassemble defective pedal to inspect actuators and dome switches. Replace foot pedal, if necessary.

B. If test pedal does not properly steer the motor or if the original pedal tests okay, proceed to next step.

Step 3. If you have not already done so, test the drive housing for proper operation. Disconnect the drive housing lead wires and apply 12 volts directly to the white and black wires. Observe drive housing for rotation. Reverse the polarity, and the drive housing should reverse the direction of rotation. Repair or replace drive housing, if required. If drive housing tests okay, proceed to next step.

Step 4. Check continuity of the individual coil cord wires with the coil cord stretched out to length. If you find a break in continuity in any of these wires, the coil cord is defective. Replace coil cord, if required. (See **page 4** for the specific effects of broken/intermittent coil cord wires.)

©Johnson Outdoors 2021

Step 5. If above steps test fine, the AutoPilot Compass Control Board assembly in the upper control box is faulty. Replace compass board assembly.

Case II. All functions are dead.

Step 1. Check for proper battery voltage and polarity at the control board input terminals. Visually check for poor or corroded connections. Check for proper wiring of control board (consult appropriate wiring diagram).

Step 2. Defective main control board. Replace main control board.

Case III. At higher thrust settings Steering Housing won't steer or steers slowly.

Step 1. Check to ensure proper voltage and polarity at battery. (Low voltage may cause steering issues.) Inspect all battery connections, trolling motor plug (if installed), and any butt splice connections in battery leadwire for corrosion and security.

Step 2. Disassemble motor to separate the steering housing from the motor and tube and bowplate extrusion assembly.

- **A.** Remove the six screws holding the top and bottom halves of the steering housing together. (Note: the top and bottom halves of the steering housing are "pinned" together at the corners with roll pins. The two halves will need to be pried apart.)
- **B.** Inspect the steering housing motor, paying special attention to the steering housing motor armature shaft and motor bushings. Test run to verify proper high speed operation and RPM.
- **C.** Remove the steering housing sleeve and bushings. Thoroughly clean the bushing and sleeve contact surfaces of all residue and old lubricant. Re-lubricate the bushing and sleeve contact surfaces with synthetic grease (Minn Kota p/n 3397709). Reassemble the steering housing taking special care to properly realign the steering housing pins, shafts, motor, and gears. Prior to installing and tightening the six steering housing case screws, test run the steering housing by applying 12 volts directly to the steering housing wire leads. If the steering housing motor runs properly, then make sure there are no gaps between the case halves (a rubber mallet works well to seat the case halves flush/tight). Install and tighten case screws.
- **D.** Reassemble the steering housing to the bow plate/extrusion assembly. Slide the motor and tube through the steering housing. Reconnect wires in the control box. Test operation of reassembled motor to complete the repair.

Case IV. Motor (lower unit) fails to run or runs intermittently.

Step 1. Check for proper voltage and polarity. Visually check to see that all wires are attached to proper control board terminals. Consult appropriate wiring diagram for the model and board being tested. Check for any corroded connections. Clean / rewire, if necessary.

Step 2. Check motor with known good test foot pedal or test the original foot pedal by performing *Foot Pedal PCB Test Procedure* (see **pages 5-8** for the appropriate pedal and test procedure). Replace, as needed.

- **A.** If test pedal properly controls propeller speed or if the original pedal tested bad, then original foot pedal is faulty. Disassemble faulty pedal to inspect if actuators are properly making contact on foot pedal board. Visually inspect foot pedal control board for collapsed / burnt dome switches or bad soft pot. Replace foot pedal control board, if necessary.
- **B.** If test pedal does not properly control propeller or if original pedal tests okay, go to **Step 3**.

Step 3. Check to see if lower unit runs properly.

- **A.** Connect 12 volts directly to the red and black brush leads at the top of the motor shaft (in the control box). The motor should run. If not, a problem exists in the lower unit. Check the lower unit for voltage at the brushes, water in the lower unit, worn brushes, or an open or shorted armature. Repair as needed. If the motor operates properly, go to **Step 4**.

Step 4. Check for control board output by hooking up test light (or V.O.M. probes) to board output terminals (consult appropriate wiring diagram). Use known good test pedal. Connect battery leads to proper voltage. Turn the foot pedal to CON (constant ON) and vary the speed selector. If there is no control board output, the main control board is defective. Replace main control board.

©Johnson Outdoors 2021

Case V. The motor runs at full speed when switched "ON" regardless of the speed selector setting. Motor will also run at full speed even when the speed selector control is at "0" or "OFF".

Cause: This is an indication of a control board failure requiring replacement of the control board assembly. However, if the board was just replaced and the new board being tested is found to be running at full speed when switched "on", the cause could be the inadvertent reversal of the black battery negative (B-) wire and the black motor negative (M-) wire. If these two wires are accidentally reversed when installing the new replacement board the motor will run at 100% (full power) when switched "on". If this occurs, re-check the wiring by comparing it to the diagram included with the replacement control board. Correct any wiring mistakes and re-test the motor for proper operation.

Corrective Action: The corrective action for the motor running at full speed when switched "on" is replacement of the main control board assembly located in the footpedal, base extrusion, or control box (depending on the model being repaired). Be sure to follow the wiring diagram and any special instructions for the board installation that are included with the replacement control board. Test run the motor to confirm proper operation.

Case VI. Motor is loose in the cradle when stowed.

Step 1. Check / replace the pivot pads (P/N 2305103), as needed. The pads tend to take a set over time.

Step 2. Ensure the latch handle firmly engages the latch collar on the composite shaft.

- **A.** Loosen latch collar clamping screw. Rotate the latch collar clockwise on the shaft (when viewed from above) to screw the latch collar down towards the motor lower unit. (The collar and shaft are threaded.)
- **B.** Check to verify that the catch on the latch handle now firmly engages the latch collar. If necessary, re-adjust latch collar position. Tighten the clamping screw to hold the collar in place.

Case VII. Motor is tight in the cradle and difficult to stow/deploy.

Step 1. Lubricate the composite shaft with a silicone spray or Armor All®.

Step 2. Adjust the latch collar.

- **A.** Loosen latch collar clamping screw. Rotate the latch collar counter-clockwise on the shaft (when viewed from above) to screw the latch collar up away from the motor lower unit. (The collar and shaft are threaded.)
- **B.** Check to verify that the catch on the latch handle firmly engages the latch collar. If necessary, re-adjust latch collar position. Tighten the clamping screw to hold the collar in place.

Step 3. If unit being serviced is a year 2001 or later "Grip Glide" unit, verify the correct motor rests are used. (Part numbers are molded on the motor rests.)

2303933 motor rest – right 4" motor assemblies
2303938 motor rest – left 4" motor assemblies

2303932 motor rest – right 3-5/8" motor assemblies
2303937 motor rest – left 3-5/8" motor assemblies

2303930 motor rest – right 3-¼" motor assemblies
2303935 motor rest – left 3-¼" motor assemblies

Step 4. Replace the pivot pads (P/N 2305103).

AutoPilot-specific issues (liquid-filled compasses, not GPS-based):

Case VIII. AutoPilot steering stops after approximately 7 seconds of continuous steering in one direction.

Step 1. This is normal. It is designed to prevent the coil cord from wrapping around the shaft of the motor. If you steer continuously in one direction until the servo motor stops, you can momentarily release the steering and then re-engage it in the same or opposite direction.

©Johnson Outdoors 2021

Case IX. AutoPilot function is erratic and doesn't maintain a heading.

Step 1. Make sure motor is mounted within 5 degrees of level (the compass card with the graduated markings must be floating level) and there are no ferrous metal objects near the motor that may be affecting the compass (including screws/nuts, anchor davits, etc…). While maintaining a level compass, rotate the control box and observe the compass card. The card should remain stationary (i.e. card should not have lost its magnetic north reference) as the control box is turned. If the compass card sticks or "hangs up" it is faulty, and the compass assembly needs to be replaced.

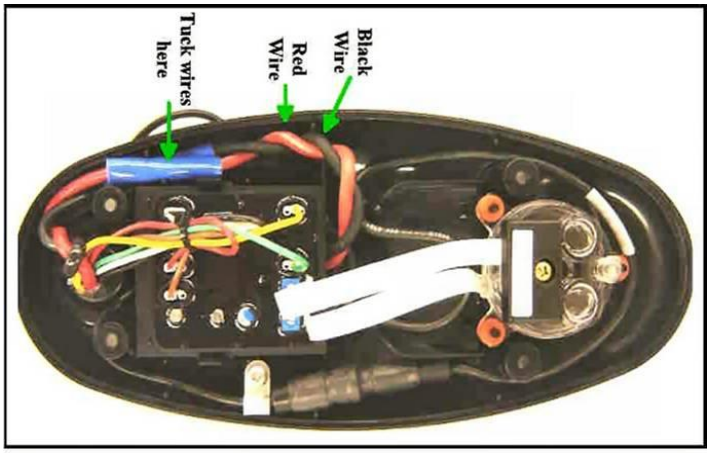
- **A.** Inspect oil level in compass capsule looking for a leaky capsule. NOTE: Examine the red compass grommets. If the compass has leaked fluid the grommets will be swollen to almost double their normal size.
- **B.** If any sign of compass fluid leakage is evident, replace the compass control board assembly.

Step 2. Check motor for excessive vibration. Inspect propeller and propeller shaft for damage. (Excessive vibration can cause the AutoPilot compass to oscillate causing erratic operation.)

Step 3. Check for proper voltage to motor <u>while motor is under load</u>. AutoPilot steering is susceptible to erratic operation in low voltage situations. (Use of inadequate gauge wire in boat or any leadwire extension can result in voltage drop / low voltage to the motor; as can an inadequate or a corroded plug / plug receptacle.)

Step 4. Check continuity of brown, red, white, and black small gauge wires in the coil cord with the coil cord stretched out to length. If you find a break in continuity in any of these wires, the coil cord is defective. Replace coil cord, if required. (See below for the specific effects of broken/intermittent coil cord wires.)

Step 5. Replace compass control board assembly with latest part. Ensure the red and black leads from the lower unit and the leads from the coil cord are twisted as per the following picture:



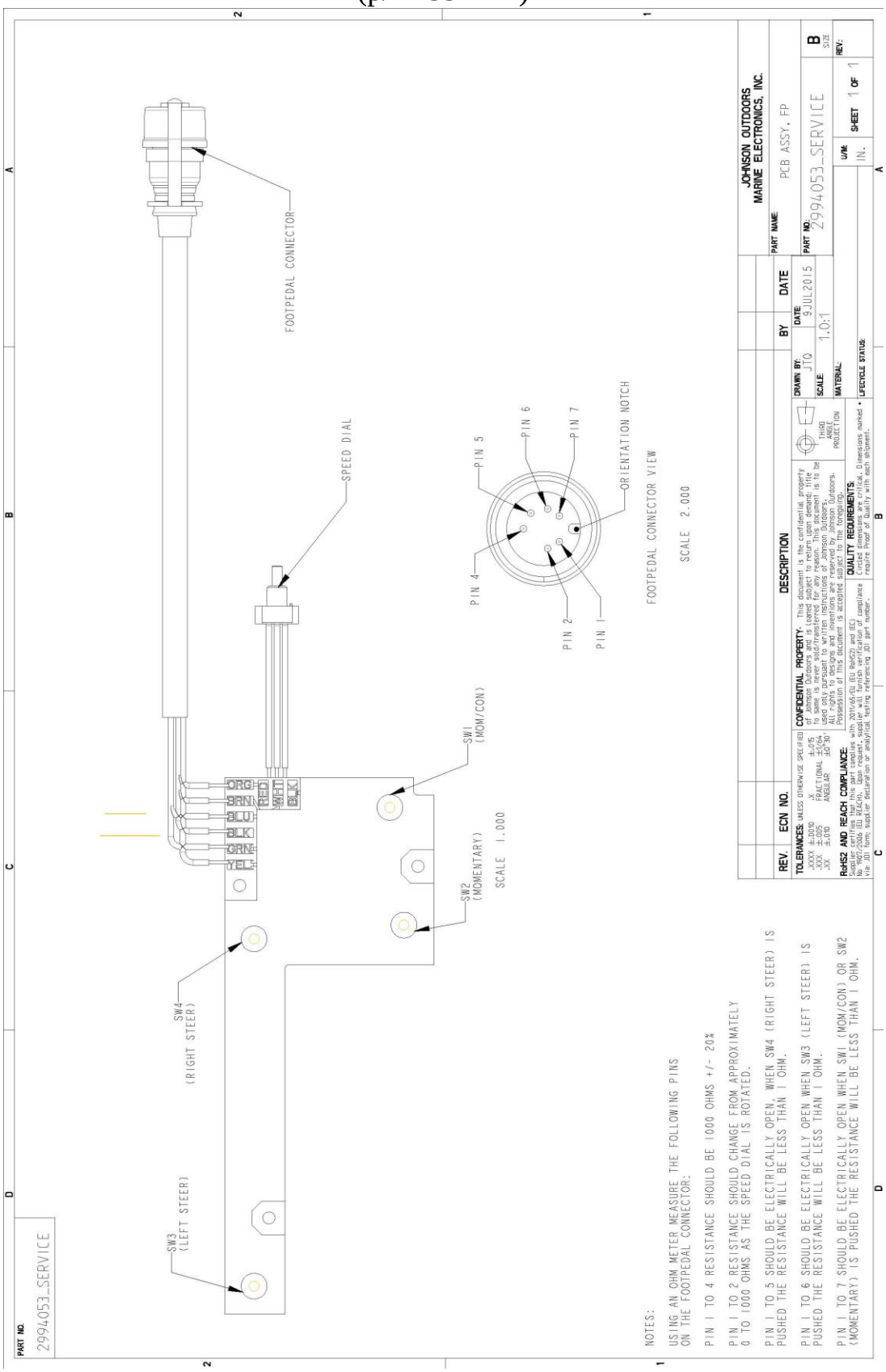
Effects of Broken or Intermittent Wires in AutoPilot Coil Cords

- If either the **yellow** or **green** coil cord wires are broken or intermittent, the **steering with the foot pedal will not function or will be intermittent**. AP function will not be affected in any way (the AP light will be lit when AP is turned on and the motor will track and hold a heading in the normal AP manner).
- If the **brown** wire in the coil cord is broken or intermittent, the **AP will not function**. If the AP function was turned on, it will turn off and the AP indicator will not be lit. **Steering with the foot pedal will be clockwise only**, regardless if either the left or right side of the steering pedal is pressed.
- If either the **white** or small **black** coil cord wires are broken or intermittent, **the steering function will be inoperative or intermittent**. The motor will not respond to the foot pedal, and the AP will not track a heading even though the AP indicator light is lit.
- If the small **red** coil cord wire is broken or intermittent, **the foot pedal steering will be inoperative or intermittent**. If the AP function was turned on, it will turn off and the AP indicator light will not be lit, and **the AP system will not function**.

©Johnson Outdoors 2021

Foot Pedal Test Procedure (2017 and later)

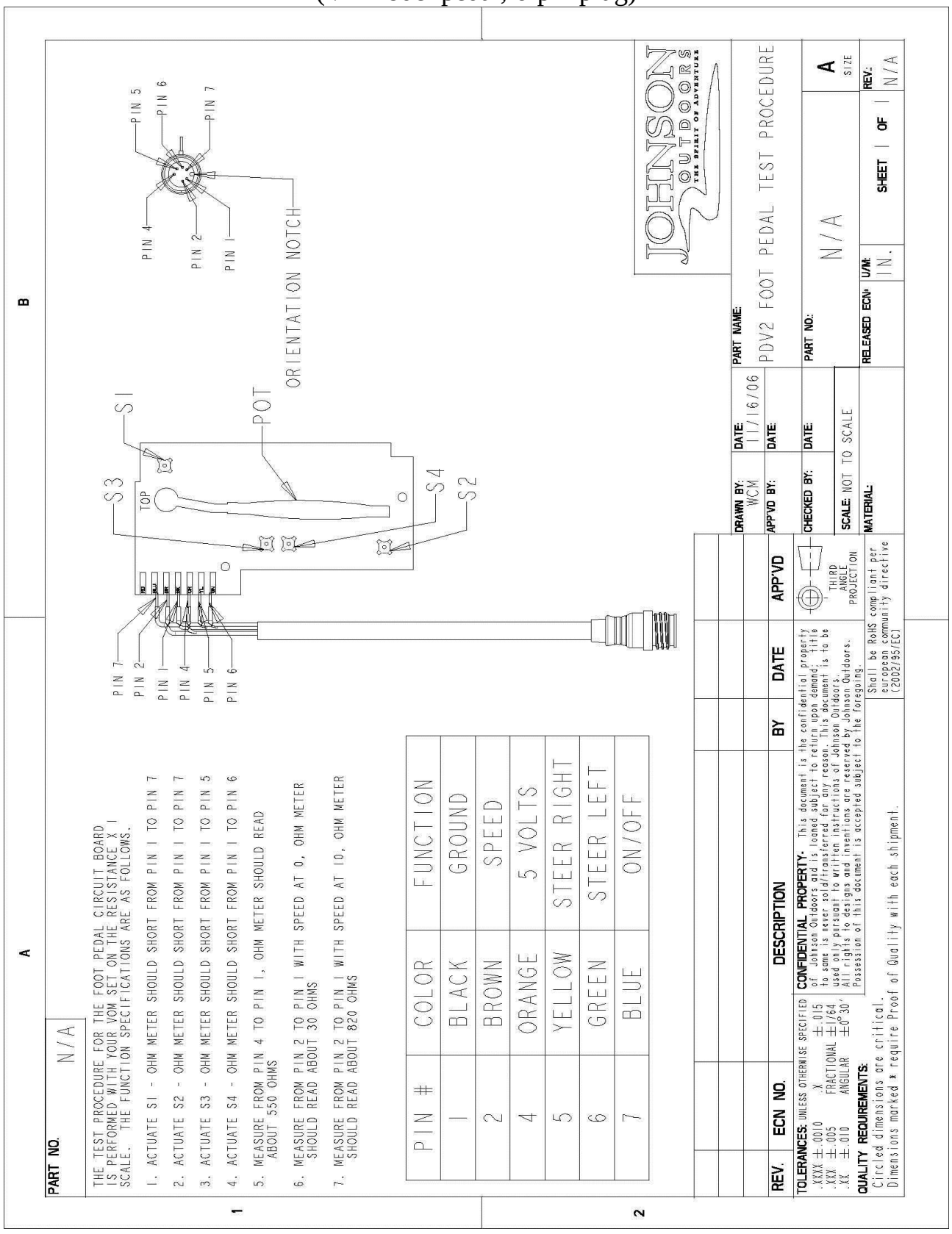
(p/n 2994727)



©Johnson Outdoors 2021

V2 Foot Pedal Test Procedure (2007-2016)

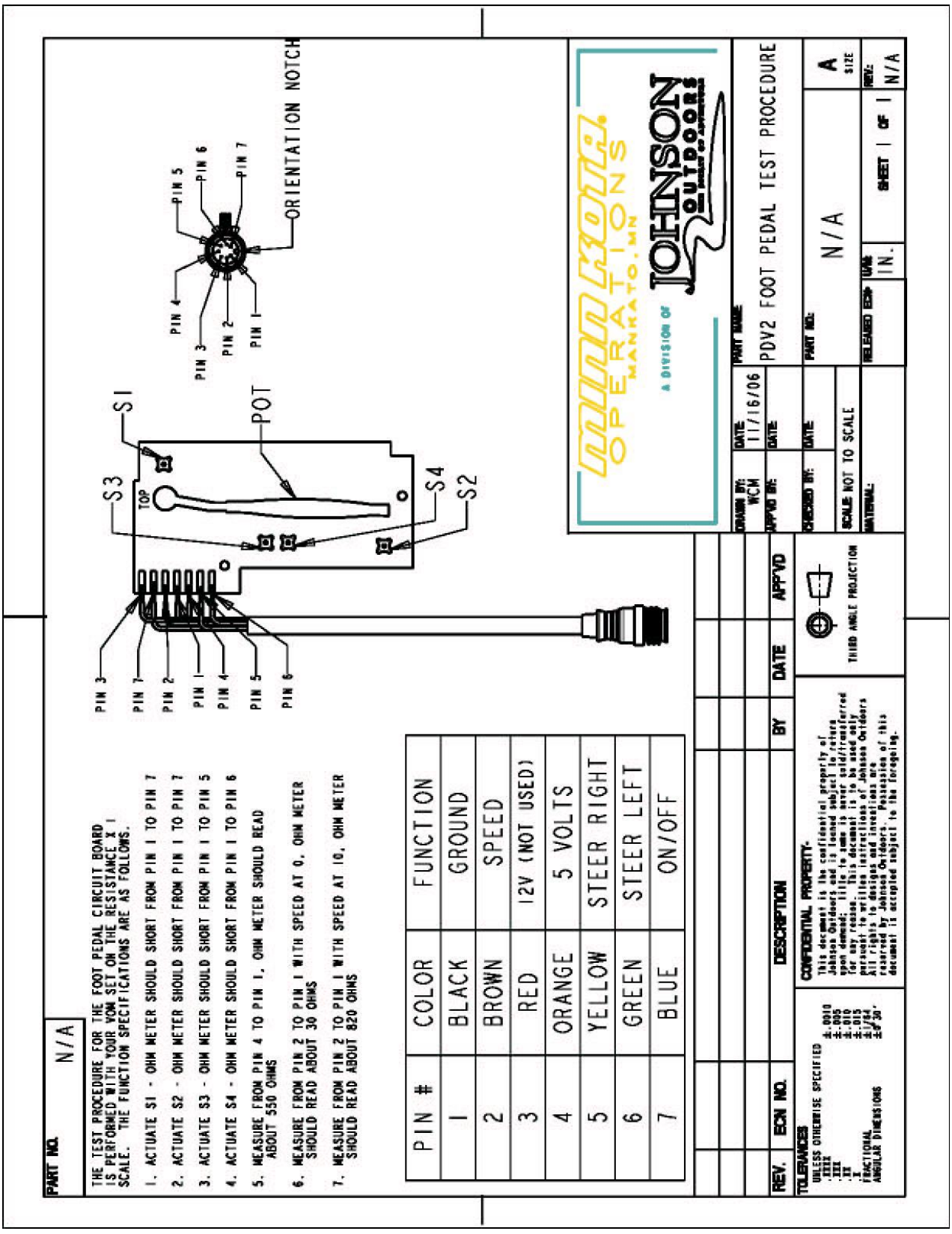
(V2 model pedal, 6-pin plug)



©Johnson Outdoors 2021

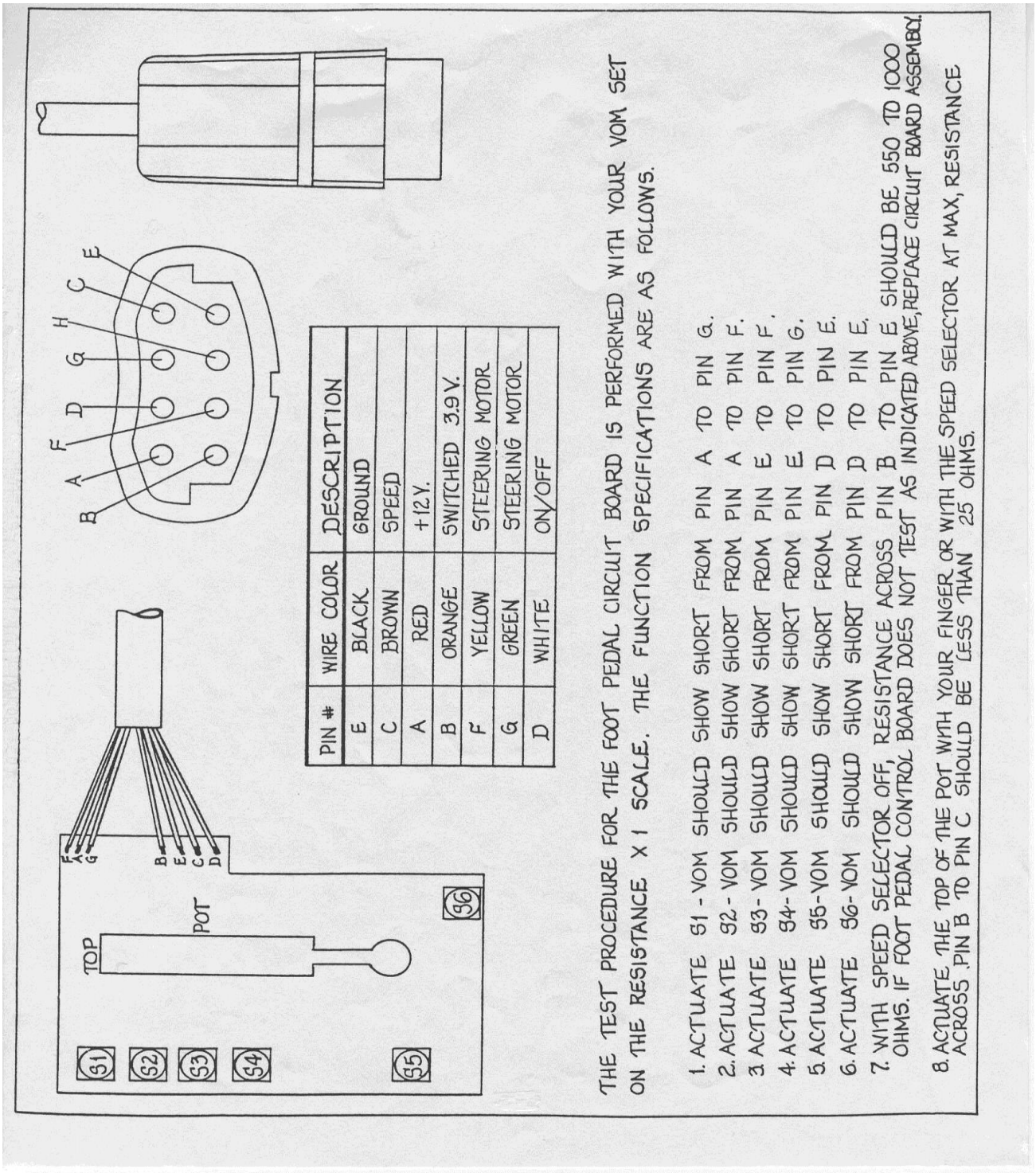
V2 Foot Pedal Test Procedure (2007-2016)

(V2 model pedal, 7-pin plug)



©Johnson Outdoors 2021

Legacy Corded Foot Pedal Test Procedure (prior to 2007)



PIN #	WIRE COLOR	DESCRIPTION
E	BLACK	GROUND
C	BROWN	SPEED
A	RED	+12 V.
B	ORANGE	SWITCHED 3.9 V.
F	YELLOW	STEERING MOTOR
G	GREEN	STEERING MOTOR
D	WHITE	ON/OFF

THE TEST PROCEDURE FOR THE FOOT PEDAL CIRCUIT BOARD IS PERFORMED WITH YOUR VOM SET ON THE RESISTANCE X 1 SCALE. THE FUNCTION SPECIFICATIONS ARE AS FOLLOWS.

1. ACTUATE S1 - VOM SHOULD SHOW SHORT FROM PIN A TO PIN G.
2. ACTUATE S2 - VOM SHOULD SHOW SHORT FROM PIN A TO PIN F.
3. ACTUATE S3 - VOM SHOULD SHOW SHORT FROM PIN E TO PIN F.
4. ACTUATE S4 - VOM SHOULD SHOW SHORT FROM PIN E TO PIN G.
5. ACTUATE S5 - VOM SHOULD SHOW SHORT FROM PIN D TO PIN E.
6. ACTUATE S6 - VOM SHOULD SHOW SHORT FROM PIN D TO PIN E.
7. WITH SPEED SELECTOR OFF, RESISTANCE ACROSS PIN B TO PIN E SHOULD BE 550 TO 1000 OHMS. IF FOOT PEDAL CONTROL BOARD DOES NOT TEST AS INDICATED ABOVE, REPLACE CIRCUIT BOARD ASSEMBLY.
8. ACTUATE THE TOP OF THE POT WITH YOUR FINGER OR WITH THE SPEED SELECTOR AT MAX, RESISTANCE ACROSS PIN B TO PIN C SHOULD BE LESS THAN 25 OHMS.