INTERFACE SERIES

Installation & Operation Instructions

DRN3.1

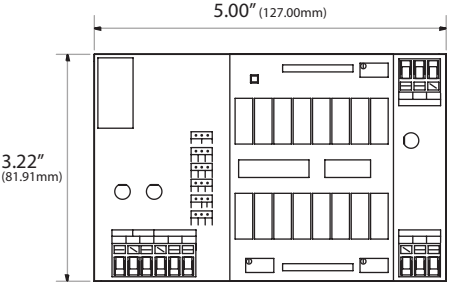
Phone: 1-888-967-5224
Website: workaci.com

GENERAL INFORMATION

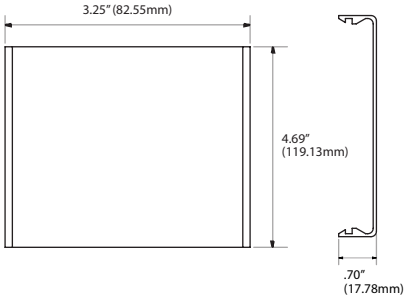
The DRN3.1 is an interface device that allows microprocessor control of a variable resistance. The DRN3.1's isolated resistor network can be controlled by several different DDC signal types. It directly replaces a variable resistance controller and simulates the action of a slide wire or rotary potentiometer. All connections of the simulated potentiometer, the wiper, and both ends of the resistance range are available on the terminal strip. The DRN3.1 must be ordered with a Resistance Network. The DRN3.1 accepts Analog, Pulse, or Floating Point input signals (including triac) and converts them into a proportional resistive output. The output resistance does not wrap around if the input signal exceeds the highest or lowest selected input value. Custom resistance ranges are available upon request. The DRN3.1 has on-board fail-back relays that lock out the original resistive signal during operation. However, if the supply power is lost, control of the circuit will revert back to the original controller signal. An easy local override can be made by placing a fixed (or variable) resistor between W and R Fail-safe terminals. Jumper inputs can be specified to have the factory set them. This will speed up installation time for the end user.

FIGURE 1: DIMENSIONS

BOARD



SNAP TRACK



MOUNTING INSTRUCTIONS

Circuit board may be mounted in any position. If circuit board slides out of snap track, a non-conductive "stop" may be required. Use only fingers to remove board from snap track. Slide out of snap track or push against side of snap track and lift that side of the circuit board to remove. **Do not flex board or use tools.**

WIRING INSTRUCTIONS

PRECAUTIONS

- **Remove power before wiring. Never connect or disconnect wiring with power applied.**
- **When using a shielded cable, ground the shield only at the controller end. Grounding both ends can cause a ground loop.**
- **It is recommended you use an isolated UL-listed class 2 transformer when powering the unit with 24 VAC. Failure to wire the devices with the correct polarity when sharing transformers may result in damage to any device powered by the shared transformer.**
- **If the 24 VDC or 24VAC power is shared with devices that have coils such as relays, solenoids, or other inductors, each coil must have an MOV, DC/AC Transorb, Transient Voltage Suppressor (ACI Part: 142583), or diode placed**

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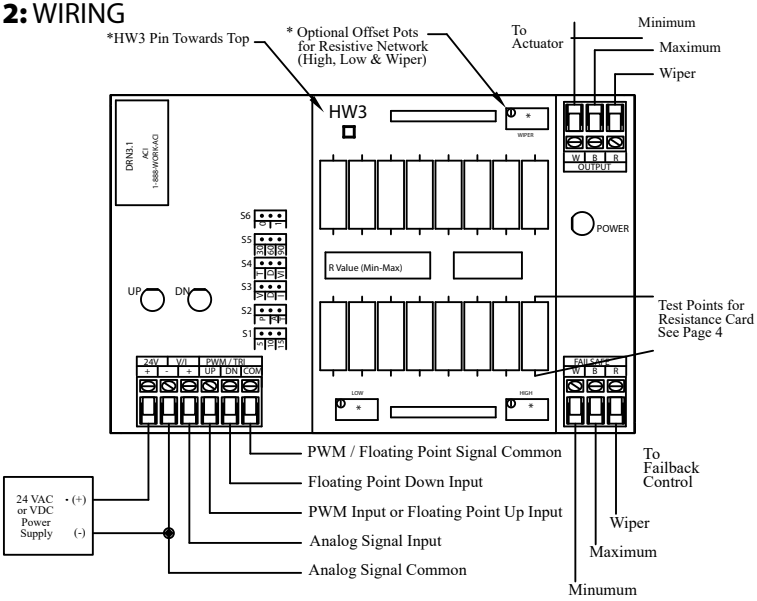
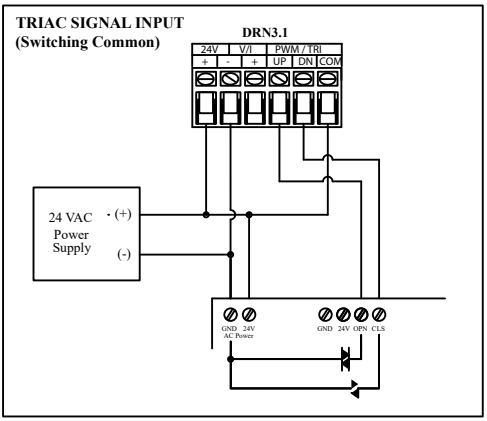
Version: 6.0
I0000475

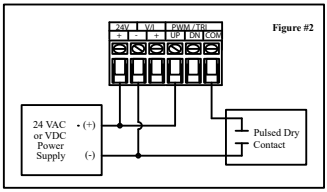
across the coil or inductor. The cathode, or banded side of the DC Transorb or diode, connects to the positive side of the power supply. Without these snubbers, coils produce very large voltage spikes when de-energizing that can cause malfunction or destruction of electronic circuits.

- **All wiring must comply with all local and National Electric Codes.**

FIGURE 2: WIRING

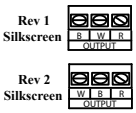






Non-Isolated PWM Signal Input
For switching common see wiring diagram on page 2.

NOTE: Please follow Minimum, Maximum, and Wiper designators as shown in Diagram for both OUTPUT and FAILSAFE terminal blocks. DO NOT refer to Silkscreen designators, W & B. Older versions of the DRN3.1 have the W and B silk screened designations swapped from those shown correctly in the diagram to the left.



CALIBRATION

VERSION IDENTIFICATION

Most DRN3.1's are shipped as version #1. An IC chip on the DRN3.1 is labeled with the version program number. Make sure you have the correct version. You may have to remove the resistor network card to view and compare to **Table 1 (pg. 3)**.

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Version: 6.0
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RESISTOR NETWORK

Each DRN3.1 requires a plug-in resistor network card (RN) to operate properly. This resistance card determines the simulated slide wire potentiometer values for the output. Insert the RN (usually in a separate package from DRN3.1) into the DRN3.1. The HW3 pin on the Resistor Network card should be oriented towards the top as shown on Page 1. There are two rows of pins on the RN and two rows of female connections on the DRN3.1. The DRN3.1 resistance output simulates a potentiometer. The Terminal Block located on the far right is the Wiper. The Terminal Block located in the middle is the Maximum; the high end of the potentiometer. The Terminal Block located on the far left is the Minimum; the low end of the potentiometer. Upon power-up, the wiper will start at the Minimum position and will remain there until the first PULSE or FLOATING POINT signal is received. The ANALOG version will begin tracking the input signal instantly after "sampling" the input signal to eliminate error. The output resistance will not change on the PULSE version until the end of the pulse. To check the resistance output, vary the input signal and measure the resistance. The resistance between terminals Wiper and Minimum will increase as the input signal increases and the resistance between Wiper and Maximum will decrease. If both floating point inputs are on for 3 seconds, the DRN3.1 resets to minimum resistance output.

TABLE 1: JUMPER SETTINGS

JUMPER SETTINGS - ANALOG
Uses same Version #1 or #2 chips as Pulse & Floating Point programs

Input	S1	S2	S3	S4	S5	S6
0 - 5 Volts						
0 - 10 Volts						
0 - 15 Volts						
1 - 5 Volts						
2 - 10 Volts						
3 - 15 Volts						
0 - 20 mA						
4 - 20 mA						

JUMPER SETTINGS - DUTY CYCLE PULSE
Version #4 - Chip # 0305y1a.hex

Input	S1	S2	S3	S4	S5	S6
0.1 - 10 sec. pulse						

JUMPER SETTINGS - PULSE & FLOATING POINT
Version #1 - Chip # 0052y0h.hex

Input	S1	S2	S3	S4	S5	S6
0.1 - 25.5 sec. pulse						
0.02 - 5 sec. pulse						
0.59 - 2.93 sec. pulse						
30 sec. Floating Pt.						
60 sec. Floating Pt.						
90 sec. Floating Pt.						

JUMPER SETTINGS - PULSE & FLOATING POINT
Version #2 - Chip # 0054y0b.hex

Input	S1	S2	S3	S4	S5	S6
0.1 - 10 sec. pulse						
0.023 - 6 sec. pulse						
45 sec. Floating Pt.						
120 sec. Floating Pt.						
240 sec. Floating Pt.						

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SETTING THE JUMPERS
Remove power from the DRN3.1. Place jumpers S1 through S6 in the appropriate positions. All six jumpers must be in proper position for each input type. Hold the DRN3.1 vertical with the label at top right to orient its jumper shunts with the chart. Version #1 and Version #2 share the same analog inputs. Ramping time for floating point inputs are selectable.

SETTING THE JUMPERS *(Continued)*
Version #4 accepts a continuous pulse signal command string within a 10 second window. No pulse in this 10 second window produces minimum percent output. A ten second pulse in this 10 second window produces 100% output. Continuous pulse will produce maximum percent output.

When power is restored, changes will be recognized. Apply 24 VAC/VDC to "PWR" terminal, confirm power light is on and measure voltage to confirm proper voltage.

When power is applied to terminals "+24V" and "-", the POWER LED will light and the Fail Safe terminals will be disconnected from the output terminals. Fail-back only occurs when the DRN3.1 has lost power. When the DRN3.1 is not powered on terminals "24V" and "-", the Fail Safe terminals are connected to the Output terminals. Check for continuity.

The DRN3.1 will automatically fail-back to 0 Ohms. For a fail-back to some other resistance, a manual potentiometer or fixed resistor can be added between Minimum and Wiper only, if outputting a normal acting signal. If outputting a reverse acting signal, please contact ACI for assistance.

TESTING THE INPUT

Voltage input
Connect the "+" or positive wire to "V/I+". Connect the common to "24V-". Apply a voltage from control source. Measure voltage at "24V-" and "V/I+" at terminal block. If the commanded voltage is not present, remove the "+" or positive wire and measure from "+" wire to "24V-". If no voltage is measured check the wiring from controller. If voltage disappears or is reduced when connected to the DRN3.1, confirm input jumper is set to voltage mode and remove signal input wires and power from unit. Measure the resistance from "24V-" to "V/I+". Resistance in the voltage modes will be around 10K. If input is shorted, contact ACI Technical Support. If not shorted, remove the controller input common and connect 24 VDC/VAC to the DRN3.1. Check for ground loop: Place meter in voltage mode and measure VAC and VDC from analog input common wire to power supply common. If any voltage is measured in DC or AC a ground loop most likely exists. Check power commons and / or ground potentials. Use a separate 24 volt transformer for the DRN3.1 and let common float.

Current input
Confirm the input jumper is in the correct position. Measured input resistance should be around 250 Ohms. Connect "+" or positive to "V/I+" and common or "-" to "24V-". Apply mA signal. Place meter in voltage and measure voltage across "V/I+" and "24V-" 4 mA is equal to 1 volt and 20 mA is equal to 5 volts. Use Ohms Law to find voltage from current. (Current x 250 = Volts. Example: 12 mA or 0.012 x 250 = 3 volts). If no voltage is present, check wiring for open. Current cannot exist without voltage present from "V/I+" to "24V-" unless dead shorted.

Pulse Width Modulated (or PWM) input
Apply 24 VAC/VDC to the PWR terminals. Connect your meter to the Wiper and Maximum terminals on the output terminal block. Set meter to resistance range of resistor network. Connect a jumper wire from UP to the 24V "+" terminal (this is your jumper wire #1). Connect another jumper wire into the 24V "-" terminal only (this is your jumper wire #2). You are now ready to simulate a timed pulse signal. For testing purposes, select 0.1 to 25.5 or 0.1 to 10 seconds on version 2. Be sure to reset power to allow the DRN3.1 to recognize new settings. Take the free end of jumper wire #2 and connect by holding wire to

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Version: 6.0
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Pulse Width Modulated (or PWM) input *(Continued)*
the COM terminal. Reference Figure #2. Count to 50% of timing range and remove. Verify the pulse UP LED indication. Voltage can be measured across the input to verify proper voltages. Read the output. Has the output changed? The output should be close to 50% of set output. If no, contact ACI Technical Support. If yes, unit is functioning properly.

FLOATING POINT / TRI-STATE

Apply 24 VAC/VDC to the PWR terminals. Connect your meter to the Wiper and Minimum terminals on the output terminal block. Set meter to resistance range of resistor network. Connect a jumper wire from UP to the 24V "+" terminal (this is your jumper wire #1). Connect a jumper wire to the 24V "-" only (this is your jumper wire #2). You are now ready to simulate a timed Up signal. For testing purposes, select the 30 or 45 second range on version 2. Be sure to reset power to allow the DRN3.1 to recognize new settings. Take the free end of jumper wire #2 and connect by holding wire to the Com terminal. Count to 50% of timing range and remove. Verify the pulse UP LED indication. Voltage can be measured across the input to verify proper voltages. Read the output. Has the output changed? The output should be close to 50% of the set output. Moving jumper wire #1 from UP to DOWN, and repeating the same test, should decrease the output signal. If no, contact ACI Technical Support. If yes, unit is functioning properly.

TESTING THE OUTPUT

Measured resistance from Wiper to Minimum terminal blocks will begin at the minimum signal, as specified by your resistor network, and will increase proportionally to the commanded input value. To reverse the output signal, measure resistance from Wiper to Maximum terminal blocks. This will begin at the maximum signal, as specified by your resistor network, and will decrease proportionally to the commanded input value. A clicking sound will occur when resistance is changed. Resistance changes in steps and is divided into 256 equal steps. Exception is version 3 where step size is selected.

Command a change or simulate an input signal to change the output. Measure the resistance value. If the resistance has not changed, check settings and reset power.

Verify the input is functional.

If yes, then contact ACI Technical Support.

MOST COMMON PROBLEM

The analog input from the controller can contain electrical noise. This noise is seen by the DRN3.1 as a change in commanded input signal and quickly changes the output. The most common symptom is a constant chatter of the relays. Standard precautions should be taken to prevent noise on the signal input of the DRN3.1 (i.e.: Do not run signal wiring near line voltage wiring or florescent light fixtures). Versions 1 and 2 of the DRN3.1 were modified in 2001 to add extra filtering to the input. Time response full scale is about 6 seconds. Check version number on your DRN3.1. If high speed response or extra filtered versions is required contact ACI Sales Department.

TEST POINTS FOR RESISTOR NETWORK (RN) CARD

The Resistor Network card does not have to be attached to the DRN3.1 motherboard for this test, but if attached to the DRN3.1, you must remove power before testing. Using an OHM meter, test the last resistor as illustrated on page 1. The value indicated should be ½ the total resistance range of the Resistor Network card.

Example: A 500 Ohm reading indicates a 0 to 1000 Ohm Resistor Network card.
A 750 Ohm reading indicates a 0 to 1500 Ohm Resistor Network card.

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PRODUCT SPECIFICATIONS

NON-SPECIFIC INFORMATION	
Supply Voltage:	24 VAC +/- 10%, 24 VDC +25% / -8%
Supply Current:	250 mA maximum
Input Voltage Signal Range (@ Impedance):	0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC, 2 to 10 VDC, 0 to 15 VDC, 3 to 15 VDC @ 10,000Ω
Input Current Signal Range (@ Impedance):	0-20 mA, 4 to 20 mA @ 250Ω
Input Pulse Signal Source:	Relay Contact Closure, Transistor, Triac
Input Pulse Signal Level (@ Impedance):	7-30 VDC, 10-26.4 VAC @ 750Ω
Pulse Ranges:	**Version 1:** 0.02-5.0 (0.02s) | 0.1-25.5 (0.1s) | 0.59-2.93 (0.01s*) **Version 2:** 0.1 to 10.0s or 0.023 to 6.0s*
Floating Point / Tri-State Input Rates of Change:	**Version 1:** 30, 60, 90s **Version 2:** 45, 120, 240s
Floating Point / Tri-State Input Signal Trigger Level:	5-24 VDC/VAC
Floating Point / Tri-State Impedance:	750Ω nominal
Resistance Output:	See Resistance Network Ordering Grid
Digital Output Type:	Form "C" Relays
Output Resolution:	256 Steps (No wrap around)
Relay Contact Rating:	2A @ 24 VDC, 0.5A @ 240 VAC
Connections:	45° Captive screw Terminal Blocks
Wire Size:	12 (3.31 mm²) to 22 AWG (0.33 mm²)
Terminal Block Torque Rating:	0.5 Nm (Minimum); 0.6 Nm (Maximum)
Operating Temperature Range:	35 to 120°F (1.7 to 48.9°C)
Operating Humidity Range:	10 to 95% non-condensing
Storage Temperature:	-20 to 150°F (-28.9 to 65.5°C)
Agency Approvals:	RoHS2, WEEE

WARRANTY

The DRN 3.1 Series is covered by ACI's Two (2) Year Limited Warranty, which is located in the front of ACI'S SENSORS & TRANSMITTERS CATALOG or can be found on ACI's website: www.workaci.com.

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