



**DCM 433**

**CURRENT BRIDGE AMPLIFIER**

**USER'S GUIDE**

[www.cooperinstruments.com](http://www.cooperinstruments.com)  
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## Description

The Model DCM 433 is a self-contained, AC powered signal conditioner for bridge type instrumentation. It contains a precision instrumentation amplifier with isolated, filtered output and a highly regulated, low noise, adjustable output bridge excitation source. The unit is completely encapsulated for use in rugged environments.

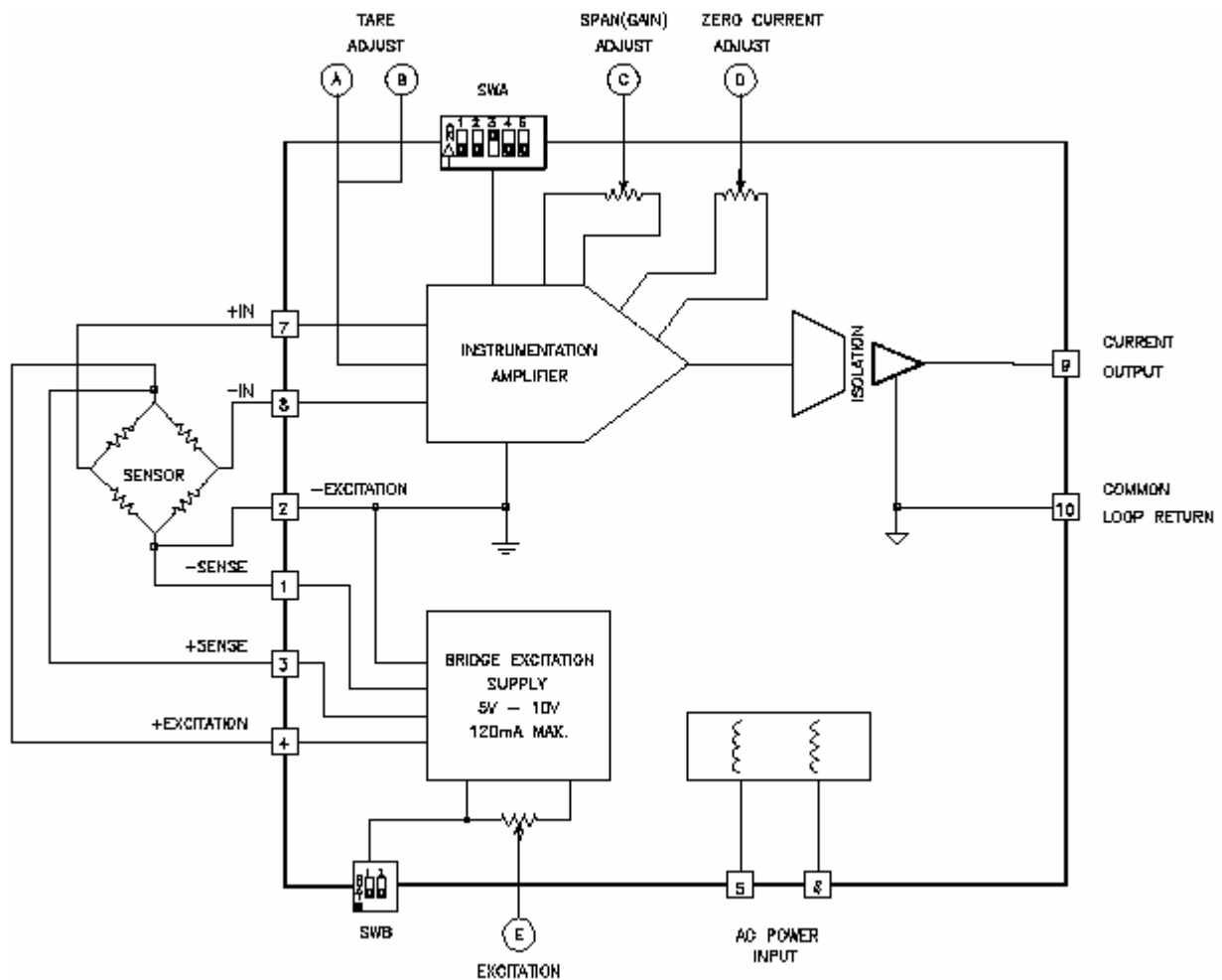
## Features

- Complete Strain Gage Bridge Signal Conditioner
- Isolated 4-20 mA or 0-20 mA Output
- Output Capable of Driving 1000-ohm Loop
- Bridge Balance with 80% Tare Offset Capability
- High Gain Amplifier; Can Accept Full Scale Live Load Signals as Low as 5 mV and Provide 16mA Output Span
- Excitation Supply Capable of Driving Four Load Cells
- AC Powered
- Rugged Epoxy Encapsulated Design

## Applications

- Weighing with Load Cells
- Process Control Add-on Loops
- Can be Used With All Types of Low Output Sensors

DCM 433 Block Diagram



## Specifications

NOTE: Unless otherwise noted, specifications apply after one hour warm up at 25°C ambient. Temperature coefficients apply between 0°C and 55°C ambient.

<b>Isolation</b>	
Input to Output	700 VDC 60pF
<b>Amplifier</b>	
<b>Gain</b>	
Adjustment Range Input 4-20mA Output	5 mV to 50 mV
Linearity	±0.01% of Full Scale
Temperature Stability	50 PPM (0.005%/°C)
<b>Input Noise</b>	
.1 Hz to 10 Hz	2µV P-P
<b>Tare Adjustment Range</b>	
Bridge Offset	-3 mV to +25 mV (Equals 80% F.S. of 3 mV/V cell)
<b>Input Resistance</b>	
Differential and Common Mode	1000 megaohm
<b>Common Mode Rejection, DC</b>	100 dB minimum
<b>Common Mode Input</b>	+5 Volts
<b>Output</b>	
<b>Zero Adjust</b>	0 or 4 mA
Temperature Coefficient	1 µA/°C
<b>Current Output Span</b>	4 to 20 mA or 0 to 20 mA
Compliance Voltage	-1 to +20 Volts
Current	-1 mA to +20 mA
Loop Resistance	0 to 1000 ohms
Frequency Response, -3dB	10 Hertz, 2 Pole Roll Off
<b>Response Time</b>	
Rise Time 10% to 90%	35 ms
To 0.1% of Final Value	100 ms
<b>Bridge Supply</b>	
<b>Voltage Adjustment Range</b>	5 to 10 Volts
Temperature Coefficient	100 PPM Typical
Fixed	10.2V ±2.5%
Temperature Coefficient	60 PPM Typical
<b>Load Current</b>	0 to 120 mA
<b>Regulation - Load and Line</b>	0.02% maximum
<b>Output Noise</b>	
120 Hz Bandwidth	1 mV RMS, Maximum
<b>Power Input</b>	115 VAC, ±10V 50/60 Hz @7 VA
Optional	220 or 230 VAC, ±10%
<b>Line Isolation</b>	
Capacitance	60 pF
Dielectric Withstand	1100 Volts RMS
<b>Environment</b>	
Ambient Operating	-25°C to +55°C
Storage	-25°C to +85°C
<b>Weight</b>	18 oz. (510 grams)
<b>Size</b>	3.75" L x 2.0" W x 2.87" H (9.53 cm x 5.1 cm x 7.62 cm)

## Getting Started with the DCM 433

1. Excitation Supply. If remote sensing is not used, connect +Sense to +Excitation, terminal 3 to 4, and connect -Sense to -Excitation, terminal 1 to 2.
2. Apply power to the DCM 433 and adjust the Excitation supply. Turn SWB-1 "ON" for a fixed 10 Volts. This will set the supply to  $10.2 \pm 2.5\%$  and provide the best temperature stability. For voltages between 5 and 10 Volts, place SWB-1 in the "OFF" position and set the Excitation Supply with potentiometer E. SWB-2 may be in either position.
3. Turn the power to the Model DCM 433 off and connect the load cell to the DCM 433 Excitation terminals and the Amplifier Inputs.
4. Turn on power to the DCM 433.
5. Turn SWA-3 "ON". (To set output ZERO current with pot D.)
6. Select the expected full-scale signal range according to the table with SWA-4 and SWA-5. If the output from the load cell is not known, set both SW-4 and SW-5 "ON" for the 40-50mV range.
7. Set SWA-2 "OFF" for 4mA or SWA-2 "ON" for 0mA output ZERO.
8. Adjust D potentiometer for desired ZERO current.
9. Turn SWA-3 "OFF". Expect output current to change.
10. Apply no load or dead weight to load cell.
11. Adjust TARE potentiometers A and B for the same ZERO current set in Step 8. SWA-1 "OFF" provides a bridge output balance of -3mV to +15mV, and "ON" between +15mV and +25mV.
12. Apply full-scale load and adjust SPAN (GAIN) potentiometer C for the desired full scale output current. Set Range switches SWA-4 and SWA-5 as required.
13. Remove full-scale load and check ZERO output current. Adjust FINE TARE potentiometer A if required.
14. Recheck full scale as in Step 12.
15. End.

**Note:** If the amplifier is used without using the DCM 433 Excitation Supply, the external power supply low side must be connected to the -EXCITATION terminal 2 on the DCM 433, or one of the inputs must be tied to terminal 2, -EXCITATION. This provides a DC return path for the finite amplifier input current.

## Amplifier

The amplifier is a true differential input, low drift Instrumentation Amplifier with less than 100pA input current. It has a common mode range of 5 Volts with respect to the - EXCITATION supply terminal and a minimum of 100dB rejection of the common mode voltage. The input amplifier and excitation supply are DC isolated from the AC line and the current output.

The isolated output current source has a compliance of 20 Volts to allow the DCM 433 to operate with zero to 1000 Ohms of loop resistance.

## Tare Weight Compensation

The Model DCM 433 has two different zero controls. One is called the OUTPUT zero and can be set to 0mA or 4mA with SWA-2. The other zero control is called TARE. SWA-1 allows the selection of one of two TARE ranges, -3mV to 15mV or +15mV to +25mV. Potentiometers are available for COARSE and FINE TARE adjustments.

## Connecting to a Sensor

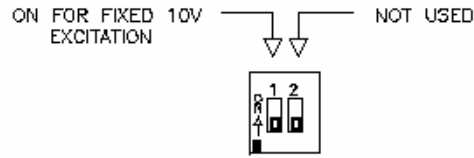
Any amplifier has a finite input current, which must have DC return path to the amplifier power supplies. This path is automatically provided when the DCM 433 Bridge Excitation Supply is used to excite the sensor. If an external supply is used, one side of the external supply must be connected to the Model DCM 433 common, Terminal 2. Be sure that the common mode voltage limits are observed. This would generally limit the external power supply to 10 Volts assuming that half the voltage would be common mode, as is the case when exciting a full bridge.

When the full-scale output of a sensor is measured in millivolts, say 10 millivolts, care must be exercised in wiring systems. At 10 millivolts full scale, each microvolt ( $10^{-6}$  volts) contributes 0.01% of full-scale output. Wire connections can generate microvolts of potential due to contact potentials. These will also be thermoelectric potentials and thus vary with temperature differences. All wires used in connecting up the DCM 433 should be of the same material. If any intervening connections are made such as a terminal block, the terminal block connecting points should have good thermal contact so they will always be at the same temperature and thus cancel each other.

## Transducer Excitation

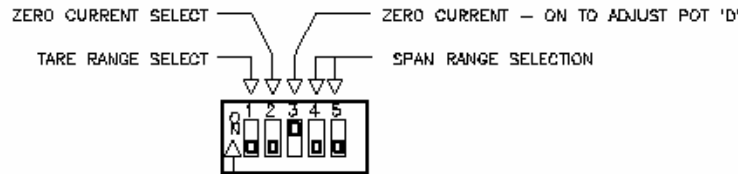
The bridge excitation supply voltage is set by SWB-1 and potentiometer E. Set SWB-1 ON for a fixed 10 Volts. This will provide the best temperature stability. The supply can be adjusted between 5 and 10 Volts by setting SWB-1 OFF and adjusting potentiometer E. The supply will deliver up to 120mA current at any voltage setting to power up to four 350-ohm sensors.

### SWB - Excitation Voltage



SWB-1	Excitation Voltage
ON	Fixed 10 Volts
OFF	Adjustable

### SWA - Control Switch

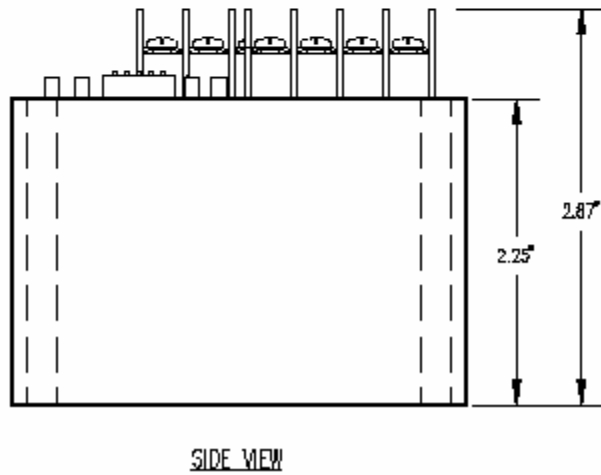
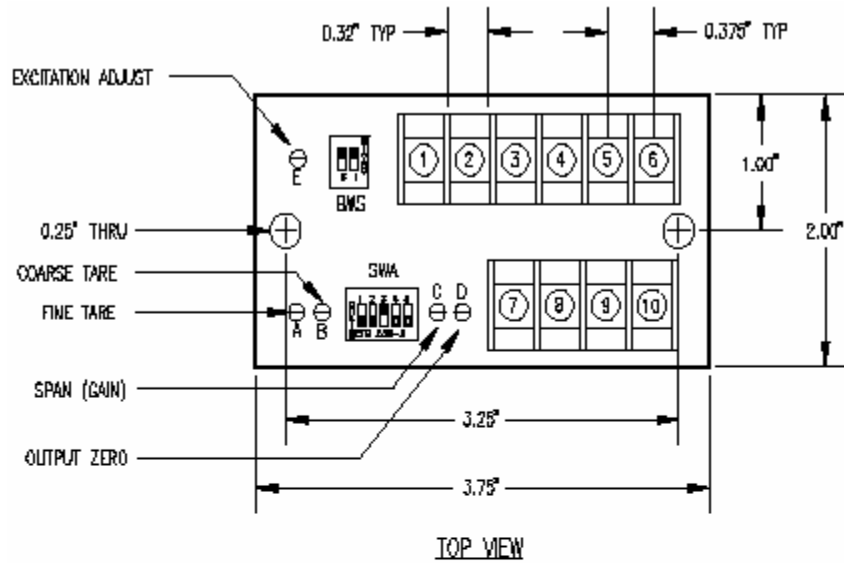


SWA-1	Tare Range
OFF	-3 mV to +15 mV
ON	+15 mV to +25 mV

SWA-2	Zero Current
OFF	4 mA
ON	0 mA

SWA-4	SWA-5	Span Range
ON	ON	40 mV to 50 mV
OFF	ON	20 mV to 40 mV
ON	OFF	10 mV to 20 mV
OFF	OFF	5 mV to 10 mV

## Mechanical Specifications



Terminal Strip Assignments			
Screw Terminal	Function	Screw Terminal	Function
1	-SENSE	6	AC
2	-EXCITATION	7	+SIGNAL
3	+SENSE	8	-SIGNAL
4	+EXCITATION	9	OUTPUT
5	AC	10	RETURN

## Warranty Repair Policy

### Limited Warranty on Products

Any Cooper Instruments product which, under normal operating conditions, proves defective in material or in workmanship within one year of the date of shipment by Cooper will be repaired or replaced free of charge provided that a return material authorization is obtained from Cooper and the defective product is sent, transportation charges prepaid, with notice of the defect, and it is established that the product has been properly installed, maintained, and operated within the limits of rated and normal usage. Replacement or repaired product will be shipped F.O.B. from our plant. The terms of this warranty do not extend to any product or part thereof which, under

normal usage, has an inherently shorter useful life than one year. The replacement warranty detailed here is the buyer's exclusive remedy, and will satisfy all obligations of Cooper whether based on contract, negligence, or otherwise. Cooper is not responsible for any incidental or consequential loss or damage which might result from a failure of any and all other warranties, express or implied, including implied warranty of merchantability or fitness for particular purpose. Any unauthorized disassembly or attempt to repair voids this warranty.

### **Obtaining Service under Warranty**

Advance authorization is *required* prior to the return to Cooper Instruments. Before returning the item, contact the Repair Department c/o Cooper Instruments at (540) 349-4746 for a Return Material Authorization number. Shipment to Cooper shall be at buyer's expense and repaired or replacement items will be shipped F.O.B. from our plant in Warrenton, Virginia. Non-verified problems or defects may be subject to a \$100 evaluation charge. Please return the original calibration data with the unit.

### **Repair Warranty**

All repairs of Cooper products are warranted for a period of 90 days from date of shipment. This warranty applies only to those items that were found defective and repaired; it does not apply to products in which no defect was found and returned as is or merely recalibrated. It may be possible for out-of-warranty products to be returned to the exact original specifications or dimensions.

Technical description of the defect: In order to properly repair a product, it is *absolutely necessary* for Cooper to receive information specifying the reason the product is being returned. Specific test data, written observations on the failure and the specific corrective action you require are needed.

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