Model: CAT2

Versatile DC or AC Transmitter

(Can Be Interfaced With Any Hoffer Flow Sensor)

USER'S MANUAL

HP-311
July 2015

HOFFER FLOW CONTROLS, INC.
PERFECTING MEASUREMENT™

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NOTICE

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This manual has been provided as an aid in installing, connecting, calibrating, operating, and servicing this unit. Every precaution for accuracy has been taken in the preparation of this manual; however, HOFFER FLOW CONTROLS, INC. neither assumes responsibility for any omissions or errors that may appear nor assumes liability for any damages that may result from the use of the products in accordance with information contained in the manual.
HOFFER FLOW CONTROLS' policy is to provide a user manual for each item supplied. Therefore, all applicable user manuals should be examined before attempting to install or otherwise connect a number of related subsystems.

During installation, care must be taken to select the correct interconnecting wiring drawing. The choice of an incorrect connection drawing may result in damage to the system and/or one of the components.

Please review the complete model number of each item to be connected and locate the appropriate manual(s) and/or drawing(s). Identify all model numbers exactly before making any connections. A number of options and accessories may be added to the main instrument, which are not shown on the basic user wiring. Consult the appropriate option or accessory user manual before connecting it to the system. In many cases, a system wiring drawing is available and may be requested from HOFFER FLOW CONTROLS.

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Return Requests / Inquiries

Direct all warranty and repair requests/inquiries to the Hoffer Flow Controls Customer Service Department, telephone number (252) 331-1997 or 1-800-628-4584. BEFORE RETURNING ANY PRODUCT(S) TO HOFFER FLOW CONTROLS, PURCHASER MUST OBTAIN A RETURNED MATERIAL AUTHORIZATION (RMA) NUMBER FROM HOFFER FLOW CONTROLS' CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned RMA number should then be marked on the outside of the return package and on any correspondence.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting HOFFER FLOW CONTROLS:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

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1. P.O. number to cover the COST of the repair/calibration,
2. Model and serial number of the product and
3. Repair instructions and/or specific problems relative to the product.

LIMITED WARRANTY

HOFFER FLOW CONTROLS, INC. ("HFC") warrants HFC's products ("goods") described in the specifications incorporated in this manual to be free from defects in material and workmanship under normal use and service, but only if such goods have been properly selected for the service intended, properly installed and properly operated and maintained. This warranty shall extend for a period of one (1) year from the date of delivery to the original purchaser (or eighteen (18) months if the delivery to the original purchaser occurred outside the continental United States). This warranty is extended only to the original purchaser ("Purchaser"). *Purchaser's sole and exclusive remedy is the repair and/or replacement of nonconforming goods as provided in the following paragraphs.*

In the event Purchaser believes the goods are defective, the goods must be returned to HFC, transportation prepaid by Purchaser, within twelve (12) months after delivery of goods (or eighteen (18) months for goods delivered outside the continental United States) for inspection by HFC. If HFC's inspection determines that the workmanship or materials are defective, the goods will be either repaired or replaced, at HFC's sole determination, free of additional charge, and the goods will be returned, transportation paid by HFC, using the lowest cost transportation available.

Prior to returning the goods to HFC, Purchaser must obtain a Returned Material Authorization (RMA) Number from HFC's Customer Service Department within 30 days after discovery of a purported breach of warranty, but no later than the warranty period; otherwise, such claims shall be deemed waived. See the Return Requests/Inquiries Section of this manual.

If HFC's inspection reveals the goods are free of defects in material and workmanship or such inspection reveals the goods were improperly used, improperly installed, and/or improperly selected for service intended, HFC will notify the purchaser in writing and will deliver the goods back to Purchaser upon (i) receipt of Purchaser's written instructions and (ii) the cost of transportation. If Purchaser does not respond within thirty (30) days after notice from HFC, the goods will be disposed of in HFC's discretion.

HFC does not warrant these goods to meet the requirements of any safety code of any state, municipality, or other jurisdiction, and Purchaser assumes all risk and liability whatsoever resulting from the use thereof, whether used singly or in combination with other machines or apparatus.

This warranty shall not apply to any HFC goods or parts thereof, which have been repaired outside HFC's factory or altered in any way, or have been subject to misuse, negligence, or accident, or have not been operated in accordance with HFC's printed instructions or have been operated under conditions more severe than, or otherwise exceeding, those set forth in the specifications for such goods.

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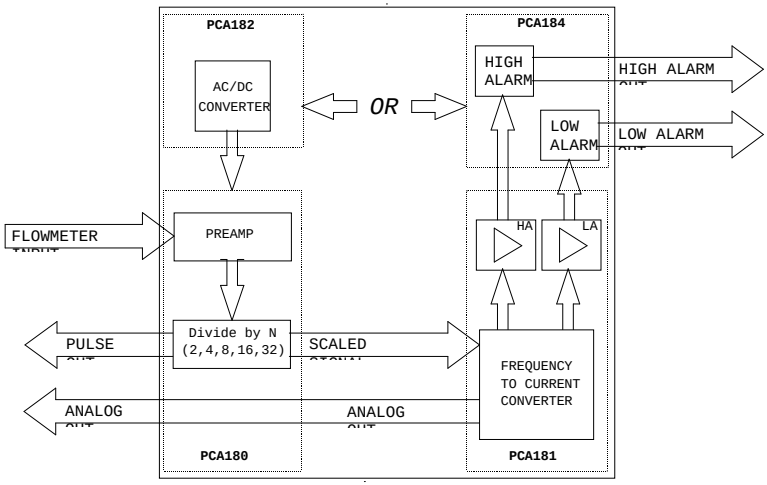
CONTENTS

1. Introduction

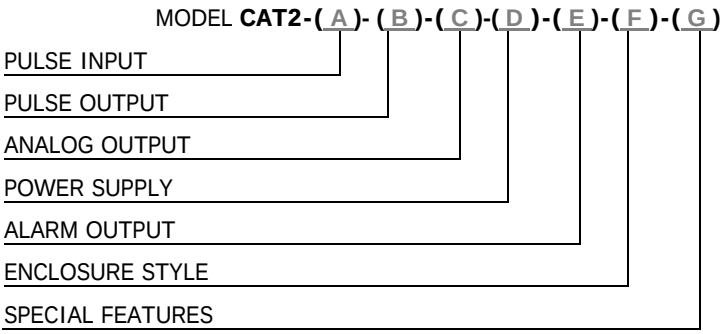
The CAT2 is a versatile DC or AC powered transmitter, which provides pulse output, analog output and High/Low flow alarm options. Up to 3 circuit boards may be installed to provide a variety of input/output options.

CAT2 Block Diagram



Many enclosure options are available including the standard extruded aluminum enclosure, an optional bracket for DIN rail mounting or direct flowmeter mounting using an optional NEMA 4X or EX enclosure.

1.1. Model Number Designation



PULSE INPUT

MODEL **CAT2-(A)-( )-( )-( )-( )-( )-( )**

OPTION (A)

(1) MAG COIL, PULSE, DRY CONTACT

(2) MC3P

(3) ISOLATED PULSE, RPM, RPR COILS

PULSE OUTPUT

MODEL **CAT2-( )-(B)-( )-( )-( )-( )-( )**

OPTION (B)

(1) 0-5V TTL / CMOS

(2) OPEN COLLECTOR

(3) OPEN COLLECTOR WITH PULL UP TO V+

(4) AC SQUARE WAVE

(5) 0-10V SQUARE WAVE

ANALOG OUTPUT

MODEL **CAT2-( )-( )-(C)-( )-( )-( )-( )**

OPTION (C)

(1) 4-20 MA

(3) 0-5 VDC

(4) 0-10 VDC

(5) 1-5 VDC

POWER SUPPLY

MODEL **CAT2-( )-( )-( )-(D)-( )-( )-( )**

OPTION (D)

(DC) 13-30 VDC

(AC) 100-240 VAC

NOTE: WHEN (AC) IS SELECTED, THE ALARM OPTION IS NOT AVAILABLE. USE REMOTE ACC39B POWER SUPPLY.

ALARM OUTPUT

MODEL **CAT2-( )-( )-( )-( )-(E)-( )-( )**

OPTION (E)

(1) HIGH / LOW OPEN COLLECTOR

(2) HIGH / LOW TTL / CMOS

(3) HIGH / LOW RELAY TWO SPDT, CONTACT RATED @ 2A 30V

(4) HIGH OPEN COLLECTOR

(5) HIGH TTL / CMOS

(6) HIGH RELAY ONE SPDT, CONTACT RATED @ 2A 30V

(7) LOW OPEN COLLECTOR

(8) LOW TTL / CMOS

(9) LOW RELAY ONE SPDT, CONTACT RATED @ 2A 30V

NOTE: WHEN ALARM OPTION IS SELECTED, (AC) POWER IS NOT AVAILABLE. USE REMOTE ACC39B POWER SUPPLY.

ENCLOSURE STYLE

MODEL **CAT2-( )-( )-( )-( )-( )-(F)-( )**

OPTIONS (F)

(1) GENERAL PURPOSE.
2.6"L X 2.6"H X 2.6"W MINIMUM MOUNTING SPACE.

(D) 2" LONG DIN RAIL MOUNT SINGLE UNIT.
UP TO 20 CAT2 UNITS CAN BE MOUNTED
ON A SINGLE RAIL. ADD 2" PER UNIT.

(E3) EXPLOSION-PROOF (ALL CONDUIT PORTS ARE ¾" FNPT)

- CSA/FM: CLASS I, DIV. 1, GR. BCD, CLASS II, DIV. 1, GR. EFG;
  CLASS III, TYPE 4X, IP66;
  CLASS 1 ZONE 1 AEx d IIB + H2, IP 66
- ATEX/IECEx: II 2 G Ex d IIB + H2, T1 – T6 Gb; IP66
  T1-T5: -40°C ≤ Ta ≤ 85°C; T6: -40°C ≤ Ta ≤ 80°C

NOTE: FOR UL LISTED EXPLOSION-PROOF ENCLOSURES CONTACT FACTORY.

(E3M) EXPLOSION-PROOF (CONDUIT PORTS D2 & D3 = M20 THR'D; CONDUIT PORTS D1- ¾" FNPT)

- CSA/FM: CLASS I, DIV. 1, GR. BCD; CLASS II, DIV. 1, GR. EFG; CLASS III, TYPE 4X, IP66; CLASS 1 ZONE 1 AEx d IIB + H2, IP 66
- ATEX/IECEx: II 2 G Ex d IIB + H2, T1 – T6 Gb; IP66 T1-T5: -40°C ≤ Ta ≤ 85°C; T6: -40°C ≤ Ta ≤ 80°C

NOTE: FOR UL LISTED EXPLOSION-PROOF ENCLOSURES CONTACT FACTORY.

(E4)* EXPLOSION-PROOF - FOR USE WITH AC POWERED CAT ONLY **(NOT Ex d SYSTEM CERTIFIED)**

- FM: CLASS I, DIV. 1, GR. ABCD; CLASS II/III, DIV. 1, GR. EFG, TYPE 4X
- CSA: CLASS I, DIV. 1, GR. ABCD; CLASS II, DIV. 1, GR. EFG; CLASS III, TYPE 4X, Ex d IIC; CLASS 1, ZONE 1, IP 66
- ATEX: Ex II 2GD, Ex d tD IIC, IP66/IP68
- IEC: Ex d IIC, IP68

NOTE: FOR UL LISTED EXPLOSION-PROOF ENCLOSURES CONTACT FACTORY.

***FOR Ex d CERTIFIED SYSTEM USE E6 OR E6M ENCLOSURE**

(E6) EXPLOSION-PROOF STAINLESS STEEL (ALL CONDUIT PORTS ARE ¾"FNPT)

- CSA/FM: CLASS I, DIV. 1, GR. BCD; CLASS II, DIV. 1, GR. EFG; CLASS III, TYPE 4X, IP66; CLASS 1 ZONE 1 AEx d IIB + H2, IP 66
- ATEX/IECEx: II 2 G Ex d IIB + H2, T1 – T6 Gb; IP66 T1-T5: -40°C ≤ Ta ≤ 85°C; T6: -40°C ≤ Ta ≤ 80°C

NOTE: FOR UL LISTED EXPLOSION-PROOF ENCLOSURES CONTACT FACTORY.

(E6M) EXPLOSION-PROOF STAINLESS STEEL **(M20 NOT AVAILABLE FOR CANADA)** (CONDUIT PORTS T2 = M20 THR'D; CONDUIT PORTS T1- ¾"FNPT)

- CSA/FM: CLASS I, DIV. 1, GR. BCD; CLASS II, DIV. 1, GR. EFG; CLASS III, TYPE 4X, IP66; CLASS 1 ZONE 1 AEx d IIB + H2, IP 66
- ATEX/IECEx: II 2 G Ex d IIB + H2, T1 – T6 Gb; IP66 T1-T5: -40°C ≤ Ta ≤ 85°C; T6: -40°C ≤ Ta ≤ 80°C

NOTE: FOR UL LISTED EXPLOSION-PROOF ENCLOSURES CONTACT FACTORY.

SPECIAL FEATURES

MODEL **CAT2-( )-( )-( )-( )-( )-( )-(G)**

OPTIONS (G)

(CE) MARK REQUIRED FOR EUROPE

(CFX) 6.75" LONG RISER AND UNION FOR EXPLOSION-PROOF **SYSTEM CERTIFIED ENCLOSURES** MOUNTED ON TURBINE. USED WITH "X" RISER TURBINE OPTION.

NOTE: IF PROCESS TEMP IS < -40°C AND > 85°C, EX-PROOF ENCLOSURE MUST BE MOUNTED REMOTELY.

(SP) ANY SPECIAL FEATURES THAT ARE NOT COVERED IN THE MODEL NUMBER, USE A WRITTEN DESCRIPTION OF THE –SP.

NOTES:

1. **IF ENCLOSURE IS MOUNTED ON TURBINE FLOWMETER, RISER MUST BE SPECIFIED ON METER.**
2. **PULSE SCALING IS SUPPLIED AS A STANDARD. THE PULSE OUTPUT IS SCALED SO THAT THE MAX FLOW IS BETWEEN 75-150 HZ WHEN THE ANALOG OPTION IS SELECTED.**

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2. Specifications

General Specifications

Input Signal Type:	Magnetic pick up, MCP pick up, Contact Closure, Pulse
Input frequency range:	0.2 Hz to 4 KHz
Signal level:	10 mV rms to 30 Vdc
Power supply:	13-30 Vdc (Reverse polarity protected) 100-240 Vac (Fuse rating 0.5A, 250 Vac
Analog Output:	4-20mA, 1-5V, 0-5V, 0-10V
Load resistance:	Max 550 Ohms at 24 Vdc
Accuracy:	+/- 0.1% of full scale @ 20° C
Temperature drift:	200ppm/deg C
Pulse output	0-5, 0-10V, Open Collector, AC square Internal pull-up resistor 10k Ohms Recommended load min. 50k Ohms
Pulse scaling	Divide by 2, 4, 8, 16, 32
Hi/Lo Alarm	Relay (2A, 30, Vdc), 0-5V, Open Collector (0.5A, 30V)
Operating temperature:	-40 to 85 C^o
Humidity:	0-90% Non-condensing
Enclosure:	Extruded aluminum DIN rail mount Explosion Proof
Regulatory:	CE compliant

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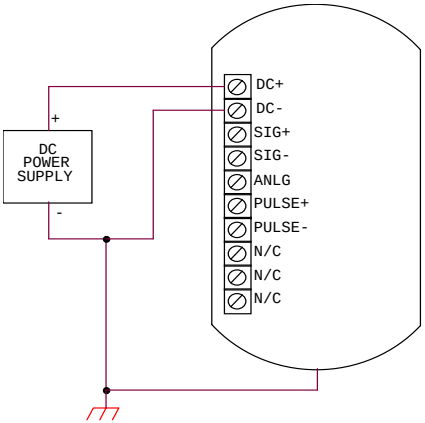
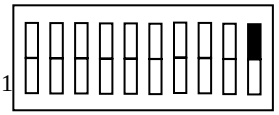
3. INSTALLATION

3.1. Power Supply

DC Power (13-30 VDC)

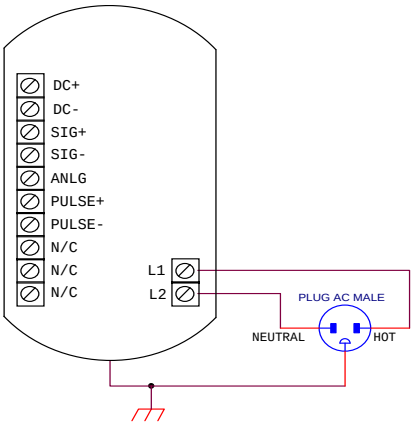


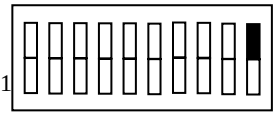


PCA180
SW2

AC Power (100-240 VAC)

AC power for CAT2 requires an optional circuit board, PCA182. The Alarm option (PCA184) is not available when the AC Power option is equipped.



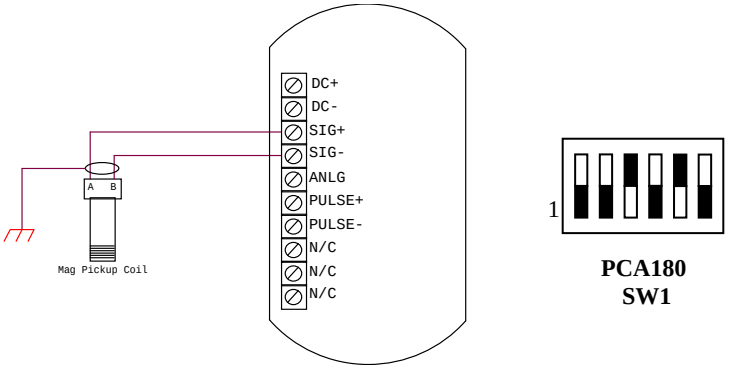


PCA180
SW2

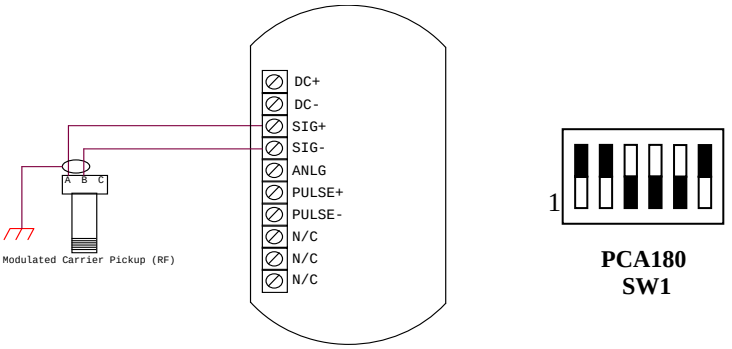
3.2. Flowmeter Input

The Preamp circuitry for conditioning the flow signal is located on PCA180. The following drawings illustrate typical connections and switch settings on PCA180 for various input signals.

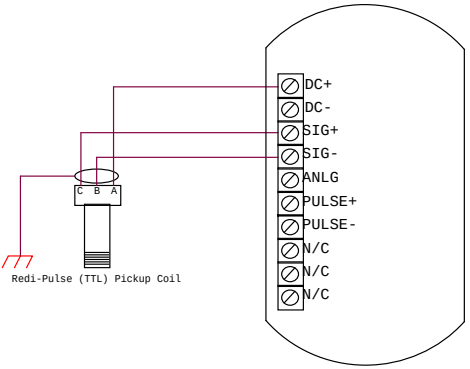
Magnetic Pickup Coil

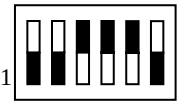


MCP/RF Coil



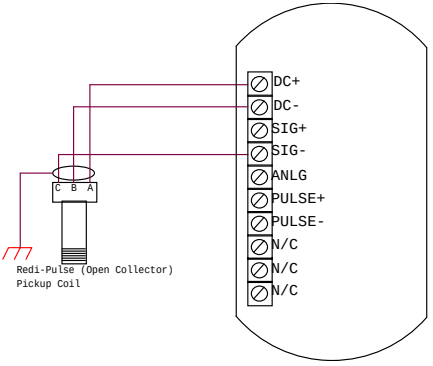
Redi-Pulse (TTL Pulse)

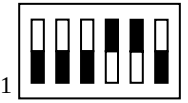




PCA180
SW1

Redi-Pulse (Open Collector)





PCA180
SW1

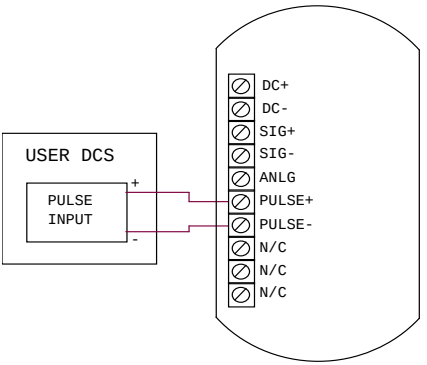
3.3. Pulse Output

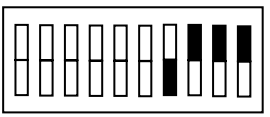
The pulse output circuitry for CAT2 is located on PCA180. The pulse output is scalable by a factor of 1, 2, 4, 8, 16 and 32 of the input frequency by selecting the proper switch on SW2. Scaling of the pulse output may be limited if an analog output is used in conjunction with the pulse output. The following drawings illustrate typical connections and switch settings for various pulse output options.

Pulse Scaling

Scaling Factor (Divide by N of Input)	**Switch Setting** (SW2, PCA180)
1	SW2-1 ON
2	SW2-2 ON
4	SW2-3 ON
8	SW2-4 ON
16	SW2-5 ON
32	SW2-6 ON

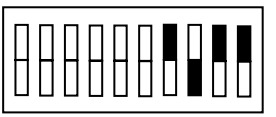
TTL(0-5V), 0-10V, High Level (DC In), AC Square





PCA180
SW2

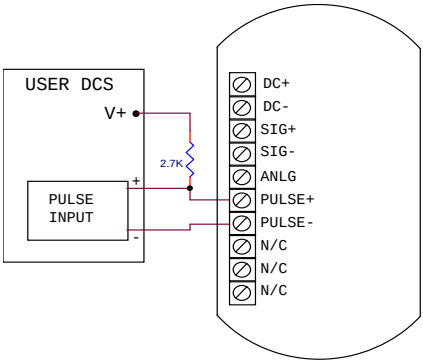
TTL(0-5V), 0-10V, AC Square

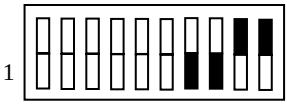


PCA180
SW2

High Level Pulse, AC Square

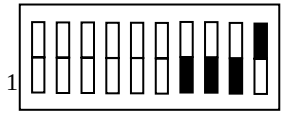
Open Collector, Isolated Pulse





PCA180
SW2

Open Collector



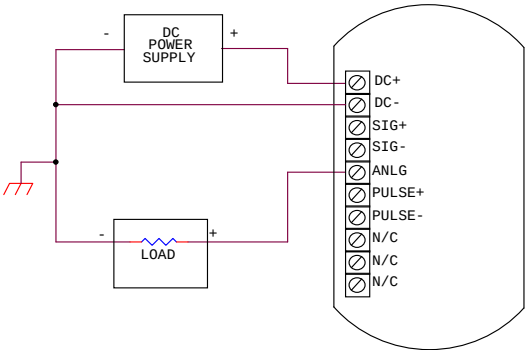
PCA180
SW2

Isolated Pulse

3.4. Analog Output

CAT2 provides an Analog Output option that will output an analog current or voltage that is proportional to the flow rate. The Analog Output for CAT2 requires an optional circuit board, PCA181.

Analog Output



The input frequency is scaled using SW2 on PCA180 so that the preamp output frequency at max flow is between 75 and 150 Hz. For example, if the max flow input signal is 1,000 Hz, SW2-4 should be in the ON position to divide the preamp signal by 8 so that the max frequency out of the preamp is 125 Hz. Refer to the table in the previous section for the appropriate switch settings. If the Pulse Output option is used in conjunction with the Analog Output, the Pulse Output frequency will be limited by this scaling factor.

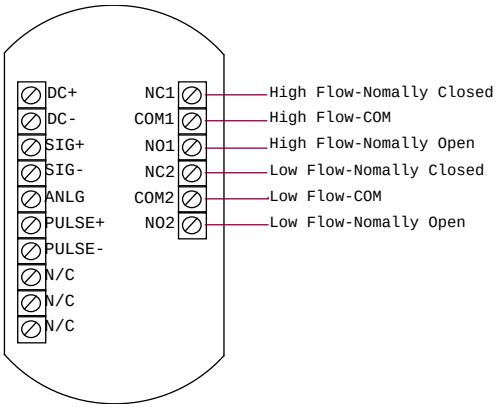
There are 3 potentiometers on PCA181 for ZERO and SPAN adjustment. The ZERO pot adjusts the no flow output, while COURSE SPAN and FINE SPAN adjusts the max flow output. All pots are labeled accordingly on the circuit board and may be accessed by removing the top plate from CAT2. The 0-20mA, 0-5V and 0-10V options require no ZERO adjustment. Contact the factory for detailed calibration instructions before making any adjustments.

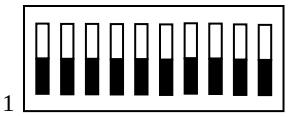
Analog Output Response Time: The analog output response time to reach steady state due to a change in the flow rate is approximately two (2) seconds.

3.5. Alarm Outputs

CAT2 provides an optional High/Low Flow Alarm feature. The Alarms require an optional circuit board, PCA184. The Alarm option is not available when the AC Power option is equipped. The following drawings illustrate typical connections and switch settings for various alarm output options.

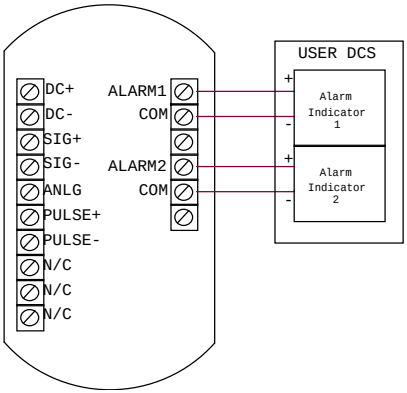
Hi/Lo Alarm Relay

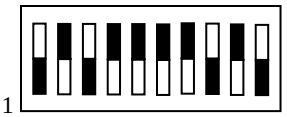




PCA184
SW1

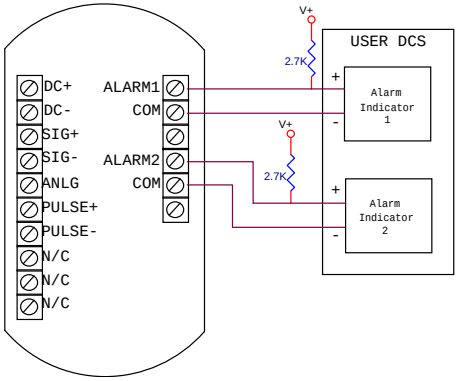
Hi/Lo Alarm TTL(0-5V)

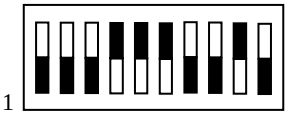




PCA184
SW1

Hi/Lo Alarm Open Collector





PCA184
SW1

3.6. Wiring Note

When installing CAT2, it is a good practice to use shielded cables for all input and output signals. The shield should be connected to the earth ground lug on the CAT2. The shield on the opposite end of the cable should be left open.

This wiring practice is mandatory in order to comply with the requirements for Electromagnetic Compatibility, as per EMC-Directive 89/336/EEC of the Council of European Community.