# Three Phase Watt/VAR & TriPlex Instruments

**Output Supplement**


October 1, 2009
Single Phase PF Instruments Document Revision B
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| | |
|---|---|
| -C41 4-12-20mA | Passive Current Output Option WATT and VAR Meters |
| -C42 4-12-20mA | Passive Current Output Option for WATT/VAR Meters |
| -C43 4-20mA | Passive Current Output Option for TriPlex Meters |
| -C12 4-20mA | Passive Current Output Option for VDAIE1 Meters |

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Bitronics LLC certifies that the calibration of its products are based on measurements using equipment whose calibration is traceable to the United States National Institute of Standards Technology (NIST).

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Bitronics' products are designed for ease of installation and maintenance. As with any product of this nature, however, such installation and maintenance can present electrical hazards and should only be performed by properly trained and qualified personnel. If the equipment is used in a manner not specified by Bitronics, the protection provided by the equipment may be impaired.

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## 1.0 DESCRIPTION

### 1.1 Introduction

The function of the 4-20mA output option is to provide a passive 4-20mA output for each displayed quantity. The outputs are passive in that they require an external DC loop power supply to operate. The MAXIMUM loop supply voltage is 29V dc. Output connection diagrams are included in Section 2.3.

### 1.2 Features

***** High reliability 100V MOSFET output drivers.

* Same precision as base meter (0.25 % Class ANSI Std 460-1988).

* Internal transient protection.

* Low Voltage drop (less than 3V @ 20mA)

### 1.3 Specifications

| | |
|---|---|
| Operating Temp.: | -20 to 70 Deg C. |
| Maximum Output: | 24mA minimum |
| Maximum Loop Voltage: | 29V dc |
| Maximum Voltage Drop: | 3V @ 20mA |
| Calibration: | Unidirectional outputs (4-20) are calibrated at 4mA (zero) and 20mA (150 Volts or 5.0 Amps).<br><br>Bidirectional outputs (4-12-20) are calibrated at 4mA (-1000 Watts/VARs), 12mA (zero), and 20mA (1000 Watts/VARs) for 2-element meter.<br><br>Bidirectional outputs (4-12-20) are calibrated at 4mA ( -1500 Watts/VARs), 12mA(zero), and 20mA (1500 Watts/VARs) for 2½ and 3-element meters.<br><br>Consult factory for non-standard calibrations. |

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## 2.0 PRINCIPLES OF OPERATION

### 2.1 System Operation

The meter is able to detect certain abnormal conditions which preclude the ability to supply valid information. One condition is the time interval between application of meter power and the first measurement. The other condition is the detection of failure code 6 (analog-to-digital converter self-test error). When either of these conditions occur, the output is brought to 2.0 + 0.1mA to alert external equipment that valid information is not available.

### 2.2 Circuit Operation

The circuitry for the output option is located on a new Analog Processing (AP) Board. Each output channel consists of a 12-bit digital to analog (DAC), precision amplifiers, and a 100V MOSFET. Constants stored in the EEPROM on the analog board are read by the MCU and used to compensate for gain and offset of each channel. This technique provides for stable calibrations for each channel. The additional circuitry for the outputs is powered from a +/-15V supply also located on the AP module. Parts for unused output channels are not populated on the board.

### 2.3 Output Connections

The output connection diagrams are shown in Figure 3. The POSITIVE terminal of the loop power supply should be connected to the common + terminal of the output connector as shown.

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## 637 4-20mA OUTPUT ANALOG BOARD

| Qty | Type | Value | Ref Designators |
|---|---|---|---|
| 2 | CAP47MFD | 47MFD 16V LYTIC | C7,C8 |
| 6 | CAP220HFD2 | 220HFD 25V LYTIC | C1, C2, C3, C4, C5, C6 |
| 2 | CAP.1MFD | .1UF CERAMIC | C11,C14 |
| 4 | DOD1N914 | 1N914 | D3,D4,D9,D10 |
| 5 | DOD1N4004 | 1N4004 | D13,D15,D16, D17, D18 |
| 1 | DOD1N5819 | 1N5819 SHOTT KEY | D14 |
| 1 | DODSA6 | SA6.0A TRANSORB | TZ7 |
| 2 | DODSA9 | SA9.0C TRANSORB | TZ1, TZ2 |
| 1 | DODSA30 | SA30 TRANSZORB | TZ8 |
| 1 | IC78L15 | LH78L15ACZ +15V | U2 |
| 1 | IC79L15 | LH79L15ACZ -15V | U1 |
| 1 | I CCAT93C46PI | CAT93C46PI | U9 |
| 1 | ICDAC8043FP | DAC8043FP DAC | U12 |
| 1 | ICIRFD9110 | IRFD9110 P-FET | U15 |
| 1 | ICLH285BYZ | LH285BYZ | U10 |
| 1 | ICLH2931Z | LH2931Z-5 .. 0 | U11 |
| 2 | ICLT1013CN8 | LT1013CN8 | U7,U13 |
| 1 | ICTLC1541IN | TLC1541IN A/D | U8 |
| 1 | JHP.4 .4" | JUMPER (YUJ) | R15 |
| 3 | RES1K | 1/4W 1% 1K HF | R4,R5,R21 |
| 3 | RES10K | 1/4W 1% 10K HF | R8,R9,R11 |
| 1 | RES120 | 1/4W 1% 1200hm | R18 |
| 1 | RES15Kl | 1/4W 1% 15K HF | R10 |
| 3 | RES221 | 1/4W 1% 221 MF | R12,R13,R17 |
| 3 | SOCBSW10624SS | 68684-306 | S2,S3,S4 |
| 2 | TRMHEAD3P | .025SQ 3 PIN | P9 |
| 2 | TRMHEAD6P | 6PIN .025SQ | P5,P6 |

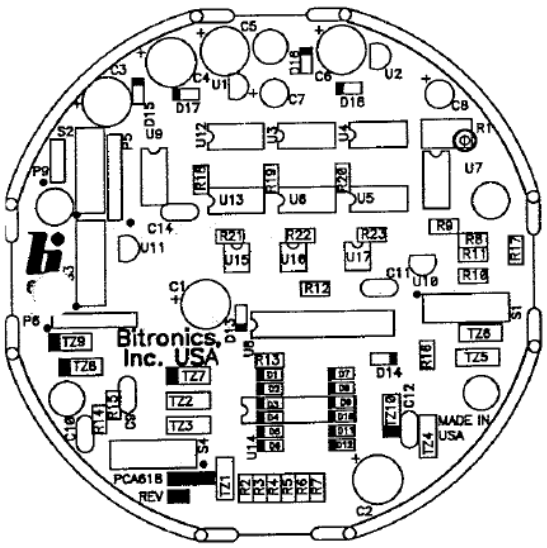


**Figure 1 – Parts Placement for Analog/4-20mA Board 637**

**PARTS FOR DOC4.x OPTION CHANNEL 1**

| | | | |
|---|---|---|---|
| 1 | 000SA30 | SA30 TRANSZORB | TZ8 |
| 1 | ICIRF09110 | IRF09110 P-FET | U15 |
| 1 | JMP.4 | .4" JUMPER (YL\I) | R15 |
| 1 | RES1K | ¼\1 1% 1K MF | R21 |
| 1 | RES120 | ¼\1 1% 120 ohm | R18 |

**PARTS FOR DOC4.x OPTION CHANNEL 2 or DOC1.2**

| | | | |
|---|---|---|---|
| 1 | 000SA30 | SA30 TRANSZORB | TZ9 |
| 1 | ICIRF09110 | IRF09110 P-FET | U16 |
| 1 | JMP.4 | .4" JUMPER (YL\I) | R1 |
| 1 | RES1K | ¼\1 1% 1K MF | R21 |
| 1 | RES120 | ¼\1 1% 120 ohm | R18 |

**PARTS FOR DOC4.x OPTION CHANNEL 3**

| | | | |
|---|---|---|---|
| 1 | 000SA30 | SA30 TRANSZORB | TZ10 |
| 1 | ICIRF09110 I | RF09110 P- FET | U17 |
| 1 | JMP.4 | .4" JUMPER (YL\I) | R16 |
| 1 | RES1K | ¼\1 1% 1K MF | R23 |
| 1 | RES120 | ¼\1 1% 120 ohm | R20 |

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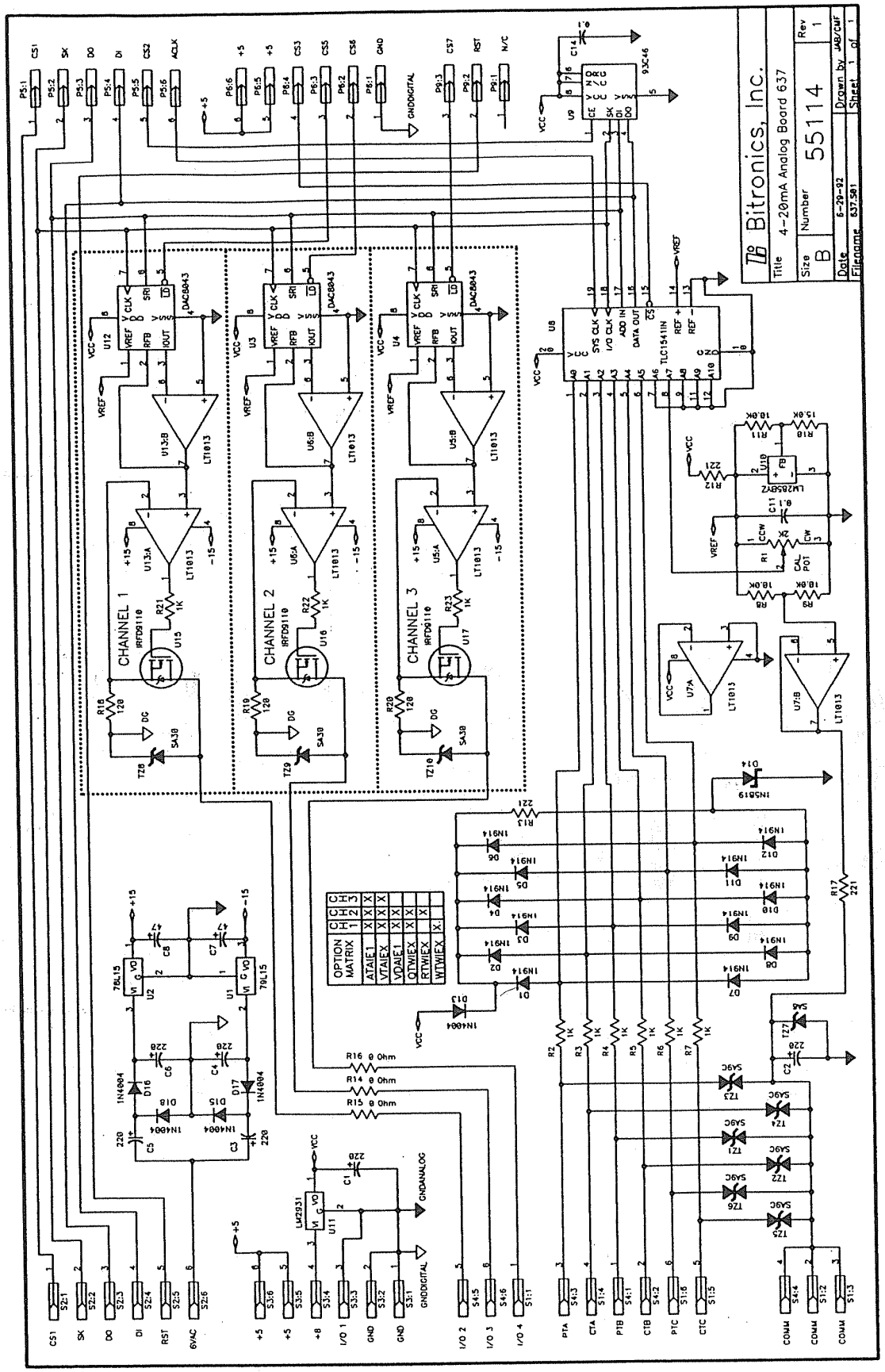


**Figure 2 – Schematic for Analog/4-20mA Board 637**

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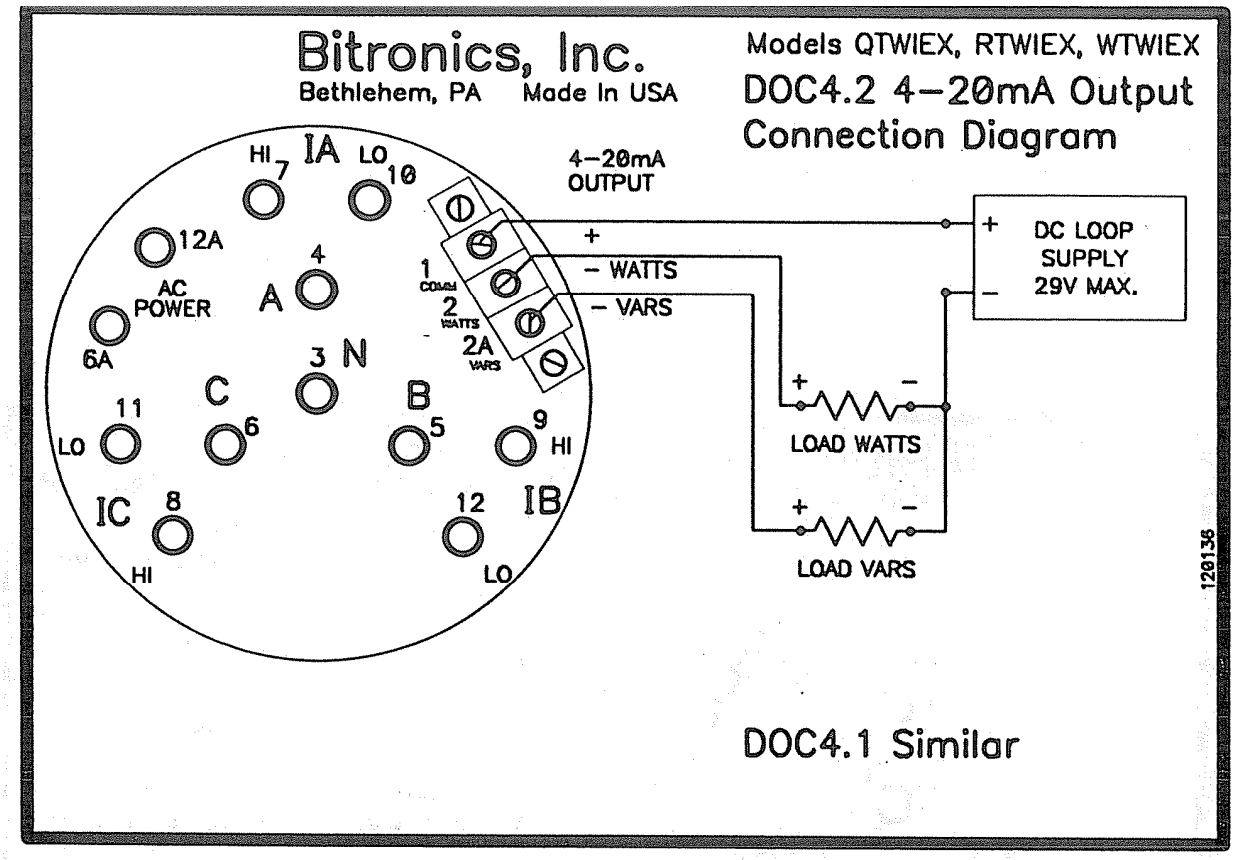


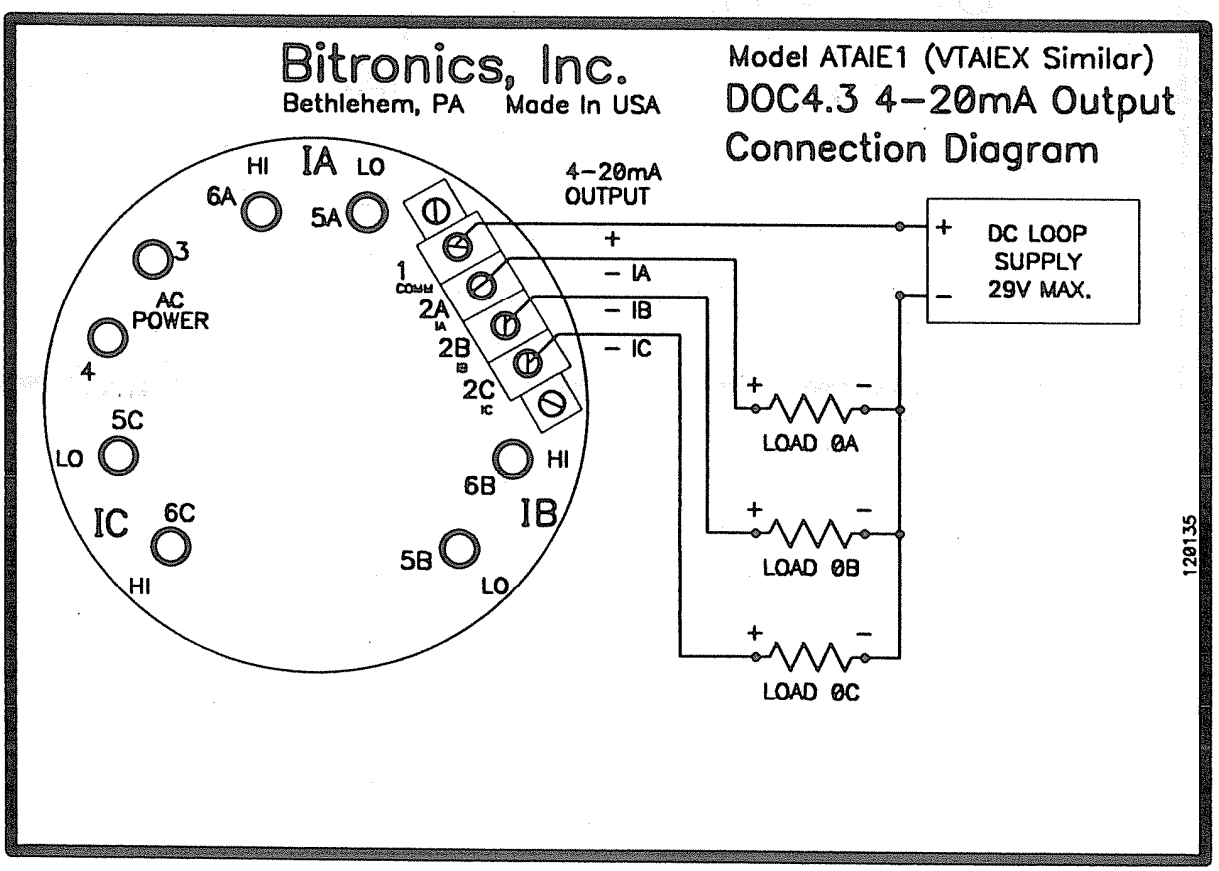


**Figure 3 – Typical Back Panel Connections**

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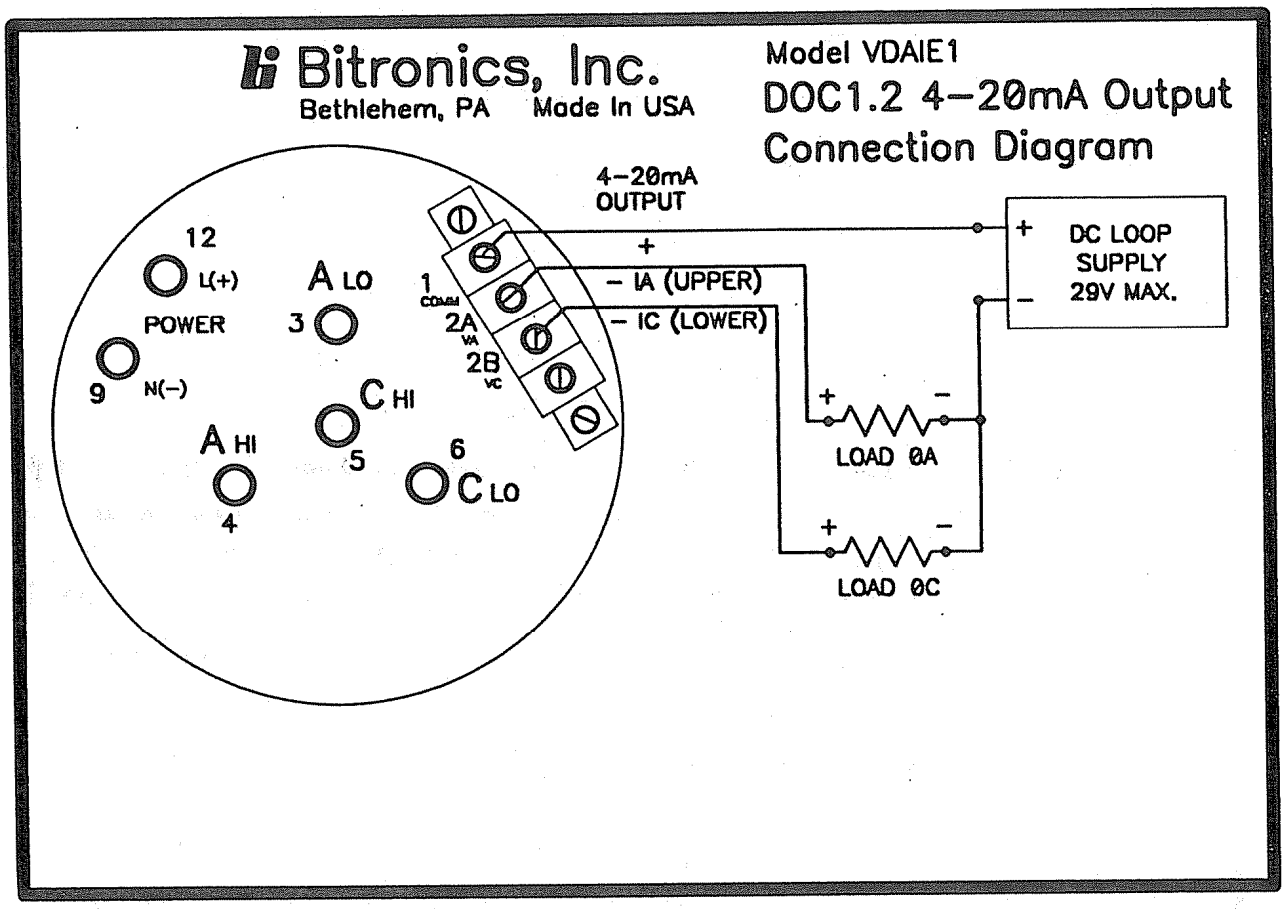


**Figure 4 – GSWIE1 Back Panel Connections**

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| Revision | Date | Changes | By |
|---|---|---|---|
| A | 01/30/2009 | Update Bitronics Name, Logo | E. Demicco |
| B | 10/01/09 | Updated logos and cover page | MarCom |
| C | | | |
| | | | |
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