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Single Phase PF Instruments Document Revision B
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No. DOC7.1 4-20mA Passive Current Output Option for Power Factor Meters
No. DOC9.1 4-20mA Passive Current Output Option for Watt or Var Meters
No. DOC9.2 4-20mA Passive Current Output Option for Combination Meters

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CERTIFICATION

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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Products manufactured by Bitronics LLC are warranted against defects in materials and workmanship for a period of thirty-six (36) months from the date of their original shipment from the factory. Products repaired at the factory are likewise warranted for eighteen (18) months from the date the repaired product is shipped, or for the remainder of the product's original Warranty, whichever is greater. Obligation under this warranty is limited to repairing or replacing, at Bitronics' factory, any part or parts which Bitronics' examination shows to be defective. Warranties only apply to products subject to normal use and service. There are no warranties, obligations, liabilities for consequential damages, or other liabilities on the part of Bitronics except this Warranty covering the repair of defective materials. The warranties of merchantability and fitness for a particular purpose are expressly excluded.

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1.0 DESCRIPTION

1.1 Introduction

The function of the DOC7 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 (0.5 % 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: Bidirectional outputs (4-12-20) are calibrated at 4mA (-500 Watts/Vars or zero lagging power factor), 8mA (-250 Watts/ Vars or 0.500 lagging power factor), 12mA (zero Watts/Vars or unity power factor), 16mA (250 Watts/Vars or 0.500 leading power factor), and 20mA (500 Watts/Vars or zero leading power factor).

The output is linear' with power factor. Unidirectional outputs (4-20) are calibrated at 4mA (0 Volt/Amps) and 20mA (5.0 Amps and 150 Volts).

Consult factory for non-standard calibrations.

2.0 PRINCIPLES OF OPERATION

2.1 System Operation

The DOC7 output option provides an analog current corresponding to the displayed value. However, when the meter is first energized, the output is brought to $2.0 \pm 0.1\text{mA}$ to alert external equipment that valid information is not available. The output changes within a few seconds to a value within the range of 4- 20mA after the first measurement becomes 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.

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 TRANSORB | TZ8 |
| 1 | IC78L15 | LH78L15ACZ +15V | U2 |
| 1 | IC79L15 | LH79L15ACZ -15V | U1 |
| 1 | ICCAT93C46PI | 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% 120ohm | R18 |
| 1 | RES15KI | 1/4W 1% 15K HF | R10 |
| 3 | RES221 | 1/4W 1% 221 MF | R12,R13,R17 |
| 3 | SOCBSW10624SS | 68684-306 | S2,S3,S4 |
| 2 | TRHHEA06P | 6PIN .. 025SQ | P5,P6 |

PARTS FOR OPTION CHANNEL 2

| | | | |
|---|-------------|----------------|-----|
| 1 | DOOSA30 | SA30 TRANSORB | TZ9 |
| 1 | ICDAC8043fP | DAC8043FP DAC | U3 |
| 1 | ICIRfD9110 | IRFD9110 P-FET | U16 |
| 1 | ICLT1013CN8 | LT1013CN8 | U6 |
| 1 | JMP.4 .4" | JUMPER (YUJ) | R14 |
| 1 | RES1K | 1/4W 1% 1K MF | R22 |
| 1 | RES120 | 1/4W 1% 120ohm | R19 |

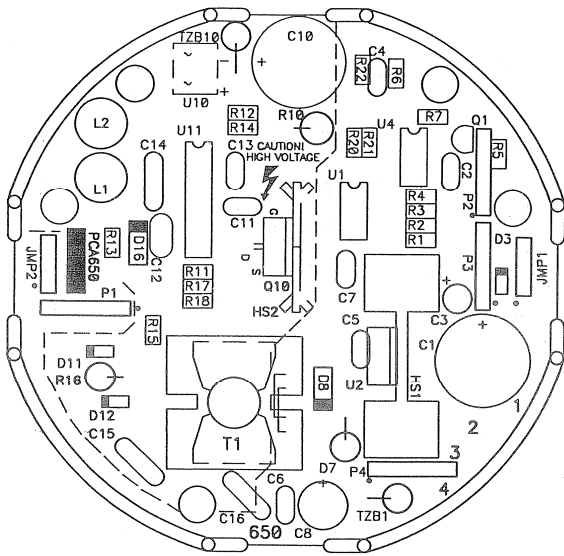
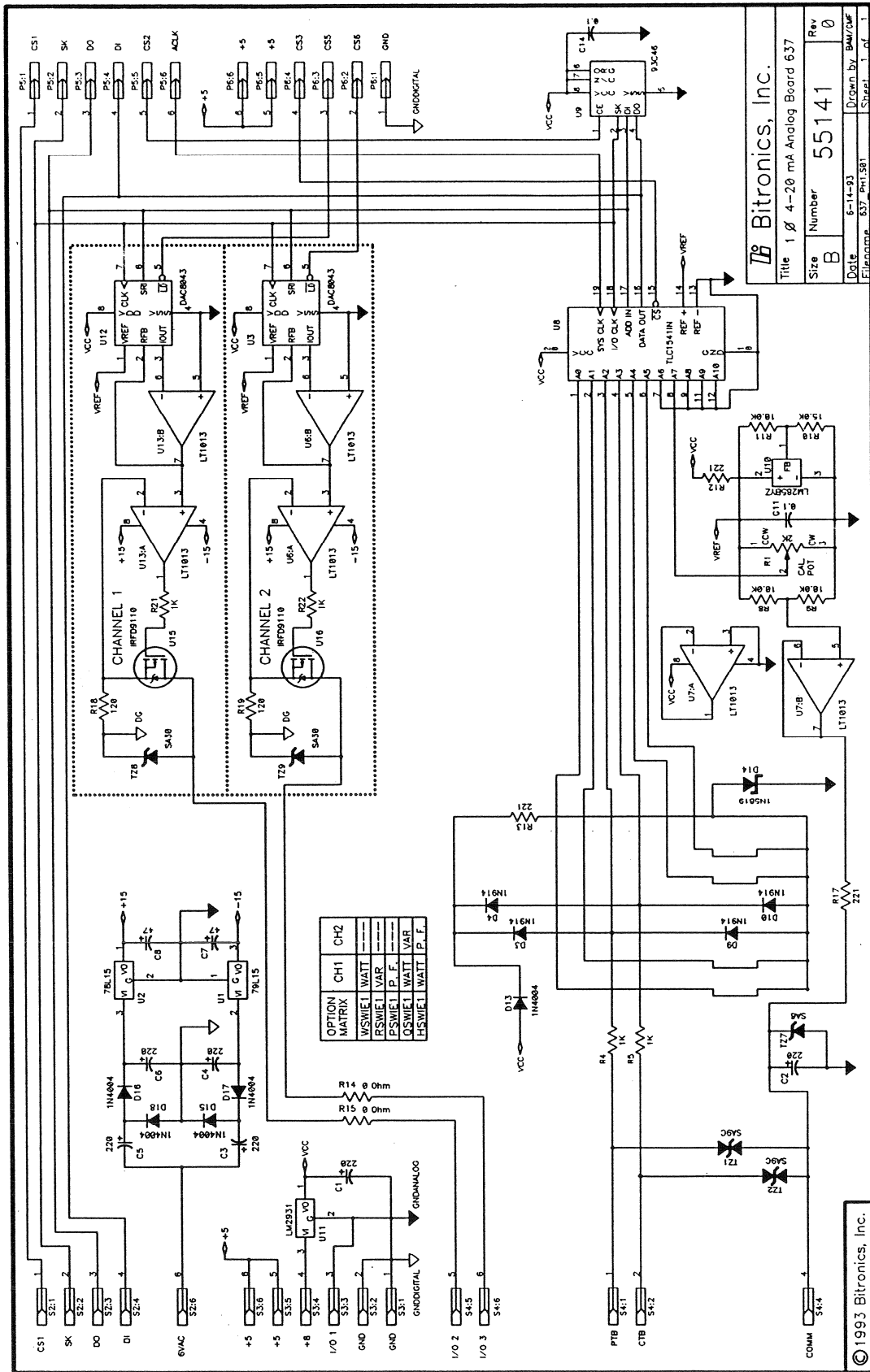


Figure 1 – Parts Placement for Analog/4-20mA Board 637

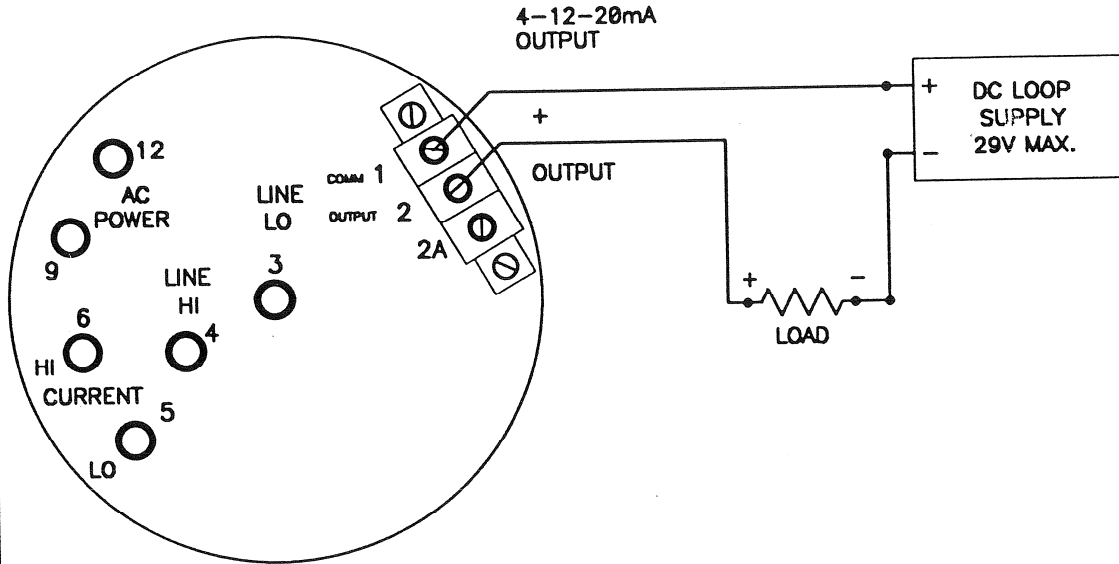


Bitronics, Inc.
 Title 1 Ø 4-20 mA Analog Board 637
 Size B
 Number 55141
 Rev 0
 Date 6-14-93
 File name 637 PNT1581
 Drawn by BMW/cmf
 Sheet 1 of 1

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

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Models WSWIE1,RSWIE1,
PSWIE1,PSWIE2
**4-12-20mA Output
Connection Diagram**



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Bitronics, Inc.
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Models QSWIE1,HSWIE1
**4-12-20mA Output
Connection Diagram**

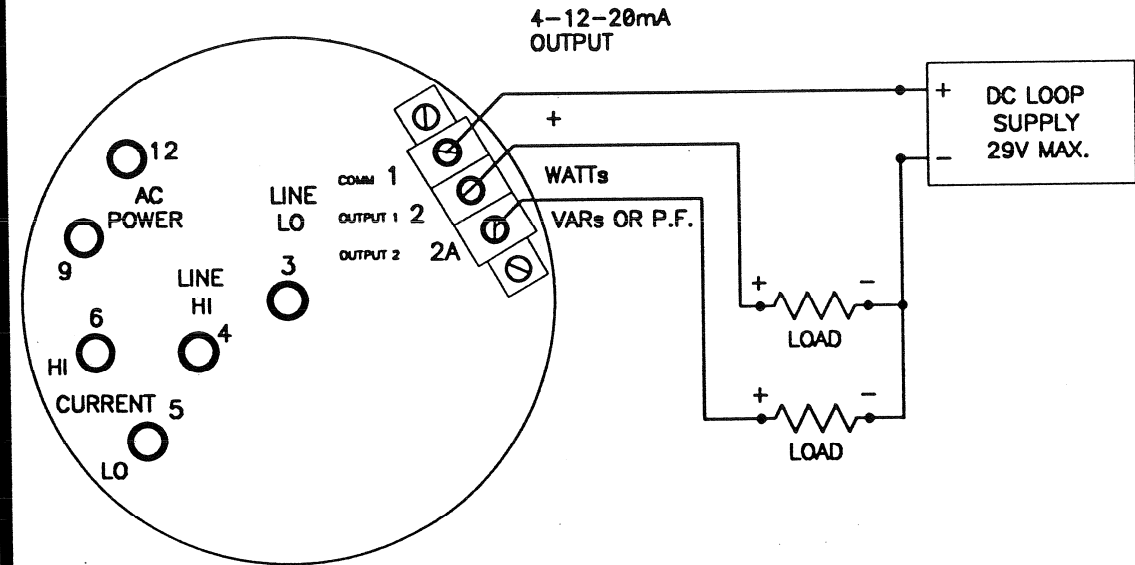


Figure 3 – Typical Back Panel Connections

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Models GSWIE1
**4-20mA Output
Connection Diagram**

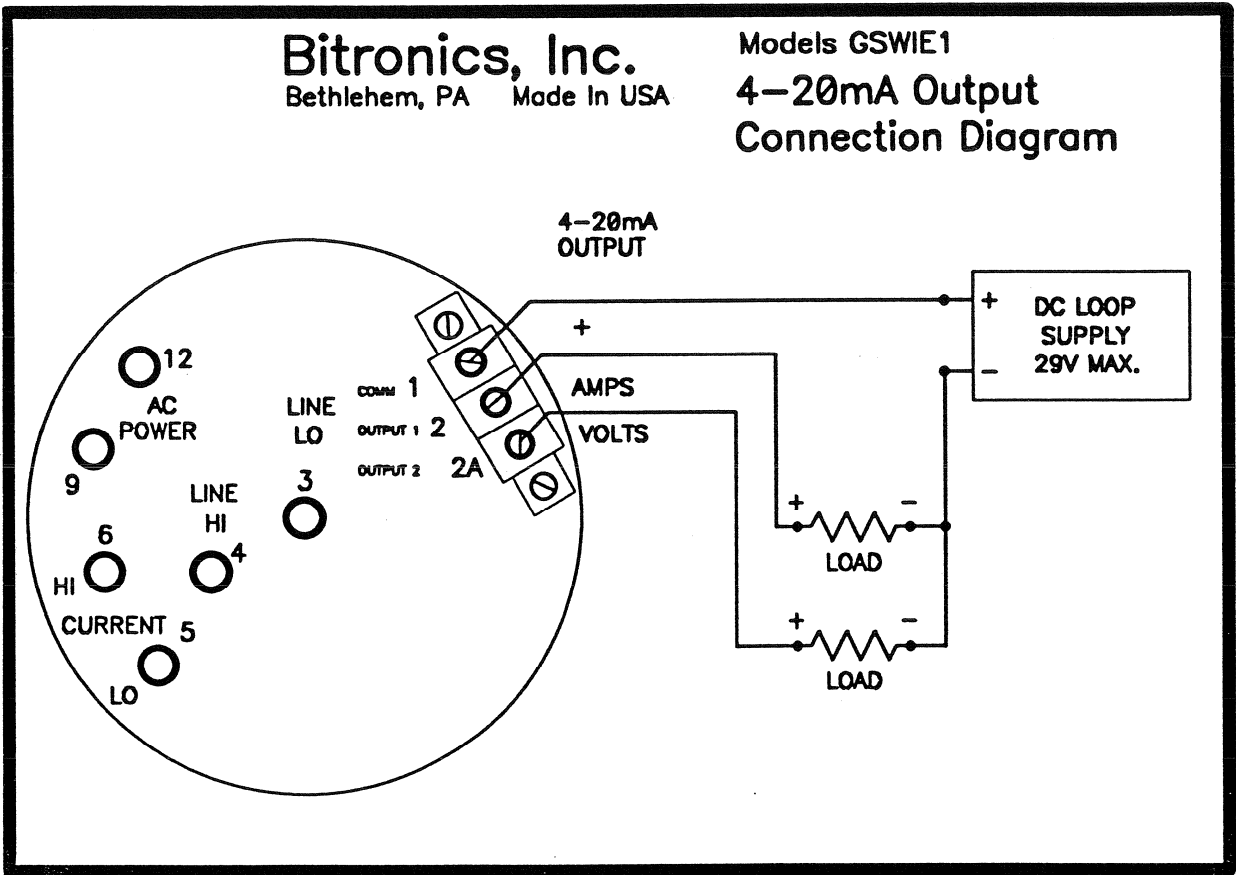


Figure 4 – GSWIE1 Back Panel Connections

| 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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