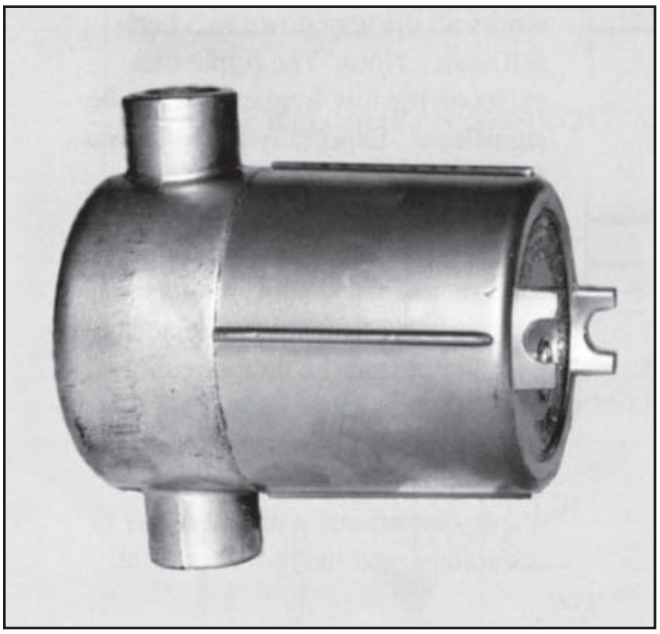
NIAGARA® meters

# *Model 1005*
# *Pulse to DC Converter*

# Installation, Operation and Maintenance Manual



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# *Installation, Operation & Maintenance*

## *GENERAL*

The Model 1005 conditions pulses from a variety of liquid flow sensing devices to a 4-20 mA output signal which is proportional to the flow rate. The output is used to transmit flow rate over long distances with no loss of accuracy and to interface with chart recorders, computers, and other instrumentation.

## *SPECIFICATIONS*

**Repeatability:** 0.1% of Full Scale

**Linearity:** 0.5% of Full Scale

**Frequency Range:** 5 to 5000 Hz, Full Scale

**Inputs:**

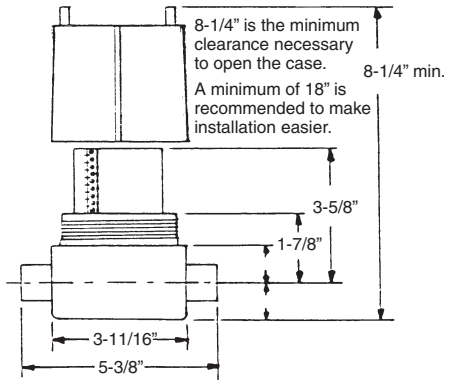
- Form A  SPST Contact Closure
- Form C  DPDT Contact Closure
- Optical Coupler (square wave)
- High Speed Pulse (10 to 15 V peak)
- Low Level Magnetic Pickup (sine wave)
- Infrared 860 and 573

**Output:** 4-20 mA, self powered into a maximum of 500 ohms

**Power Requirements:** 115 or 230 VAC, ±10% less than 10VA required or 16 to 32 VDC will output ±12 VDC @50 mA max.

**Enclosure:** Metal enclosure with two 1" conduit connections; rated for Class I Groups C & D, Class II Groups E, F, & G, and Class III

**Dimensions:**




## *INSTALLATION*

Incorrect wiring of this device may cause permanent damage.

The enclosure should be mounted before wiring the unit. It may be necessary to remove the PC board before pulling wires to the 1005.

**Note:** When inserting or removing the PC board, tilt the top edge away from the side of the board with the transformer. Otherwise, the brackets on the end of the board will not have enough clearance to get through the opening of the enclosure. Do not use force. It is not necessary.

All electrical connections are made at the terminal strip on the left side of the board. Power, an input and output, must be wired to the 1005. See Wiring Diagrams.

The power must be supplied by a 115 or 230 VAC source, or by a 16 to 32 VDC source. It attaches to Terminals 8 & 9, with the power ground (earth or safety ground) attached to Terminal 7. **Note:** Terminal 7 is also tied to the case of the 1005. **Caution:** Power should not be run in the same conduit with any of the input or output signals. Because the other signals are low voltage, they might pick up enough noise from the AC power leads to cause signifi cant errors.

The input must come from a meter with a pulse output. There are types of meter inputs that can be accepted by the 1005. The meter always goes to Terminal 4 and some combination of Terminals 3, 4, and 6. Examples can be found in the Input Wiring Diagrams. For the output, Terminal 2 is the positive supply (source) of the 4-20 mA output, and Terminal 1 is the return. Terminal 1 is also the circuit common (ground) for the 1005. Because the 1005 is an isolated unit, circuit ground can be tied to some voltage other than earth ground, if desired.

Under most conditions, the low voltage circuitry should be grounded at some point. If the 4-20 mA loop connects to circuitry that is grounded, it should be left floating. If the 1005 connects only to other floating circuitry, then the 1005 circuit common probably should be tied to ground. If there appears to be a noise problem with the 1005, you might try adding or deleting the connection between ground and circuit common.

**Warning:** Always be careful to avoid ground loops (circuit grounds of different instruments connected together through more than one circuit path), whether Terminal 1 is tied to earth ground or not. Ground loops can create significant errors.

## *THEORY OF OPERATION*

The Model 1005 comes in four input versions to handle different types of inputs.

The 1005 amplifi es and conditions its input signal to create a sharp, clean square wave. The square wave becomes the input for a voltage-to-frequency (v/f) converter which has an analog voltage output. The signal is then used to control a 4-20 mA current source. The current output is proportional to the pulse rate of the input signal. It can be used with a local indicator or transmitted over long distances with little loss in accuracy.

The Model 1005 can be calibrated for a wide variety of frequency ranges. At the high end, the maximum is 5000 Hz full scale.

The 1005 has all of the components it needs to cover its full range. Scaling components are selected with jumpers at the time of calibration. All that is needed to calibrate the 1005 is an accurate signal source (to stimulate the maximum frequency input) and a digital meter to accurately read the output current.

### Setup

The 1005 is set up at the factory according to the meter it will be working with. The only two items of concern when setting up the 1005 are the full scale frequency and the meter that interfaces with the 1005. If both were defined when the 1005 was purchased, or if the input meter was bought from Niagara, no setup work is needed. It was already completed at the factory. Setup and calibration are needed only if something is changed later within the system.

"HI" Damping: Hi frequency only (the least amount of damping)

"LO" Damping: For low frequencies (and minimum ripple)

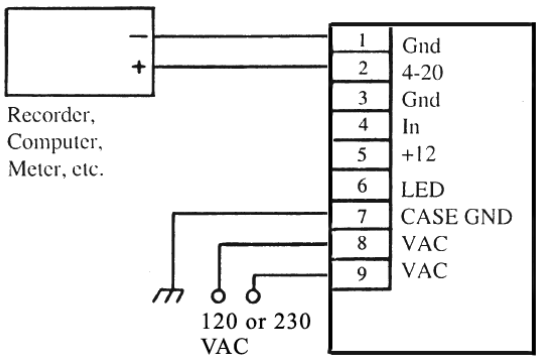
Time Constants:

| Damping | Time Constant (approximate only) |
|---|---|
| Min ("Hi") | .07 sec.; .3 sec.; 1.5 sec. |
| Max ("Lo") | 7 sec. |

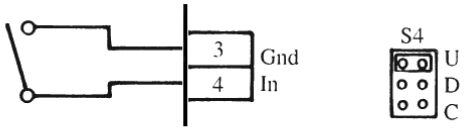
**Terminal Identification for AC input**

| | | |
|---|---|---|
| Gnd | 1 | Low voltage circuit common/ground |
| 4-20 | 2 | Output; Current source to Gnd; 4 mA out at 0 Hz in, 20 mA at full scale |
| Gnd | 3 | Low voltage circuit common/ground |
| In | 4 | Input pulse, relative to Gnd. |
| +12 | 5 | +12 VDC supply voltage for devices needing external power |
| LED | 6 | 750 ohms to Gnd; To LED cathode; For powering LED of photo sensor |
| Case Gnd | 7 | AC/safety ground |
| VAC | 8 | 120 VAC power lead or 230 VAC |
| VAC | 9 | 120 VAC power lead or 230 VAC |

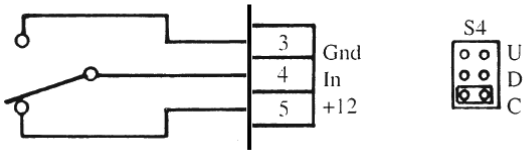
**AC Input Wiring (See to Page 4 for DC)**




**Form A**
P/N 60380G275



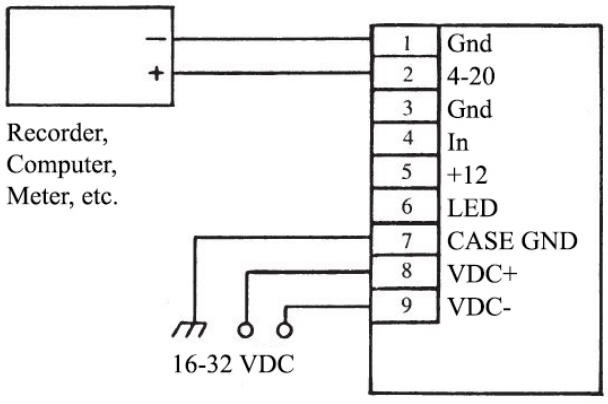

**Form C**
P/N 60380G275



**Terminal Identification for DC input**

| | | |
|---|---|---|
| Gnd | 1 | Low voltage circuit common/ground |
| 4-20 | 2 | Output; Current source to Gnd; 4 mA out at 0 Hz in, 20 mA at full scale |
| Gnd | 3 | Low voltage circuit common/ground |
| In | 4 | Input pulse, relative to Gnd. |
| +12 | 5 | +12 VDC supply voltage for devices needing external power |
| LED | 6 | 750 ohms to Gnd; To LED cathode; For powering LED of photo sensor |
| Case Gnd | 7 | AC/safety ground |
| +VDC | 8 | VDC 16 to 32 VDC |
| -VDC | 9 | VDC 16 to 32 VDC |

**DC Input Wiring (See page 3 for AC)**




**Form A**
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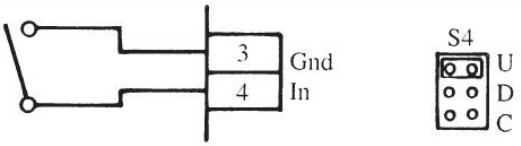
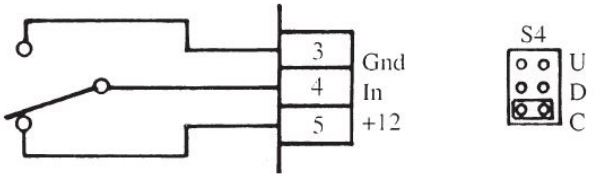
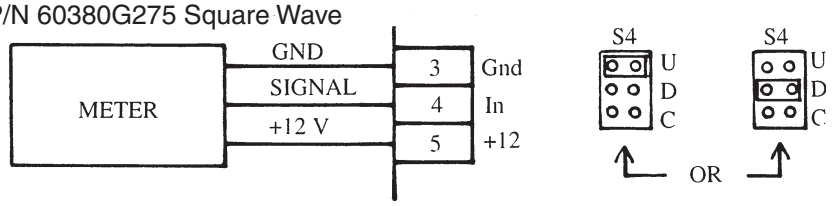



**Form C**
P/N 60380G275

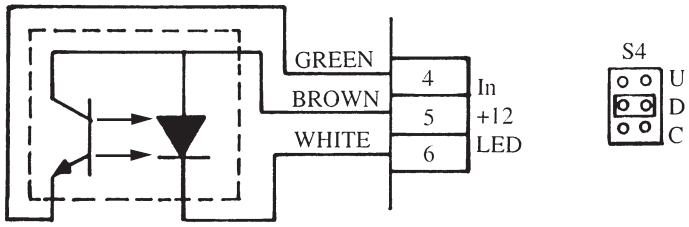


**Input Connections**

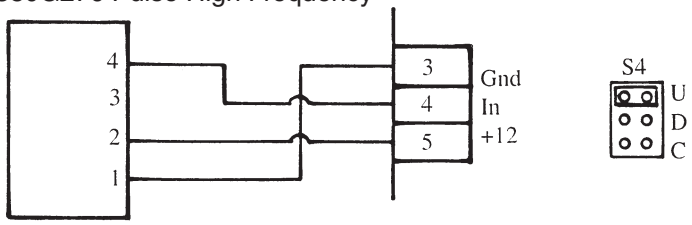
P/N 60380G275 Square Wave



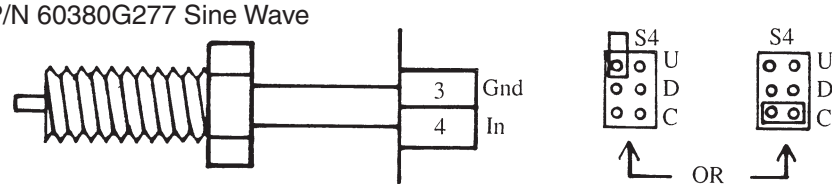

P/N 60380G275 Pulse Low Frequency (860)



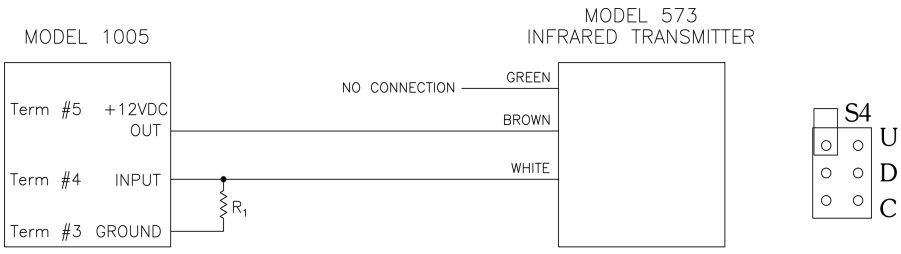

P/N 60380G276 Pulse High Frequency




P/N 60380G277 Sine Wave




P/N 60380G520




$R_1$: LUC035942 RES 1.27K OHM 1/4W 1%

## *MAINTENANCE*

**Calibration**

The meter calibration should not need adjusting when it is first installed. However, periodic checks are recommended for all measurement equipment.

**I. Equipment Needed**

Signal Generator, Frequency Counter, Digital Multi-meter (for reading DC volts and 4 to 20 mA)

**II. Hookup (see diagram)**

The signal generator output should be:

1. 0 to 12-15 V pulse for either the pulse or hi speed versions. (60122G207 and 60122G208)
2. 100 mV, AC coupled signal for the low level sine-wave input version. (60122G209)

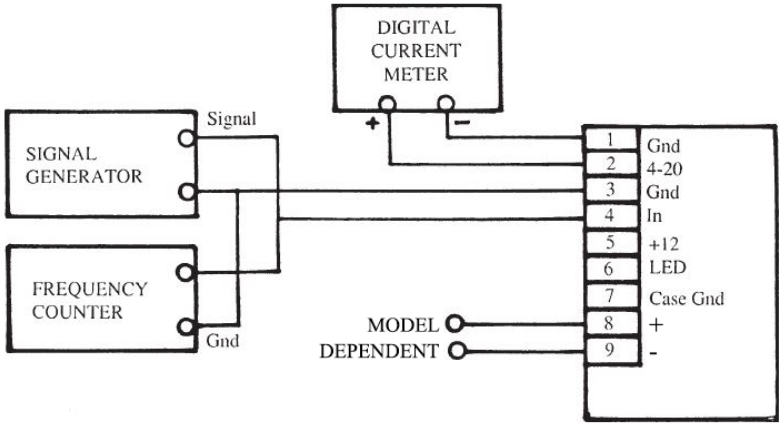
**III. Testing**

When power is first applied, verify that the power supply is correct by checking the +12 V on the terminal block. Using the digital meter in voltage mode, connect to ground at Terminal 1 and measure Terminal 5 which should be +12 V ±0.5 V.

**IV. Calibration**

1. With no input (0 Hz), adjust RP2 for 4 mA out.
2. Turn RP1 full CW.
3. Using the signal generator, and measured with the frequency counter, input the maximum signal frequency. (This is the frequency that is to output 20 mA.)
4. Set the jumpers on S1 and S2 to CLO and RLO (the bottom positions), and the DAMP jumper (S3) to the bottom. **Note:** As the C jumper (S2) is moved one position, the DAMP jumper (S3) should be moved one position in the same direction, i.e., both up or both down.
5. Verify IOUT is > 20 mA. If not, either the frequency is too low or something is wrong with the 1005.
6. Move the C jumper (S2) up one position and the DAMP jumper (S3) up one position.
7. If IOUT is still > 20 mA and the C jumper (S2) is on CHI, go to step 9. Otherwise, repeat step 6.
8. Move the C jumper (S2) back down one position so the output is again > 20 mA.
9. Move the R jumper (S1) up one position.
10. If IOUT is still > 20 mA and the R jumper (S1) is on RHI, go to step 12. Otherwise, repeat step 9.
11. Move the R jumper (S1) down one position so the output is again > 20 mA.
12. Adjust RP1 to get 20 mA out.
13. Remove the input to check 4 mA. If it has changed, adjust RP2 to get 4 mA. As needed, continue checking 4 and 20 mA, and adjusting RP2 and RP1, until no further adjustment is needed.

**Hookup Diagram For Calibration Only**



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NIAGARA® meters

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