



Q478-0000



# ACTIONI/Q<sup>®</sup> Q478

## DC Powered Frequency Input Field Configurable Isolator

Provides an Isolated DC Output  
in Proportion to an Input Frequency



- Eliminates Ground Loops
- Field Configurable Input Ranges 2Hz to 10,000Hz
- Field Configurable Output Ranges
- 150mV to 150V Input Amplitude

- TouchCAL Technology
- High Density DIN Rail Mounting
- Flexible DC Power Supply Accepts 9 to 30VDC
- SnapLoc<sup>™</sup> Plug-in Terminals

### Description

The Q478 is a DC powered DIN rail mount, frequency input signal conditioner with 1800VDC isolation between input, output and power. The field configurable input and output offers flexible, wide ranging capability for variable frequency drives, magnetic pickups, turbine flowmeters, and other pulse or frequency output transducers.

The input of the Q478 can be configured for any frequency span from 2Hz to 10,000Hz. The input amplitude threshold sensitivity can be adjusted from 150mVp to 10Vp to ensure accurate frequency measurement and minimize transient noise related errors. The maximum input amplitude is 150 Vrms. The output can be set for either 0-5V, 0-10V, 0-1mA, 0-20mA or 4-20mA.

The Q478 can be field configured for virtually any frequency input to DC signal output within the ranges specified. There is also an 8VDC excitation source common to the input. This can be used as a signal source for relay contacts or as an excitation source for open collector type proximity sensors. The Q478 is DC powered and will accept any power between 9 and 30VDC.

### TouchCAL Technology

The Q478 utilizes TouchCAL Technology to greatly simplify configuration. The high and low input ranges are stored in non-volatile memory and correspond to the high and low output range which is selected via DIP switches.

### Diagnostic LEDs

The Q478 utilizes three diagnostic LEDs. The green (RUN) LED indicates DC power and input signal status. Active line power is indicated by an illuminated LED. If the input signal is 7% or more high, the LED will flash at 8Hz. If the input signal is 7% or more low, the LED will flash at 4Hz.

The yellow (IN) LED is lit when calibrating the input. The red (OUT) LED is lit when calibrating the output.

### Application

The Q478 field configurable, frequency input signal conditioner is useful in eliminating ground loops and interfacing pulse output transducers, such as turbine flow meters and magnetic pickups, to data acquisition and control systems.

Advanced digital technology, combined with ASIC technology, provides a stable output at low frequencies for higher accuracy, and 3-way isolation which completely eliminates ground loops from any source.

### Configuration

Any 2Hz range from 0 to 10,000Hz can be converted to a full scale output signal (e.g. 0-2Hz/4-20mA or 9998-10,000Hz/4-20mA).

Unless otherwise specified, the factory presets the Model Q478 as follows:

Input Range: 0 to 1000Hz  
 Sensitivity: 1V RMS  
 Output Range: 4 to 20mA

*Note that "Sensitivity" refers to the noise rejection level (the trigger threshold of the input).*

For other I/O ranges, refer to the tables.

**WARNING:** Do not change switch settings with power applied. Severe damage will result!

1. With power off, snap off the faceplate by lifting the right edge away from the heatsink. Then slide the heatsink forward and off the module. The output switch block (SW2) is located under the heatsink. Choose the desired output voltage/current range from Table 1 and set positions 1-8 of SW2.

2. Set the input sensitivity switch (SW2, 9 & 10) to LO for input amplitudes between 150mVp and 50Vrms, with noise rejection to 1Vp; or to HI for input amplitudes between 500mVp and 150Vrms, with noise rejection up to 10Vp.

3. Return the heatsink to its original position and attach the faceplate before beginning calibration.

## Calibration

For best results, calibration should be performed in the operating installation, allowing at least one hour for thermal stability of the system. If pre-calibration on a test bench is preferred, then an output load equal to the input impedance of the device connected to the Q478 output is recommended, along with a 1 hour warm up period.

*Note: An I/QRail is required to power the modules. See Ordering Information.*

1. Install the module on a piece of DIN rail and the I/Q Rail mounting combination. See the I/Q Rail data sheet for details.

2. Connect the input to a calibrated frequency source and the output to a voltage or current meter. Apply power and allow the system to reach thermal equilibrium (approx 20 minutes).

3. Adjust the input frequency to the desired maximum and observe that the output has increased and is sensing the input. If the output fails to increase, turn the sensitivity potentiometer in a counterclockwise direction until the output begins to change proportionally to the input.

*Note: The level LED may not appear to be on if the new range is less than 10% of the previously calibrated range.*

4. With the green LED on press the CAL button for 5 seconds to enter the calibration mode. The yellow and green LEDs will now be on.

5. Input the maximum desired frequency and press the CAL button to store. The yellow LED will now be the only LED on.

6. Input the minimum desired frequency and press the CAL button to store. The green and red LEDs will now be on.

*Note: The most reliable way to input 0Hz is to short circuit the input pins (C5 & C6).*

7. To precisely adjust the maximum output, adjust the input frequency until the output reads within  $\pm 0.1\%$  of the maximum selected output range. This typically occurs near 90% of the HI input frequency. Press the CAL button to store the value. The red LED will now be on.

8. To precisely adjust the minimum output, lower the input frequency until the output reads within  $\pm 0.1\%$  of the minimum selected output. This typically occurs near 10% of the HI input frequency. Press the CAL button to store the value. The yellow and Red LEDs will be on. The green LED should be dim.

9. Press the CAL button once again to exit the calibration mode. The green LED will now be on.

10. Check the minimum and maximum input-to-output calibration. Repeat steps 1 to 8 if calibration is not within desired specifications.

*Note 1: To reset the unit while in the calibration mode, push the CAL button and hold for 5 seconds.*

*Note 2: Removing power to the unit at anytime before Step 8 will restore previous settings and calibration.*

## Optimal Sensitivity

If the amplitudes of the input frequency are within the sensitivity parameters (i.e. 150mVp - 1Vp for LO and 0.5Vp - 10Vp for HI), then the sensitivity parameters can be set for optimum noise rejection.

1. Set the input near midrange (50% input) or to a frequency that exhibits the minimum pulse amplitude.

2. Turn the sensitivity pot (SENS) clockwise (CW) until the output drops to minimum.

3. Turn the sensitivity pot counter-clockwise (CCW) a turn or two until the output returns to the previous level.

4. Run the input through the entire frequency range to make sure that the pulses are sensed at both the low and high input frequencies. If the output drops out during this test, turn the sensitivity pot counterclockwise another turn or two until the output picks up. Repeat to validate sensitivity settings.

Table 1: Output Range Settings

Ranges	Selector SW2							
	1	2	3	4	5	6	7	8
0 to 5V	■	■	■	■				
0 to 10V	■		■	■				
0 to 1mA		■	■	■				
4 to 20mA						■	■	■
0 to 20 mA	■	■			■		■	■

Key: ■ = 1 = ON or Closed

Table 2: Input Sensitivity Settings

Sensitivity	SW2	
	9	10
High (0.5 to 10Vp; 150Vrms maximum)		
Low (150mVp to 1Vp; 50Vrms maximum)		■

Key: ■ = 1 = On or Closed

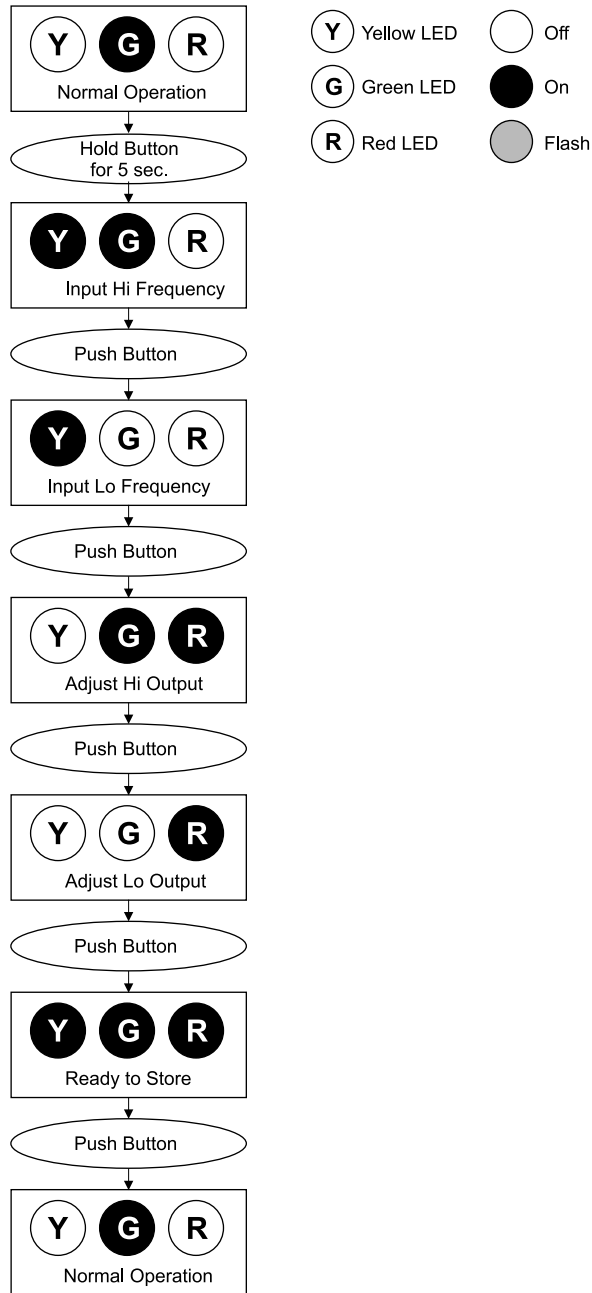


Figure 1: Q478 Calibration Flow Chart

## Specifications

### Input:

- Frequency
  - Full Scale Range: 2 Hz to 10,000Hz.
  - Amplitude Range: 150mVp to 150Vrms
  - Impedance: >10K ohms
  - Overvoltage: 180Vrms, max.
  - Over-range: 20KHz, max.
  - Common Mode (Input to Gnd): 1800V, max.
  - Zero Turn-Up: 99% of full scale range (9998Hz)
  - Span Turn-Down: 99% of full scale range (2Hz)

### Output:

- Voltage:
  - Output: 0-5V, 0-10V
  - Source Impedance: <100 ohms
  - Drive: 10mA, max. (1K ohms, min. @ 10V)
- Current:
  - Output: 0-1mA, 0-20mA, 4-20mA
  - Source Impedance: >100K ohms
  - Compliance:
    - 0-1mA; 7.5V, max. (7.5K ohms, max.)
    - 0-20mA; 12V, max. (600 ohms, max.)
    - 4-20mA; 12V, max. (600 ohms, max.)

### Accuracy (Including Hysteresis & Linearity):

+0.1% of selected range at 25°C

### Stability:

±0.025%/°C maximum of selected range.

### Excitation Voltage:

8VDC, for open collector and contact closure inputs, 5mA short circuit current max.

### Response Time (10 to 90%)

500mSec., or 100 times the period of the full scale frequency.

### Common Mode Rejection:

DC: 100dB  
>60Hz: 80dB

### Isolation:

1800VDC between input, output and power.

## ESD Susceptibility

Capable of meeting IEC 801-2 level 3(8KV)

## LED Indication:

- LVL (green):
  - Lit when power is on
  - Input < 107% then 8Hz flash
  - Input > -7% then 4Hz flash
- IN (yellow):
  - Input range programming status
- OUT (red):
  - Output range programming status

## Humidity (Non-Condensing):

Operating: 15 to 95% @ 45°C  
Soak: 90% for 24 hours @ 65°C

## Temperature Range:

Operating: 0 to 55°C (5 to 131°F)  
Storage: -25 to 70°C (-13 to 158°F)

## Power:

2.5W max., 9 to 30VDC

## Weight:

0.50 lbs

## Wire Terminations:

Screw terminals for 12-22 AWG

## Agency Approvals:

UL recognized per standard UL508 (File No. E99775).  
CE Compliance per EMC directive 89/336/EEC and Low Voltage 73/23/EEC.

Terminal	Connection	Terminal	Connection
A1	DC Output (+)	C3	Not Used
A2	DC Output (-)	C4	Excitation Source (8VDC)
A3	Not Used	C5	Frequency Input (-)
A4	Not Used	C6	Frequency Input (+)
A5	DC Power (+)	P1	Not Used
A6	DC Power (-)	P2	Not Used
C1	Not Used	P3	DC Power (+)
C2	Not Used	P4	DC Power (-)

## Ordering Information

### Models & Accessories

#### Specify:

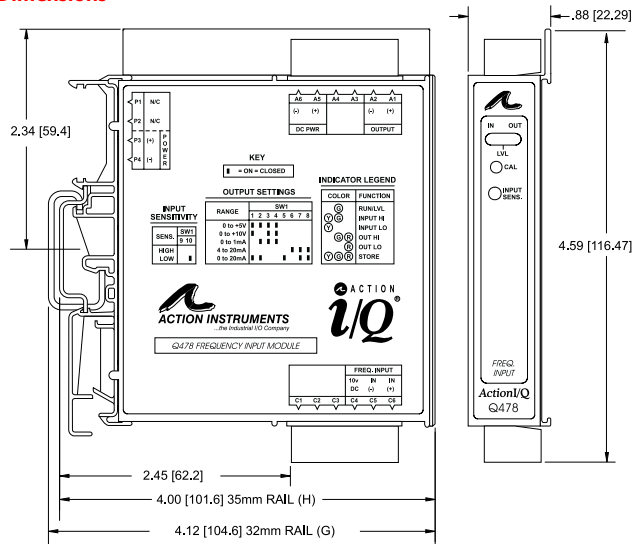
- Model: **Q478-0000**
- Specify optional I/QRail, type and quantity.
- Optional Custom Factory Calibration; specify **C620** with desired input and output range
- Accessories: (see Accessories)

### Accessories

Action/I/Q modules will mount on standard TS32 (model MD02) or TS35 (model MD03) DIN Rail. In addition, the following accessories are available:

- MD02** TS32 DIN rail
- MD03** TS35 x 7.5 DIN rail
- IQRL-D002** 2 Position I/QRail & DIN rail
- IQRL-D004** 4 Position I/QRail & DIN rail
- IQRL-D008** 8 Position I/QRail & DIN rail
- WV905** 24VDC Power Supply (0.5Amp)
- H910** 24VDC Power Supply (1Amp)
- H915** 24VDC Power Supply (2.3Amp)

## Dimensions



## Factory Assistance

For additional information on calibration, operation and installation contact our Technical Services Group:

**703-669-1318**

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