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# Installation and Operating Instructions

Series 401-1000  
Setcon™ Current Relay

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EDO# 8-01-244  
401-1000-LM

# Series 401-1000 Setcon™ Current Relay

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## **Table of Contents**

- 1.0 Introduction
  - 1.1 Models Available
  - 1.2 Specifications
- 2.0 Installation
  - 2.1 Unpacking
  - 2.2 Mounting
  - 2.3 Wiring
- 3.0 Calibration/Operation
  - 3.1 Start-up
  - 3.2 Controls
  - 3.3 Standard Calibration
  - 3.4 Adjustable Differential Calibration
- 4.0 Troubleshooting
  - 4.1 Introduction
  - 4.2 Testing the Relay Circuits
- 5.0 Factory and Field Service Assistance
  - 5.1 Telephone Assistance
  - 5.2 Equipment Return
  - 5.3 Field Service
  - 5.4 Customer Training



## 1.0 Introduction

The instructions in this manual are for the Drexelbrook Series 401-1000 Setcon™. Setcon is a Drexelbrook tradename for a current operated setpoint relay. It is designed for use with any current output transmitters to provide relay operation at a specific point in the transmitter's 0-100% range. See Figure 1-1.

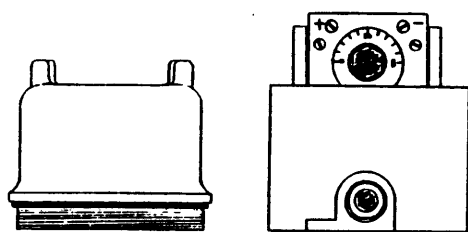


Figure 1-1  
Typical Setcon  
Current Relay

### 1.1 Models Available

401-1000-1	Single pole double throw (SPDT) unit for 4-20 mA input
401-1000-11	Same as above for 1-5 mA input
401-1000-21	Same as above for 10-50 mA input
401-1001-1	Double-pole double-throw (DPDT) unit for 4-20 mA input
401-1001-11	Same as above for 1-5 mA input
401-1001-21	Same as above for 10-50 mA input
401-1003-1	Adjustable differential unit, SPDT, for 4-20 mA input

401-1000-LM/p.3

### 1.2 Specifications

- A. Power requirement: 120  $\pm$ 25 Vac, 50/60 Hz
- B. Ambient temperature: -40°F to 140°F (-40°C to 60°C)
- C. Input: 4-20 mA, 100 $\Omega$  std. 1-5 mA or 10-50 mA optional
- D. Temperature effect:  $\pm$ .1%/10°F
- E. Line voltage effect:  $\pm$ .25%/20V
- F. Setpoint: direct reading 0-100% corresponding to 4-20 mA (1-5 mA or 10-50 mA)
- G. Setpoint accuracy:  $\pm$ 2% of full scale
- H. Contacts: SPDT std., DPDT optional
- I. Contact rating: 5A, 120 Vac (non-inductive)
- J. Differential: 1.5% max. (Adjustable differential unit with 0-100% deadband range, optional)
- K. Fail-Safe: field adjustable to either High-Level Fail-Safe (HLFS) or Low-Level Fail-Safe (LLFS)

Note: There are no instruments that are absolutely "fail-safe". "Fail-safe" means that in the event of most probable failures, the instrument will fail safely. "Most probable failures" mean such things as loss of power or most transistor and component failures. If your application needs absolute fail-safe, a completely independent backup instrument should be installed.

- L. Housing: Std. explosionproof housing meets Nema classifications 1-5 and 12. Suitable for Class I Groups A, B, C, D and Class II Groups E, F, G (Div. 1 and 2).

**2.0 Installation**

**2.1 Unpacking**

Carefully remove the contents of the shipping carton and check each item against the packing slip before destroying any packing materials. If there is any damage or shortage, report it immediately to the factory.

**2.2 Mounting**

The 401-1000 Series instrument was designed for field mounting, either in its own explosionproof housing or in large cases with other instruments. It should be mounted in a location as free as possible from vibration, corrosive atmospheres, and any possibility of mechanical damage. For convenience at start up, mount the instrument in an easily accessible location. Ambient temperatures should be between -40°F and 140°F (-40°C to 60°C). See Figure 2-1.

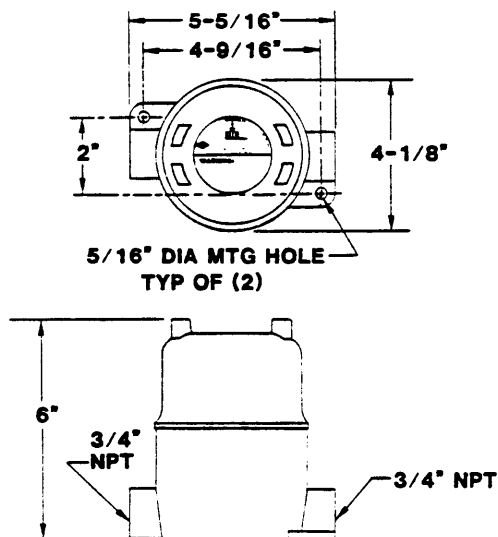


Figure 2-1  
Mounting Dimensions

**2.3 Wiring**

The power and relay connections are made to the terminal strips on the front and top of the Setcon chassis. See Figures 2-2, 2-3 and 2-4. The current loop input connections are made to the (+) and (-) terminals on the back of the chassis. See Figure 2-5.

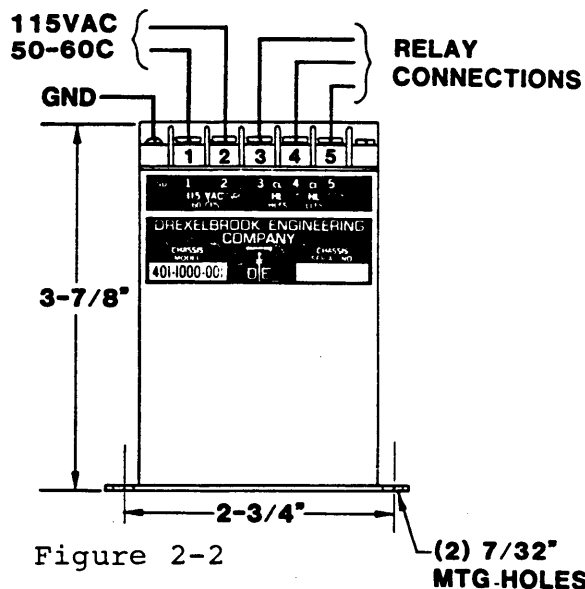


Figure 2-2

Power and Relay Connections to 401-1000 SPDT Series Setcon

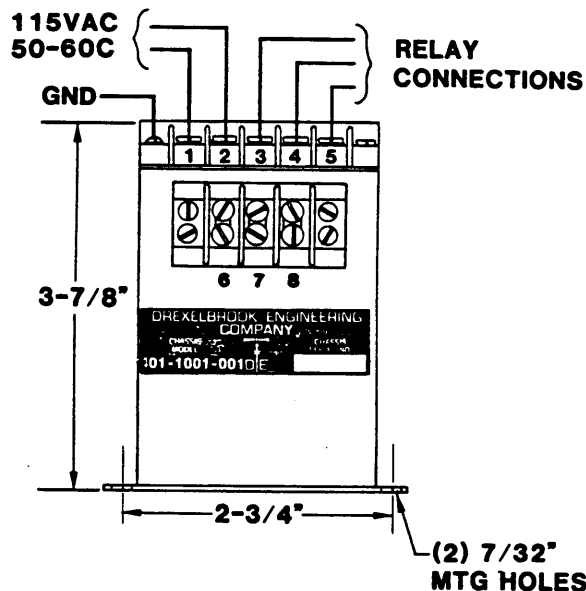


Figure 2-3

Power and Relay Connections to 401-1001 DPDT Series Setcon



# Installation

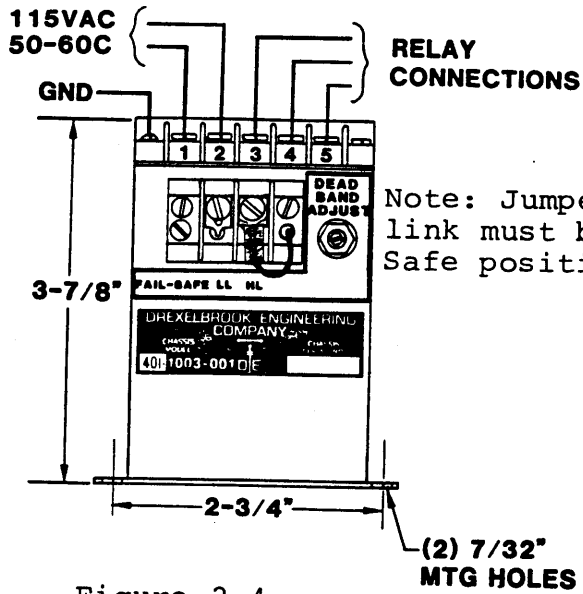


Figure 2-4

Power and Relay Connections  
to 401-1003 Adjustable  
Differential Setcon

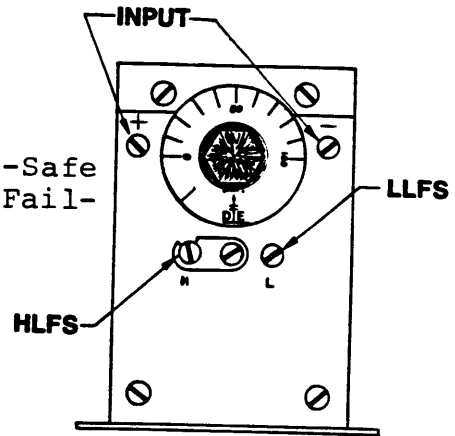


Figure 2-5

Current Loop Input Connections  
to 401-1000, 401-1001, and  
401-1003 Series Setcons

**3.0 Calibration/Operation**

**3.1 Start-Up**

Before applying power to the instrument, be sure that the input power will be 120 ±25 VAC, 50/60 Hz. Check all wiring connections. See Section 2.3.

Caution: Units in hazardous areas.

Before the explosionproof housing cover is removed to calibrate a unit, the area must be checked and known to be non-hazardous.

When calibration is complete, the cover must be replaced. Each conduit from the explosionproof case must be equipped with an approved seal fitting.

**3.2 Controls**

**3.2.1 Setpoint control**

There is a single dial located on the printed circuit side of the instrument that controls the point at which the relay will operate. See Figure 3-1.

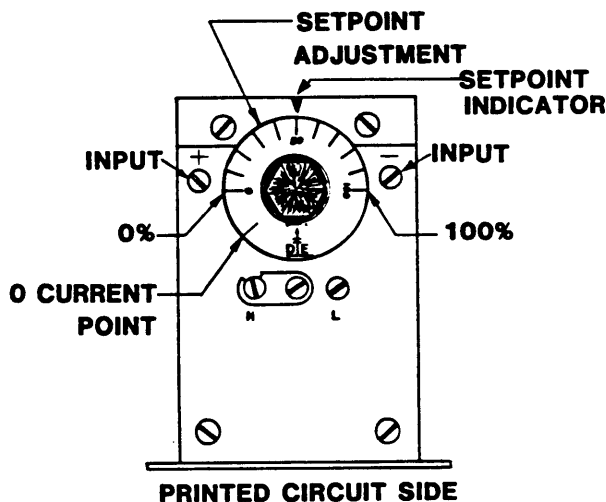


Figure 3-1  
Setpoint Adjustment

**3.2.2 Adjustable Differential Control**

Differential is the dead band or change in current necessary to switch the relay from one state to another. The 401-1003 Series units have an adjustable differential control located to the right of the terminals on the chassis. See Figure 3-2.

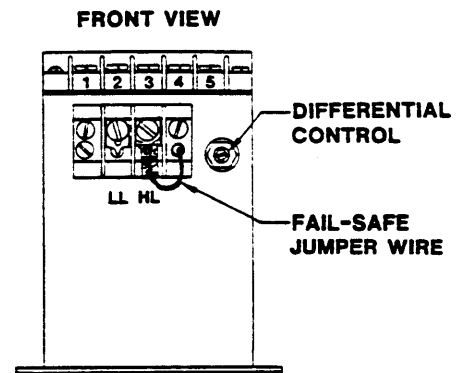


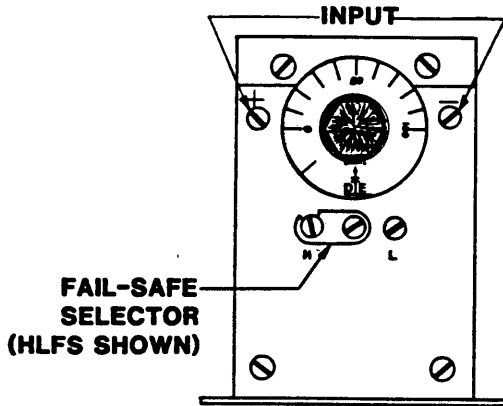
Figure 3-2  
Adjustable Differential Control

**3.2.3 Fail-Safe Selector**

Fail-safe describes the level condition which causes the output relay to de-energize. High level fail-safe (HLFS) means the relay will de-energize with high loop current or loss of power. Low-level fail-safe (LLFS) means the relay will de-energize with low loop current or loss of power. The instrument is supplied in the fail-safe state requested on order (HLFS if not specified).

The fail-safe may also be changed in the field by moving the link shown in Figure 3-3 from one position to the other.

# Calibration/Operation



Relay contact positions for HLFS and LLFS are shown in Figures 3-4 and 3-5.

Note: For 401-1003 Series units, the jumper wired on the front terminal strip must be set in the same fail-safe position as the link on the back of the unit. Do not remove the jumper wire. See Figure 3-2.

Figure 3-3  
Fail-Safe Link

TERMINAL	HIGH-LEVEL FAIL-SAFE		LOW-LEVEL FAIL-SAFE	
	FAILURE & HI-LEVEL	LO-LEVEL	HI-LEVEL	FAILURE & LO-LEVEL
3-4	CLOSED	OPEN	OPEN	CLOSED
4-5	OPEN	CLOSED	CLOSED	OPEN
6-7	CLOSED	OPEN	OPEN	CLOSED
7-8	OPEN	CLOSED	CLOSED	OPEN

Figure 3-4

Relay Switching Chart  
for 401-1001 Setcon

TERMINAL	HIGH-LEVEL FAIL-SAFE		LOW-LEVEL FAIL-SAFE	
	FAILURE & HI-LEVEL	LO-LEVEL	HI-LEVEL	FAILURE & LO-LEVEL
3-4	CLOSED	OPEN	OPEN	CLOSED
4-5	OPEN	CLOSED	CLOSED	OPEN

Figure 3-5

Relay Switching Chart  
for 401-1000 and 401-1003  
Setcon

### **3.3 Standard Calibration**

This procedure is used with 401-1000 and 401-1001 Series units.

A. Turn the setpoint dial to the number that represents the percent of level where relay operation is desired. See Figure 3-1. The setting on the Setcon dial directly corresponds to current from the level transmitter in percent.

B. When the transmitter current reaches the point set on the Setcon dial, the relay will change states.

Calibration is complete.

### **3.4 Adjustable Differential Calibration**

This procedure is used with 401-1003 Series units. For proper calibration, it will be necessary to vary the input current to the Setcon through known values. This may be done with:

- A battery and resistors or a current generator
- A level transmitter
- Raising and lowering the level after system calibration
- Factory presetting from 1-100% of span

Before calibration, be sure both the fail-safe link and the fail-safe jumper are in the same fail-safe position. See Section 3.2.3

#### **3.4.1 HLFS Calibration**

A. Using a small screwdriver, turn the differential adjustment to the full counterclockwise (CCW) position (minimum deadband). See Figure 3-2.

B. Increase the input current to the desired upper control point.

C. With the setpoint dial in the full CCW position, turn the dial slowly CW toward the current setting until the relay just drops out. (Relay will "click" and terminals 3 and 4 will be closed.) See Figure 3-1.

D. Turn the differential adjustment to the full clockwise (CW) position. See Figure 3-2.

E. Lower the input current to the desired lower control point.

F. Slowly turn the differential adjustment counterclockwise (CCW) until the relay just pulls in. See Figure 3-2. (Relay will "click" and terminals 4 and 5 will be closed.)

G. Raise and lower the input current to check the relay operation.

Calibration is complete.

#### **3.4.2 LLFS Calibration**

A. Using a small screwdriver, turn the differential adjustment to the full counterclockwise (CCW) position (minimum deadband). See Figure 3-2.

B. Raise the input current to the desired upper control point.

C. With the setpoint dial in the full CCW position, turn the dial slowly CW toward the current setting until the

## **Calibration/Operation**

relay just pulls in. See Figure 3-1. (Relay will "click" and terminals 4 and 5 will be closed.)

D. Turn the differential adjustment to the full clockwise (CW) position. See Figure 3-2.

E. Lower the input current to the desired lower control point.

F. Slowly turn the differential adjustment counterclockwise (CCW) until the relay just drops out. See Figure 3-2. (Relay will "click" and terminals 3 and 4 will be closed.)

G. Raise and lower the input current to check the relay operation.

Calibration is complete.

TERMINAL	HIGH-LEVEL FAIL-SAFE		LOW-LEVEL FAIL-SAFE	
	FAILURE & HI-LEVEL	LO-LEVEL	HI-LEVEL	FAILURE & LO-LEVEL
3-4	CLOSED	OPEN	OPEN	CLOSED
4-5	OPEN	CLOSED	CLOSED	OPEN
6-7	CLOSED	OPEN	OPEN	CLOSED
7-8	OPEN	CLOSED	CLOSED	OPEN

Figure 4-1  
Relay Switching Chart

## 4.0 Troubleshooting

### 4.1 Introduction

The 401-1000 Series Setcons are designed to give years of unattended service. No periodic or scheduled maintenance is required.

There are no specific spare parts recommended. However, if the application is critical, it is best to have a spare unit available in the event of a component failure. A defective chassis should be returned to the factory for exchange or repair.

### 4.2 Testing the Relay Circuits

A. The relay circuit consists of SPDT or DPDT relay contacts brought out to a terminal strip. When the relays are operating properly, one or two sets of contacts will be open with high or low level, and one or two sets will be closed with high or low level. See Figure 4-1.

B. With the unit disconnected from the loop, but with ac power still connected the relay should pull in and out ("click") as you adjust the setpoint dial about the zero current point. See Figure 4-2.

C. If the background noise is too high to hear the "click", use one of the methods shown in Figure 4-3 to determine if the relay contacts are switching.

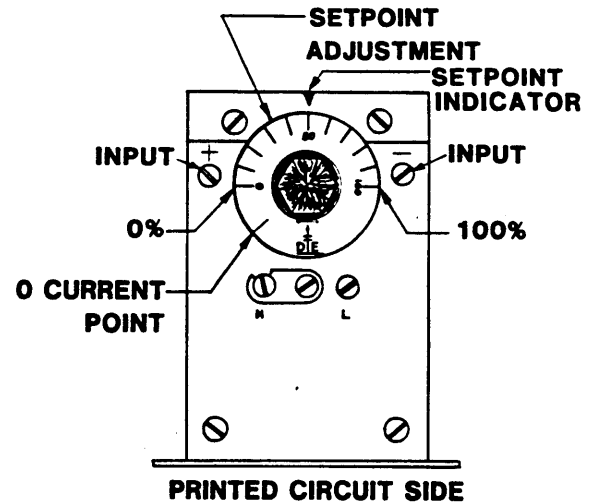


Figure 4-2  
Setpoint Adjustment and "0" Current Point

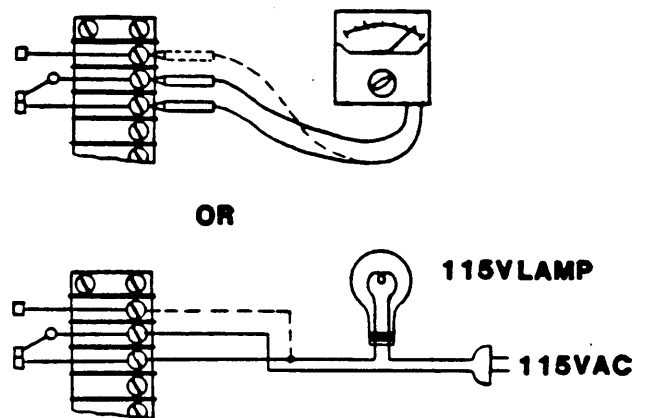


Figure 4-3  
Testing the Relay Circuit

## 5.0 Factory and Field Service

### 5.1 Telephone Assistance

If you are having difficulty with your Drexelbrook equipment, and attempts to solve the problem have failed, notify your local Drexelbrook representative, or call the factory direct and ask for the service department. Drexelbrook Engineering Company is located at 205 Keith Valley Road, Horsham, PA 19044. The telephone number is (215) 674-1234. To help us solve your problem quickly, please have as much of the following information as possible when you call:

Instrument Model # \_\_\_\_\_

P.O. # \_\_\_\_\_  
& Date \_\_\_\_\_

Brief description of the problem \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Checkout procedures that failed \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### 5.2 Equipment Return

Do not return equipment without first contacting the factory for a return authorization number. Any equipment being returned must include the following information in addition to that above.

Reason for return \_\_\_\_\_

Return Authorization # \_\_\_\_\_

Person to contact at your company \_\_\_\_\_

"Ship To" address \_\_\_\_\_  
\_\_\_\_\_

If available, please include the original P.O.# and the original Drexelbrook order # also.

To keep the paperwork in order, you must include a purchase order with returned equipment, even though it may be coming back for warranty repair. You will not be charged if the equipment is covered under warranty. Please return your equipment with freight charges prepaid. We regret that we cannot accept collect shipments.

Drexelbrook usually has a stock of reconditioned exchange units available for faster turnaround of a repair. If you prefer your own unit repaired rather than exchanged, please mark clearly on the return unit "Do Not Exchange".

Standard electronic units are generally in factory stock. If the application is critical, a spare electronic chassis should be kept on hand.

### 5.3 Field Service

Trained field service technicians are available on a time-plus-expense basis to assist in start-ups, diagnosing difficult application problems, or in-plant training of personnel. Contact the service department for further details.

### 5.4 Customer Training

Periodically, Drexelbrook instrument training seminars for customers are held at the factory. These sessions are guided by Drexelbrook engineers and specialists, and provide detailed information on all aspects of level measurement, including theory and practice of instrument operation. For more information about these valuable workshops, write to Drexelbrook Engineering, attn: Communications/Training group, or call direct (215) 674-1234.







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