



DREXELBROOK
Engineering Company

RF Level and Flow Controls

Installation and Operating Instructions

for

401-3800 Series Receiver (Line Monitoring)

LCT™ Two-Wire Level Control Systems

Installation and Operating Instructions
for
401-3800 Series Receiver (Line Monitoring)
LCTtm Two-Wire Level Control Systems

**For factory service,
call toll-free
1-800-527-6297**

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Section 1 - Introduction

1.0 Preface

This manual describes the installation and operation of the 401-3800 Series Receiver used in a Drexelbrook LCT™ point level control system. Section 1 includes a system description. Section 2 outlines the product specifications. Section 3 details the installation and wiring. Section 4 provides operating instruction and Section 5 gives the maintenance and troubleshooting tips. Customer service information is provided in Section 6.

1.1 System Description

The Drexelbrook LCT (Level Control Transmitter) system is a precision RF (radio frequency) two-wire, point level control system, consisting of two parts: a point level transmitter and a separate receiver with power supply and relay contacts. The transmitter provides a change in signal current when the material being measured reaches a preset point in a vessel. The output current is monitored by a receiver that provides relay contact closure for up to 6 control signals. The receiver circuitry also provides a self-checking status monitor for loop-fault alarms. Figure 1-1 depicts a typical system.

The transmitter's output (4-10 mA in the alarm state and 15-22 mA in the normal state) can be used with the Drexelbrook 401-3800 Series Receiver. The Receiver converts switched signals from the LCT Series point level control into 0 or 5 volt signals used by customer-supplied control devices. It accepts up to 6 transmitter inputs.

When used with the optional Magi-Cal™ calibrator, all transmitter signals can be remotely calibrated and verified from the control room or anywhere along the two-wire loop.

1.2 Physical Description

The 401-3800 Series Receiver, as shown in Figure 1-2, is contained in 12 x 14 housing. Up to 6 relay output connections are included on an inserted terminal strip panel within the box, along with a common status alarm. The signal wire connections to the transmitter are contained on a separate terminal strip, also located within the housing.

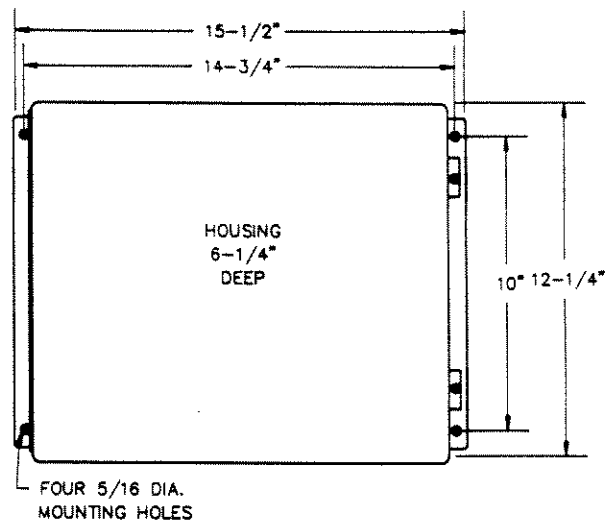


Figure 1-2. 401-3800 Receiver, Physical Dimensions

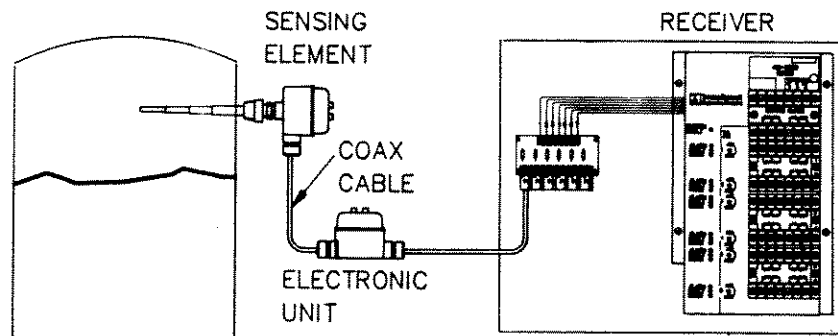


Figure 1-1. LCT System with 401-3800 Receiver

INTRODUCTION

1.3 Functional Description

The 401-3800 Series relay contact receivers provide a DPDT relay output for the LCT system. Every package includes a specified number of level alarms (up to 6) with relay output and a power supply. They also include self-checking circuits for opens, shorts, or equipment faults. LEDs pinpoint the location of a fault. Also included, is a common relay for fault monitoring.

Figure 1-3 is a block diagram of the receiver circuitry.

1.4 Model Numbering

The following receiver models can be used with the 506-6200 Series or the 506-6200 Series Magi-Cal transmitters.

401-3800-X12*: 120/230 Vac, 12" x 14" Nema 12 housing.

401-3804-X12*: 120 Vac only, 12" x 14" Nema 12 housing. Intrinsically safe without separate barriers for C,D,E, F,G.

401-3811-X12*: 120/230 Vac or 24 Vdc, 12" x 14" Nema 12 housing. Intrinsically safe with barriers for C,D,E,F,G.

*X indicates number of channels (1 through 6).

Standard Features:

- LED display module for 6-channel output relay conditions.
- Six-channel time delay module.

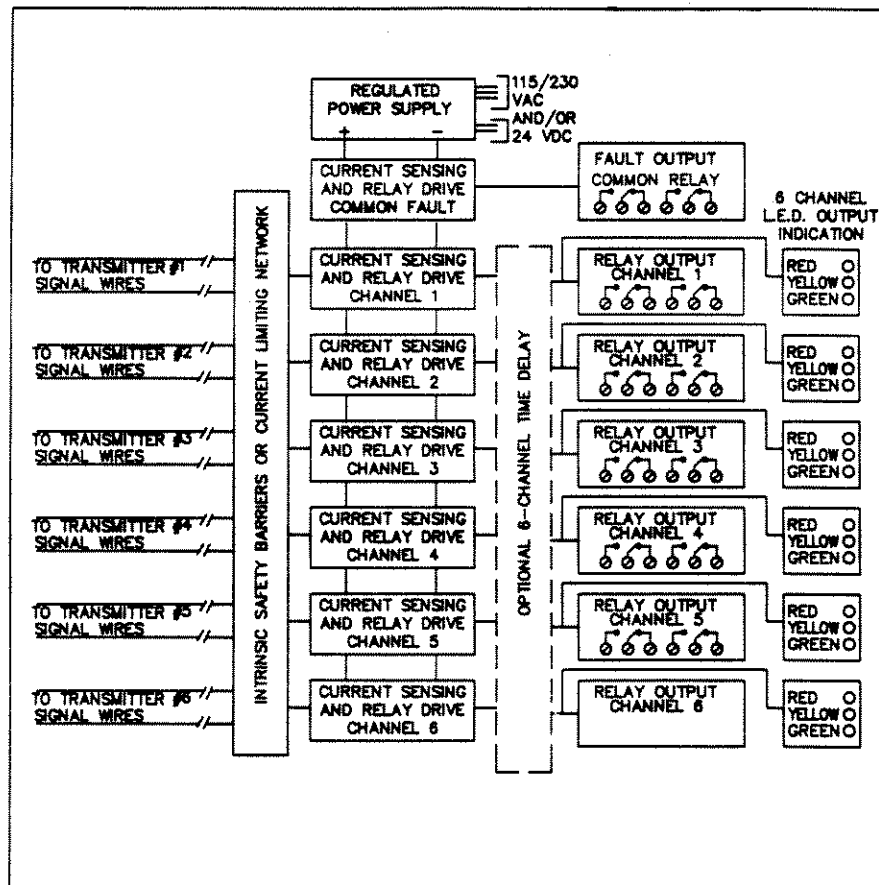


Figure 1-3. 401-3800 Functional Block Diagram

Section 2 - Specifications

2.1 Power Requirements

The 401-3800 requires 115/230 Vac 50/60 Hz and/or 24-50 Vdc, 18 watts maximum (typical).

Two sets of power input terminals may be provided:

- a) dc input (negative ground) - 24 to 50 Vdc @ 1/2 amp. **Note: Not available on 401-3804 Series.**
- b) ac input -95 to 145 Vac or 190 to 290 Vdc, 50/60 Hz.

Backup power can be provided on models designed to accept both an ac and dc power supply.

2.2 Operating Temperature

The recommended operating temperature is -40° to 140°F. Receiver will operate above 140°F, but with reduced component life.

2.3 Level Output

The standard level output is a DPDT relay.

120 Vac: 5A non-inductive,
3A inductive

240 Vac: 5A non-inductive
2A inductive

24 Vdc: 5A non-inductive,
1A inductive
for inductances up to 300 mH

2.4 Internal Power Supply

22 Vdc supplies up to 6 channels.

INSTALLATION

Section 3 - Installation

3.1 Unpacking

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

3.2 Mounting the Receiver

Drexelbrook Receiver packages are designed for mounting in the control room. However, the 12" x 14" package in a weatherproof housing may be field-mounted. It is recommended that the receiver be mounted in a location as free as possible from vibration, corrosive atmospheres, and the possibility of mechanical damage. For start-up convenience, it is best to mount the receiver in an easily-accessible location. Figure 1-

2 gives the mounting dimensions of the 401-3800 Receiver.

3.3 Wiring the Receiver

Customer wiring connections to the 401-3800 Receivers typically include 115/230 Vac or 24-50 Vdc power wiring, signal loop wiring, and relay output wiring.

3.3.1 Power Wiring

Power connections are made to the power input terminal strip, as shown in Figure 3-1. Connections for both the ac and dc power source are provided on models 401-3800 and 401-3811. By connecting both power sources, the receiver will continue to operate with the loss of either power source.

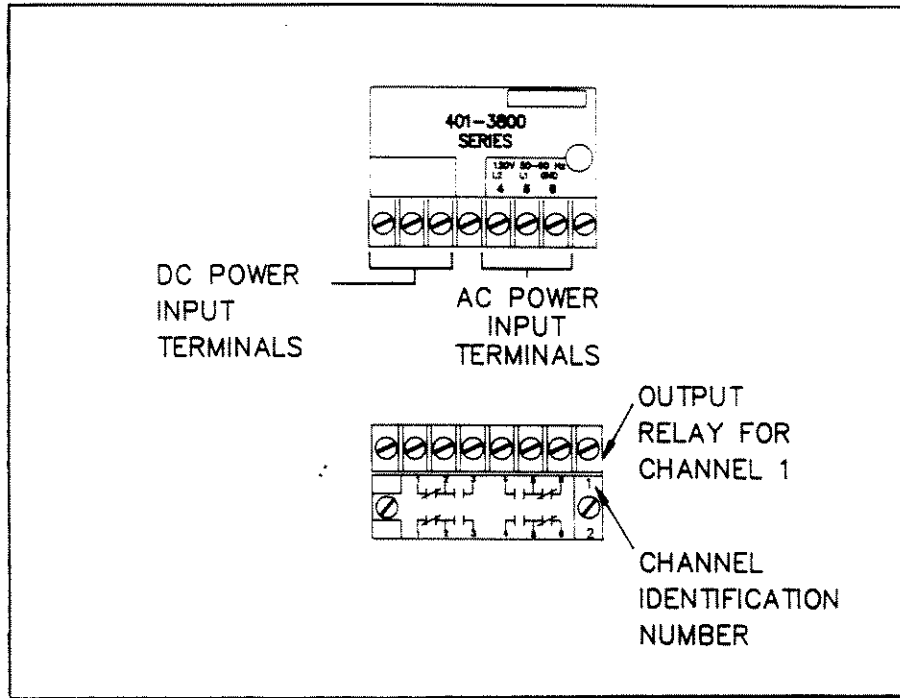


Figure 3-1. Power and Relay Wiring Connections

3.3.2 Signal Loop Wiring

Each of the field transmitter signal loops are connected to a terminal strip at the receiver. The terminal strips are labeled for each loop. Each signal loop number corresponds to the same number on the appropriate relay. Refer to wiring diagram 3-2 for signal wiring and 3-3 for signal wiring with intrinsic safety barriers.

NOTE: For signal wiring and transmitters to be intrinsically safe, intrinsically safe wiring practices must be followed.

For the 401-3811 models that need intrinsic safety barriers, each signal loop must be connected to the field terminal of an intrinsically safe barrier (+) and at the grounded bus bar which mounts the barrier (-). The bus bar itself must be connected to a true earth ground by two conductors, each of which has one ohm or

less resistance, and is wired according to intrinsically safe wiring practices. Access to the terminals is gained by unscrewing the knurled knob on the door of the barrier housing and opening the hinged door. Refer to Figure 3-3.

CAUTION: Before using intrinsic safety barriers, read the manufacturer's instructions for barrier operation. Barriers supplied by Drexelbrook Engineering Co. and prewired to the power supply, have already been tested for proper operation.

3.3.3 Relay Contact Wiring

The relays used in the 401-3800 Receiver have DPDT contact closure. All relay connections are made to the individual terminal strips provided in the unit, as shown in Figure 3-1. For proper contact wiring, the fail-safe level of the relay's respective transmitter should be determined. See Figure 3-4 for appropriate contact closures.

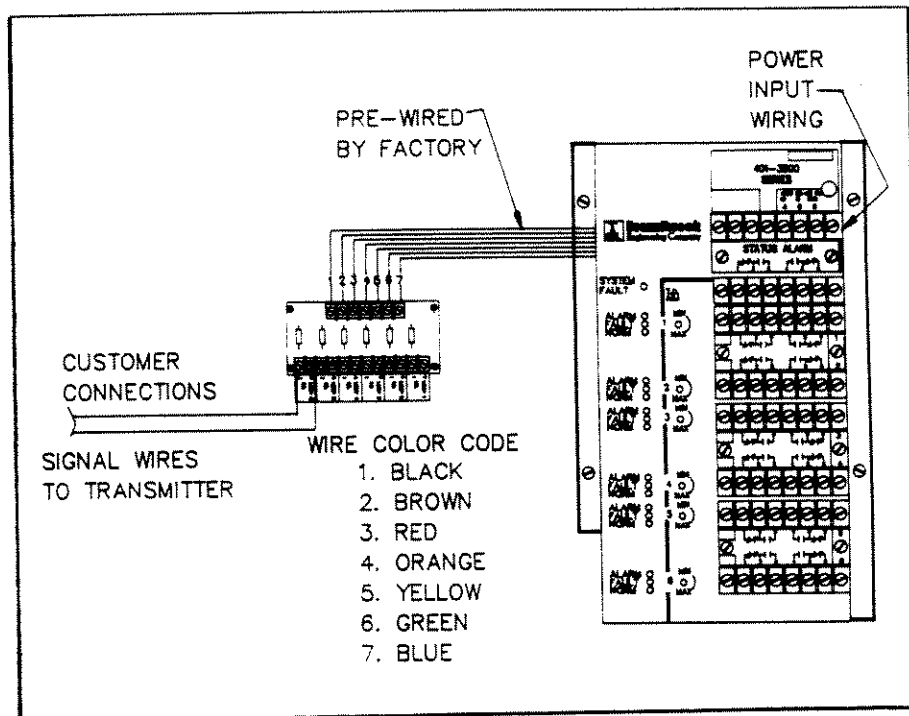


Figure 3-2. Signal Wiring to Unit Without Intrinsic Safety Barriers

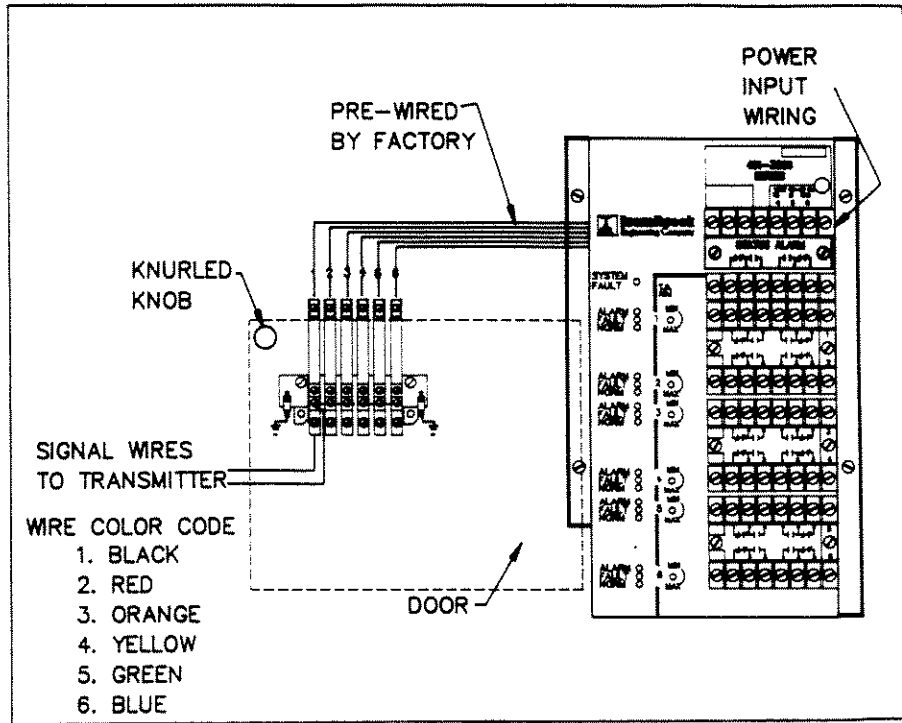


Figure 3-3. Signal Wiring to Unit With Intrinsic Safety Barriers

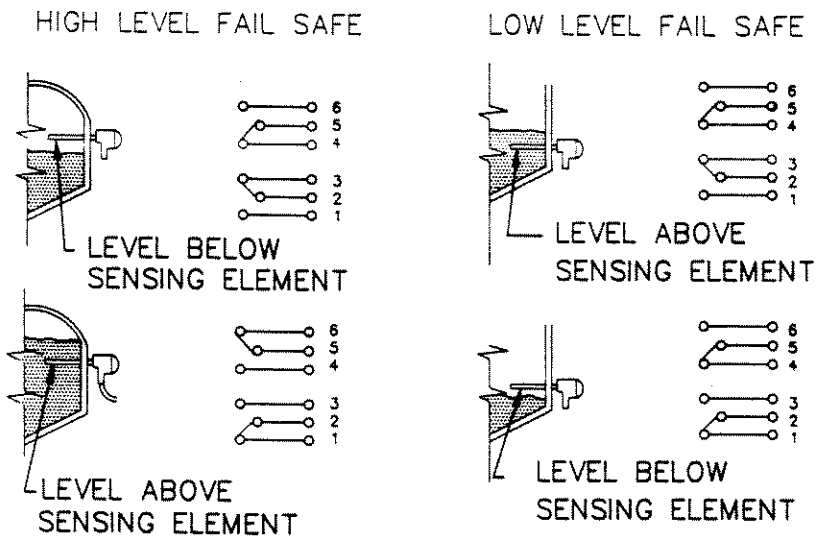


Figure 3-4. Fail-Safe Relay Contact Operation

Section 4 - Operation

4.1 Start-Up

Before applying power to the receiver, check all wiring connections using paragraph 3.3. Figure 4-1 shows the operating features of the 401-3800 Receiver.

4.2 Power Supply

The 401-3800 Receiver contains a regulated 22 Vdc power supply that provides power for up to six signal loops and the processing of that signal information. The power supply's output is controlled regardless of changes in the input voltage.

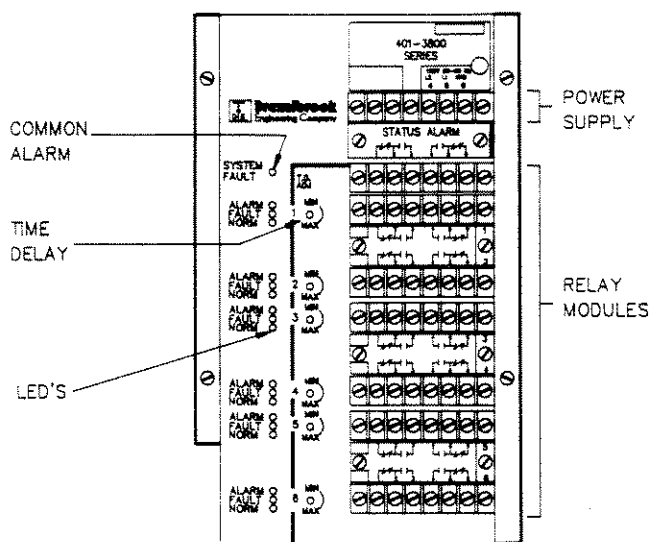


Figure 4-1. Operating Features of 401-3800 Receiver

4.3 Relay Output

The 401-3800 Receiver contains up to 6 relay modules that provide DPDT contact closure output for relays and alarms and 1 relay module for a common fault alarm. The relay modules consist of a printed circuit mounted relay, a terminal strip, and connections for the relay drive signal. Relay modules are field changeable and can be added after purchase to increase number of active channels.

4.4 Line Monitoring Operation

The amount of current flowing in each signal loop is monitored and converted electronically to generate a relay drive and LED output signal. The relay is de-energized when the loop current indicates an alarm condition. The receiver also

de-energizes any relay whose loop current indicates open or shorted signal wires, thus providing line monitoring operation.

4.5 LED Display

The LED output display provides a visual indication of the line-monitoring-state of the relays. The standard display has red, yellow, and green LEDs for each of six channels. The green LED is lit when the relay is in the "normal" condition. The red LED is lit when the relay is in the "alarm" condition. The red and yellow LEDs are lit simultaneously when a "fault" condition exists, i.e., open or shorted signal wires. If there are fewer than 6 channels connected to relays, all of the unused channels' red LEDs are lit.

Table 4-1 summarizes the LED states and the respective operating condition.

Activated LED State	Operating Condition
Green	Normal
Red	Level Alarm or unused channel
Red and Yellow	Fault

Table 4-1. LED Display States

4.6 Time Delay Module

The time delay module provides an adjustable time delay (1 to 60 ± 10 seconds) for all of the 6 available channels. The delay time for each channel is adjusted by using a small screwdriver to turn the corresponding potentiometer. For those channels where time delay is not desired, potentiometers should be set to the full counterclockwise position (minimum delay). Delay time is set by turning the potentiometer to the desired scale mark. If the reason for time delay is wave cycling, set the delay to the minimum value and, when cycling occurs, advance the time delay until the cycling stops.

The delay applies only to recovery from the alarm condition. On a high-level fail-safe unit, the delay is effective only on falling level. The output indicates high level as long as waves continue to touch the sensing element. The unit stops indicating high level only after the delay time has passed, with no further contact between the sensing element and the material being measured.

Section 5 - Maintenance

5.1 Troubleshooting

The LCT Series Receivers are designed to give years of unattended service. No periodic or scheduled maintenance is required.

If a difficulty does occur in the operation of your receiver, use the troubleshooting procedures listed below. If attempts to locate the difficulty fail, notify your local factory representative or call the factory direct at 1-800-527-6297.

5.1.1 Testing the Power Supply

To verify proper operation of the power supply measure any signal loop's voltage at the receiver where the factory and customer signal wire loop connections are terminated on the factory/customer connection card. Refer to Figure 5-1.

- a. Disconnect all positive (+) field signal wires. This ensures that a shorted signal pair does not overload the power supply.
- b. With a voltmeter, measure the dc voltage between any pair of positive and negative terminals on the factory/customer

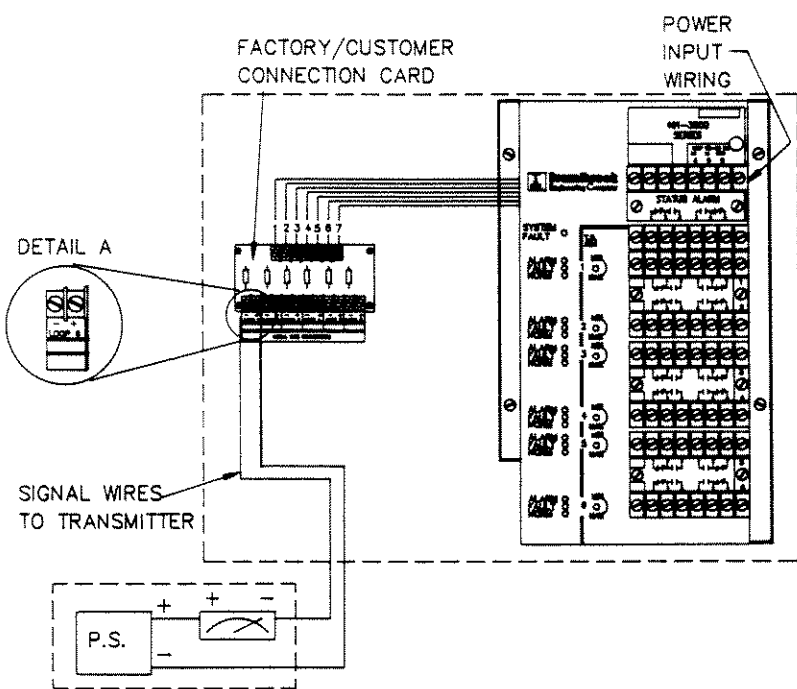


Figure 5-1. Power Supply Check

connection card. Voltage should equal 22 ± 1 Vdc. If the voltage is out of range, please consult the factory Service Department.

- c. With the voltmeter still connected, create a short between any pair of positive and negative terminals at the factory/customer connection card. (Verifies operation under load conditions.) Voltage should remain at 22 ± 1 Vdc. If the voltage changes, please consult the factory Service Department.

5.1.2 Testing the Relay Modules

- a. Disconnect a pair of field signal wires at the customer connection card.
- b. If the receiver includes a time delay module, set all time delays to the minimum setting.
- c. One at a time, hook up resistors listed in Table 5-1 to the signal connections. Observe the relay state and/or LED indication.
- d. Compare the results with those in Table 5-1. In case of discrepancy, please consult the factory Service Department.

Relay Contacts			
Resistor	Closed		LED Lit
10,000Ω	1&2	5&6	Red & Yellow
3300Ω	1&2	5&6	Red
1800Ω	1&2	5&6	Red & Yellow
1200Ω	2&3	4&5	Green
330Ω	1&2	5&6	Red & Yellow

Table 5-1. Relay Contact Operation Check

Section 6 - Factory & Field Service Assistance

6.1 Telephone Assistance

If you are experiencing difficulty with Drexelbrook equipment, and attempts to solve the problem have failed, notify the local Drexelbrook representative, or call the factory service department direct using the toll-free number (1-800-527-6297). Drexelbrook Engineering Company is located at 205 Keith Valley Road, Horsham, PA 19044. To help solve your problem quickly, please have the following information available:

Instrument Model # _____

 Probe Model # _____

 P.O. # _____
 & Date _____
 Cable Length _____
 Application _____

 Material Being Measured _____

 Temperature _____
 Pressure _____
 Agitation _____
 Brief Description of the Problem _____

 Checkout Procedures that Failed _____

6.2 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, include a purchase order with returned equipment, even though it may be coming back for warranty repair. There will be no repair charge if the equipment is covered under warranty. Please return your equipment with freight charges prepaid. Collect shipments cannot be accepted.

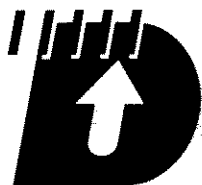
Standard electronic units are generally in factory stock. If the application is critical, a spare electronic chassis should be kept on hand.

6.3 Field Service

Trained field servicemen 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.

6.4 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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