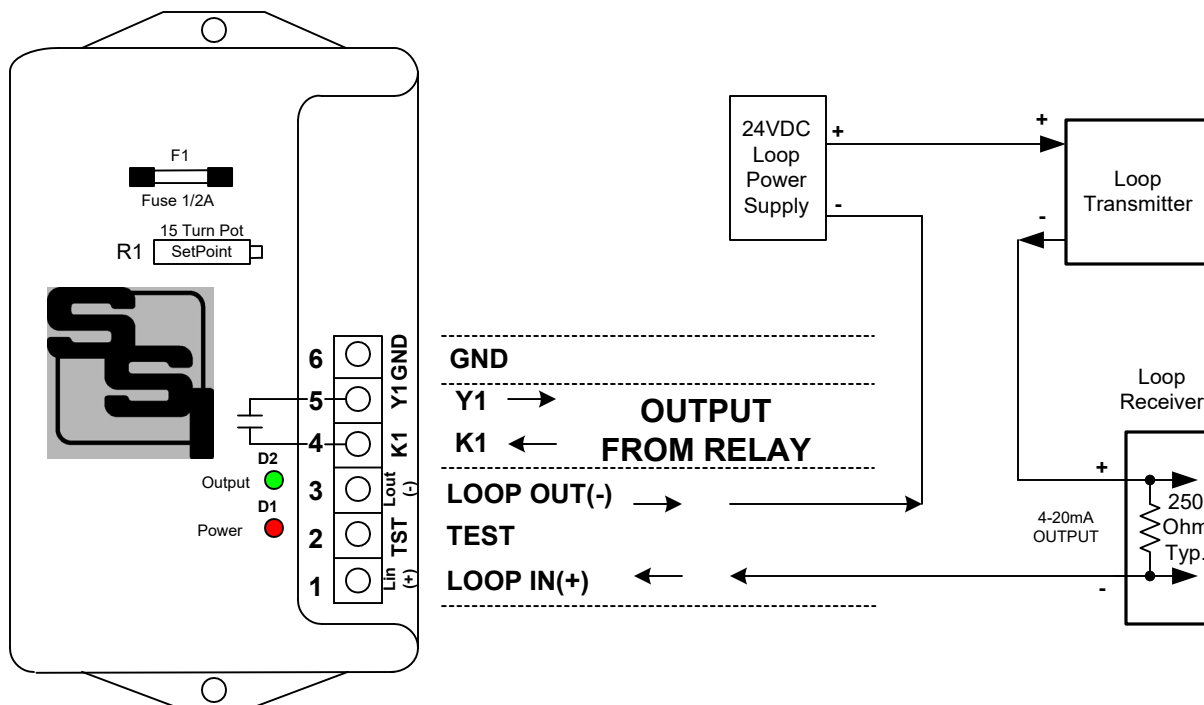


# INSTALLATION INSTRUCTION SHEET

## CLS-1 Current Loop Switch Relay



**PURPOSE** - The CLS-1 is 4-20mA current loop receiver with an electrically isolated switch contact output that is normally open when the loop current is below the setpoint and closed when above the setpoint.

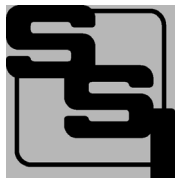
**MOUNTING POSITION** - The CLS-1 can be mounted in any position. Two mounting holes are provided in tabs outside the bottom of the enclosure.

**POWER SOURCE** - The CLS-1 is self-powered from the 4-20mA current loop. No external power is necessary to power the unit. The unit has a voltage drop that varies with the loop current, but less than 8V@20mA.

**INPUT CONNECTIONS** - The loop current should come into terminal #1 labeled Lin+. It should ultimately be connected to the positive terminal of the loop transmitter or of the loop power supply. The loop current should flow out of the terminal #3, labeled Lout-. This should be connected to the negative terminal of the loop transmitter or the loop power supply as shown in the diagram above.

**OUTPUT** - The normally-open switched contact is between terminals K1(#4) and Y1(#5). The contact is rated for up to 0.5A ac or dc (at 25C room temperature), and up to 120VAC. Derate the current to 0.3A for 70C ambient. This is suitable for a load up to 36W at 120VAC. The contact is also suitable for lower voltage such as 24VAC or VDC relay coil, or even for 5V logic level use.

**SETPOINT** - The CLS-1's setpoint is set using a 15-turn pot (designated as R1 on the board). Turning the pot clockwise increases the setpoint. When the loop current is below the setpoint the green LED is on and the output contact is open. When its above the setpoint the RED LED is on and the contact is closed. There is about 2% hysteresis. When the current increases to the setpoint level, the contact closes. The current must decrease about 2% lower than the setpoint level to open the contact. This is to prevent chattering if the current level is not perfectly stable.



## SOLID STATE INSTRUMENTS

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# CLS-1 INSTALLATION INSTRUCTIONS (con't)

## **SETPOINT (Con't)**

To adjust the setpoint, the current loop transmitter needs to output a steady current at the level desired to be the threshold. The loop current can be measured by connecting a millivolt meter between the Lout- (#3) terminal and the TST (#2) terminal. A 10 ohm 1% resistor is in series with the loop current, so the millivolt meter will read 40mV at 4mA loop current, or 200mV at 20mA loop current. This allows you to see the loop current level at all times.

With the loop current at the desired threshold level, if the LED starts out green the setpoint is presently above the threshold so the pot needs to be turned counterclockwise to decrease the setpoint until the red LED just comes on. If the LED starts out red the setpoint is presently below the threshold so the pot needs to be turned clockwise to increase the setpoint until the green LED comes on. Because of the 2% hysteresis the threshold for increasing current would be higher, so it would be best to then rotate the pot back counterclockwise until the red LED just comes on.

**OPERATION** - The voltage drop across the CLS-1 will vary with the loop current, and will be slightly lower when the contact is closed than it would be when open. If the loop transmitter is a less than ideal current source, this can make the measured loop current change slightly when the contact opens or closes. This change is in the direction such that the current would increase a bit when the contact closes, which has the effect of additional hysteresis which prevents oscillation and contact chattering.

At 20mA loop current the voltage across the CLS-1 could be as high as 8V. This must be taken into account to determine the loop current power supply voltage required because it must be above the sum of the transmitter drop, the CLS-1 drop, any additional receiver drop, and the wire resistance drop.

The GND terminal on the CLS-1 is not connected to any of the current loop circuitry in the CLS-1; that is totally isolated to avoid any ground loops. The GND connection is only to provide static discharge of the contacts through 10 Megohms to preserve isolation integrity.



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