

HCS-4 HIGH CURRENT SENSOR USER MANUAL

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CUSTOM ENGINEERING



HCS-4 HIGH CURRENT SENSOR USER MANUAL

Designed to detect excessive current draws by track switching machines, the HCS-4 can be used to provide an early warning indication of motor, lubricant, wiring or gearbox problems.

Description

This document is intended to provide a detailed description of the use and operation of the MICRO-AIDE HCS-4 High Current Sensor.

The HCS-4 is designed to provide its user with a simple and reliable method of sensing excessive current flow. It can be of great use in detecting unusual current levels in motor and lamp circuits that are commonly found in track switching and rail signal applications.

As many as four current carrying conductors can be monitored by an HCS-4. The user may adjust each of the four sensors to any limit value in the range of 1 to 20 A. Both AC and DC currents can be monitored. Twenty-turn potentiometers allow the user to set very precise limit values.

If the current being sensed increases above the desired limit value an internal relay will operate. Both normally open and normally closed contacts are available at the front panel of the unit. The dry contacts may be used to signal a fault condition to an alarm reporting device or data logger such as a MICRO-AIDE CWR-22xt Event Recorder. Each of the four relays can be set to either latch or not latch if the current becomes excessive. Additionally, four LEDs are used to indicate a prior excessive current condition. A toggle switch allows the user to reset the LEDs and relays (assuming that the relays are set for latching mode).

Each sensor incorporates a filter that allows the HCS-4 to ignore high current transient signals. Current spikes of greater than 100 A are easily rejected. The filter is comprised of a single stage R-C network with a time constant of 2.66 seconds. Careful research has demonstrated that this time

constant works effectively when used to monitor track switching equipment such as motors.

The HCS-4 may be powered by any DC source with a voltage in the range from 8 to 40 Vdc. It utilizes a state-of-the-art Hall Effect device to sense current flow. Use of the HCS-4 does not require any modifications to the user's circuits. Its installation and operation is completely non-intrusive.

Figure 1 provides a three-sided view of the HCS-4. Figure 2 illustrates the inside of the unit. The last page of this document lists detailed specifications.

Installation

The HCS-4 may be mounted on a shelf or back board. It may be oriented in either a horizontal or vertical plane. Six mounting holes at the base of the unit are used to secure the HCS-4.

Five detachable connectors are used to simplify the installation procedure. Wire gauges in the range of 12 to 22 AWG may be used. Each conductor is secured by tightening the set screw associated with each connector terminal. Power should not be applied to the HCS-4 prior to completing the installation work. The unit's silkscreening provides a clear depiction of the connections to be made.

Four of the connectors are used to make connections to the internal relays. Normally open, normally closed and two common leads are available per sensor. The fifth connector is used to connect power to the HCS-4. Dual positive and negative terminals are provided.

The two terminals of the fifth connector labeled "Test" can be used to test the unit by supplying a current to the two terminals. The same current will

be sensed by each circuit. Its magnitude will be five times the actual current supplied. Five turns of wire, internal to the HCS-4, are wound around the toroid that is used in conjunction with the Hall Effect device. Either positive or negative current can be supplied.

Each current carrying conductor to be monitored must be inserted through one of the holes in the unit. The diameter of the hole is such that a conductor terminated with a typical .5" ring lug will slip through the hole. The HCS-4 is designed to be insensitive to current polarity. Consequently, the conductor may be inserted front-to-back or back-to-front.

Setup and Operation

Operation of the HCS-4 is fully automatic once the limit values and mode of operation have been selected.

To adjust the limit values remove the cover plate. Verify that power has been applied to the unit. The green LED should be illuminated. Locate the green test point and the appropriate red test point. Connect a Digital Volt Meter (DVM) across the two test points. The positive lead of the DVM should be connected to the red test point. Press the reset button to clear any red LEDs. Adjust the appropriate potentiometer until it reads in volts 1/10th of the desired current limit value in Amps. As an example, if 9.5 A is desired a reading of .95 V is required. Adjust the remaining sensors in a similar fashion.

Note - The factory default settings for the HCS-4 are 10.0 A, DC and no latching operation.

To select the desired mode of operation set the pair of jumpers associated with each sensor to the correct position. Figure 2 illustrates the various settings. If latching mode is selected the normally closed contacts will remain open and the normally open contacts will remain closed until the user presses the reset switch. Non-latching mode allows the relay to operate only for the time period that the current is excessive. In either mode the LEDs will remain illuminated until a reset is performed. This allows the user to always identify the offending circuit even if non-latching mode is selected.

Reinstall the cover plate after all of the settings have been completed. The HCS-4 is ready for use.

Reminder - The adjustable DVM voltage reading should always be 1/10th of the desired current limit value in Amps.

Maintenance and Trouble-shooting

The HCS-4 is designed to be completely maintenance free. It contains no consumable materials or serviceable components. It is equipped with an internal 1 A fuse for protection. If the fuse should blow or the unit fails to power-up for some other reason (as indicated by the green LED not being illuminated) the unit should be returned to MICRO-AIDE for repair.

As an aid to the user the HCS-4 can be easily tested. To test an HCS-4 supply a current to the terminals labeled "Test". The current should be slightly greater than 1/5th of the highest limit value. Refer to the Installation section for additional details concerning testing of the HCS-4. When testing an HCS-4 the normal current conductors should be carrying no current. Otherwise the sensor will react to the algebraic sum of both currents.

All rail signal products manufactured by MICRO-AIDE are protected by a five-year warranty. Telephone numbers and a shipping address are listed below.

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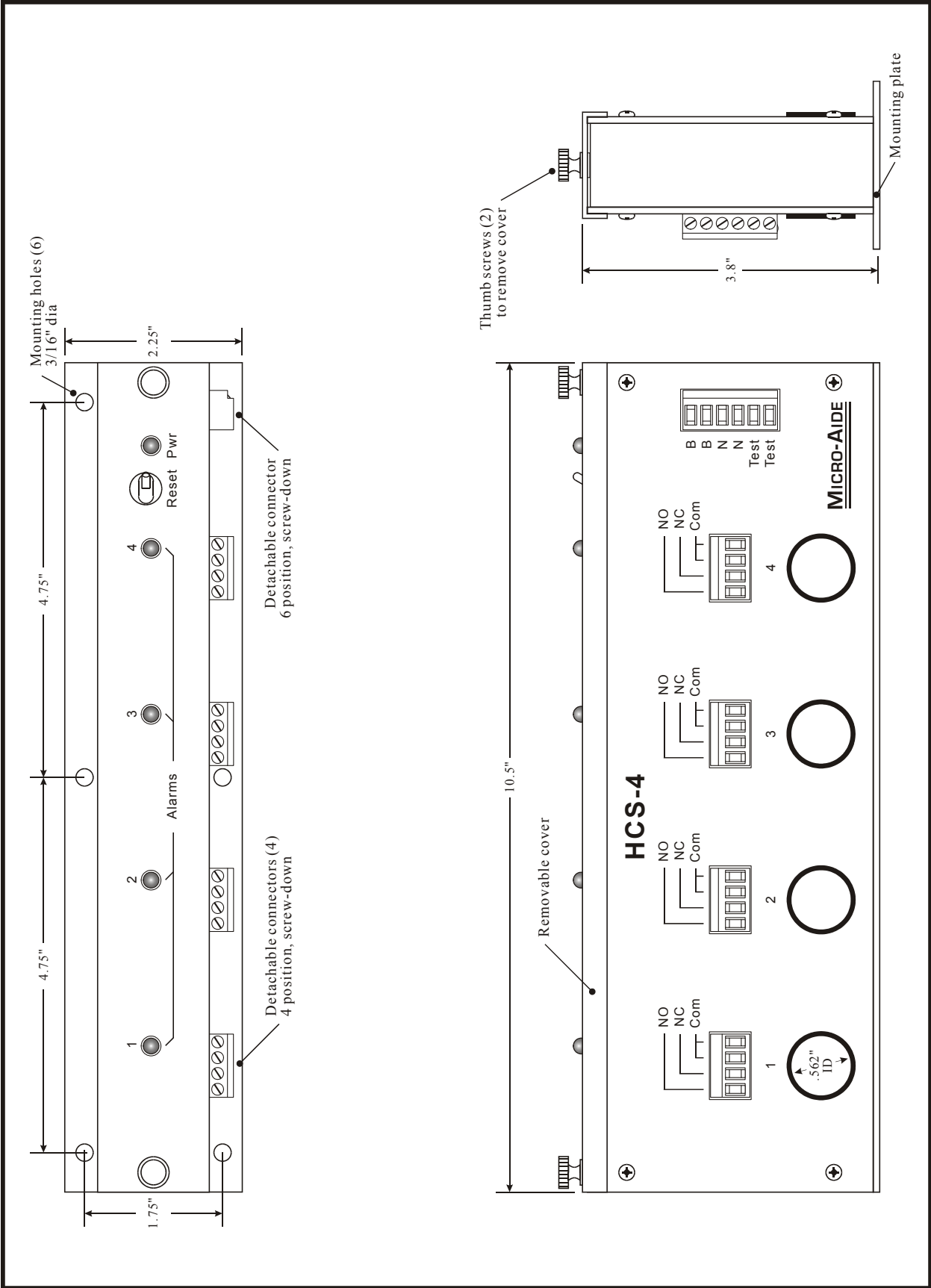


Figure 1 – Three-sided view

Inside View with Cover Removed

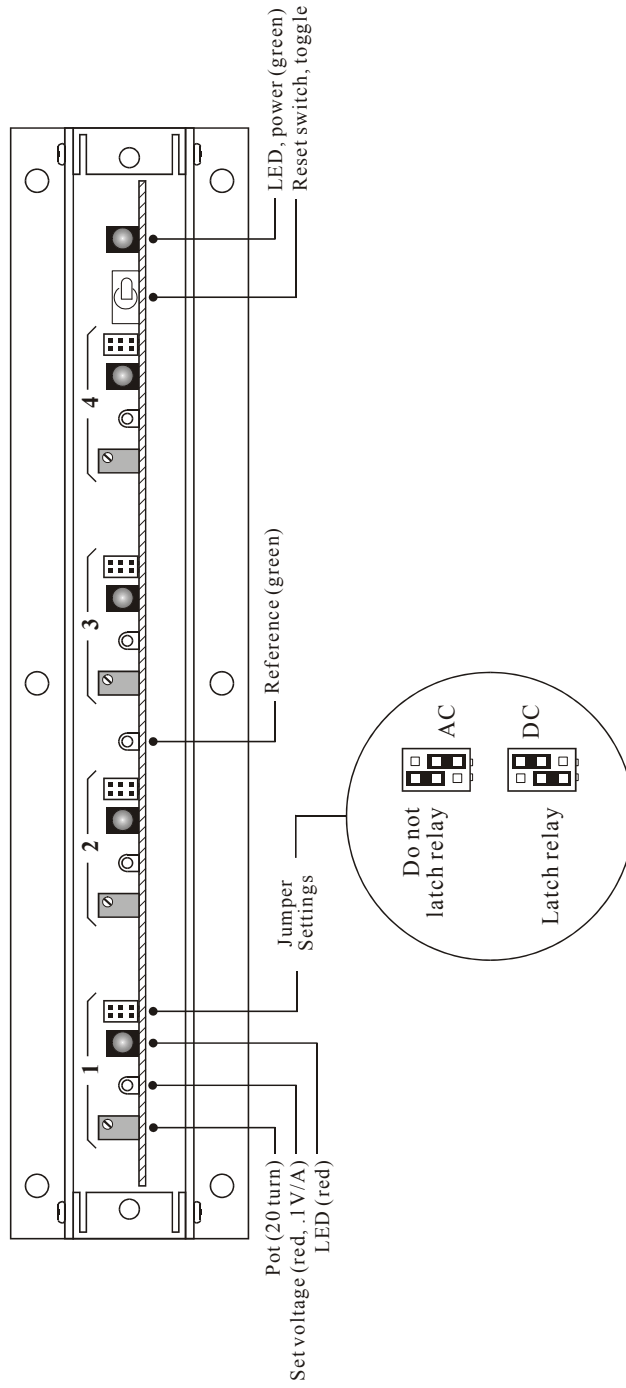


Figure 2 - Inside view

HCS-4

HIGH CURRENT SENSOR

SPECIFICATIONS

Physical

Size

Length: 10.5"

Width: 2.25"

Height: 4.1"

Weight

24 oz.

Environmental

Storage

Temperature: -50°C to +85°C

Humidity: 0% to 95%, non-condensing

Operating

Temperature: -40°C to +72°C

Humidity: 0% to 95%, non-condensing

Mounting

Shelf or desktop

Construction

Chassis

Fully enclosed, anodized aluminum, thumbscrews allow access inside

Externally accessible connectors and LEDs

Electrical

Single printed circuit board inside chassis

Power

Voltage

Input: 8 to 40 Vdc

Consumption

Typical: 50 mA (at 12 Vdc)

Fully Active: less than 150 mA (at 12 Vdc)

Protection

Isolation

Minimum 4000 Vdc to ground, infinite duration, to any terminal input

Input Impedance

Infinite to current conductor (fully isolated)

Internal Relays (4)

Operation

Operates when current exceeds limit value

Type

Non-latching mechanical, with dual form C contacts, wired in parallel

Contacts

Rated Load: 2 A at 24 Vdc, 1 A at 125 Vac

Minimum Load: 2 mA at 5 Vdc

Maximum Operating Voltage: 60 Vdc, 125 Vac

Maximum Switching Capacity: 125 VA, 60 W

Service Life: 5 million mechanical (minimum), 1 million electrical (typical)

Transient Filtering

Each sensor includes hysteresis and a 2.66 second filter that will ignore momentary current fluctuations

LED Indicators

High Current (4)

Red: indicates current has exceeded limit value

Power

Green: indicates that power has been applied to unit

Controls

Internal (4)

Potentiometer: 20-turn, used to adjust current limit value

Test Points: female, used to connect DVM when setting current limit value

Jumpers Settings: dual, for selecting latching mode and AC or DC current

External

Toggle switch to reset LEDs and relays

Connectors

Power

Detachable, screw-down with 6 terminals, 12 to 22 AWG

Terminals 1 & 2: B, battery positive

Terminals 3 & 4: N, battery negative

Terminals 5 & 6: test inputs

Input / Output (4)

Detachable, screw-down with 4 terminals, 12 to 22 AWG

Terminal 1: normally open relay contact

Terminal 2: normally closed relay contact

Terminals 3 & 4: relay common

Range

Current limit value may be adjusted between 1.0 and 20.0 Adc or Aac

Accuracy

The greater of $\pm 2.0\%$ or .15 A as compared to 10 times limit value