# HACS
## LIGHT OUT DETECTOR
## USER MANUAL

MICRO-AIDE

### HIGHWAY PRODUCTS

LOW POWER MODEMS

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**LIGHT OUT DETECTORS**

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# HACS
## LIGHT OUT DETECTOR
## USER MANUAL

*Failed power supplies, wiring faults and relay problems often cause failures in LCS head assemblies. The HACS can be used to passively monitor actual current flow to an indication.*

## Description

This document is intended to provide a detailed description of the use and operation of the MICRO-AIDE HACS Light Out Detector.

The design of the HACS is very similar to that of MICRO-AIDE's other light out detector device, the LOD-1. Unlike the LOD-1, the HACS is fully compatible with LED-based head assemblies. It will provide its user with an accurate and stable method of sensing current flow to the head assembly's power supply. The HACS will automatically identify an indication failure. Each HACS is equipped with current sensing circuitry to monitor a single LCS indication. An open collector output transistor and LED are used to indicate a failure. The operating range of the HACS extends from .02 to .15Aac. It cannot be used to sense direct current.

The size and physical configuration of the HACS allows it to be secured to an existing wiring panel inside a roadside cabinet. The HACS can be powered by a nominal 24Vdc (±4Vdc) source. The limit value for a failure can be set precisely by adjusting a twenty-turn potentiometer. As a convenience to the user the limit value is pre-set at the factory prior to shipment. If the monitored current drops below the limit value the output transistor will turn off and +24Vdc will be presented at the output pin. Additionally, an LED will indicate the drop in current by turning off. The HACS is designed for fail safe operation. A loss of power to the HACS is indistinguishable from a failure caused by insufficient current to the head assembly.

Figure 1 provides a two-sided view of the HACS and an explanation of its various controls and indicators. The last page of this document lists detailed specifications.

## Installation

The HACS is designed to be mounted in place of existing LCS sensor modules (e.g., LOD-1). Its use does not require any modifications to existing wiring or cable plans, including the LCS head assembly. Its installation and operation is completely non-intrusive. It may be oriented in either a horizontal or vertical plane. It is not susceptible to stray magnetic fields.

The HACS must be installed between the output of the Relay Load Switch (RLS) and the power input side of the LCS head assembly. It is pre-adjusted for use with a Southern Manufacturing LCS head. The HACS transistor output is typically connected to an input of a MICRO-AIDE LCU.

The HACS is equipped with five male pins. Refer to Figure 1 for a definition of each pin. These pins must be carefully aligned and inserted into the female sockets located on the interconnect panel PCB. Tighten the mounting screw to secure the module in place.

**Note** - The HACS mounting footprint conforms to the Opto-22 G1 standard.

## Setup and Operation

The operation of the HACS is fully automatic once the limit value is properly adjusted. The limit value and sensor circuitry are designed to be stable over a wide range of temperatures and current levels. All of the HACS features are consistent with a desire for "set and forget" operation.

To adjust the limit value refer to Figure 1. Verify that power has been applied to the device. The green power LED should be illuminated. Locate the green test point and the red test point identified as "TP2-

major failure". Connect a Digital Volt Meter (DVM) across the two test points. The positive lead of the DVM must be connected to the red test point. Adjust the appropriate potentiometer until it reads in DC Volts 10 times the desired limit value in AC Amps. As an example, if .05Aac is desired, a reading of .5Vdc is required.

**Reminder** - The HACS is pre-adjusted with a limit value of .5Vdc which corresponds to .05Aac of current flow. The limit value should only be adjusted if these conditions are not applicable.

**Note** - The design of the HACS is based upon the LOD-1. However, the HACS does not require the use of dual limits values. Only the test point, adjustment and LED identified with a major failure in Figure 1 are used. Accordingly, MICRO-AIDE recommends that the adjustment identified as "low current" be left at its factory established setting of 1.5 to 1.8Vdc.

## Maintenance and Trouble-shooting

The HACS is designed to be completely maintenance free. It contains no consumable materials or serviceable components. If it fails to operate, the device should be returned to MICRO-AIDE for repair or replacement.

The HACS is protected by a five-year limited warranty. Telephone numbers and a shipping address are listed below.

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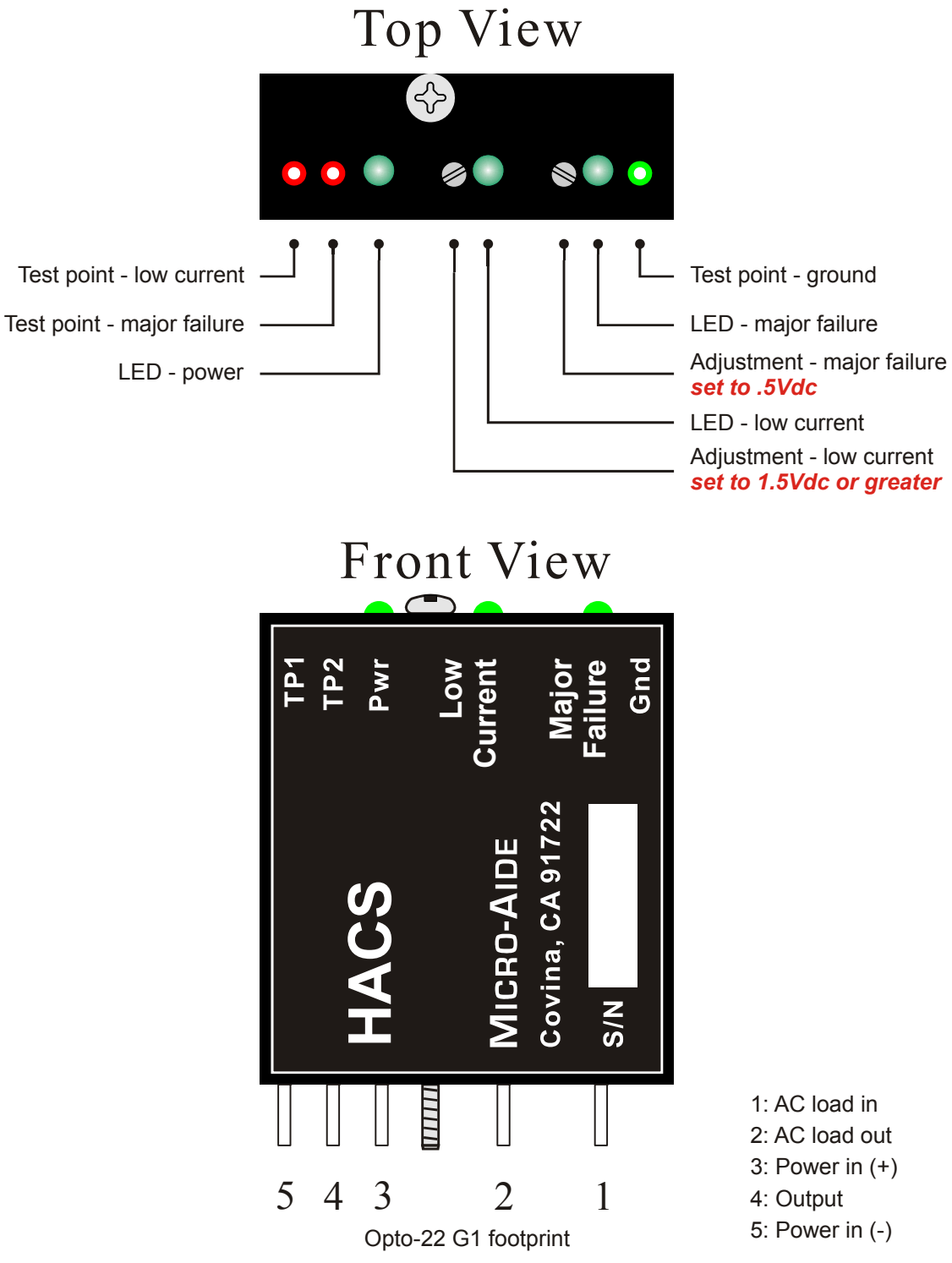


Figure 1 – Top and front views

# HACS
## LIGHT OUT DETECTOR SPECIFICATIONS

## Physical
### Size
**Height**: 2.25"

**Width**: 1.70"

**Thickness**: .6"

### Weight
3 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
4-40 screw into G1 module rack

## Construction
### Housing
Completely sealed, non-conductive plastic case

Externally accessible adjustments and LEDs

### Electrical
Single printed circuit board inside housing

## Power
### Voltage
**Input**: 20 to 28Vdc

### Consumption
Less than 30mA at 24Vdc

## Protection
### Isolation
Minimum 4000Vdc from current leads to output and power leads

### Input Impedance
Infinite to current conductor (fully isolated)

## Output
### Operation
Open collector type, pulls low when current exceeds limit value

Non-latching, restores automatically

### Load
**Maximum Load**: 10mAdc sink

**Maximum Output Voltage**: 36Vdc

## Transient Filtering
Each sensor includes hysteresis and a .53 second filter that will ignore momentary current fluctuations

## LED Indicators
### Current Level (2)
**Green**: indicates current exceeds respective limit value (separate LEDs for major and low current failures)

### Power
**Green**: indicates that power has been applied to the unit

## Controls
### Potentiometer (2)
20-turn, used to adjust current limit value

### Test points (3)
Female, used to connect DVM when setting current limit value

## Connector
Single row, five terminals, male, conforms to Opto-22 G1 std.
**Terminals 1 & 2**: AC Load, in/load
**Terminal 3**: Power Input, positive
**Terminal 4**: Output
**Terminal 5**: Power Input, negative

## Range
Current limit value may be adjusted between .02 and .15Aac rms or .22A peak

## Accuracy
The greater of ±4% or .005Aac as compared to current limit value