EXHIBIT 3

Technical Description

Para. 2.1033(b)(4)

<u>Technical Report 2.1033(b)(4)</u>

Equipment Manufacturer

Nu-Metrics
University Drive
Uniontown, PA 15401

FCC Identifier

MIKNUMETNC97A

Operating Instructions

See Exhibit 5

Trade Name

Nu-Metrics

Model Number

NC97-418

Additional Model Numbers and Trade Names

Not Applicable

Product Brief

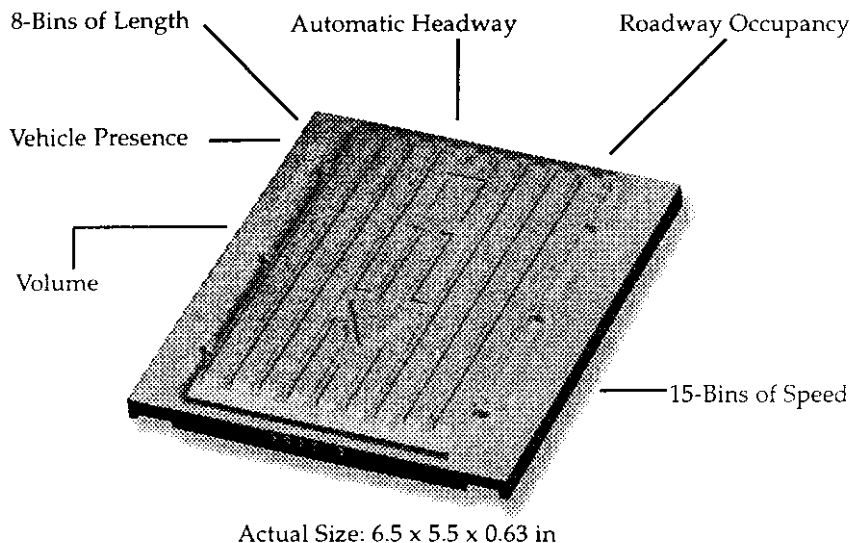## PORTABLE TRAFFIC COUNTER/CLASSIFIER

Features

- Totally self-contained - requires no external sensors such as loops or tubes.

- Vehicle Magnetic Imaging (VMI) sensor technology with Automatic Bi-Directional capability.

- Solid state Giant Magnetoresistive (GMR) sensors for vehicle detection.

- Multiple Derivative Correlation (MDC) for improved speed and classification accuracy.

- Extended memory for over 600 time interval studies.

- Optional short range radio for on-road operation verification.*

- Ni-Cad battery management for maximum battery capacity retention.

- Small Case size, one-half that of NC-90A. Simple and easy to install and retrieve.

  * Frequency available in certain countries. Check with Sales Dept.

8-Bins of Length
Automatic Headway
Roadway Occupancy
Vehicle Presence
Volume
15-Bins of Speed

Actual Size: 6.5 x 5.5 x 0.63 in

Portable counter classifies vehicles to length & speed bins

The new Hi-Star Model NC-97 is the latest generation of Hi-Star portable counters that are being used throughout the world. The NC-97 represents the latest technology in both magnetic sensing and the methodology for computing vehicle speed and classification. This totally self-contained counter is only one-half the size of previous model NC-90A but still contains more computing power.

After four years of sensor research, the NC-97 uses a chip with Giant Magnetoresistive (GMR) technology for detecting vehicles. These signals are then processed by Multiple Derivative Correlation circuits for the ultimate in classification. In addition to traffic volume and occupancy, the NC-97 stores data in Frame Mode files, placing each vehicle's speed and length into a pre-assigned speed and length memory bin. You also have the ability to assign parameters to 15 different speed bins and 8 different length bins. These data are then reported in preset time periods from 1 to 120 minutes. The Sequential Mode of operation is used for in-

depth studies that track vehicle movement in seconds along with the vehicle's speed and length. Subsequent processing of a vehicle's time gives data on Gap, Headway and Spacing. The extended 64 Kbyte memory in the NC-97 can store over 16,000 time-tagged vehicles per study.

The NC-97 represents a number of technical advances for counting and analyzing vehicle traffic. Special linear magnetic sensors are used in a binary format to provide greater accuracy in speed calculations. The internal microprocessor controls the entire process of battery charging which keeps the battery at its maximum capacity. Automatic bi-directional notation is provided for single lane road studies. To help verify a counter's operation after placement on the road, a low power radio transmitter outputs a data signal for each recorded vehicle.

The new NC-97, with its small impact resistant die-cast aluminum case, will perform in extremely high volumes of traffic. It is the world's ideal choice for conducting all types of traffic studies. Before you consider anything else - check out the NC-97; the world's best self-contained traffic counter/classifier.
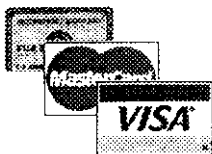
INTRODUCTION

In 1994, Nu-Metrics initiated the wireless Groundhog permanent traffic counter program and a project to upgrade the portable Hi-Star Model NC-90A traffic Counter with new emerging technology. The project evaluated areas of the NC-90A's design and suggested changes in response to customer requests. Initially, the project was hampered by the inability to develop a new and more accurate technique for computing high speed vehicles. As a result of research conducted at the Nu-Metrics Outer Lab, a new linear sensor material was tested and qualified using special flux concentrators. Linear magnetic sensors were necessary for a new procedure in calculating speed and length within a very short footprint. These important research projects opened the door for many new features that are incorporated in the newly designed counters. These improvements are noted in the following feature descriptions.

NEW SENSOR TECHNOLOGY

Beginning in the second quarter of 1997, all permanent Groundhog models and the new portable Hi-Star NC-97 will use Giant Magnetoresistive (GMR) Sensors. These devices, when used with highly permeable flux concentrators, exhibit good sensitivity and are exceptionally linear over a wide range of magnetic fields and temperatures. The result is a linear voltage output proportional to the changing magnetic field created by vehicles.

NEW METHOD OF CALCULATING SPEED AND LENGTH

For calculating a vehicle's speed, the NC-97 will use a new proprietary development referred to as, "Multiple Derivative Correlation (MDC)". This technique, designed by Dr. Harry Sampey, employs hardware to convert the analog magnetic signals to a random number of derivatives representing a digital binary format for each area of magnetic influence from the passing vehicle. Computer acquisition and correlation of the binary input occurs at a time rate of 8 microseconds which is a resolution of better than 1.0 percent. This improves the accuracy of speed and length calculations and results in only a small number of unclassified vehicles. Of course, dynamic accuracy is never as good as system resolution due to thermal noise within the electronic circuits. Nevertheless, early field tests demonstrate a field accuracy from a number of tested

vehicles at better than +/- 3.2 percent at 60 mph (100 kmh). The MDC methodology also improves vehicle magnetic length recordings.

BI-DIRECTIONAL CAPABILITY

The NC-97 can accurately and automatically determine the direction of travel of each vehicle. Since most applications for bi-directional traffic studies are for counts only, the NC-97 will classify vehicles only in the "forward" direction. Vehicles in the "reverse" direction will be counted and data will be stored with a notation. This is a desirable feature for many two lane roads and on city streets with single lane traffic.

EXTENDED MEMORY

Memory has been doubled from 32 Kbytes in the NC-90A to 64 Kbytes in the NC-97. The number of possible data report periods has increased from 300 to 600. Extended memory will mostly benefit units operating in the special Sequential Mode that time tags each recorded vehicle. This will allow for approximately 16,000 vehicle recordings per study, time tagged in memory.

COMPUTER CONTROLLED BATTERY CHARGING

Ni-Cad batteries typically establish a lower capacity (referred to as "memory") over time. This occurs when their capacity is not fully utilized or the battery pack is left on charge for a long period of time. Over-charging is probably the most common problem with instruments using Ni-Cad battery packs. A special circuit in the NC-97 monitors and controls the battery charging and discharging periods. The system's microprocessor maintains a running log on the amount of usage and implements the charging cycle to an appropriate time by constantly monitoring the charge voltage level. In addition, the processor may decide to fully discharge the battery pack prior to a new charge cycle. This procedure will maintain the battery near its full capacity. This will also allow the charger to be connected to the NC-97 for any length of time without damage to the cells. Self-discharge of the the cells (1.0 % per/day for Ni-Cad) is also noted and recharging is managed by the microprocessor.

SMALLER SIZE FOR THE NC-97

The NC-97 will occupy the smaller NC-40 case, which is one half the length of the NC-90A case. The smaller case is less intrusive and less noticeable on the highway, simply because of its smaller size. Reducing the dimensions of the NC-97 is possible from the advantages of using MDC technology for computing classification within a short footprint. Reliability is greatly increased since the NC-97 requires fewer batteries, has less components and it's reduced size diminishes impact and shock. Furthermore, the Protective Cover is also smaller, reducing installation and retrieval time to less than 15 seconds.

## WIRELESS RADIO VERIFICATION (optional)

The NC-97 employs a low power 1.0 milliwatt radio transmitter that, when selected, transmits a 7 byte data string for each passing vehicle. The counter begins to transmit from the time it is placed on the road surface. The string consists of: Header, I.D. (ser. no. of unit), Speed, Length and CRC (check sum). Baud rate is set at 1200. The antenna for the NC-97 is a disposable length of wire, approximately one half wavelength long (6 inch or 153 mm), connected to one of the external pins. See case drawing and specifications on this page. Radio verification transmitters are available as an option in certain countries. The U.S. has four frequencies at 418.0 MHz. Germany authorizes 433.92 MHz which may become a European Community standard. A pocket size receiver employs a small 8-bit processor and a single chip RF receiver circuit. An LED and sound circuit will announce each vehicle. An RS-232 port provides connection to a Laptop computer for the monitoring and recording of each vehicles speed and classification.

SPEED & CLASSIFICATION BINS

There are 15 assigned Speed Bins and 8 assigned Classification (vehicle length) Bins. Both the speed and class bins may be changed by the user to any appropriate value. Speed default bins are in 5 mph (8 kmh) increments from 10 mph (16 kmh) and up. Class bins may be set to any vehicle length value that represents the area traffic flow.

Hi-Star Model NC-97

Actual Size 6.5 x 5.5 x 0.63 in.

Antenna —
RS-232 in —
Ground —
Charge (RS-232 out) —
Wet/Dry (Power on Sig.)
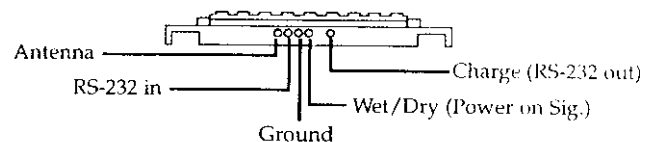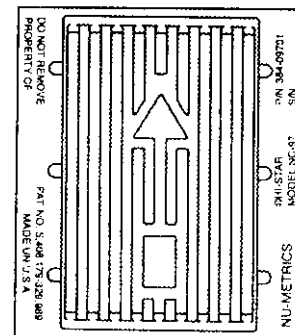
Specifications:
NC-97

Sensor: GMR Magnetic Chip for Vehicle Magnetic Imaging with Presence.
Speed and Class: Multiple Derivative Correlation (MDC)
Microprocessor: MC68HC11E9
Power: Ni-Cad Battery 3.6 Volt @ 850 mah
Battery Charging: Automatic processor managed for Maximum Capacity
Weight: 2.0 lb (56.7g)
Operating Temperature: -30C to +75c
Dimensions: 165 x 140 x 16 mm, (6.5 x 5.5 x 0.63 in)
Wet/Dry & Temp Measurements: -25c to +75c
Housing Material: Die-Cast Aluminum
Count/Class/Speed Rate: 5/Vehicle/sec.
Headway Factor: Automatic 10 to 100 mph (16 to 160 kmh).
Length Classification (% of Volume): 8-bins (user selectable length range).
Speed Class (% of Volume): 15-Bins user selectable speed range.
Occupancy: Percent Occupancy over Report Interval
Bi-Directional: Traffic Count for Both Directions.
Count Period (Interval): Frame Mode: =1 to 120 min.
        Sequential Mode: Time Marked (sec.), Optional (m/sec)
Data Prog / Read Rate: 9600 baud RS-232.
Real-Time-Clock: Yr,Mo,Day,Hr,Min, Sec.
Data Storage Memory: 64 k /byte.
Vehicle Count Accuracy: Free Flow >99.0%,± 1 Count.
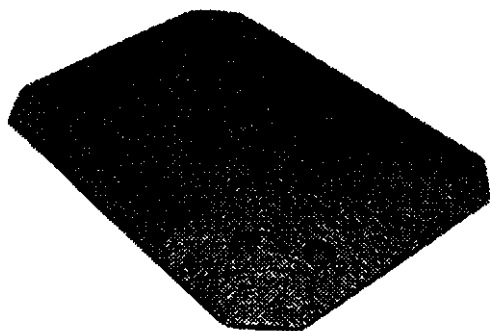**Vehicle Count Accuracy for Slow/Stop vehicles:** >96.0%,± 1 Count.
Vehicle Speed Accuracy: +/- 4.2% @ 95% probability
Vehicle length Accuracy: +/- 8% at 95% probability at speeds > 15mph (24km/h).
Wireless Verification (optional): 300 to 400 MHz. Serial on/off Data at 1200 baud
Wireless Data Format for each Vehicle: Total=7 byte. Preamble-speed-class-CRC.

Protective Cover

*The Protective Cover is placed over the NEW NC-97 for fast installation.*

A specialized polyurethane Protective Cover (also referred to as a "ramp") was developed to provide a fast and secure installation of the Hi-Star NC-97. The cover is constructed of a high impact polyurethane elastomer to withstand the impact of heavy vehicles and is impervious to oil, fuel and other chemicals and will not deteriorate from ultraviolet radiation. Originally designed for the high speed, heavily-traveled German Autobahn, our cover has found a place in traffic studies all over the world. The Protective Cover provides security and protection and eliminates the necessity of straps and sticky Tapecoat extruded rubber tape. Placed over your NC-97, the tough cover can be easily installed, literally within seconds, using a powder activated nail gun, regardless of the most adverse conditions. After the traffic study is complete, simply remove the cover with a small pry bar and it is ready to use on another installation. Contact the Nu-Metrics Sales Department at 1-800-346-2025 for more information.

Highway Data Management (HDM) Software Version 7

HDM imports data traffic studies from Hi-Star portable traffic counters for assimilation of count, speed, classification, occupancy, presence, surface temperature, roadway, wet/dry and gap time of vehicles. From the data that is stored, a number of valuable reports and graphs can be generated depicting all types of traffic related information. Multiple data files can be created to help organize your studies and information. Once a traffic study has been completed, preset recording periods (1 to 120 minutes) can be adjusted to better analyze the reports. To provide a totally new report, separate studies can be merged or joined. Studies can be subtracted from one another

to indicate a difference in traffic flows. Portions of a study can even be separated to form new studies. The latest development to come from the Nu-Metrics Software department is the HDM Version 7 software designed for Windows 95 and Windows NT. This software now incorporates both the instrument programming and data analysis portions into one complete package, making this release the most powerful yet.

Version 7 comes with a toolbox overflowing with data manipulation and comparison functions that will produce eye-catching informative graphs and reports. These capabilities are now turbo charged by utilizing the Microsoft DataBase file storage format. Automatic conversion utilities have been incorporated into the software so that existing HDM data can be processed while using all the latest features. To extend the data reporting possibilities, Version 7 provides direct integration with Microsoft Office 97, allowing you to cut and paste traffic data directly into an Office document for superb presentation and graphic effects.
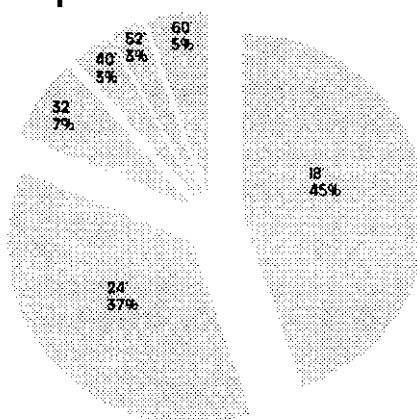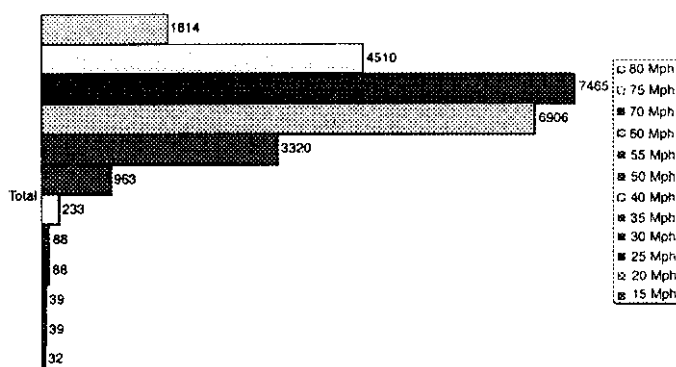
Color Graphs and Charts display extensive data in formats that can be comprehended at a glance.