Canoga™ Traffic Sensing System
Canoga™ 942E and 944E Traffic Monitoring Cards
Canoga™ Traffic Monitoring Card Configuration Software (TMC-CS)

Matched Components of the Canoga™ Traffic Sensing System  October 2007

Canoga™ 942E and 944E Traffic Monitoring Cards

Description
The Canoga™ Traffic Sensing System is a matched component system that includes Canoga™ 942E and 944E Traffic Monitoring Cards, designed for use with Canoga™ 701 Microloop™ Sensors and Canoga™ 702 Non-invasive Microloop™ Sensors. Canoga 942E and 944E measure individual vehicle speed and length with industry-leading accuracy and reliability; classify traffic according to speed and vehicle length; and measure vehicle presence, average traffic speed, vehicle count and roadway occupancy. Canoga 942E and 944E are designed for DIN 34 rack cabinet standards.

Both Canoga 942E and 944E are configured with Canoga™ Traffic Monitoring Card Configuration Software (TMC-CS). The Canoga TMC-CS is required to select the vehicle-sensing algorithm for the traffic monitoring cards used with Canoga Microloop sensors or inductive loops. Canoga traffic monitoring cards are readily configured for optimal accuracy. Card status and operation can be monitored remotely and in real-time.

Traffic Sensing
Canoga 942E and 944E use inputs from two Canoga 701 or 702 Microloop assemblies installed in a traffic lane and separated by at least 2.50 m (8.2 ft.) and generally separated by no more than 6.1 m (20 ft.). Each Canoga Microloop assembly is connected to one channel of a channel pair.

Real-time Traffic Data
Canoga 942E and 944E make available two types of information for real-time traffic monitoring:

- Individual vehicle speed and length
- Mean speed, count and occupancy collected during consecutive, user-defined time periods

This information is stored in a circular, rotating, volatile memory buffer sized to hold the last 15 minutes or more of data. The buffer permits rapid polling of Canoga 942E and 944E without loss of data should communication errors occur.
**User-defined Real-time Traffic Events**

The user can monitor real-time events based on vehicle-specific, user-defined vehicle speed and length conditions. For example, a condition may be defined as vehicle speed greater than a defined limit and vehicle length longer than a defined length. When the condition occurs, Canoga™ 942E and 944E Traffic Monitoring Cards may turn on an optional solid-state switching output for a user-defined length of time and stores the event occurrence in the event history log.

**Historical Traffic Data**

Canoga 942E and 944E have 16KB of built-in memory that can be extended to 64KB with the Canoga™ 848 Memory Module. This memory is used to store historical traffic information collected in consecutive, user-defined time periods:

- Mean speed, count and occupancy and
- Vehicles classified by speed and/or
- Vehicles classified by length
- Vehicles classified by length and speed

**Operating Characteristics**

Canoga 942E and 944E have built-in protection against lightning-induced and other transients. User-programmed settings and data collected by the traffic monitoring card are stored in non-volatile memory.

**Communications**

Two independent serial ports are available for local or remote communication:

- Front panel multi-drop TIA232 (RS232) port
- Back panel transmit/receive pin connectors for multi-drop TIA485 (RS485) communication

Canoga™ Traffic Monitoring Card Configuration Software (TMC-CS) uses the ports for local or remote configuration of Canoga 942E and 944E.

**Synchronization**

Each Canoga traffic monitoring card is capable of synchronizing the sampling of its sensors to other traffic monitoring cards of the same make and model within the same card rack. One card is set as synchronization leader while all other cards in the group are set as synchronization followers.

**Sensitivity and Tuning Range**

Sixteen software-configurable sensitivity settings are available per channel (eight “Pulse” modes, seven “Presence” modes and an “Off” mode) over a tuning range from 20 to 2,500 microhennies.

**Frequency Settings**

Four frequencies are available per channel.

**Remote Reset**

External input allows a remote reset of the Canoga traffic monitoring card. When the input voltage on pin C is pulled below 6 VDC for more than 17 milliseconds, the card resets all active channels and establishes a new reference for each “On” channel within four seconds.

**Power On/Off Switch (Reset Switch)**

The “On/Off” switch allows the user to turn off or reset the Canoga traffic monitoring card.

**Internal Diagnostics**

Canoga 942E and 944E identify and store the type of sensor fault and time of occurrence.

**Channel-by-Channel Programmability**

All parameters for accurate sensing of all licensed vehicles are programmable separately for each channel, including sensitivity, background adapt rate, recovery method, wash delay time and wash adapt rate.

**Detect and Fault LED Indicators**

Green Detect LED indicators display the status of the channel output and its timing.

- “On” during detection indicates that a vehicle is being detected.
- “Flash” indicates that the direction of the vehicle has been detected, when the traffic monitoring card is programmed for directional detection, or that a real-time event has been detected.
- Continuous “On” indicates a fault condition exists.

Red Fault LED indicators display coded messages of current or historical sensor fault status and failure type.

- One long (“On” for one second) and one short pulse indicate a current “Open” condition.
- One long and two short pulses indicate a current “Shorted” condition.
- One long and three short pulses indicate current excess inductance change ($\Delta L \geq 25\%$).
- A delayed (“On” for five seconds) pulse followed by the flash code for a fault indicates historical fault status.
Power LED Indicator
Power LED indicator displays when power is applied to the Canoga traffic monitoring card.

Communication Port Activity
• Rapidly flashing LED indicates data transmission.
• COM 1 LED indicates front port communication.
• COM 2 LED indicates rear port communication.
• A 1-Hz flash by either LED indicates synchronization faults.

Environmental
Temperature: ..., -34°C (-29°F) to +74°C (+165°F)
Humidity: 5% to 95% (non-condensing)
Electrical: ............10.8 VDC to 37.8 VDC
 .......... ≤ 50 milliamperes/channel at 24 VDC
 .......... 110 milliamperes/unit typical at 12 VDC
 .......... 55 milliamperes/unit typical at 24 VDC

Physical Dimensions
Net Weight Canoga 942E: ............ 181 g (4.2 oz.)
Net Weight Canoga 944E: ............ 213 g (7.5 oz.)
Width: ............2.87 cm (1.13 in.)
Height: ............11.43 cm (4.5 in.)
 ............ Face Plate: 11.43 cm (4.5 in.)
Depth: ............18 cm plus 1.4 cm for handle
 ............ (7.1 in. plus 0.55 in. for handle)

Canoga™ Traffic Monitoring Card Configuration Software (TMC-CS)

Description
Canoga TMC-CS is a matched component of the Canoga™ Traffic Sensing System. It uses communication ports to access Canoga 942E and 944E to read and change the configuration, monitor operation or identify and verify faults, monitor traffic in real-time, and retrieve the historical traffic and vehicle classification data.

Sensing Performance Configuration
Canoga TMC-CS is used to completely configure Canoga 942E and 944E using the front TIA232 serial port.

Configuration of Sensing Parameters/Channel
• Canoga™ Microloop™ Sensor parameters
• Inductive loop parameters
• Sensitivity/mode and operating frequency
• Adapt parameters
• Directional vehicle detection parameters
• Detect LED, switch (call) output, fault LED and disturbance (status) output (can be forced on or off)

Configuration of Canoga 942 and 944 Parameters
• Field modem parameters
• Front and rear communication ports
• Programmable card address/password
• Synchronization mode
• State of outputs for fault conditions
• Three types of noise filtering
• Pulse rephrase time

Traffic Data Collection Configuration
Data Collection Parameters
• Channel pairs configuration
• Speed and length calculation parameters

Real-time Traffic Data Parameters
• Time periods for real-time data collection
• Event conditions and event pulse output
• Duration of data collection based on memory size limitation

Historical Data Collection Parameters
• Historical data collection time period and duration
• Speed and length vehicle classification parameters
• Duration of data collection based on memory size limitation

Performance Diagnostics and Verification
Real-time Activity Monitoring
The real-time activity monitoring application allows a traffic engineer to monitor the activity of the Canoga traffic sensing system in real-time. The following parameters can be monitored:
• Sensor measurements (sensor status, sensor inductance, sensor frequency, reference frequency)
• Last fault or disturbances (type, time and date of occurrence)
• Vehicle sensing information (inductance change, duration, and time and date of detection)
• Vehicle count (count, directional count and time period remaining)
• Synchronization status
Performance Verification Real-time Traffic Data
Canoga TMC-CS allows the user to observe one of two real-time traffic data displays:
- Date, time, and individual vehicle speed and length
- Mean speed, count and occupancy for consecutive, user-defined time periods
The real-time date is displayed for either one (Canoga 942E) or two (Canoga 944E) channel pairs.

Historical Traffic Data
Canoga TMC-CS can display historical traffic data collected for each consecutive time period:
- Mean, count, occupancy and unclassified vehicles for each time period
- Speed classification for each time period (35 classes), if enabled
- Length classification for each time period (six classes), if enabled
- Speed classification by length for each time period, if enabled
The table below shows the binning duration depending on the available memory and on the collected data for a 15-minute binning interval.

<table>
<thead>
<tr>
<th>Collected Data</th>
<th>Four Channels</th>
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<tr>
<td></td>
<td>On-Board Memory</td>
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<tr>
<td>Mean Speed, Count and Occupancy</td>
<td>20 Days</td>
</tr>
<tr>
<td>Mean Speed, Count, Occupancy and Six Length Classes</td>
<td>4.5 Days</td>
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Historical Traffic Data Retrieval
Canoga TMC-CS can retrieve all historical traffic data from Canoga traffic monitoring cards. The retrieved data can be saved for later analysis using Microsoft® Excel®, Microsoft® Access™ or another spreadsheet or database software.

Directional Vehicle Travel Application
Canoga TMC-CS can configure Canoga 942E and 944E for detection of vehicle travel direction. Two closely spaced Canoga Microloop sensors (or overlapping inductive loops) are connected to either channels 1 and 2 or 3 and 4. The travel direction of a vehicle is identified by the directional vehicle count and the directional output in either the first or second channel of the pair, depending on the direction of travel.

Real-time Traffic Event Application
Canoga TMC-CS can be configured for the detection and logging of real-time traffic events for each channel pair. A traffic event may be composed of one or two conditions based on vehicle speed and/or vehicle length. Some examples are:
- Event if vehicle speed is greater than 80 km/h (vehicle is exceeding the speed limit)
- Event if vehicle speed is greater than 80 km/h and vehicle length is greater than 15 meters (vehicle is a speeding large truck)
- Event if vehicle length is greater than 10.5 meters and vehicle length is less than 13.5 meters (vehicle is probably a bus)
Canoga™ 942E and 944E Traffic Monitoring Card Options

**Canoga™ 848 Memory Module**

The Canoga™ 848 Memory Module is an optional accessory for Canoga™ 942E and 944E Traffic Monitoring Cards. It expands the memory for collection of historical traffic data. This module increases the standard available memory from 16KB to 64KB.

**Model 832 Communication Module**

The Model 832 Communication Module changes the rear TIA485 port to an TIA232 port. The Model 832 module cannot be used when a Canoga 848 module is installed and vice versa.

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### REAR BOARD CONNECTOR CONTACT ARRANGEMENT

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(E) = Emitter of opto-coupler    (C) = Collector of opto-coupler    (OC) = Open Collector/Open Drain    NC = No Connection
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