Global Traffic Technologies

Canoga™ Traffic Sensing System

Canoga™ 942 and 944 Traffic Monitoring Cards

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

Matched Components of the Canoga™ Traffic Sensing System **October 2007**

Canoga™ 942 and 944 Traffic Monitoring Cards

Description

The Canoga™ Traffic Sensing System is a matched component system that includes Canoga™ 942 and 944 Traffic Monitoring Cards, designed for use with Canoga™ 701 Microloop™ Sensors and Canoga™ 702 Non-invasive Microloop™ Sensors. Canoga 942 and 944 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 942 and 944 are designed for North American cabinet standards (NEMA compatible).

Both Canoga 942 and 944 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 942 and 944 are readily configured for optimal accuracy. Card status and operation can be monitored remotely and in real-time.

Traffic Sensing

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

Canoga™ 942 Traffic Monitoring Card and
Canoga™ 944 Traffic Monitoring Card

Real-time Traffic Data

Canoga 942 and 944 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 942 and 944 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™ 942 and 944 Traffic Monitoring Cards may turn on an optional solid-state switching output for a user-defined length of time and store the event occurrence in the event history log.

Historical Traffic Data

Canoga 942 and 944 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 942 and 944 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 942 and 944.

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 microhenries.

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 Canoga traffic monitoring card.

Internal Diagnostics

Canoga 942 and 944 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: . . -29° F (-34° C) to +165° F (+74° C)
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 942: . . . . . 4.2 oz. (181 g)
Net Weight Canoga 944: . . . . . 7.5 oz. (213 g)
Width: . . . . . 1.13 in. (2.87 cm)
Height: . . . . . PC Board: 4.5 in. (11.43 cm)
. . . . . Face Plate: 4.5 in. (11.43 cm)
Depth: . . . . . 7.1 in. plus 0.55 in. for handle
. . . . . (18 cm plus 1.4 cm 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 942 and 944 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 942 and 944 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 942) or two (Canoga 944) 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.

Collected Data	Four Channels	
	On-Board Memory	Memory Module
Mean Speed, Count and Occupancy	20 Days	84 Days
Mean Speed, Count, Occupancy and Six Length Classes	4.5 Days	18 Days

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 942 and 944 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 65 mph (105 km/h) (vehicle is exceeding the speed limit)
- Event if vehicle speed is greater than 65 mph (105 km/h) *and* vehicle length is greater than 50 feet (15 m) (vehicle is a speeding large truck)
- Event if vehicle length is greater than 35 feet (10.7 m) *and* vehicle length is less than 45 feet (13.7 m) (vehicle is probably a bus)

Canoga™ 942 and 944 Traffic Monitoring Card Options

Canoga™ 848 Memory Module

The Canoga™ 848 Memory Module is an optional accessory for Canoga™ 942 and 944 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.

BOARD EDGE CONNECTOR TERMINATIONS

Pin	Function	Canoga 942	Canoga 944	Pin	Function	Canoga 942	Canoga 944
A	Common of +24 VDC	•	•	1	Synchronize Conductor 1	•	•
B	+24 VDC (+10.8 VDC to 38 VDC)	•	•	2	Synchronize Conductor 2	•	•
C	RESET External	•	•	3	NC		
D	Channel 1 Loop Input A	•	•	4	Channel 1 Redundant Loop Input A	•	•
E	Channel 1 Loop Input B	•	•	5	Channel 1 Redundant Loop Input B	•	•
F	Channel 1 Switch Output (C)	•	•	6	NC		
H	Channel 1 Switch Output (E)	•	•	7	Channel 1 Disturbance Signal (OC)	•	•
J	Channel 2 Loop Input A	•	•	8	Channel 2 Redundant Loop Input A	•	•
K	Channel 2 Loop Input B	•	•	9	Channel 2 Redundant Loop Input B	•	•
L	PE (Protective Earth)	•	•	10	NC		
M	NC			11	NC		
N	NC			12	NC		
P	Channel 3 Loop Input A		•	13	Channel 3 Redundant Loop Input A		•
R	Channel 3 Loop Input B		•	14	Channel 3 Redundant Loop Input B		•
S	Channel 3 Switch Ouput (C)		•	15	NC		
T	Channel 3 Switch Ouput (E)		•	16	Channel 3 Disturbance Signal (OC)		•
U	Channel 4 Loop Input A		•	17	Channel 4 Redundant Loop Input A		•
V	Channel 4 Loop Input B		•	18	Channel 4 Redundant Loop Input B		•
W	Channel 2 Switch Ouput (C)	•	•	19	EIA-485-A (EIA-232 TX [M832 Option])	•	•
X	Channel 2 Switch Ouput (E)	•	•	20	Channel 2 Disturbance Signal (OC)	•	•
Y	Channel 4 Switch Ouput (C)		•	21	EIA-485-A (EIA-232 TX [M832 Option])	•	•
Z	Channel 4 Switch Ouput (E)		•	22	Channel 4 Disturbance Signal (OC)		•

•	Means this model has a connection to this pin.

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

Pins 1 through 22 are on the top (component) side, and pins A through Z are on the back (solder side). Polarization keys shall be located at three positions: between B/2 and B/3, between M/11 and N/12, and between E/5 and F/6.

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