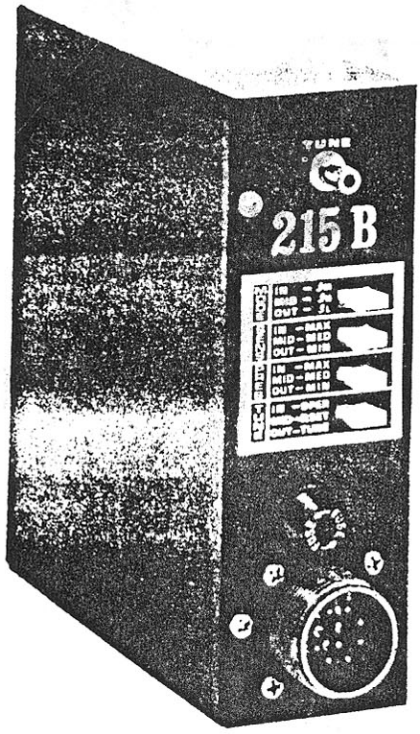


215 B/MS
DETECTOR

- Maximum Sensitivity & Range
- Ultra Stable
- Front Plug

Sarasota's 215B/MS Detector is a front-plug version of the 15B. Tens of thousands of 15B Detectors are providing truly dependable service the world over. Sarasota detector specifications set the standard for the industry.

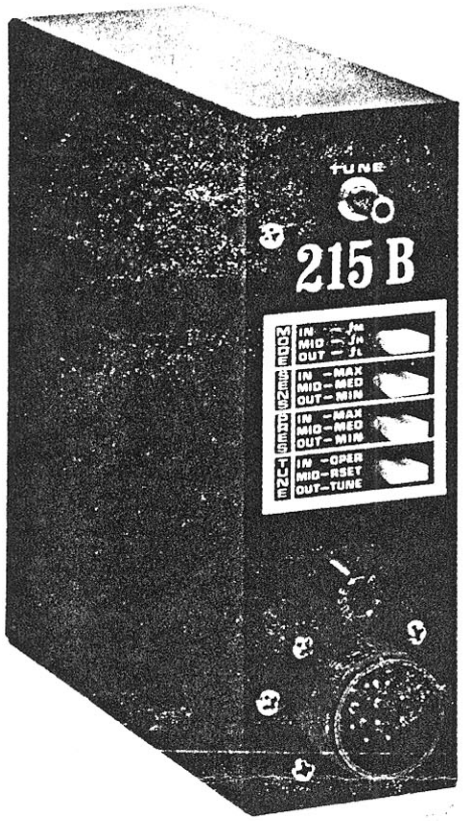
Tuning is accomplished in a simple, two-step operation using the 24 turn, "tuning" knob and the "set-up" switch. After an initial tuning, automatic "tracking" circuits keep the detector in tune over a wide drift range. A pilot lamp indicates detection. Three position "sensitivity" and "presence" controls allow adjustment for special conditions. Three position "mode" switch provides positive frequency separation. An internal card edge connector allows instant board removal for service or exchange.

specifications

INPUT –	120VAC ±20%, 50/60 HZ, 5 Watts.
OUTPUT –	Plug-in Relay, 5 Amp N.O. & N.C. Contacts.
CONNECTOR –	10 Pin MS. Front Mounted. 4 Foot Harness Standard.
FUSE –	3/10 Amp. Front Mounted.
ADJUSTMENT –	Single Knob. Requires only Initial Adjustment.
DRIFT COMPENSATION –	Automatic. 5% Δ L Range.
TEMPERATURE RANGE –	−40° to +180° F.
SEMI-CONDUCTORS –	100% Silicon. Transistor Sockets.
LOOP INDUCTANCE RANGE –	20-700 microhenries.
MAXIMUM SENSITIVITY –	.02% Change in Loop Inductance. Three Step Adjustable.
MAXIMUM LEAD-IN –	1000 Feet.
PRESENCE TIME –	Three Step Adjustable. Maximum Exceeds 1 hour at 1% Δ L, 2 min. at .05% Δ L.
FREQUENCY SEPARATION –	Three position Mode Switch provides Positive Frequency Separation.
LIGHTNING PROTECTION –	Total circuit Optimized for Lightning Protection including Loop, Line and Earth circuits.
DIMENSIONS –	6"H X 2"W X 6"D. 3 Pounds.

SARASOTA ENGINEERING COMPANY, INC.

TECHNICAL DATA



SARASOTA

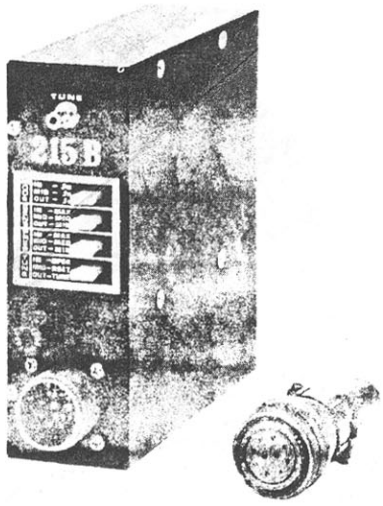
215B

DETECTOR

The Sarasota 215B is a 100% solid state inductive vehicle detector. The detector is a double, frequency locked, oscillator type with capacitive memory, very similar to the standard 15B.

The loop is the inductive component of an LC oscillator consisting of Q4, C1 and C2. The mode switch couples C4 or C3 and C4 into the capacitive network to provide frequency separation to prevent cross-talk. Zener diodes, D1 and D2, provide surge protection for loop induced transients. The tuning inductor, L1, along with Q5, C5 and C6 form a second oscillator which is coupled to the first, via R9, in such a manner that the initial tuning of L1 brings the two oscillators into synchronization in frequency and phase. The decrease in loop inductance caused by a vehicle causes the first oscillator to try to change frequency. Because of the cross coupling circuit, very little, if any, frequency shift occurs. A phase shift does result, however, and this is the basis for detection.

The outputs of the two oscillators are limited by D3, D4 and D5, D6 and fed into the phase comparator, Q6. A voltage is developed at the collector of Q6 which is proportional to the phase difference between the two oscillators. Transistors Q7 and Q8 form a differential amplifier whose output is dependent upon the difference in voltage between the base of Q7 and the base of Q8. During the initial tuning procedure, the base of Q8 and the memory capacitor, C8, are clamped at power supply midpoint (9 volts) via the "tune"switch and the resistive divider R13, R14. The tuning inductor, L1, is then tuned to bring the voltage at the collector of Q6 (also the base of Q7) to 9.6 volts, which is just below the differential amplifier trip point.



plug code

PIN	WIRE COLOR	FUNCTION
C	Black	120VAC 50/60 HZ
A	White	Neutral
H	Green	Earth
B	Yellow	Relay Common
F	Blue	Relay N.O.
G	Red	Relay N.C.
D	Gray	Loop
E	Brown	Loop
I		Not Used
J		Not Used

operation

MODE SWITCH provides for frequency separation when used on identical loops. For normal operation, use the "fM" position. If interaction between detectors is observed, operate one of the detectors in an alternate position.

TUNE SWITCH is placed in it's "Tune" position during the tuning procedure. At all other times, it remains in the "Operate" position. Should a false call occur subsequent to tuning it is only necessary to cycle this switch to it's "Reset" position and back to "Operate". Retuning is unnecessary. NEVER adjust "Tune" knob with "Tune" switch in the "Operate" position.

SENSITIVITY SWITCH provides three step control over detector sensitivity. For normal applications this switch should be set in it's "Maximum" position. "Medium" or "Minimum" positions may be used to ignore adjacent lane vehicles, bicycles, or other objects.

PRESENCE SWITCH controls the rate at which detector tracking circuits cause the unit to tune-out a stationary vehicle over the loop. The "Maximum" setting should be used except for special applications where this feature is desirable.

loops

The detector will operate loop and lead-in systems whose composite inductance falls between 20 and 700 microhenries. Single loops as small as 1.5' x 6' or as large as 10' x 100' would fall well within this range. Loops with perimeters less than 30 feet should be three turn. Loops with perimeters between 30 feet and 120 feet should be two turn. Loops with perimeters greater than 120' should be 1 turn. Loop and lead-in wire should be #14 solid or stranded. Shielded lead-in wire is not required but does serve to optimize loop systems. When buried or pulled in conduit, lead-in should be twisted in order that conductors remain as close together as possible.

Loop size, shape and placement are a function of application. The Sarasota Detector will handle an extremely wide range of loop designs. Detailed information on specific design problems is available from Sarasota.

multiple loops

Two or more similar loops may be connected to one detector in either series or parallel. Parallel connection will result in the highest sensitivity, however the parallel connection must not be allowed to reduce the system inductance below 20 microhenries. On short lead-in, six 6' x 6' (or larger) 3 turn loops in parallel will not fall below 20 microhenries; nor will six 6' x 20' (or larger) 2 turn loops; nor eight 6' x 50' (or larger) 2 turn loops. Lead-in increases system inductance and significantly reduces the percentage change in inductance.

Sarasota Detectors should provide reliable detection and good holding times for passenger vehicles on any of the above loop combinations with moderate lead-in lengths. Sensitivity and holding time are a function of many factors including, loop size, lead-in length, vehicle size, vehicle height and pavement characteristics. Sarasota Detectors will handle even very difficult situations, however for marginal design situations, field trials using actual loops and detectors are recommended. Sarasota's Loop Analyzer which allows direct measurement of operating frequency, system inductance and percentage change of inductance, is quite useful in evaluating vehicle loops.

circuit description

The 215B/MS Detector is a fully solid state device except for the output relay. The field loop is the inductive component of an LC oscillator whose frequency can fall between 25 and 170 KHz. A second, internal oscillator is tuned to be in frequency and phase with the first. Vehicle presence lowers loop inductance and the loop oscillator attempts to pull out of synchronization with the internal oscillator. A phase difference develops and is detected and converted into a DC voltage proportional to the size of loop inductance change.

The phase comparator voltage corresponding to the "no vehicle" state is stored on a "memory" capacitor. Slow rate changes in this voltage due to loop or oscillator drift are followed by the capacitor over a range corresponding to 5% Delta L. The capacitor is unable to track fast rate voltage changes in the "detect" direction. The difference in voltage which results causes relay operation. When operating in "maximum presence", the "memory capacitor" tracks very slowly during detection, resulting in extremely long presence holding times.

Detailed technical information including schematics, component locators, test voltages and circuit description is available from Sarasota.

Sarasota Engineering pioneered the loop vehicle detector business starting in 1955. Loop detectors are our principal product. Our production and engineering facilities are geared for the detector business. We produce our own printed circuit boards at our Circuit Etch Division plant. Sarasota Limited, our subsidiary in Great Britain, is the principal supplier of vehicle detectors on the European market.

SARASOTA ENGINEERING COMPANY, INC.

World pioneer and pacesetter in vehicle detectors

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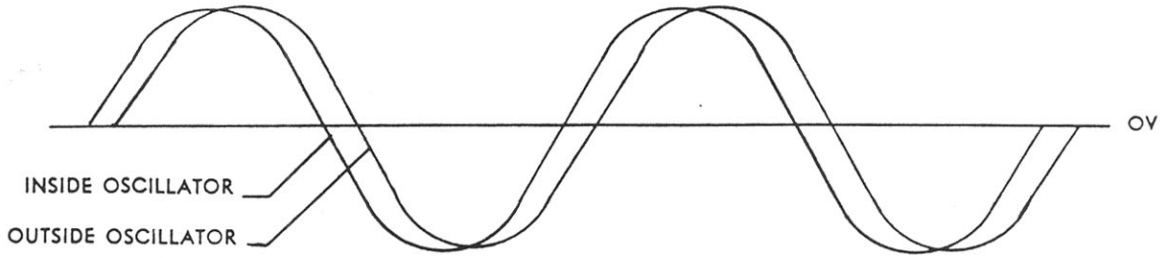
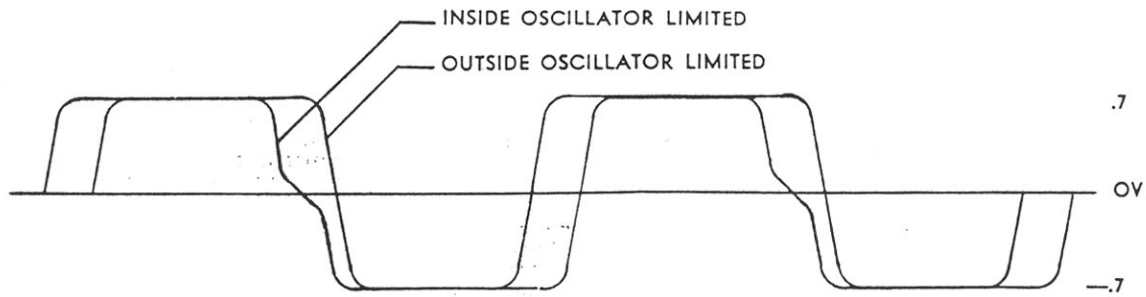
Phone (813) 366-8770

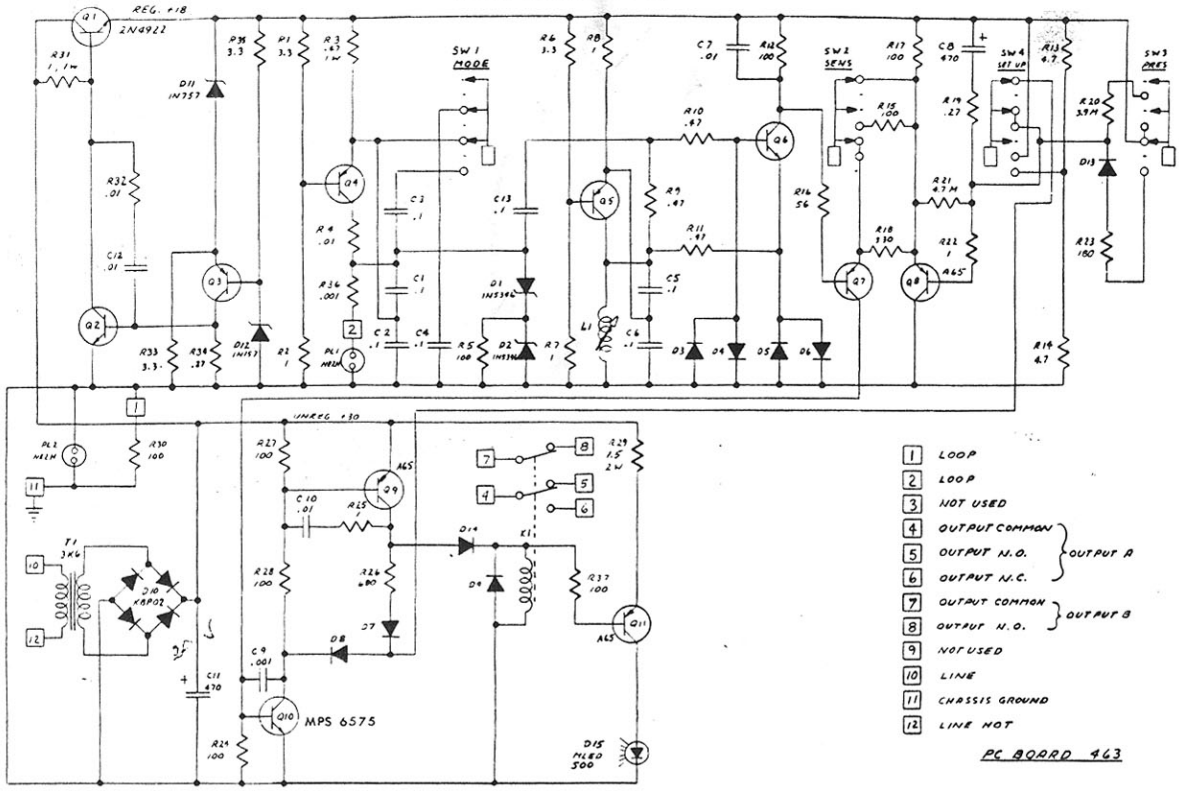




TEST VOLTAGES

TEST POINT	CIRCUIT FUNCTION	APPROXIMATE VOLTAGE	WAVE FORM	REMARKS
C1(+) End	Unregulated Supply	30V.	D.C.	Varies with line
Q1, Emitter	Regulated Supply	18 to 19V.	D.C.	Steady to ±20% of line
Q4, Collector	Loop Oscillator	8 to 12V. PP	Sine Wave	Frequency 20 to 135 KHZ
Q5, Collector	Internal Oscillator	10V. PP	Sine Wave	Frequency same as collector of Q4 in tune
D3 and D4	Limiter	1.4V. PP	Limited Sine Wave	
D5 and D6	Limiter	1.4V. PP	Limited Sine Wave	
Q4, Base	Oscillator Bias	4.5V.	D.C.	
Q5, Base	Oscillator Bias	4.5V.	D.C.	
Q6, Collector	Phase Detector Output	9.6V.	D.C.	9.6V. in tune, increases in detection
C8(−) End	Memory Capacitor	9V.	D.C.	.6V. below collector of Q6
Q10, Collector	Amplifier Output	8.4V. or 30V.	D.C.	1.2V. below collector of Q6, quiescent; 30V. unregulated line in detect
Q9, Collector	Relay Driver	29.4V. or OV.	D.C.	.6V. below unregulated line, drops to ground in detect

SCHEMATIC



PC BOARD 463

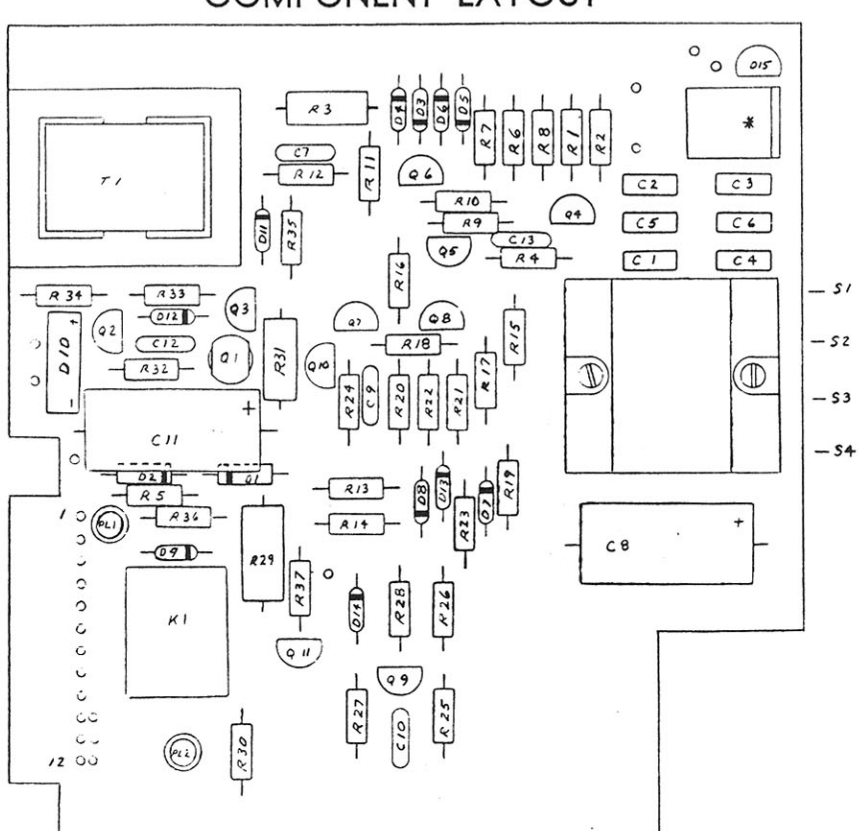
K1 IS NORMALLY ENERGIZED
(NO CAR ON LOOP)

LAST USED
R 37
C 13
D 15

UNLESS OTHERWISE NOTED
ALL RESISTOR VALUES ARE IN KILOHMS
ALL CAPACITOR VALUES ARE IN MICROFARADS
ALL DIODES ARE TYPE IN4148
ALL NPN TRANSISTORS ARE TYPE 2N3904
ALL PNP TRANSISTOR ARE TYPE 2N3906
ALL SWITCHES ARE IN "IN" POSITION
☐ DENOTES CARD EDGE CONNECTOR

SD 464
REV. 6-18-75

COMPONENT LAYOUT



* L1 NOT SHOWN

CL 465
REV. 6-18-75