

AVI SYSTEM

AUTOMATIC VEHICLE IDENTIFICATION (AVI)



LOW FREQUENCY INDUCTIVE COUPLED COMMUNICATION SYSTEM



AVI-X-n* Transmitter
n* Designates Unique Transmitter Code



AVI-A-n* Receiver
n* Designates Unique Receiver Code



AVI-C Receiver

Ordering Information:

Model AVI-X-n*

↑↑ Unique Transmitter Code
X, XP, or XP36 X = 12 VDC Input power
XP = 24 VDC Input power
XP36 = 36 VDC Input power

Model AVI-A-X-n*

↑↑ Unique Receiver Code
Must match Transmitter
1 or 4 1 = 120 VAC Input power
4 = 12 VDC / 24 VDC / 12 VAC / 24 VAC Input power

Model AVI-C-X

↑ R or SS R = Relay outputs
SS = Solid State outputs

Overview

The Model AVI-X-n* transmitter is designed to work in conjunction with either the Model AVI-A-n* receiver or the Model AVI-C receiver. The system provides Automatic Vehicle Identification (AVI) and/or priority access.

The Model AVI-X-n* transmitter communicates with either receiver through standard roadway loops. When power is applied the transmitter sends out a continuous low frequency coded signal. This coded signal is permanently programmed into the transmitter at the time of manufacture. The transmitter is ruggedly built and is designed to be securely mounted to the underside of the vehicle and connected to the vehicle's electrical system.

The Model AVI-A-n* receiver is programmed to identify any one of 19,683 possible codes. When the transmitter code matches the receiver code, the receiver provides a signal (relay contact closure) for external use. The receiver requires no adjustment or setup.

The Model AVI-C receiver is a two channel, card-rack type receiver that identifies all codes. Each channel is capable of independently identifying all 19,683 individual transmitter codes and can be programmed to accept or reject each code. The Model AVI-C provides an output signal (relay contact closure or solid state output) for any of the 19,683 possible codes that have been programmed as a valid code. The AVI-C uses two loops (one per channel) installed in the roadway surface to receive transmitter codes. The AVI-C continually monitors the integrity of the loop circuits. The AVI-C receiver includes a DB-9 RS-232 connector that facilitates communication with external equipment.



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AVI SYSTEM SPECIFICATIONS

This is a Performance Specification. It not intended to be used as Operating Instructions.

Model AVI-X-n* Transmitter

General Description The Model AVI-X-n* Automatic Vehicle Identification (AVI) Transmitter is a small, self-contained device that is easily installed on the underside of a vehicle. When power is applied the transmitter outputs a uniquely coded signal. This signal is picked up by a loop coil mounted in the roadway surface that is connected to a Model AVI-A-n* or a Model AVI-C Automatic Vehicle Identification (AVI) Receiver capable of decoding the transmitted signal.

Transmitter Codes 19,683 possible transmitter codes.

Setup The transmitter is operational immediately upon application of power and does not require any adjustment or setup.

Carrier 375 kHz pulse modulated carrier. Complies with Part 15 of the Federal Communications Commission (FCC) rules and regulations.

Fuse A one ampere (1 A) fast blow fuse should be installed in the power lead.

Power 12 VDC version (AVI-X): 11.5 to 15.0 VDC, 135 milliamps maximum.

24 VDC version (AVI-XP): 23 to 30.0 VDC, 73.5 milliamps maximum.

36 VDC version (AVI-XP36): 34.5 to 45 VDC, 54 milliamps maximum.

Ruggedized Construction To ensure reliable, long term operation, all electronic components are encapsulated in an epoxy-based resin.

Operating Temperature -40° F to +180° F.

Humidity Up to 100% relative humidity.

Power Cable 15 foot unterminated, two conductor shielded twisted pair cable.

Size Transmitter base - 4.50 inches diameter x 1.00 inch thick. Mounting stud - 0.38 inch diameter (3/8-16 UNC thread) x 3.25 inches long.

Weight 1.00 lb.

Model AVI-A-n* Receiver

General Description The Model AVI-A-n* Automatic Vehicle Identification (AVI) Receiver identifies vehicles equipped with a uniquely coded AVI-X-n* transmitter and provides a control signal for external use. The receiver uses a loop coil installed in the roadway surface to receive the transmitter's code. The receiver is factory programmed to identify one specific transmitter code and does not require any adjustments or setup. The receiver is operational immediately upon application of power. LEDs on the front of the receiver indicate the presence of power and the presence of a valid-coded transmitter within the loop area.

Receiver Codes 19,683 possible receiver codes.

Setup The receiver does not require any adjustment or setup.

Receiving Range The transmitter must be directly above the loop coil embedded in the roadway surface.

Response Time The receiver will reliably recognize a valid coded transmitter remaining within the area of the loop coil for a minimum of 75 milliseconds.

Presence Time Once a valid coded transmitter has been recognized, the receiver will output a signal as long as the transmitter is over the loop coil and for a period of two (2) seconds after the transmitter leaves the loop coil.

Loop Coil Area The maximum area recommended for the loop coil is 150 square feet.

Loop Coil Turns The loop coil should have a minimum of two (2) turns of wire for loops up to 75 square feet and a minimum of three (3) turns of wire for loops between 75 square feet and 150 square feet.

Loop Feeder Length The maximum length of loop feeder cable (lead-in cable) is 300 feet.

Power Indicator A high-intensity, green light-emitting diode (LED) indicates power is present.

Detect Indicator A high-intensity, red light-emitting diode (LED) indicates the presence of a valid coded transmitter within the area of the loop coil.

Relay Output Ratings The output relay contacts are rated for maximum continuous current of 6 amps, 300 VAC maximum, 150 VDC maximum, and 180 Watts maximum switched power.

Power 120 VAC version (AVI-A-1-n*): 89 to 135 VAC, 50/60 Hz, 6 Watts maximum.

Low voltage version (AVI-A-4-n*): 12.0 to 24.0 VDC / 12.0 to 24.0 VAC, 2 Watts maximum.

Ruggedized Construction The receiver enclosure is 0.062 inch thick aluminum with a durable powder coated finish. The printed circuit board is 0.062 inch thick FR4 material with 2 oz. copper on both sides and plated through holes. Circuit board components are conformal coated with polyurethane.

Lightning Protection The receiver can tolerate, without damage, a 10 microfarad capacitor charged to 2000 volts being discharged directly into the loop input terminals, or a 10 microfarad capacitor charged to 2000 volts being discharged between either loop terminal and earth ground.

Operating Temperature -40° F to +180° F.

Connector: Front mounted, 10-pin, MS style connector (MS3102A-18-1P). (See *AVI-A-n* Receiver / Wiring Harness Pin Assignments* table.)

Size 2.90 inches high x 1.60 inches x wide x 4.96 inches deep excluding connector. Connector adds 0.675 inches to the depth measurement.

Weight 12.8 oz.

Model AVI-C Receiver

General Description The Model AVI-C Automatic Vehicle Identification (AVI) Receiver is a two channel card-rack type receiver that detects and identifies vehicles equipped with AVI-X-n* transmitters. The AVI-C uses two loops (one per channel) installed in the roadway surface to receive the transmitter's code. Each receiver channel identifies all 19,683 codes and can be programmed to set any code as either valid or invalid. The AVI-C continually monitors the integrity of the loop circuits.

Receiver Codes 19,683 possible receiver codes. Each channel can be independently programmed to accept or reject any one or more of the coded signals.

Setup The receiver does not require any adjustment or setup.

Channel Enable / Disable Switch Each channel has a front panel mounted two position toggle switch that controls the associated channel. When the switch is in the **DISABLE** position, the channel will not recognize coded signals. When the switch is in the **ENABLE** position, the channel operates in a normal manner (i.e. AVI function active, loop monitoring function active, communication function active).

Audible Detect Signal A front panel mounted push button is used to enable an audible detect signal (buzzer) that is emitted whenever a coded transmitter is present within the loop zone.

Valid Code Indicator Each channel has a front panel mounted high intensity red LED that indicates the presence of a coded signal that has been programmed as valid.

Loop Fail Indicator Each channel has a front panel mounted high intensity red LED that indicates a current or prior loop failure condition. When the LED is OFF the loop is in tolerance. When the LED is continuously illuminated a loop failure condition (open or shorted loop) exists. When the LED flashes at a three Hz rate it indicates a prior loop failure condition.

Communication Port The AVI-C receiver has a front panel mounted DB-9 RS-232 connector that allows data to be communicated to and from external equipment (e.g. a control system or PC). The RS-232 connector can be used to program each channel of the AVI-C receiver to accept or ignore coded input signals.

Transmit Indicator Two front panel mounted high intensity red LEDs (one per channel) provide an indication of an active transmit state. When the transmit (TX) LED corresponding to either channel is illuminated, that channel is currently transmitting data via the RS-232 communication port. When the LED is OFF, no data is being transmitted.

Receive Indicator An active receive state to the AVI-C via the RS-232 communication port is indicated via a front panel mounted, high intensity, green LED. When the receive (RX) LED is illuminated, the AVI-C is currently receiving data via the RS-232 communication port. When the LED is OFF, no data is being received.

Receiver Address DIP Switches A four-position DIP switch located on the PC board is used to select one of sixteen (16) possible address bit combinations for the AVI-C receiver.

Receiving Range The transmitter must be directly over the loop coil embedded in the roadway surface.

Response Time The receiver will reliably recognize a valid coded transmitter remaining within the area of the loop coil for a minimum of 75 milliseconds.

Loop Coil Area The maximum area that can be covered by the loop coil is 600 square feet.

Loop Feeder Length The maximum length of loop feeder cable (lead-in cable) is 300 feet.

Loop Input(s) Transformer isolated.

Solid State Outputs Optically isolated. 40 VDC maximum collector (drain) to emitter (source). 100 mA maximum saturation current. 2 VDC maximum transistor saturation voltage. The output is protected with a 47 volt Zener diode connected between the collector (drain) and emitter (source).

Relay Outputs The relay contacts are rated for 6 Amps maximum, 150 VDC maximum, and 180 Watts maximum switched power.

Power 10.8 to 30 VDC, 160 milliamps maximum.

Circuit Board Printed circuit boards are 0.062 inch thick FR4 material with 2 oz. copper on both sides and plated through holes. Circuit boards and components are conformal coated with polyurethane.

Lightning Protection The receiver can tolerate, without damage, a 10 microfarad capacitor charged to 2,000 volts being discharged directly into the loop input terminals, or a 10 microfarad capacitor charged to 2,000 volts being discharged between either loop terminal and earth (chassis) ground.

Operating Temperature -40° F to +180° F.

Connector 2 x 22 contact edge card connector with 0.156 inch contact centers. Key slots located between pins B/2 & C/3, E/5 & F/6, and M/11 & N/12. (See *AVI-C Receiver Pin Assignments (2 x 22 Card Edge Connector* table.)

Communication Interface Connector Front panel mounted, nine pin, metal shell, D subminiature receptacle with gold plated female contacts. (See *AVI-C Receiver Pin Assignments (DB-9 RS-232 Communication Interface Connector* table.)

Size 4.50 inches high x 1.12 inches wide x 6.875 inches deep (including connector, excluding handle). Handle adds 1.00 inch to depth measurement.

Weight 6.0 oz.

AVI-A-n* Receiver / Wiring Harness Pin Assignments (Wire Colors refer to Reno A&E Wiring Harness 801-4)

Pin	Function	Wire Color
A	AC Neutral / DC Common	White
B	Relay Output, Normally Open (N.O.)	Brown
C	AC Line / DC +	Black
D	Loop Input	Red
E	Loop Input	Orange
F	Relay Output, Common	Yellow
G	Relay Output, Normally Closed (N.C.)	Blue
H	Chassis Ground	Green
I	No Connection	Violet
J	No Connection	Gray

AVI-C Receiver Pin Assignments (2 x 22 Card Edge Connector)

Pin	Function	Pin	Function
A	DC Common	1	No Connection
B	DC +	2	No Connection
C	External Reset Input	3	No Connection
D	Channel 1 Loop Input	4	Channel 1 Loop Input
E	Channel 1 Loop Input	5	Channel 1 Loop Input
F	Channel 1 Output, Collector (Drain) Relay Normally Open (N.O.)	6	No Connection
H	Channel 1 Output, Emitter (Source) Relay Common	7	No Connection
J	Channel 2 Loop Input	8	Channel 2 Loop Input
K	Channel 2 Loop Input	9	Channel 2 Loop Input
L	Chassis Ground	10	No Connection
M	No Connection	11	No Connection
N	No Connection	12	No Connection
P	No Connection	13	No Connection
R	No Connection	14	No Connection
S	No Connection	15	No Connection
T	No Connection	16	No Connection
U	No Connection	17	No Connection
V	No Connection	18	No Connection
W	Channel 1 Output, Collector (Drain) Relay Normally Open (N.O.)	19	No Connection
X	Channel 1 Output, Emitter (Source) Relay Common	20	No Connection
Y	No Connection	21	No Connection
Z	No Connection	22	No Connection

AVI-C Receiver Pin Assignments (DB-9 RS-232 Communication Interface Connector)

Pin	Function	Pin	Function
1	No Connection	6	No Connection
2	Receive (RX)	7	No Connection
3	Transmit (TX)	8	No Connection
4	No Connection	9	No Connection
5	DC Common	Case	Chassis Ground