GMS - System description

   The Gasoline Management System (GMS) is designed to provide automatic control of vehicle refueling at the gas stations.

   The system comprises Reader system , installed in the gas station and transponder tags installed in the vehicles and / or carried by the drivers.

   The Reader system comprises the following :

1. Antenna controller , mounted inside the pumps housing. The Antenna controller is a μ.P. controlled Transceiver.
2. A loop antenna is mounted on each refueling nozzle or at the Pump. The antenna is connected to the Antenna controller via a 50 Ω coax cable which , part of the way in a case of using a refueling nozzle, runs inside the petrol hose. The loop antenna works in inductive coupling and works in close proximity.
3. Intrinsic Safety (I.S.) Terminal, located in the gas station office. The I.S. Terminal supply to the Antenna controller the 12VAC power supply and the RS422 communication network. The I.S. Terminal interfaces between the Antenna controllers and the gas station main computer. It also provides the Intrinsic Safety protection required since the antenna is located in hazardous area.

  The enclosed GMS wiring schematics describes the above at a block diagram level.

 The Tags are passive transponders which exchange data with the Reader by demodulating the carrier on off key, 100% amplitude modulation in one direction , and by varying their internal loading , thereby affecting small variations of the transmitted

amplitude , in the other direction. In this respect the tags do not transmit any active energy. Exchanging the data in both directions requires continuous transmission of the RF carrier by the Reader.

   In an operative environments at an active gas station, the station main computer, which controls all the actions of the gas pumps, upon detecting a need to read a tag at a specific nozzle, activates a short interrogation sequence via the I.S. Terminal and the corresponding Antenna controller. The resultant mode of work is highly intermittent, where most of the time the individual transmitter in the Antenna controller shut off

Title:	GMS - System description	
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Signature:		**Author :** Ronnie Gilboa V. P. of R&D

and is only turned on for a short periods of time upon demand generated by the host computer.

   In the EMC tests a continuous transmission mode of operation was enforced by specific settings of jumpers in the Antenna controller.

Table 2-1 Antenna Controller models

Description	Model No.	Catalog No.
1 Channel	NI-1-U1- RS485- CE	100xxxx
2 Channel	NI-2-U1- RS485- CE	1001080
4 Channel	NI-4-U1- RS485- CE	100xxxx

1.1   Product Description

The **Antenna Controller** is an inexpensive, compact radio frequency communications electronic interface with **contactless read/write** capability.
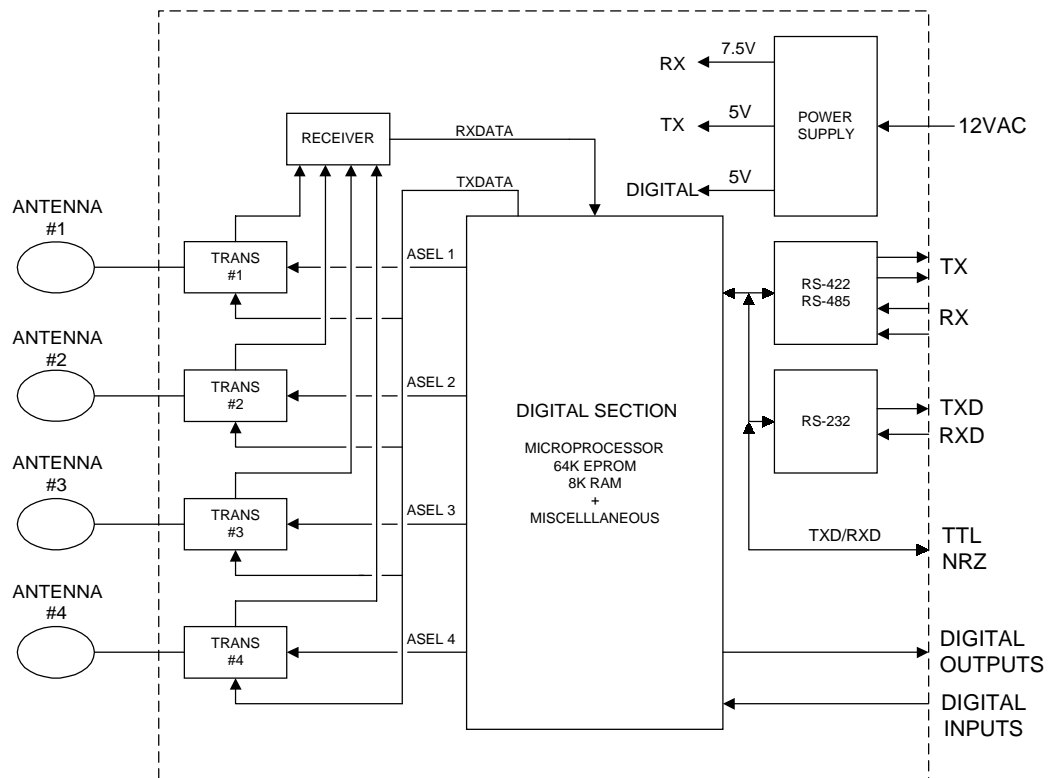

Figure 2-1: Antenna Controller Block Diagram (4 channel)

At the Host's command, the Antenna Controller generates and modulates a 13.56 MHz carrier signal for the transmission of power, commands and data to an in-range

smart Tag. The smart tag, acting as a passive transponder, utilizes variable load modulation on the transmitted carrier wave to transfer data to the Antenna Controller. Read and write operations have equal data rates and ranges. Antenna Controller operation requires a single, external 12Vac power source with a maximum current drain of 250 mA in operation mode and 65 mA in standby mode. Additional drain may be required (up to 400mA) to operate external outputs. LED indicators for Power, Receive, and Transmit. Digital Inputs and Digital Outputs are also provided.

Figure 2-2: Antenna Controller Schematic Diagram

1.2   Product Features

- Contactless, bi-directional radio frequency interface, between Host and Contactless Smart Tag.
- Flexible, software configurable microcomputer-based design.
- Integrated sophisticated Smart Card Operating System on board.
- 13.56 MHz transmission frequency conforming to emerging ISO standard 14443.
- Modulated carrier-signal transmission of commands and data to/from the EYECON tag.
- Equidistant read/write transaction operation.
- Proximity range - up to 10 cm (4 inches).
- Signal penetrates virtually any non-conductive material - no contact or line-of-sight required.
- BI-directional data transmission from/to the Tag at 50/106 KBPS.
- Unique passive "electronics free" remote antenna for added security and easy physical integration.
- TTL, RS-232C, RS-422, RS485 Multi-drop Communications interface to Host computer.
- Simultaneous transmission of power and BI- directional read write messages, through it's antennas, to the passive smart tags.
- RF Transmit, RF Receive and Digital I/O indicator LEDs.
- Compliance with FCC Section 15 and ETS 300 330 emission limit requirements.
- Compliance with Intrinsic Safety demands for explosive environments.
- Operating temperature range -25°C to 70°C (-13°F to 158°F).
- Single 12Vac-power source required for operation.

1.3   Product Specifications

Table 2-2: Performance/Electrical Specifications

■ **Read/Write Range:**	Up to 10 centimeters (4 inches) with Contactless Smart Tag (depending on antenna size and orientation).
■ **RF Interface**:	
RF Carrier Frequency	13.56 MHz
RF Output	200mW
Output Short Protection	Built-in (continuous)
Data Transfer	Half duplex
Data Transmission Rate	50/106 KBPS
Data Error Checking	Message Length, Parity, Frame , Bits , LRC.
■ **Host Data Communications Interface RS232C/RS422/RS485/TTL/**:	
Signals	Transmit, receive
Bit/Byte Protocol	Async. (start/stop), bit serial, half duplex, 9600baud; data byte=8 data bits, no parity, 2 stop bits, full 8-bit binary data
Data Error Checking	Message Length, Parity, Frame, Bits and LRC.
Connector/Cable	Standard Terminals for external connections, Molex connectors for testing and additional options
■ **Human Interface**:	
Power	5 Red LEDs
Receive	1Yellow LED
Transmit	Green LEDs (1 per antenna)
Inputs	8 Red LEDs
Outputs	8 Red LEDs
■ **I/O Interface:**	8 Active low Digital Inputs 8 Open Collector Digital Outputs
■ **Microprocessor Circuit**	
Microprocessor	80C32 - PLCC44
XTAL	24 MHz
EPROM	64k byte

Performance/Electrical Specifications (continued)

■ **Electronic Board Power Requirements**:

Power Supply	12Vac 500mA - for MCI board only. Up to 1A - including power to external I/O
Maximum Current Draw	250 mA (powering signal ON)
Standby Mode Current Draw	65 mA (powering signal OFF)

■ **Mechanical:**

Dimensions	Model NI-1- 200x200x80 mm. Model NI-2- 300x200x80 mm. Model NI-4- 300x200x80 mm.
Weight	Model NI-1 270 gr. Model NI-2- 350 gr. Model NI-4- 370 gr.
Vibrations	10 - 200 Hz @ 2.0G

Environmental

■ **Temperature:**

Operating	-25° to 70°C (-13° to 158°F)
Storage	-25° to 85°C (-13° to 185°F)
■ **Humidity:**	5 to 95% non-condensing
■ **Tuning:**	RF output filter (1 for each antenna) SQUELCH
■ **Regulatory Compliance:**	EMC directive89/336/EEC I-ETS 300 330, FCC Section 15 (US) certified, MIL-STD-461C Intrinsic safety EN 500 14 EN 500 20
■ **Antenna Interface**	Suitable for all antennas

2.   Antenna

2.1   Antenna Designs Considerations

2.1.1 Loop Antenna

Optimal dimensions for the loop antenna are 10×10 cm., or 10 cm. $\varnothing$.

2.1.2 Minimal clearance around Antenna

The minimal distance from the antenna to metallic objects or printed circuit boards is 2 cm.

2.1.3 Minimal clearance behind Antenna

The recommended distance from the antenna's back to metallic objects or printed circuits is 4 cm, or more. The minimum distance is 2 cm.
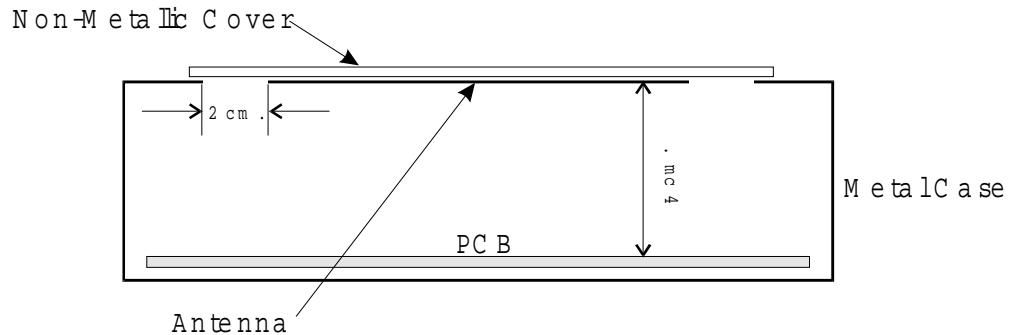

Figure 2-1: Internal Antenna - Cross-sectional View

2.2   Antenna Assembly

The antenna is formed from a single-turn loop of 24-gauge wire. Wire ends are twisted (twisted wire length should not exceed 20 cm.).

Figure 2-2: Antenna Loop
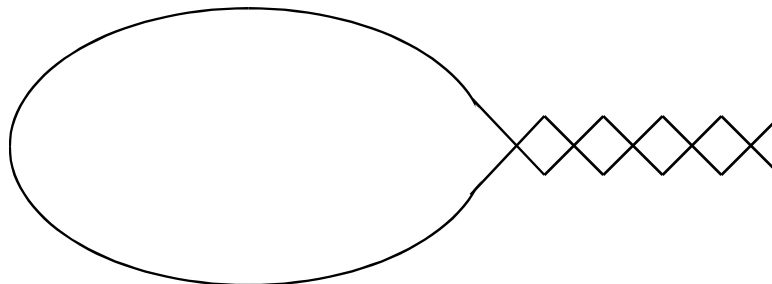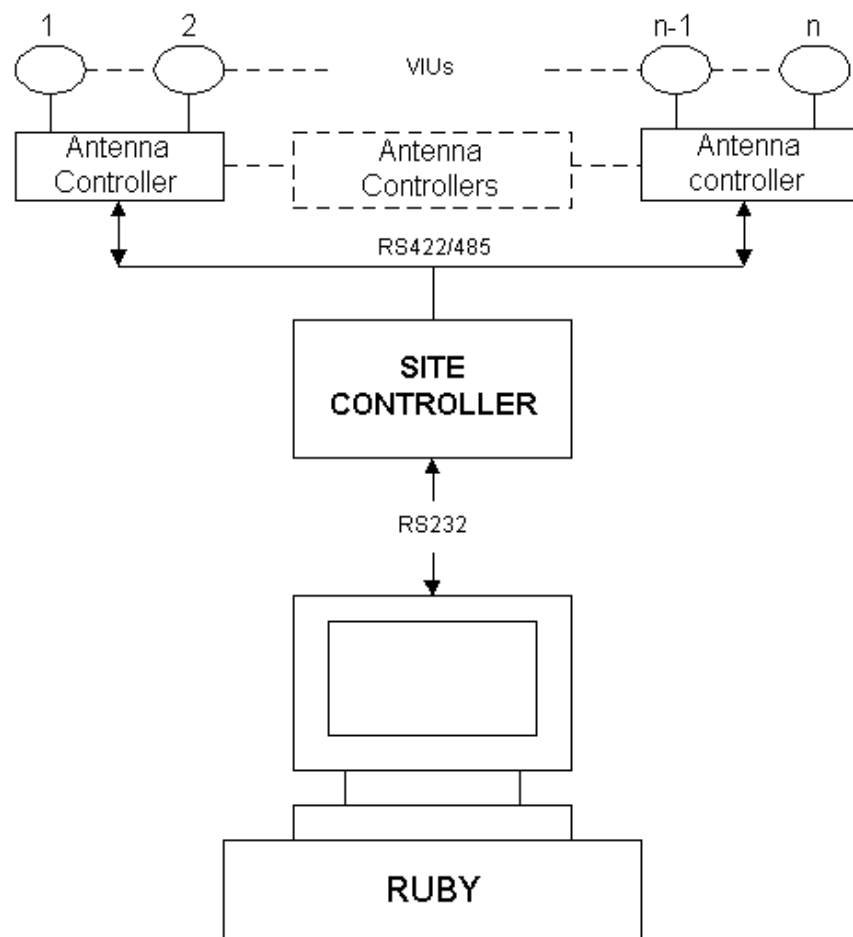
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3.   Product description

The GBI 2.0 Site Controller is a microprocessor based device designed to communicate with a network of local Antenna Controllers through RS422/485 serial interface. Serving as interface between the Site's Host and the Antenna Controllers, it enables the Host Computer to access all the site's antennas using its conventional RS232 serial communication port. Simple protocol between host and local units relieves the host of managing the network, thus freeing it to attend to other tasks. In addition the Site Controller's RS422/485 serial port is intrinsically safe, complying with UL gas stations safety requirements.

3.1 Product Features

- Microprocessor based
- Flexible, software configurable protocol
- RS232 serial interface port to host computer
- RS422 serial interface to local unit (Nozzle Interface) network
- CE approval
- Meets EEC Intrinsic Safety demands for explosive environment
- Auto test mode
- Operating temperature range -25°C to 70°C (-13°F to 158°F)
- Led indication for selected transceiver (nozzle) address
- Led indication for selected transceiver (nozzle) successful response
- Power indicator led
- 110VAC supply to Antenna Controller assembly
- AC/DC power supply to GBI board

3.2 Product Specifications

Table 3-2: Performance/Electrical Specification

● **Antenna Controller Serial Data Communication:**

Signals	Transmit, Receive
Bit/Byte Protocol	RS422 9600 baud asynchronous, 8 bit DATA, one stop bit, no parity.
Data Error Checking	Message length, Frame, Bits, LRC.
Connector	P15 - 5 screw terminal block

● **Host Serial Data Communication:**

Signals	Transmit, Receive
Bit/Byte Protocol	RS232 9600 baud asynchronous, 8 bit DATA, one stop bit, no parity.
Data Error Checking	Message length, Frame, Bits, LRC.
Connector	P14 - 3 screw terminal block

● **Human Interface:**

Selected transceiver (nozzle) "address" indication. (binary coded)	8 red indicator leds

Selected transceiver (nozzle) "successful response" indication (binary coded)	8 green indicator leds
5VDC "power on" indication	1 red led

● **Microprocessor Circuit:**

Microprocessor	80C32
XTAL	12MHz
EPROM	64K byte
RAM	8K byte

● **Power Requirements:**

Site Controller Assembly	
Input power to transformer	110VAC @ 1A
GBI board	
Power supply	9 - 12VAC/DC
Maximum current draw	100mA

Table 3-2: Performance/Electrical Specification (continued)

● **Mechanical:**

Site Controller Assembly	
Dimensions	200x300x80mm
Weight	470gr.
Vibrations	10 ÷ 200Hz @ 2.0G
GBI Board	
Dimensions	190x123x25mm
Weight	160gr.
Vibrations	10 ÷ 200Hz @ 2.0G

● **Temperature:**

Operating	-25° to 70°C (-13° to 158°F)
Storage	-25° to 85°C (-13° to 185°F)
Humidity:	5 to 95%
Regulatory Compliance:	ε x Intrinsic safety certified
	CE Approval