

GP90A

Extra long-range RFID (proximity) card reader

(1) Features:

- Extra long reading range of up to 90 cm with ISO-size passive RFID cards*, over 100 cm with special “optimized” passive cards
- High-precision auto tuning circuitry compensates for environmental changes and presence of metal objects
- Bright LED indicators, tuning LED bar
- Four user-selectable interfaces: Magstripe, Wiegand, RS232 and RS485
- Internal relay and serial port commands to control it
- Firmware upgradeable in the field
- Attractive and waterproof housing design
- High-quality power supply with noise filter included

(2) Cable wire assignment

The GP90A has two cables: a signal cable (thicker one) and power cable (thinner one of the two). Cable wiring is shown in the tables below:

Signal Cable	Magstripe I/F	Wiegand I/F
Green	Data	Data0
White	Clock	Data1
Orange	Card present	<unused>
Dark Blue	RS232, TX	
Brown	RS232, RX	
Light Blue	+RS485	
Light Green	-RS485	
Yellow	I/F selection, see (see section 4)	
Pink	I/F selection, see (see section 4)	
White w. black stripe	Enable firmware download	
Black	Ground	
Red	Relay, common	
Purple	Relay, normally opened	
Gray	Relay, normally closed	

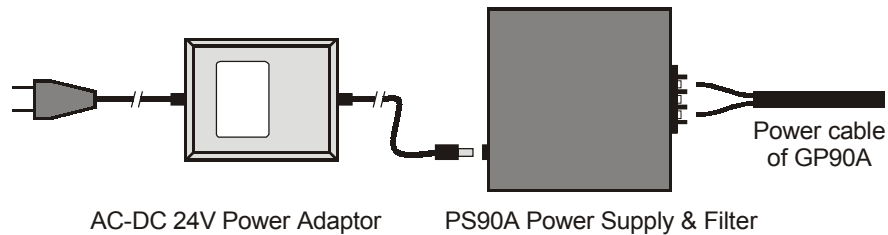
Power Cable	Function
White	+VDC (19.2V)
Black	Ground
Shield	Earth ground

* Measured in a noise-free environment with good-quality RFID cards and in the noise and metal-free environment

(3) Power supply

The GP90A is powered by a two-stage power circuitry (see figure below): the power adaptor that transforms 220V AC (110V AC) into 24V DC, and the PS90A power supply that converts 24V DC into 19.2V DC required by the GP90A. The power supply also filters out the power line noise and further stabilizes the voltage supplied to the GP90, which is very important to proper reader operation.

The GP90A should only be powered as described above. Using any other power arrangement may lead to a decreased reading range and result in a permanent damage to the GP90A.



(4) Interface selection

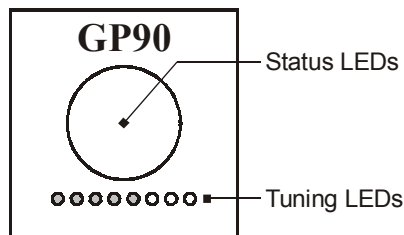
Data output interface is selected using Yellow and Pink wires:

Interface	Yellow wire	Pink wire
Magstripe	Connect to ground	Connect to ground
Wiegand	Leave unconnected	Connect to ground
RS232	Leave unconnected	Leave unconnected
RS485	Connect to ground	Leave unconnected

(5) LED indicators

The GP90A has status and tuning LEDs (see figure below). Status LED area has blue, red, and green LEDs:

- Blue LED is on whenever the GP90A is powered and ready to read the card
- Red LED blinks once when the good read has been achieved. Red LED is also used during the firmware download (see section 10)
- Green LED is only used during the firmware download (see section 10)



Tuning LEDs form a light bar that shows current *tuning point*- see section 7.

(6) Obtaining the best reading range

To obtain advertised reading range use high-quality RFID cards and install the GP90A in a noise and metal-free environment.

The quality of RFID cards affects the reading range of the GP90A. Poor cards can reduce the reading distance by as much as 50%. On the other hand, using special “thick” RFID cards (that contain the coils with a much larger number of turns) can increase the reading distance to beyond 100-110 cm.

The main frequency of the GP90A is 125KHz. Regular CRT monitors generate noise in this band and can interfere with the operation of the GP90A. Other 125KHz RFID readers can affect the reading range of the GP90A even from a distance of several meters! The GP90A provides a special serial command that can be used to verify current noise level- see section 9.

Avoiding metal objects means that the GP90A should not be installed on metal surfaces. Metal grids inside the concrete walls also count. The GP90A includes advanced auto-tuning circuitry that compensates for the presence of metal (see section 7) but the best reading range is still obtained in the metal-free environment.

(7) Auto-tuning circuitry

The GP90A is equipped with an advanced auto-tuning circuitry that compensates for the presence of metal objects in the vicinity of the GP90A and for other environmental factors (such as temperature variations) that affect the tuning of the GP90A’s internal antenna and decrease the reading distance. Auto-tuning recovers significant portion of the reading distance that otherwise would have been lost due to the loss of tuning. The GP90A is constantly adjusting its tuning to obtain the best reading distance possible under the circumstances.

The GP90A displays the results of auto-tuning on the tuning LED bar (see section 5). The bar contains 8 LEDs and displays the light line (“growing” from left to right) that shows current *tuning point*. Specific position of the bar does not represent tuning quality- it is the changes in the tuning point that are of interest.

Before installing the GP90A in its intended location power the reader in a noise and metal-free environment and note the light bar status. Since all readers are slightly different (due to internal component variations) the nominal position will not always be the same. Typically, you will see a bar of four to six LEDs.

After installing the reader at the intended location observe the tuning bar again. If the same number of LEDs is still on then the installation environment is similar to the one in which you have tested the reader before. If the light bar is shorter than before, then this indicates a presence of metal in the vicinity of the reader.

Despite the “efforts” of the auto-tuning circuitry you may not obtain advertised reading range if the light bar is significantly shorter (i.e. only 1 or 2 LEDs are on).

(8) Internal relay

The GP90A features an internal relay that can be controlled by sending serial commands via the RS232 or RS485 interface (see section 9). Relay can be used to control an electric lock.

(9) Serial commands

All commands are sent to the GP90A via its RS232 or RS485 interfaces. For each command the GP90A will issue a reply. Serial port settings are 9600, N, 8, 1. Commands and replies have the following format:

STX(02 h)	Command or reply code (+ data)	Check field	CR(0D h)
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Currently supported commands (with their check field already calculated and shown in gray) are shown below (without STX and CR):

Switch the relay on (relay enable)	“RE68”
Switch the relay off (relay disable)	“RD69”
Get current noise level	“NB1”
Get firmware version	“VA9”

The GP90A can issue the following replies:

Command acknowledged	“ABE”
Command acknowledged, data returned	“AnnnXX”*
Invalid command	“CBC”

- Current noise level is returned as a HEX value from 0 to 3FF. If there is no major interference the GP90A returns the value in the 50-100 range. If the noise is higher than 100 then this will probably affect the reading range of the GP90A.

(10) Firmware Download Mode

Internal firmware of the GP90A can be upgraded in the field. The download is performed through the serial port (9600, N, 8, 1). To download a firmware file you'll need any PC software that supports an XMODEM communications protocol (checksum version). Procedures below assume the use of *HyperTerminal* for Windows:

- Power the GP90A off
- Connect the RS232 port of the GP90A to the COM port of the PC
- Ground the “enable firmware download” wire of the GP90A
- Launch the *HyperTerminal* and configure it for an appropriate COM port with communications parameters set to 9600,8,N,1.
- Choose *Transfer* → *Send file* from the *Main* menu- the *Send file* dialog will appear
- In the *Send file* dialog, select the firmware file that you want to download into the GP90A and choose the *Xmodem protocol* from the *Protocol* drop-down box. Click *OK* when finished
- Power the GP90A up- the download will begin
- Green status LED of the GP90A will blink during the download
- When the download is finished, disconnect the “enable firmware download” wire from the ground and switch the GP90A off and back on again
- If, when you power the GP90A up after the download, both Green and Red status LEDs start blinking rapidly then this means that you have downloaded a wrong file or that the download process was not completed.

A number of errors can occur during the download. These errors are displayed by the Red status LED:

1 long "blink"	Communications timeout (check baudrate, protocol)
1 long + 1 short "blink"	Communications error (check baudrate, protocol)
1 long + 2 short "blinks"	Invalid data file (check which file you are downloading)
1 long + 3 short "blinks"	Hardware failure (this GP90A is malfunctioning)

(11) Data output formats

Magstripe interface, simulated to 38 IPS (inches per second)

10 leading zeros	SS	Data (14 digits)	ES	LRC	10 trailing zeroes
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Wiegand interface (26-bit format):

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
P	S	S	S	S	S	S	S	S	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	P
P	E	E	E	E	E	E	E	E	E	E	E	E	E												
														O	O	O	O	O	O	O	O	O	O	O	P
Summed for even parity (E)													Summed for odd parity (O)												

P- parity (Even/Odd), S- site bits, C- card data

Serial interface (9600,N,8,1)

STX (02h)	Data (10x "hex" ASCII chars)	CR (0Dh)	LF (0Ah)	ETX (03h)
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(13) Specifications

Interfaces	Magstripe, Wiegand (24 bits), RS232, RS485 (9600,N,8,1)
Nominal reading range (with high-quality ISO-size RFID card in a noise and metal-free environment)	~90 cm
RFID (proximity) cards accepted	125KHz, 64 bits, Manchester encoding
Maximum power switched by internal relay	Up to 24V/2A
Operating temperature range	-10 ~ +60 C°
Dimensions	420x320x45mm
Packing carton dimensions (carton includes power adaptor and PS90A power supply)	485x475x100 mm
Gross packing weight (with power adaptor and power supply):	2.3 kg