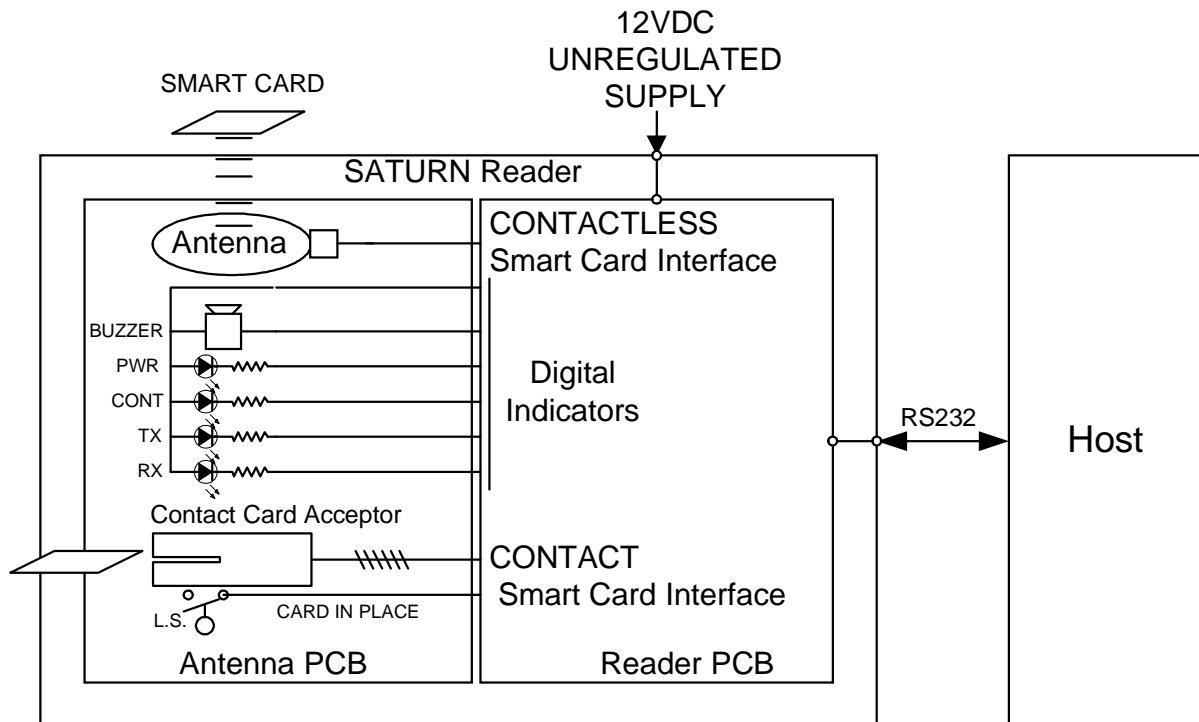


*Saturn Reader*  
*Operational description*



# 1. Product Overview

## 1.1 Product Description



**Figure 1-1: SATURN Reader System Block Diagram**

The SATURN Reader is an inexpensive, compact radio frequency communications electronic interface unit. With bi-directional contact & contactless communication to smart cards and RS232 communication to local controllers, the SATURN reader is the key stone in contactless smart card systems.

The SATURN Reader can be integrated into existing systems. Using RS232 serial communication interface between reader and Host, the Saturn allows **bi-directional, full duplex** communication between the Host and passive, contactless smart card.



The SATURN OEM Reader Board serves as a smart interface unit between the application controller and:

1. ISO14443 Type B Contactless smart cards.
2. SAM Secured Applications Module
3. Contact smart cards.

#### **Contact cards**

The SATURN provides interface (T=0 and T=1) between the contact card and the Application Controller. Communication with the contact card acceptor is TTL NRZ.

#### **Contactless Cards**

At the Host's command, the SATURN generates and modulates a 13.56 MHz carrier signal for the transmission of power, commands and data to an in-range smart card. Read and write operations have equal data rates and range.

#### **Secured Transactions**

Secured Purse to Purse transactions can be achieved either between a Contact card and a Contactless card or between cards (contact or contactless) and an "on board" SAM Secured Applications Module

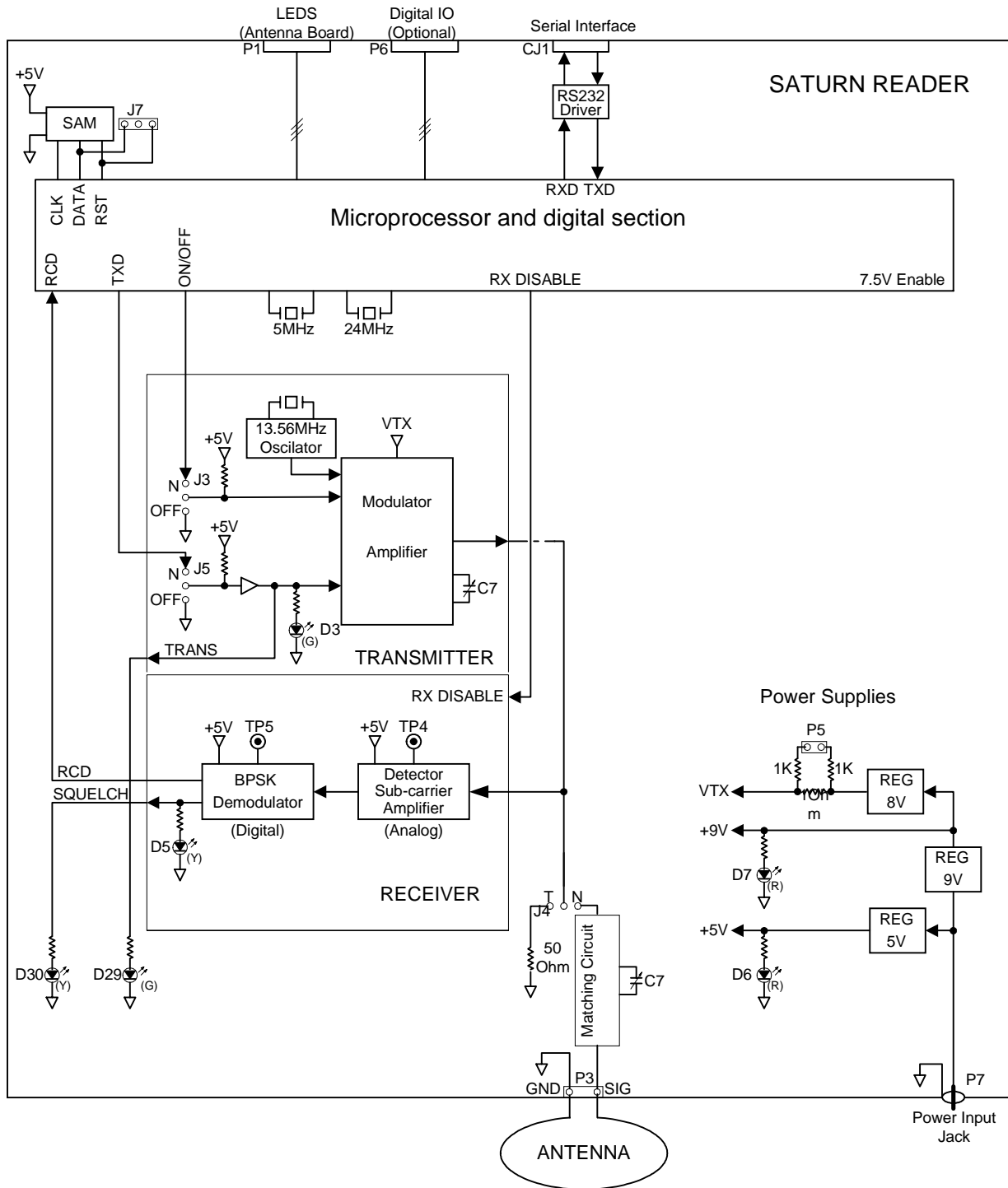
#### **Indicator LEDs**

Nine on board indicator LEDs are provided. (see **Error! Reference source not found.**)

#### **Digital IO**

The Saturn provides interface to an external contact card acceptor as well as external indication LEDs and user configurable sink type digital IO.





**Figure 1-2: SATURN Reader Schematic Diagram**



## **1.2 Product Features**

- Bi-directional radio frequency interface between Host and Contactless Smart Cards
- Bi-directional interface to Contact Smart Cards
- Flexible, software configurable microcomputer-based design.
- Integrated, sophisticated Smart Card Operating System on board.
- High security encryption system (DES/RSA) in the board's Operating System (with SAM option on-board).
- 13.56 MHz transmission frequency conforming to ISO 14443 standard.
- ISO 14443 Type B transmission of commands and data to/from the card.
- Equidistant read/write transaction operation.
- Proximity range - up to 6 cm.
- Signal penetrates virtually any non-conductive material - no contact or line-of-sight required.
- Bi-directional data transmission from/to the EYECON at 50/106 kbps.
- RS232 Communications interface to Host computer.
- SAM "on-board" option.
- Simultaneous transmission of power and bi-directional read write messages, through its antenna, to the passive smart card.
- Indicator LEDs for Power, Card Detected, RF Transmit/ Receive.
- Flash programmable digital IO.
- Operating temperature range 0°C to 70°C (32°F to 158°F).
- Single 12V 500mA non-regulated power supply.
- Firmware stored in on-line programmable Flash memory.



## 1.3 Product Specifications

**Table 1-1: Performance/Electrical Specifications**

<ul style="list-style-type: none"> <li>■ Contactless Read/Write Range:</li> </ul>	Up to 6 centimeters with Contactless Smart Card (depending on card type and orientation).
<b>■ RF Interface:</b>	
RF Carrier Frequency	13.56 MHz
RF Output	200mW
Output Short Protection	Built-in (continuous)
RF Data Operations	Half duplex
RF Data Transmission Rate	50/106 kbps
Data Error Checking	Message Length, Parity, Frame , Bits , CRC.
<b>■ Contact Card Interface</b>	
Data line	TTL level
Reset line	Bi-directional, Half duplex
Clock	5MHz
Data Error Checking	Message Length, Parity, Frame , Bits , CRC.
<b>■ Host Data Communications Interface</b>	
<b>■ TTL NRZ/ RS232</b>	
<b>■ Signals</b>	
Bit/Byte Protocol	Transmit, receive
Data Error Checking	Async (start/stop), bit serial, full duplex, 9600/38400 baud; data byte=8 data bits, no parity, 2 stop bits, full 8-bit binary data
Connector/Cable	Message Length , Parity , Frame , Bits , CRC.
	Standard connectors on board
<b>■ Indicators:</b>	
+5V Power	Red LED
+9V Power	Red LED
Transmit	Green LED (x2)
Receive B	Yellow LED



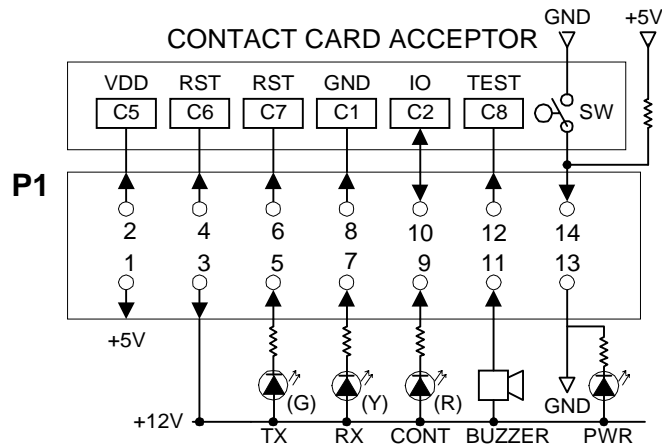
**Performance/Electrical Specifications (continued)**

■ <b>Digital I/O:</b>	Serial TTL Level
■ <b>Microprocessor Circuit</b>	
Microprocessor	80C32 - PLCC - 24MHz
XTAL	24 MHz
FLASH MEMORY	128Kbyte
RAM	8Kbyte
LOCK-UP PROTECTION	Watch Dog Timer
■ <b>Electronic Board Power Requirements:</b>	
	12VDC @ 500mA (non-regulated)
Maximum Current Draw	300 mA
■ <b>Mechanical:</b>	
Dimensions	125x102x20mm
Weight	100 gr.
Vibrations	10 ÷ 200 Hz @ 2.0G
<b>Environmental</b>	
■ <b>Temperature:</b>	
Operating	0° to 70°C (32° to 158°F)
Storage	-25° to 85°C (-13° to 185°F)
■ <b>Humidity:</b>	
	5 to 95% non-condensing
■ <b>Tuning</b>	
	RF output filter SQUELCH
■ <b>Secured Applications</b>	
	Secured applications with SAM option



## 1.4 Digital IO Connectors

### 1.4.1 Antenna Board Connector P1



**Figure 1-3: Antenna Board Connector P1**

*Pin 1* - +5Vdc out.

*Pin 3* - +12Vdc out. Output common

*Pin 5* - Transmit LED output. (Sink)

*Pin 7* - Receive LED output. (Sink)

*Pin 9* - Contact card in place indicator. (Sink)

*Pin 11* - Buzzer output. (Sink)

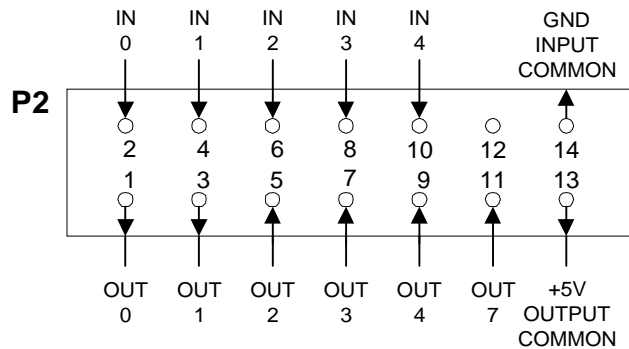
*Pin 14* - GND.

*Pins 2,4,6,8,10,12* - Connections to contact card acceptor.

*Pin 14* - Input from "contact card in place" indicator switch.



## 1.4.2 Optional I/O Connector P2

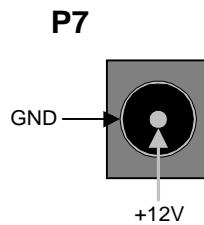


**Figure 1-4: I/O Connector P1**

- Pins 1,3,5,7,9*, - Programmable digital outputs 0 to 4. (Sink)
- Pin 11* - Programmable digital output 7. (Sink)
- Pin 13* - +5V (output common).
- Pins 2,4,6,8,10* - Programmable digital inputs 0 to 4. (Sink)
- Pin 12* - Not connected.
- Pin 14* - GND (input common).

## 1.5 Power Connection

### 1.5.1 Power input Jack P7



**Figure 1-5: SATURN Power Input Jack**

Power supply to the SATURN OEM reader is made via 2.5mm input jack P7. (+V connected to center pin)



## **2. Jumper & Mode Settings**

### **2.1 Transmission Jumper J1**

- 1) N position - normal microprocessor controlled data transmission.
- 2) Off position - no RF signal.
- 3) No jumper - constant RF signal.

### **2.2 Transmission Modulation Jumper J3**

- 1) Normal position (N) - normal microprocessor controlled data modulation.
- 2) 80% position (OFF) – Carrier level at 80%.
- 3) No jumper – Carrier level at 100%.

### **2.3 Antenna Jumper J4**

- 1) Normal position (N) - transceiver connected to antenna.
- 2) Resistor position - transceiver connected to 50Ω load.
- 3) No jumper - Transceiver disconnected.

### **2.4 Transmitter Carrier Jumper J5**

- 1) Normal position (N) - normal microprocessor controlled carrier transmission.
- 2) Off position - no carrier transmission.
- 3) No jumper - constant carrier transmission.



## **2.5 Normal Operation Jumper Settings**

- 1) Jumpers J1, J3, J4 and J5 should be placed in N position

## **2.6 Selection of Operating Mode and Baud Rate**

The operating system mode and baud rate settings may be changed during operation by transmitting the following ASCII strings:

- 1) MODE0 - switches from Host Mode to OEM Mode.  
MODE0 → Response M0
- 2) MODE1 - switches from OEM Mode to Host Mode.  
MODE1 → Response M1
- 3) BAUD0 - switches to 9600-baud rate.  
BAUD0 → Response B0
- 4) BAUD1 - switches to 19200-baud rate.  
BAUD1 → Response B1

