Saturn 5000
User Manual

Preliminary

On Track Innovations Ltd**.**
(O T I)

Confidential & Proprietary

Revision History

Version	Description	Date	Author
Preliminary	First draft	23-February 2004	Avner
Preliminary	Added mounting options and minor changes	24 February 2004	Avner
Preliminary	Added mounting options and minor changes	01 March 2004	Avner
Preliminary	Added explanation on options	07 March 2004	Avner
Preliminary	Added power supply requirements and contact information	16 January 2005	Avner
Preliminary	Edit: ▪ Power supply requirements ▪ FCC compliance statement ▪ RF power output to 400mW	28 January 2005	Hemy

FCC Compliance

This device (Saturn 5000) complies with Part 15, of the FCC Rules.

Operation is subject to the following two conditions:

1. **This device may not cause harmful interference, and**

2. **This device must accept any interference received, including interference that may cause undesired operation**

   NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generate, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
   -- Reorient or relocate the receiving antenna.
   -- Increase the separation between the equipment and receiver.
   -- Connect the equipment into an outlet on a circuit different
      from that to which the receiver is connected.
   -- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications in this equipment, not expressly approved by the party responsible for compliance (On Track Innovations Ltd,) could void the user's authority to operate the equipment.

FCC ID: JNX-OTI-SAT5000

Responsible Party:
OTI America Inc.
1601 South DeAnza Blvd.
Cupertino, CA95014
USA
Phone: 408-252-0333

NOTICE

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Table of Contents

1   Introduction

OTI's SATURN 5000 is a sophisticated stylishly designed contactless card reader designed for contactless payment and loyalty applications providing unsurpassed cost to performance value.

The reader communicates with ISO14443A&B and Mifare cards and supports major financial contactless card programs including MasterCard's' PayPass™.

The Saturn 5000 employs OTI's patented matched antenna technology to provide:

- Highly efficient power to card transfer
- Reliable and stable reader/card communication

The Saturn 5000 is a combined microprocessor based ISO14443 A&B proximity transceiver with on board antenna, indicator leds and buzzer in a plastic enclosure H - 6.4" (163.5mm), W – 4.2" (105mm), D – 0.75" (19mm)

The reader is designed as an on-counter device with mounting holes for connection to various stands. Reader can also be mounted behind glass allowing contactless communication with contactless cards and tags through the glass.

Unit rating

- Nominal supply: 12V DC, 200mA
- Allowed supply range: 7-15VDC/2.4W

Power Supply requirements

An external AC/DC adaptor is required with the following specifications:

- Input Voltage: 120VAC/60Hz or 230VAC/50Hz according to the destination country national electrical code.
- Output voltage: 12VDC.
- Output current: 250-800ma.
- Connector: Round polarized connecter with the following polarity:

Additional requirements for the AC/DC adaptor:

- Class 2.
- 60950 safety approved
- UL approval for USA/Canada.

Interface Options to POS Terminal via serial communication

- RS232
- RS485
- USB

Interface Options to POS Terminal via Magnetic Stripe Reader (MSR)

- MSR PS2
- MSR RS232
- Magnetic card emulator

Note:

A specific reader model supports one serial communication option and optionally one MSR interface option.

Standards

- ISO14443 Type B&A (including Mifare) compliant
- FCC part 15 and EN 301 489-3 compliant
- PayPass™ compliant

1.1 Reader with PayPass™ Application

When the reader detects a valid PayPass™ card at its antenna it reads track 1 and track 2 data stored in the contactless chip. If the data is valid the reader gives audiovisual indication and communicates the track data to the merchant's POS system.

Four programmable LEDs behind a transparent cover on top of the reader give status indication. Led at far left indicates system ready, other three leds and buzzer indicate data read successfully from valid card.
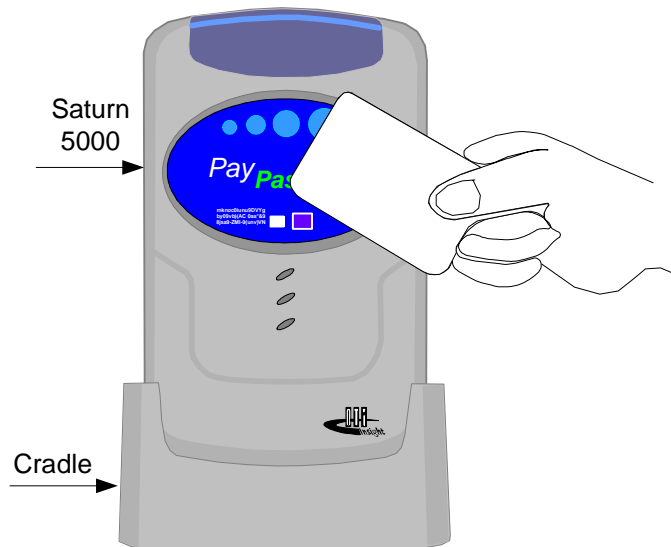An oval PayPass™ sticker covering the area over the reader's antenna indicates where card should be presented.

Figure 1-1: Card Presentation

2 Technical Specifications

2.1 Product Features

- Bi-directional radio frequency interface between Host and Contactless 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.
- Simultaneous transmission of power and bi-directional read write data to the passive Contactless smart card.
- ISO 14443 Type A/B and Mifare cards support.
- Equidistant read/write transaction operation.
- Signal penetrates virtually any non-conductive material - no contact or line-of-sight required.
- RS232/485 & USB Communications interface to Host.
- PS2 or RS232 Magnetic Stripe Reader support.
- Magnetic Stripe Emulation Coil support.
- Up to two EMV2000 compliant "on-board" SAMs.
- Four programmable indicator LEDs and buzzer.
- Compliance with FCC Section 15 and I-ETS 300 330 emission limit requirements.
- Operating temperature range -20° to 70°C (-4° to 158°F).
- Power input from 7.0 to 15VDC/2.2W.
- In system programming of reader firmware to 128KB flash memory via standard RS232/485/USB communication.
- Optional outputs via RJ45 connector for four external LED indicators.
- Embedded watchdog timer and full reset on brownout.

2.2 Product Specifications

Table 2-1: Performance/Electrical Specifications

■   RF Interface:

RF Carrier Frequency	13.56 MHz
RF Output	400 mW
Output Short Protection	Built-in (continuous)
RF Data Operations	Half duplex
ISO 14443 A&B and Mifare	Full compliance

■   SAM/ Contact Card Interface (up to two channels)

EMV 2000	
Data line	Bi-directional, Half duplex
Reset line	
Clock	5MHz (up to 10MHz@EMV2000)

■   Communication Links

RS232 (up to two channels)/485

Signals	Transmit, receive
Bit/Byte Protocol	Async (start/stop), bit serial, (, full duplex. @ 232, half @ 485); data byte=8 data bits, no parity, 2 stop bits, full 8-bit binary data Flexible protocol. Client defined baud rate (up to 57,600 baud)
Data Error Checking	Message Length, Parity, Frame-bits, CRC.
Connector/Cable	Standard connectors on board RJ45 for RS232, RS485

USB
Fully 1.01 compliant

Connector cable	Standard USB Device (B) connector
USB "Good link" indication	Green LED

Performance/Electrical Specifications (continued)

■   Indicators:

Four programmable onboard LEDs	
Buzzer	

■   Microprocessor Circuit

Microprocessor	80C32 − QFP44 - 24MHz
XTAL	24 MHz
FLASH MEMORY	128Kbyte
RAM	32Kbyte
LOCK-UP PROTECTION	Watch Dog Timer

■   Electronic Board Power Requirements:

From 7.5 to 15VDC	Onboard switching power supply
Maximum Power consumption	2.2W (RF signal ON)

■   Mechanical:

Dimensions	H-- 6.4" (163.5mm) W - 4.2" (105mm), D − 0.75" (19mm)
Weight	190 gr.
Vibrations	10 ÷ 200 Hz @ 2.0G

Environmental

■   Temperature:

Operating	-20° to 70°C (-4° to 158°F)
Storage	-45° to 85°C (-49° to 185°F)

■ Humidity:	5 to 95% non-condensing
■ Tuning:	NON
■ Regulatory Compliance:	EMC directive 89/336/EEC I-ETS 300 330 FCC Section 15 (US) certified
■ Secured Applications	Secured applications with SAM option. (Up to two SAMs)

3 Reader Interface options

3.1 Reader Connectors
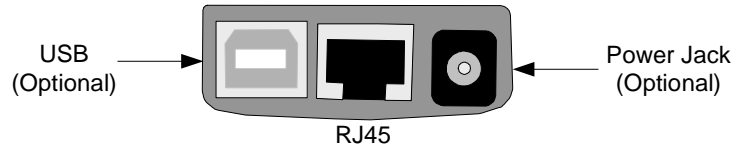
3.2 RS232 Interface

RS232 port can be used to send track data directly to POS terminal or concentrator via serial RS232 communication. Software integration with POS is required.
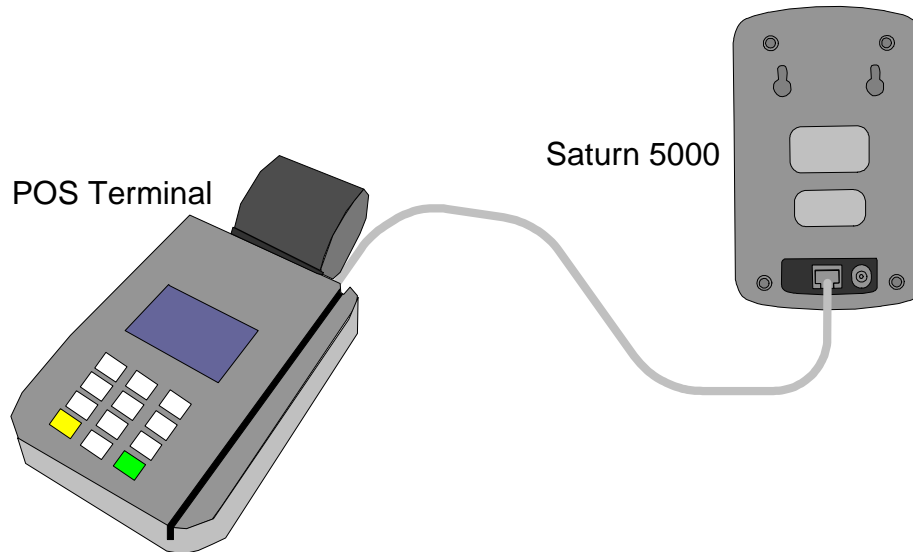

Figure 3-1: RS232 Interface

3.3 Magnetic Card Emulator Coil Interface

The reader uses the MSR coil interface to emulate magnetic card signals to the POS terminal's magnetic reader head. The POS terminal sees this data as standard track data read off the cards magnetic stripe. The coil insert unit is very thin allowing parallel use of standard magnetic stripe cards.

The advantage of this interface option is that it is a plug and play add on to any existing POS systems supporting magnetic stripe cards and requires no integration effort.
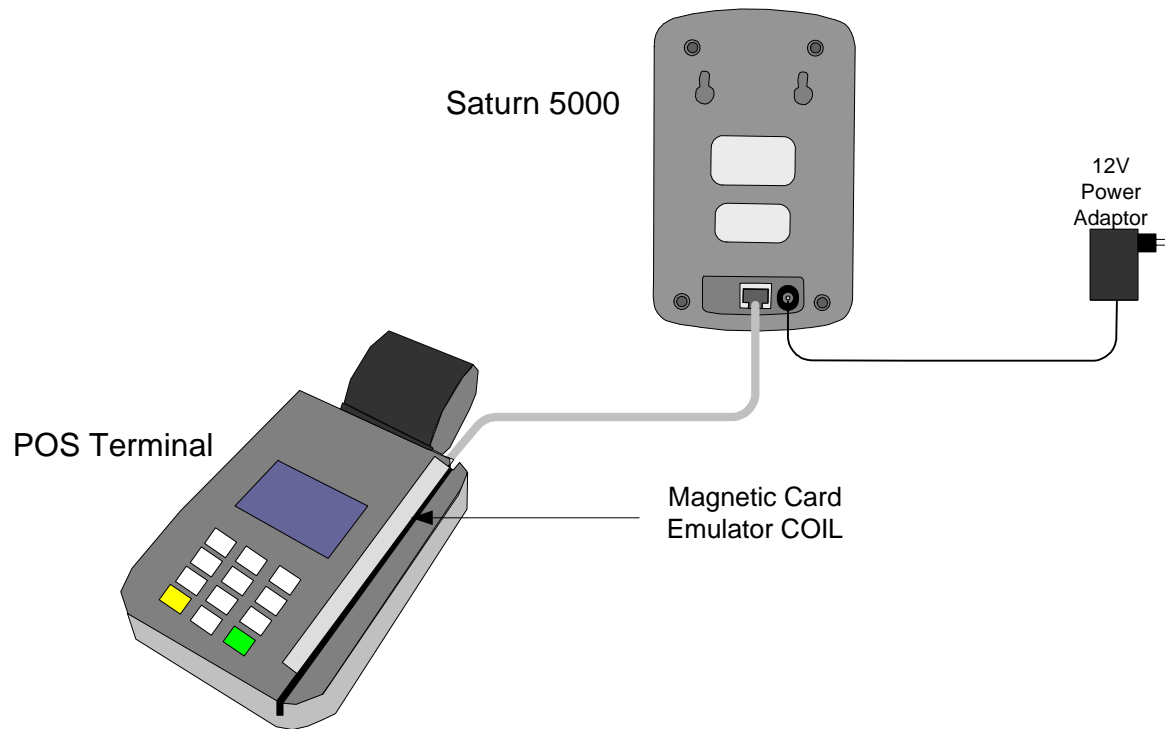
Figure 3-2: Magnetic Card Emulator Coil Interface

3.4 MSR-PS2 Interface

The reader uses the MSR-PS2 interface to emulate MSR message to the POS terminal. The POS terminal sees this data as standard track data read off the cards magnetic stripe. Functionality of PS2 MSR with standard magnetic stripe cards is preserved.

This interface is intended for POS terminals with separate PS2 MSR that plugs into POS terminal.

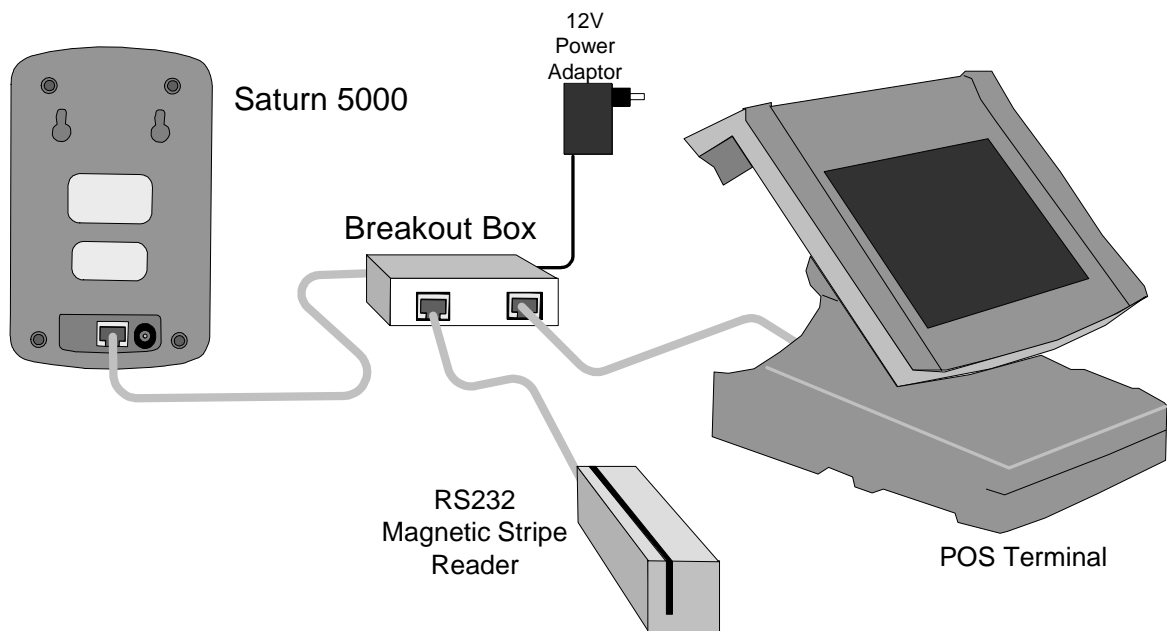The advantage of this interface option is that it leaves the existing MSR free and requires no integration effort.
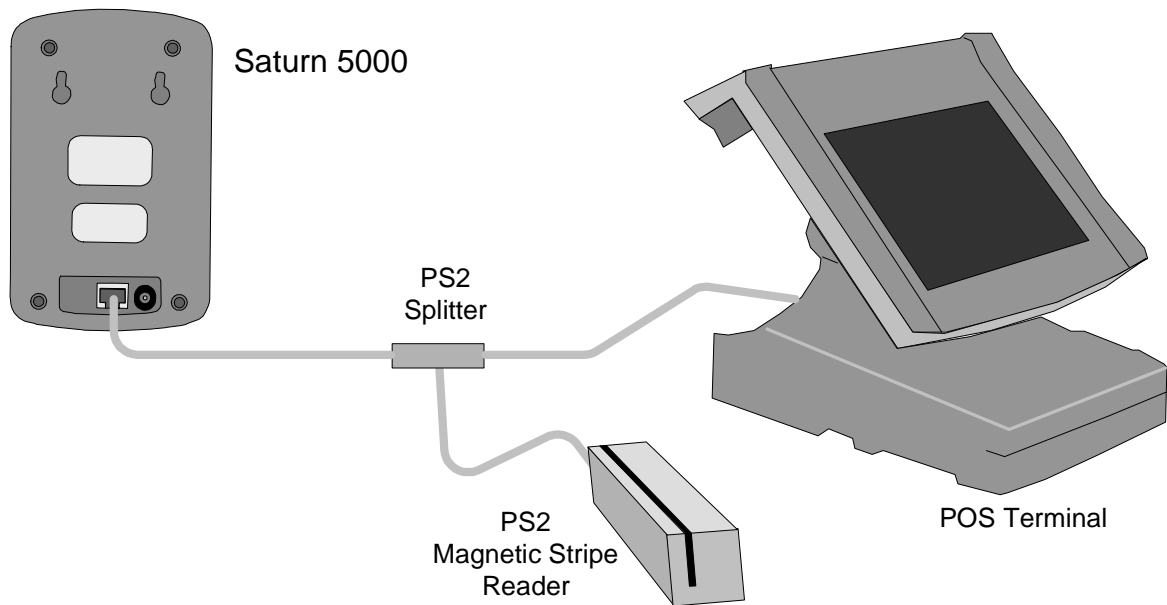
Figure 3-3: MSR PS2 Interface

3.5 MSR-RS232 Interface

The reader uses MSR-RS232 interface to emulate MSR message to the POS terminal. The POS terminal sees this data as standard track data read off the cards magnetic stripe. Functionality of MSR-RS232 with standard magnetic stripe cards is preserved.

This interface is intended for POS terminals with separate MSR-RS232 that plugs into POS terminal.

The advantage of this interface option is that it leaves the existing MSR free and requires no integration effort.

Figure 3-4: MSR RS232 Interface

3.6 MSR Head Interface

The reader uses the MSR head interface to emulate MSR head signals sent from the MSR head to the POS terminal. The POS terminal sees this data as standard track data read off the cards magnetic stripe. Functionality of MSR head with standard magnetic stripe cards is preserved.

This interface is intended for POS terminals like the Radiant with a magnetic head that plugs directly into POS terminal with out PS2 or RS232 convector.

The advantage of this interface option is that it leaves the existing MSR free and requires no integration effort.
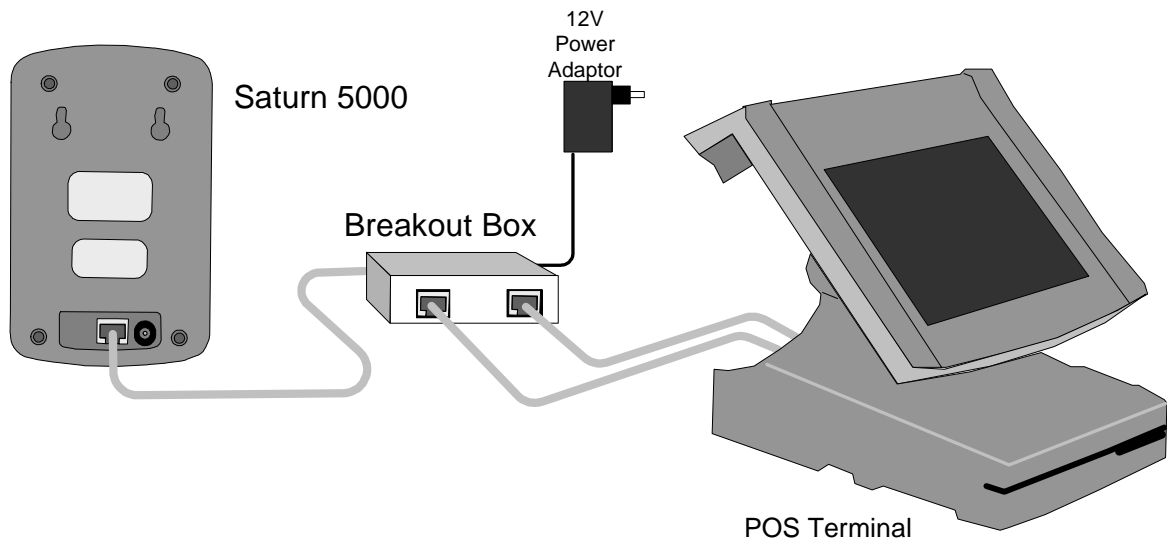
Figure 3-5: MSR Head Interface

4 Wiring Diagrams

4.1 RS232 Wiring
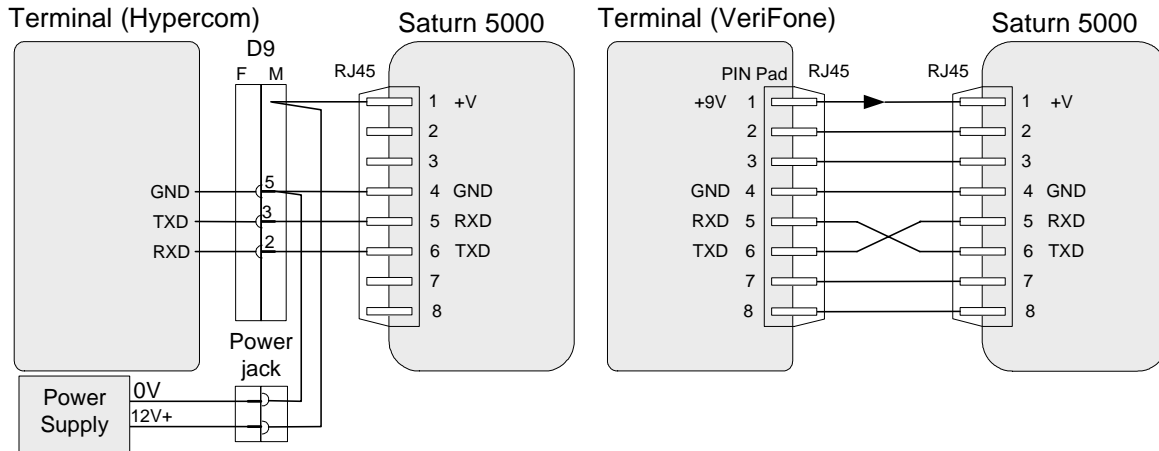
Figure 4-1: RS232 Wiring

4.2 Magnetic Card Emulator Coil Wiring
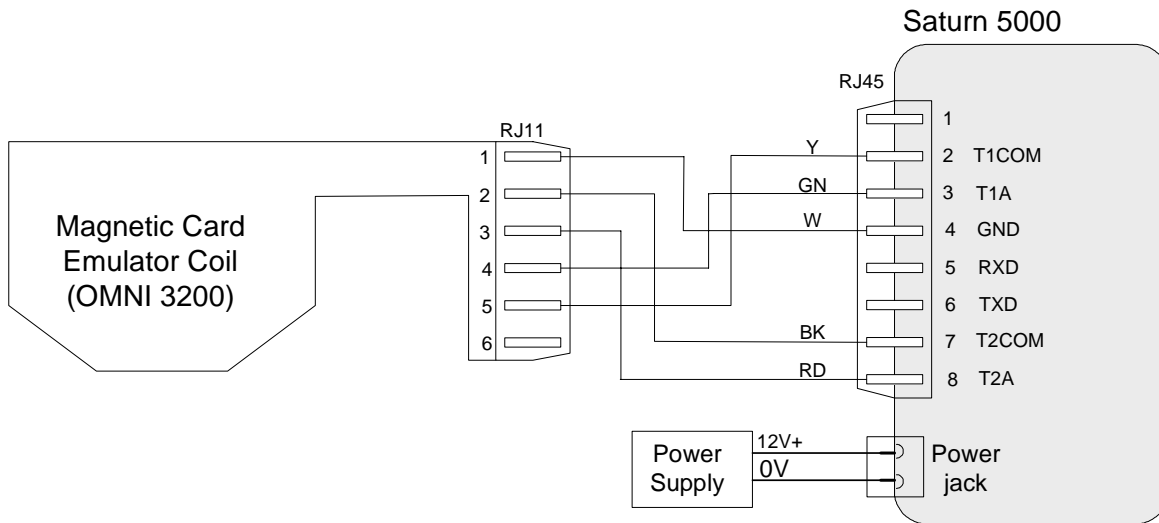
Figure 4-2: MC Emulator Coil Wiring
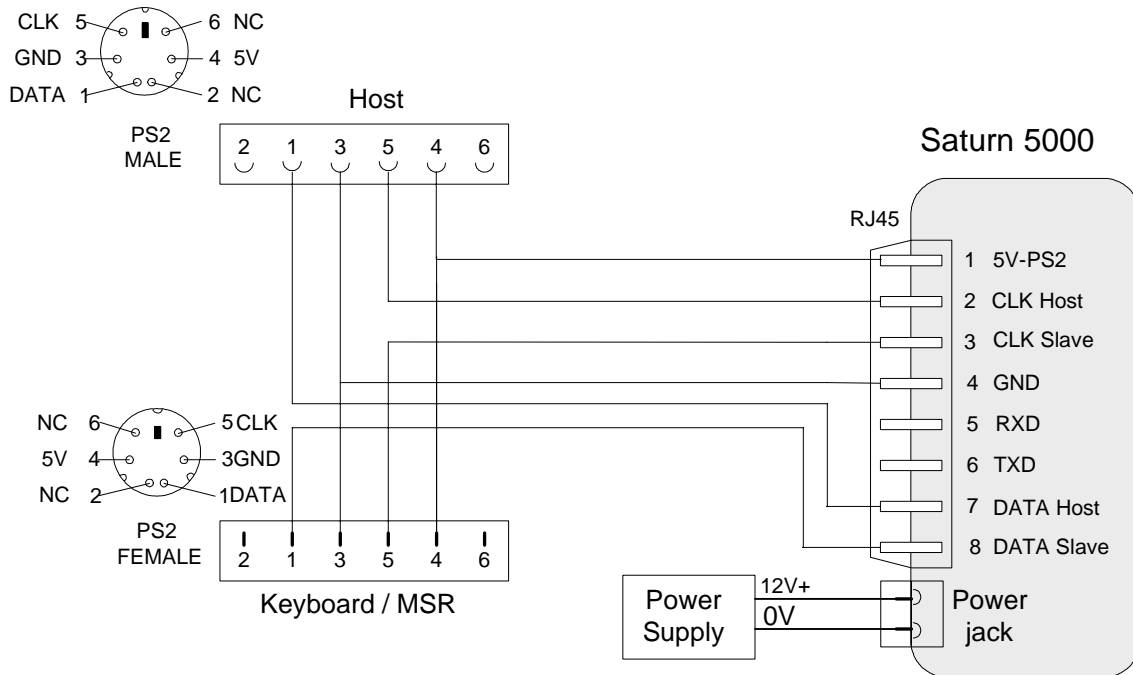
4.3   MSR PS2 Wiring

Figure 4-3: MSR PS2 Wiring
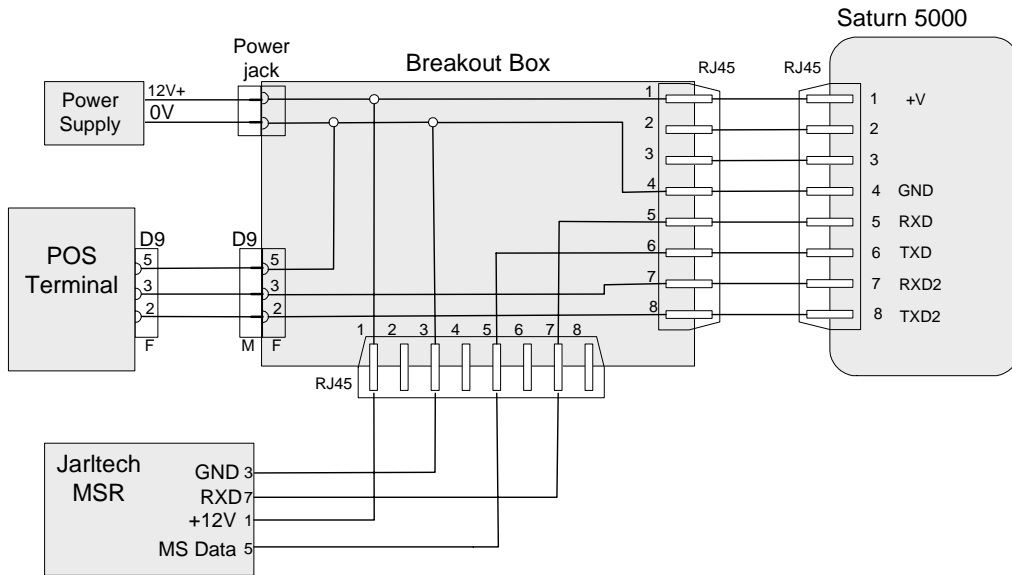
4.4   MSR RS232 Wiring

Figure 4-4: MSR RS232 Wiring

5 Mounting Options

The Saturn 5000 comes with a cradle for easy counter top applications. Cradle is also used for mounting reader behind glass

Two mounting holes in back of reader are intended for optional mounting on various metal stands supplied by others or for mounting on wall.

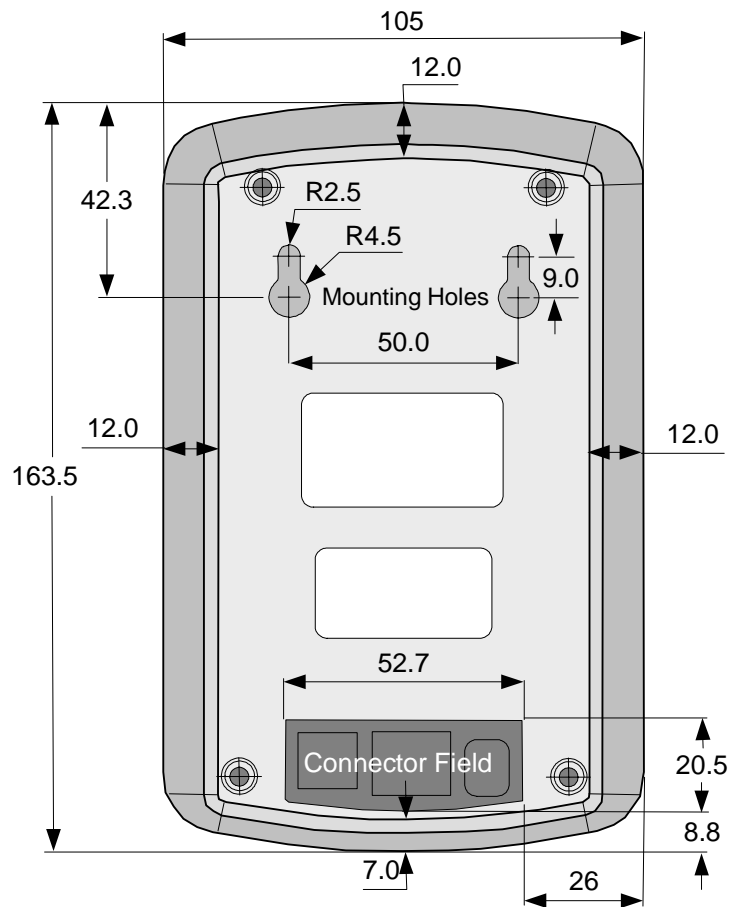## 5.1 Mounting Holes and connector field layout

Note: All dimensions in millimeters

Figure 5-1: Mounting holes and connector field layout

5.2 Cradle Mount – Counter Top

Place the cradle at desired position on counter.
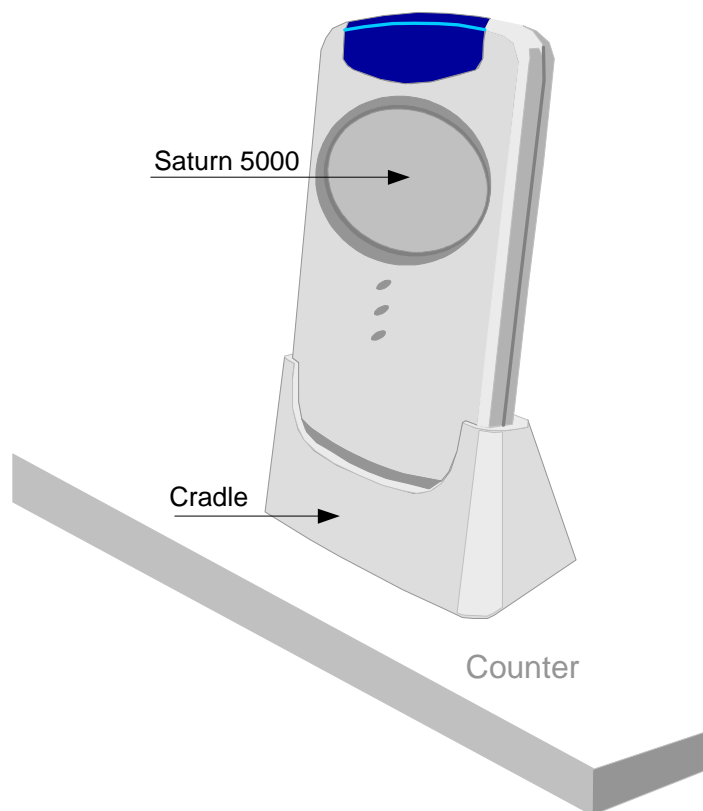
Slip Saturn 5000 into cradle.

Figure 5-2: Cradle

5.3 Cradle Mount - Behind Glass

Glue cradle to glass with double side adhesive.
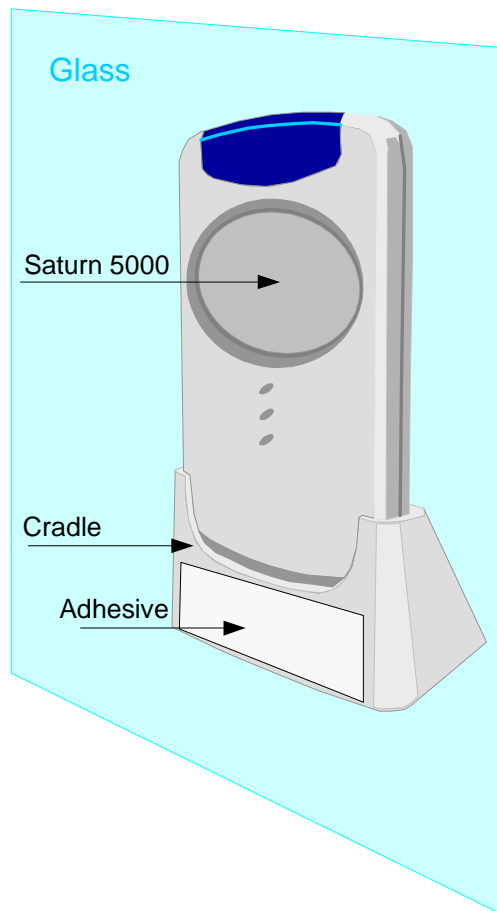
Slip Saturn 5000 into cradle.

Figure 5-3: Behind Glass

5.4 Metal Stand Option

The Saturn 5000 reader can be connected to a metal stand for optional counter top mounting.

The metal stand for this option is not supplied with the reader.

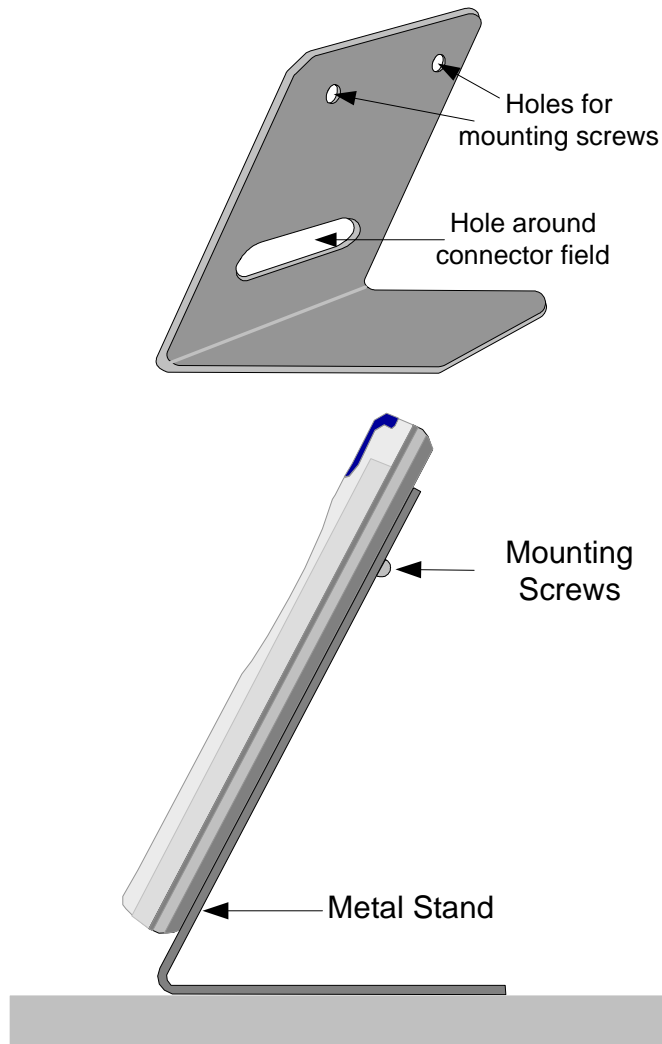See Figure 5-1 for position of connector field and mounting holes.

Figure 5-4: Metal Stand

5.5   Wall mount option

Mounting hole at back of reader see Figure 5-1 can also be used for wall
mounting. A metal wall mount bracket as shown in Figure 5-5 below is
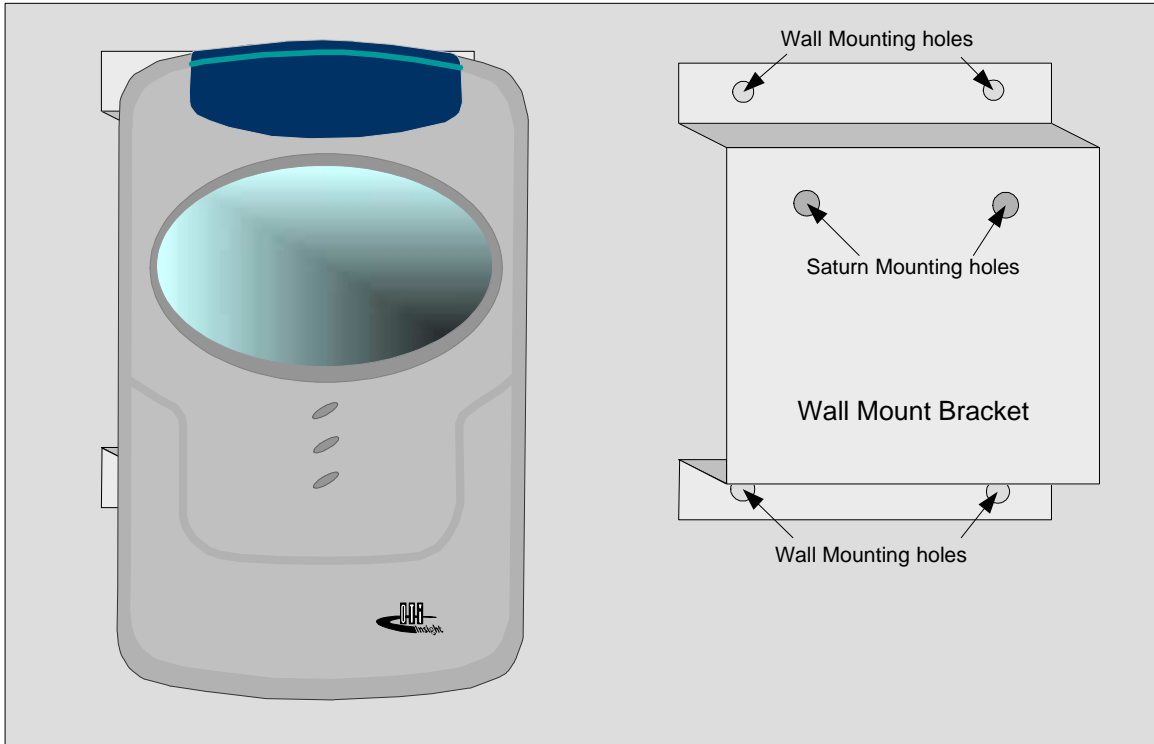suggested.

The metal wall mount bracket is not supplied with reader.

Figure 5-5: Wall Mount Option