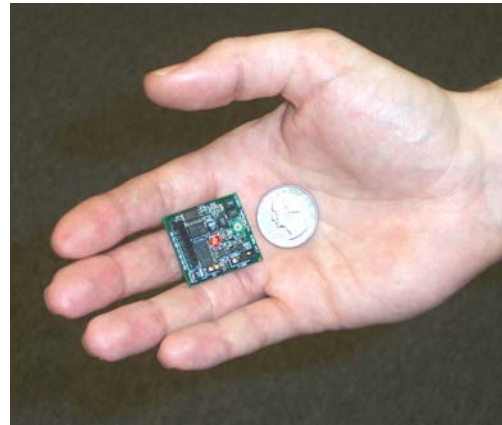




MICRO-1356 MULTI-PROTOCOL READER

The Micro-1356 reader is a miniature multi-protocol RFID reader suited for embedded applications, such as handheld readers or door key card readers. The Micro-1356 has a built-in antenna, but can easily be used with an external antenna as well. The Micro1356 is easy to interface with serial RS232 or USB using simple ASCII text commands. A small yet powerful command set makes this reader useful for many applications.



Unique Features:

- Multi protocol: EPC, i-Code, ISO15693, ISO14443A, and Tag-It
- Reader can automatically identify the protocol of the tag being read
- Functions as both a reader AND a tag emulator for bi-directional near field communication (NFC protocol)
- Programmable reader ID code for networking many readers together
- Your custom reader settings can be saved in EEPROM so the reader will automatically boot-up in the correct mode
- On board EEPROM memory for storing IDs

TagSense, Inc.

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MICRO-1356 BOARD

INTERNAL ANTENNA
(connect 2 left-most pins together)

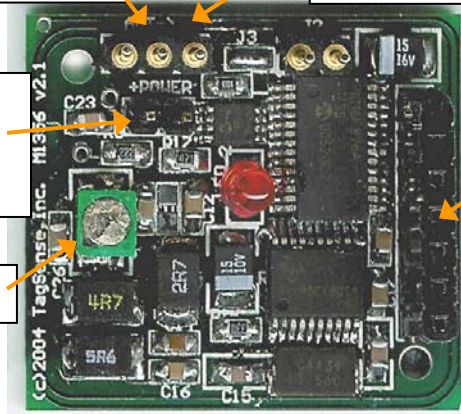
EXT. ANTENNA
(connect to 2 right-most pins)

EXT. POWER
+ 5 Volts to left pin, GND to right pin

TUNING

SERIAL PORT

**PWR
GND
TX
RX**



- **Frequency: 13.56 MHz**
- **Operating Voltage: 3-5 V**
- **Current consumption:**
 - <1mA when idle
 - 80mA when transmitting
- **Protocols Supported:**
 - EPC, i-Code, ISP15963
 - ISO14443A, and Tag-It
- **Payment Protocols:**
 - ISO14443A
- **Data Output:**
 - RS232-TTL built in
 - RS232 and USB external adapters available
- **Small Size: 28mm X 30mm**

To use the internal antenna, place a jumper across the two left-most antenna pins. The tuning capacitor adjusts the resonant frequency of the internal antenna – no extra capacitors necessary. To use an external antenna, attach it to the two right-most pins.

The Micro-1356 uses RS232 TTL-level communication. This enables the tag reader module to easily communicate with any external electronic circuit or device such as a microcontroller using an RS232 serial UART. TagSense also offers RS232 and USB serial adapters that allow the Micro-1356 to communicate with an external computer or remote network.

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MICRO-1356 COMMAND SUMMARY

ASCII Command	Description
p0	multi-protocol reader mode
p1	i-Code
p2	EPC
p3	ISO15693
p4	ISO14443A
p5	Tag-It
t	tag modem mode -near field communication (NFC) protocol
N0	set anti-collision to 1 slot
N1	set anti-collision to 4 slots
N2	set anti-collision to 8 slots
N3	set anti-collision to 16 slots
N4	set anti-collision to 32 slots
N5	set anti-collision to 64 slots
N6	set anti-collision to 128 slots
k / K	start/end reader continuous autoscans
Z	do a single scan (only with autoscans turned off)
d / D	enable/disable continuous data streaming
m / M	enable/disable printing of reader protocol type
i / I	enable/disable printing of reader ID
r	display the reader ID number
R<ID>	set reader ID number
e	display tag emulator ID number
E	set tag emulator ID number
s	display current state of reader
S	save the current state of the reader as the default i.e. it will boot up in this state
W<data>	write <data> to EPC tag (only in EPC [p2] mode)

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GETTING STARTED

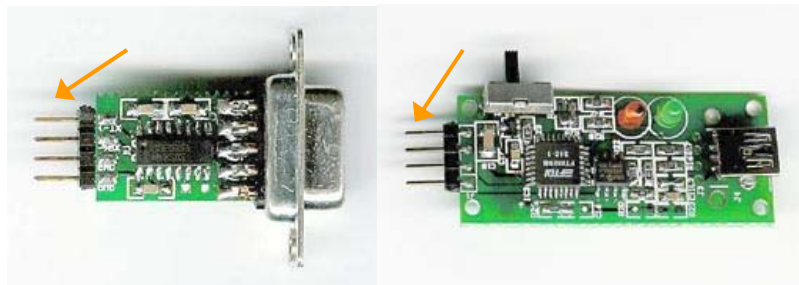
To operate the Micro-1356 using an RS232 or USB serial adapter, start a terminal program such as Hyperterminal with settings of 9600 baud, 8, N, 1, and no flow control. Set the communications port to whichever one the adapter is using. Set the line delay to 150 ms. In Hyperterminal this setting is found in File > Properties > Settings > ASCII Setup...> Line Delay 150 milliseconds.

Using the USB serial adapter:

The drivers for the USB serial adapter can be found at <http://www.ftdichip.com>. Attach the adapter to the USB cable and plug it into your computer. Install the drivers using the Windows Device Manager. Look in the Device Manager under Ports to see which comport the adapter is using (for example COM12). The adapter has an on/off switch, when you flip it on the LED by the switch will light up. Turn the adapter on, and then plug it into the serial port header on the Micro-1356 board. It should go in the four holes labeled V+-GD-TX-RX.

Using the RS232 adapter:

Connect the adapter to the serial port header on the Micro-1356 board. It should go in the four holes labeled V+-GD-TX-RX. Connect an external power supply to the reader.



SERIAL CONNECTOR PIN ORDER:

PWR
GND
RX
TX

When the Micro-1356 is has a serial connection and is powered up it will flash its LED and then print:
TagSense MicroReader v3.6

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USING THE MICRO-1356

Each time the reader reads a tag it will flash the LED and print the tag data. Each line of output data consists of an asterisk (*), followed by the 8 byte reader ID (if enabled), followed by the protocol type 0-5 (if enabled), followed by the tag ID: *<READER ID><PROTOCOL IDENTIFIER><TAG ID>

The number of bytes in the tag ID depends on the type of tag used. Each line of data ends with a carriage return and newline character (“\r\n”).

If you are using the Micro-1356 with a terminal program and see the reader LED flash when you present a tag but do not see any output data in the terminal, this means the reader is working but there is a problem with the serial connection. To reset the connection, in the terminal program, you should disconnect and then reconnect. If you are using Hyperterminal, these commands are under the Call menu.

Notes on the Commands:

p0-p5: Switching the reader mode automatically disables continuous autoscan.

N0-N6: Increasing the number of anti-collision slots slows down the reader.

d/D : The data streaming mode can be set to meet the needs of the application. For some applications, we only want to know when a tag has entered the reader field. In this case, data streaming is turned off. When a tag is detected, its ID will be displayed only once.

In other applications, it is necessary to continuously monitor the tag(s) in the reader field. For example, we may want to know exactly when a particular tag has left the reader field. In this case, the data streaming is turned on, and the tag ID will be continuously printed until the tag leaves the reader field.

S: Once you save the settings using the “S” command, the reader will automatically boot up in that configuration next time it is power on. You do not need to change these settings each time the reader is turned on.

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EXAMPLE #1

If you want to configure the reader to automatically detect the type of tag and report it back, send the following commands to the reader:

<i>p0</i>	put the reader in multi-protocol mode
<i>k</i>	set the reader to continually scan for tags
<i>m</i>	enable printing of tag protocol identifier

If you bring an ISO14443A tag into the reader's field the reader will print:

*4 12345678 (8 byte tag ID)

The number "4" is the protocol identifier. In this case, the reader prints a number "4" to indicate that the tag uses ISO14443A. The remaining number is the Tag ID.

If you want to display the current reader settings, simply send the "s" command to the reader. Below is some sample data output that you would see after sending the "s" command:

p=0	protocol mode
N=4	number of anti-collision slots
L=1	continuous autoscan – 0: disabled, 1: enabled
S=0	continuous data streaming
I=0	printing of reader ID
M=1	printing of protocol type

Once you adjusted the settings of the reader as desired, the configuration can be saved using the upper-case "S" command.

S	save the current configuration in the EEPROM
---	--

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EXAMPLE #2

If you want to write an ID to an EPC tag, the reader must be in EPC mode and autoscan must be OFF.

If you are already reading tags in EPC mode, enter

K disable continuous autoscan.

If the reader is not in EPC mode, enter:

p2 put the reader in EPC mode

Changing the reader mode automatically disables continuous autoscan.

Now place the tag very close to the reader antenna.

Next, we send the write command ("W") followed by the desired 24 byte ID:

W123456789012345678901234

We can verify that the data was written successfully by having the reader scan the tag. Type the following character:

k start auto-scanning for tags

Now, if you bring the tag into the reader's field, and the write was successful, the reader will print the following:

**123456789012345678901234*

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EXAMPLE #3

If you want to use a Micro-1356 as a tag emulator, we use the following command

```
t          this put the reader in emulator mode
```

Now, we can choose the tag ID and write it into memory using the “e” command. For example:

```
e234565
```

Now, if we bring the module near another RFID reader that can read the ISO14443A protocol, the reader will detect the following ID

```
*234565
```

To change the module function from tag emulator mode back to reader mode, we simply select one of the reading modes (p0 – p5) (The p0 command reads all protocols). For example, if we wanted to enter ISO14443A reader mode, we would type the following:

```
p4          ISO14443A reader mode  
k          enable continuous autoscans
```

Thus, by using the commands t and p4, it is possible to have two readers exchange data to each other by alternating between reader and tag functions.

The NFC protocol provides a standard higher-level protocol for coordinating such transfers of information.

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