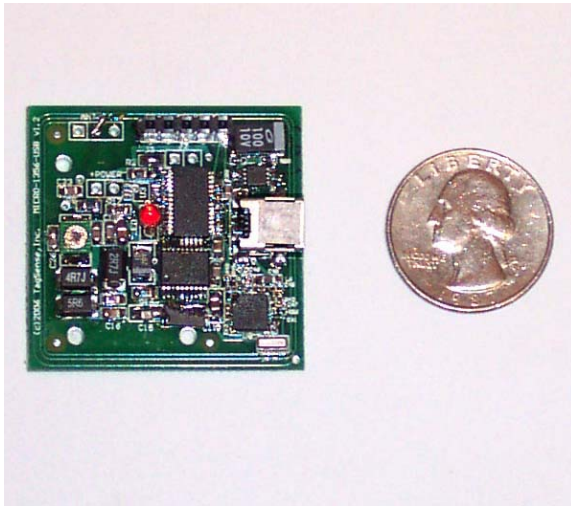




MICRO-1356 MULTI-PROTOCOL READER



The datasheet for the Micro-1356-USB and Micro-1356 readers are the same. The Micro-1356-USB reader is a USB version of the Micro-1356 embedded RFID reader module. The Micro-1356-USB has a built-in antenna, but can easily be used with an external antenna as well. The Micro-1356-USB is easy to interface to any computer program using simple ASCII text commands. A small yet powerful command set makes this reader useful for many applications.

Unique Features:

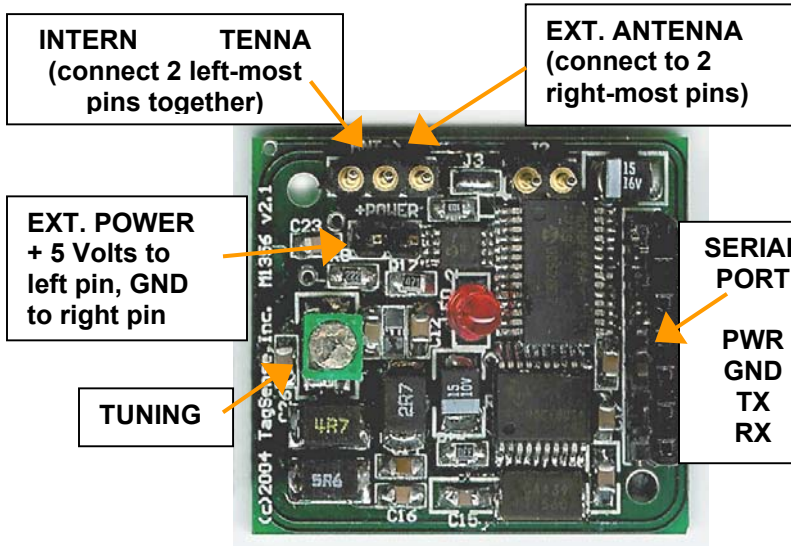
- Multi protocol: EPC, i-Code, ISO15693, ISO14443A, and Tag-It
- Reader can automatically identify the protocol of the tag being read
- Functions as both a reader AND a tag emulator for bi-directional near field communication (NFC protocol)
- Programmable reader ID code for networking many readers together
- 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

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MICRO-1356 BOARD



- 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.

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MICRO-1356 COMMAND SUMMARY

<u>ASCII Command</u>	<u>Description</u>
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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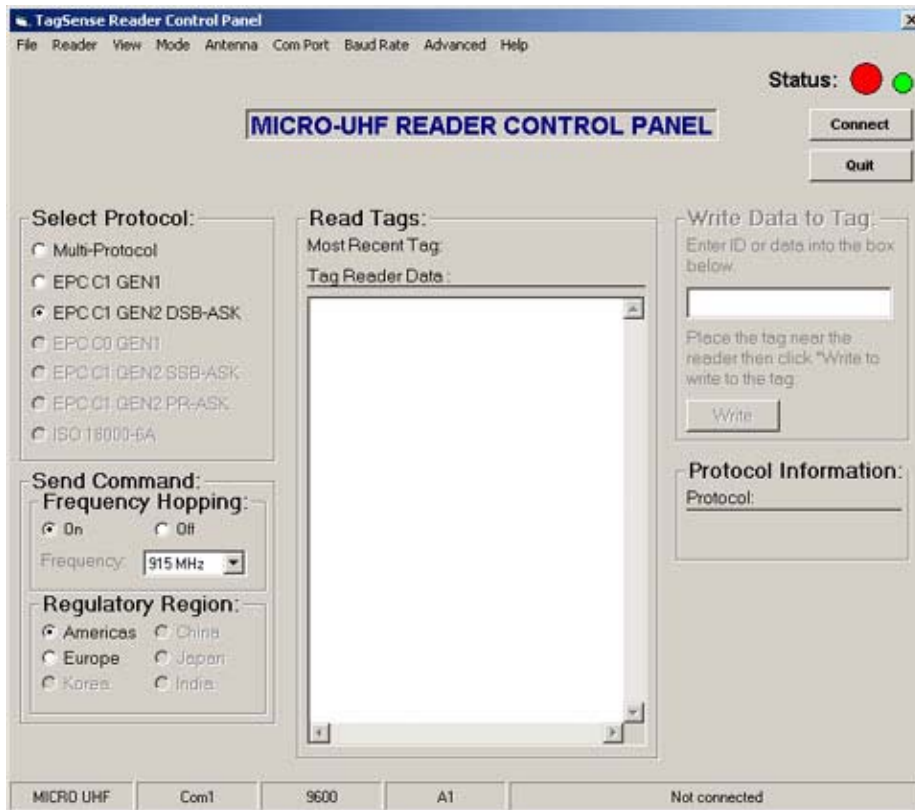
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INTERFACING WITH THE MICRO-1356-USB

There are two ways to interface with the Micro-1356-USB. The simplest way is to use the TagSense Reader Control Panel software, which comes with the Micro-1356-USB Evaluation Kit. To install this software, follow the instructions that come with the CD. Additionally, drivers for the USB Virtual Com Port must be installed (instructions for installing these can also be found on the CD). Linux drivers are also available, although TagSense does not provide any sample code.



Windows Interface

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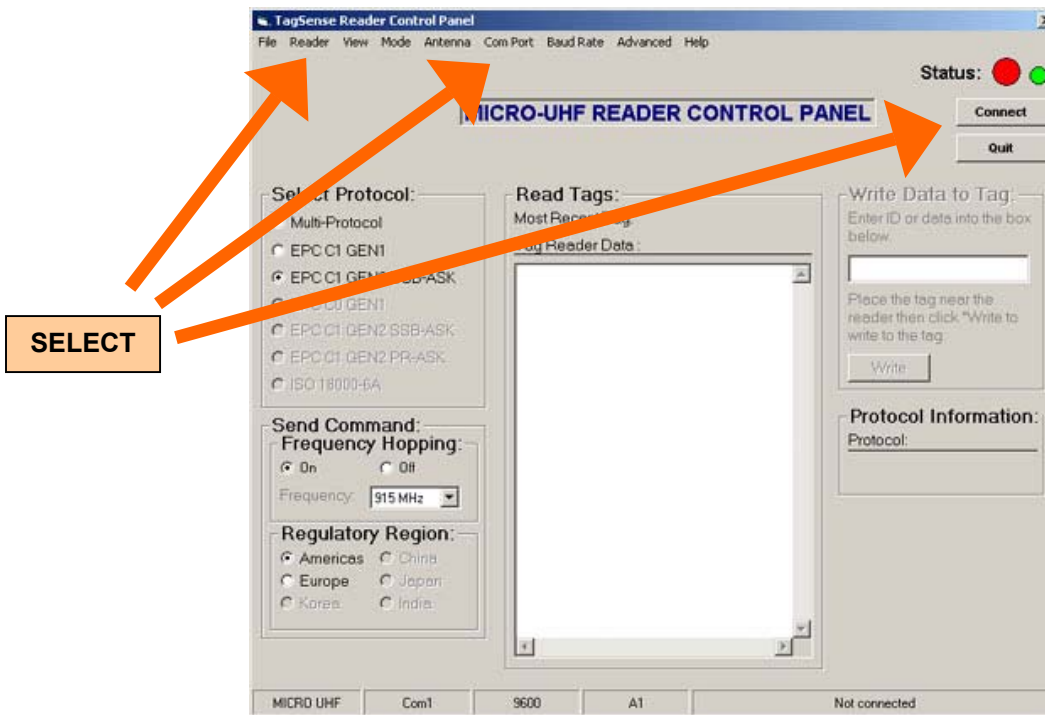
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STARTING WINDOWS DEMO PROGRAM

After installing the USB drivers and the demo program, you can connect the reader to the computer using a USB cable. Please make sure that you have an antenna connected to the reader.

You should open the program (TagSense reader control panel), then go to the Reader menu and select "**MICRO-1356-USB**". Then select the proper COM port for your USB port. If you are not sure, then you can use the USB COM Port locator utility, which is under the HELP menu. You should then verify that the BaudRate setting is correct (9600), then you can click the **CONNECT** button.



Windows Interface

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USING THE MICRO-1356-USB

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-USB 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 window, this means that the reader is working but there is a problem with the PC serial port 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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ADVANCED COMMANDS

Certain electromagnetic conditions, such as a change of antenna, tuning of the antenna, or the presence of metal near the antenna, will affect the strength of the modulations signal received by bit comparator on the receiver section of the tag reader; this will, in turn affect the width of the bit pulses that are output by the comparator. This effect should only be noticeable at the longer reading distances. To compensate for these changes, the Micro-1356-USB also allows fine tuning of its data sampling. The reader is shipped with default settings that should work well for most tags and most situations, and it is not recommend that these settings be changed unless the antenna is changed. However, for advanced users, this is a handy capability.

The Micro-1356-USB also has an operating mode that will automatically sweep over a range of sampling delays (from a to b, where a and b are the min and max delay, respectively). This can be used to help you find the optimum value of the sampling delay for each protocol. The current settings can be viewed by sending the u command to the reader, which returns the following format:

```
1 0e 08 18
2 0f 09 16
3 39 30 40
4 3a 36 3d
5 1a 18 1d
```

The first number in the line indicates the protocol (1 = i-Code, 2=EPC, etc), the second number indicated the value of the delay when sweeping is OFF (e.g. the fixed delay), and the last two numbers in the line indicate the min and max delays, respectively. All of these parameters can be modified by using the set of advanced commands.

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ADVANCED COMMANDS

Command (ASCII)	Description
h/H	enable/disable response sampling delay sweep
a	display minimum sweep sample delay
b	display maximum sweep sample delay
g	display fixed sweep delay
u	display the current sample delay settings
U	save the current sample delay settings as the default i.e. it will boot up with these settings
+	increment the current parameter value
-	decrement the current parameters value

The 'u' command can be sent to the reader regardless of which protocol the reader is currently using (including the p0 multi-protocol mode. However, to change the values of the delay parameters, it is necessary to place the reader in a specific protocol mode.

For example, if we wish to increase the minimum delay parameter for ISO15693, then we must send the following commands:

p3	– this puts the reader in ISO15693 mode
a	– this selects the minimum delay parameter
39	– this is the value of the min. delay parameter for ISO15693
+	– this decrements the presently selected parameter
40	
U	— this saves all the current settings to EEPROM memory

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