

U23BTE 11

Discovery Mini user manual

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1 Introduction

The *Discovery Mini* device is designed for the reading of UHF tags in mobility.

It has a interface Bluetooth 5.0 to communicate with host.



2 Turn on/off and statud of the device

The device is turned ON with the RED button. The device makes a vibration and the RED led blinks.

When the device is on user can have information about the status pressing the status of the device:

- If the Led light is RED during the pressing of the button the device is disconnected
- If the Led light is BLUE during the pressing of the button the device is connected to a Bluetooth device

The device is turned OFF pressing the RED button for 5 seconds.

3 Battery

3.1 Battery charging

The device is equipped with wireless charging system based on the QI standard.

To recharge the battery, you have to place the device on the charger from the back side as shown in the picture.

When the led on the charger turns on, the charging starts.



4 Reading of the TAGs

The device is always in scanning mode, when a tag is detected the Discovery Mini makes a vibration and send the EPC tag code via Bluetooth connection to the connected device.

5 Bluetooth 5.0 communication

The *Discovery Mini* can communicate via Bluetooth 5.0 interface.

It has the following services and characteristic:

Sensor ID s.r.l.

- **Service** Generic Access
 - **Characteristic** Device Name
 - **Characteristic** Appearance
- **Service** Device Information
 - **Characteristic** Manufacturer Name String
 - **Characteristic** Model Number String
 - **Characteristic** System ID
- **Service** OTA
 - **Characteristic** OTA Control
- **Service** Communication Service
 - **Characteristic** Communication Data

The OTA service is used to upload the firmware of the device.

To send and receive data the device uses the custom communication service

F000C0E1-0451-4000-B000-000000000000

and custom communication characteristic

F000C0E1-0451-4000-B000-000000000000

The characteristic has the write property to send data to a connected BLE 5.0 device and the notify property to receive data.

6 Data sending

When a tag is found, the device sends through the bluetooth connection the data in the following format:

\$	00	LL	EPC	CR LF (\r\n)
----	----	----	-----	--------------

The data are in ASCII format.

If a tag is detected when the device is disconnected, the tag is saved in the internal memory and sent as soon as the connection is established.

If the sending of the RSSI value is active the data are:

\$	00	LL	EPC	;	RSSI Value	CR LF (\r\n)
----	----	----	-----	---	------------	--------------

7 Send commands to the device

The frame format to send command to device is:

\$ (EOF)	command	frame length (number of byte to send)	data	CR LF (\r\n) (SOF)
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The data are in ASCII format.

7.1 *Firmware and hardware release*

To read the hardware release is possible to send the command:

\$	10	06	01	CR LF (\r\n)
----	----	----	----	-----------------

To read the firmware release is possible to send the command:

\$	10	06	00	CR LF (\r\n)
----	----	----	----	-----------------

7.2 *Get the device id*

The Bluetooth MAC address is used as Device ID.

To read the hardware release is possible to send the command:

\$	0c	06	01	CR LF (\r\n)
----	----	----	----	-----------------

To read the firmware release is possible to send the command:

\$	0d	10	00	XX	XX	XX	XX	XX	XX	CR LF (\r\n)
----	----	----	----	----	----	----	----	----	----	--------------

Where XXXXXXXXXXXX is the Bluetooth MAC address of the device used as device id.

7.3 Activate/deactivate scanning

To activate and deactivate the scanning is possible to send the command:

\$	5D	08	01: set configuration in RAM	01: activate	CR LF (\r\n)
			02: set configuration in EEPROM	00: deactivate	
			03: read actual configuration		

The answer is:

\$	5E	06	01: scanning ON	CR LF (\r\n)
			00: scanning OFF	

7.4 Power configuration

With this command is possible to increase and decrease the RF power emitted by the reader.

The command is:

\$	14	frame length	00:to read set value	XX:power value to set	CR	LF
			01:to set new value		(\r\n)	

The field power can assume values from 01 to 0A.

The default value is 0x0A and corresponds to a power of 20dB (100 mW).

Decreasing this value of one unit the power is decreased of one dB, for example if power = 5, the output power at the antenna is 15dB.

The reader's answer is:

\$	15	06	power value set	CR LF (\r\n)
----	----	----	-----------------	--------------

7.5 Sensitivity configuration

With this command is possible to increase and decrease the RF input gain of the reader.

The command is:

\$	16	08	00:to read set value	XX:sensitivity value to set	CR	LF
----	----	----	----------------------	-----------------------------	----	----

Sensor ID s.r.l.

			01:to set new value		(\r\n)
--	--	--	---------------------	--	--------

The field sensitivity can assume values from 01 to 0A.

The default value is 0x0A and corresponds to a RF rx gain of -90 dB.

Decreasing this value of one unit the power is decreased of three dB, for example if sensitivity = 5, the rx gain is -75dB.

The reader's answer is:

\$	17	06	Sensitivity value set	CR LF (\r\n)
----	----	----	-----------------------	--------------

7.6 Read battery value

With this command is possible to read the remaining battery percent.

The command is:

\$	02	06		00	CR LF (\r\n)
----	----	----	--	----	--------------

The answer is:

\$	03	06	XX	CR LF (\r\n)
----	----	----	----	--------------

Where XX is the remaining battery percent (in hex). For example:

XX=32 means 50% remaining battery charge.

7.7 Enable/disable vibration

With this command is possible to enable and disable the vibration made when a tag is detected

The command that activates the vibration is:

\$	12	08	01	01	CR LF (\r\n)
----	----	----	----	----	--------------

The command that deactivates the vibration is:

\$	12	08	01	00	CR LF (\r\n)
----	----	----	----	----	--------------

Sensor ID s.r.l.

The command to read the actual configuration is:

\$	12	06	00	CR LF (\r\n)
----	----	----	----	--------------

The answer is:

\$	13	06	XX	CR LF (\r\n)
----	----	----	----	--------------

Where XX is 01 if the vibration is active and 00 if the vibration is not active.

7.8 Make Vibration acknowledge

With this command is possible to send a vibration acknowledge to the user from the connected device. This command is useful, for example, as a feedback on the correct reading of the tag.

The command is:

\$	04	06	XX	CR LF (\r\n)
----	----	----	----	--------------

If XX=01 the device makes a single vibration.

If XX=00 the device makes a triple vibration.

The answer is:

\$	05	06	XX	CR LF (\r\n)
----	----	----	----	--------------

7.9 Activation of RSSI value sending

With this command is possible to activate and deactivate the RSSI value sending when a tag is read a vibration acknowledge to the user from the connected device. The command is:

\$	1E	08	00:to read set value	00: to deactivate	CR LF (\r\n)
			01:to set new value	01: to activate	

The answer is:

\$	1F	06	00:if RSSI sending is disabled	XX	CR LF (\r\n)
			01: if RSSI sending is enabled		

7.10 Filter activation

This functionality avoids to have multiple readings of the same tag, for a set .

To manage this configuration, the command is the following:

\$	2C	08	01: to set configuration	01: enabled	\r\n
			00: to read configuration	00:disabled	

The reader answer is:

\$	2D	06	Actual configuration	\r\n
----	----	----	----------------------	------

7.11 Filter time configuration

This command sets the life time of the filter. The default value is 15 seconds

The command is the following:

\$	2E	0a	01: to set configuration	XXXX	\r\n
			00: to read configuration		

Where XXXX is the hex value of filter duration, for example to set 15 seconds the command is:

\$2E0501000f\r\n

The reader answer is:

\$	2F	06	Life time of filter	\r\n
----	----	----	---------------------	------

7.12 Reading distance

Using this command is possible to increase or decrease the tag reading distance.

The command to send is:

\$	53	08	01: to set distance	XX: distance to set	\r\n
			00: to read the set reading distance		

Where XX is a value that can varies from 01 to 14 (20 in hex).

The reader answer is:

\$	54	06	XX: distance set	\r\n
----	----	----	------------------	------

8 Use with a smartphone

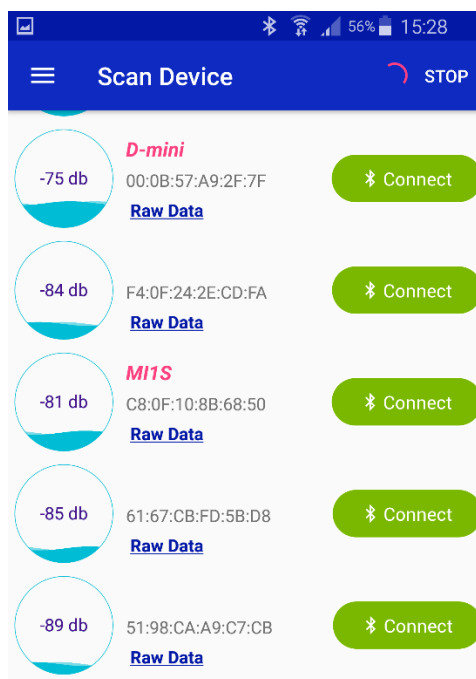
Is possible to use the Discovery Mini with a smartphone using various apps available on the store in order to test the communication and the functionalities.

For example, a useful app is BLE Term

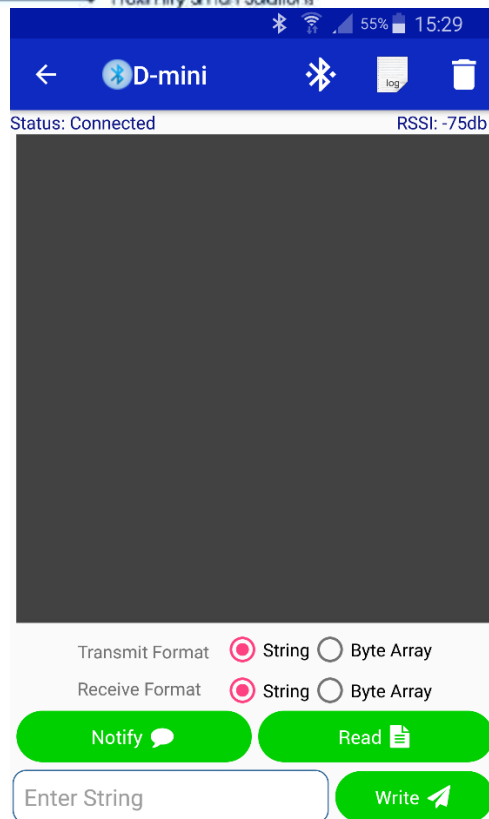
(<https://play.google.com/store/apps/details?id=com.manishtaraiya.bleterm&hl=it>)

To test the device the user has to perform the following steps:

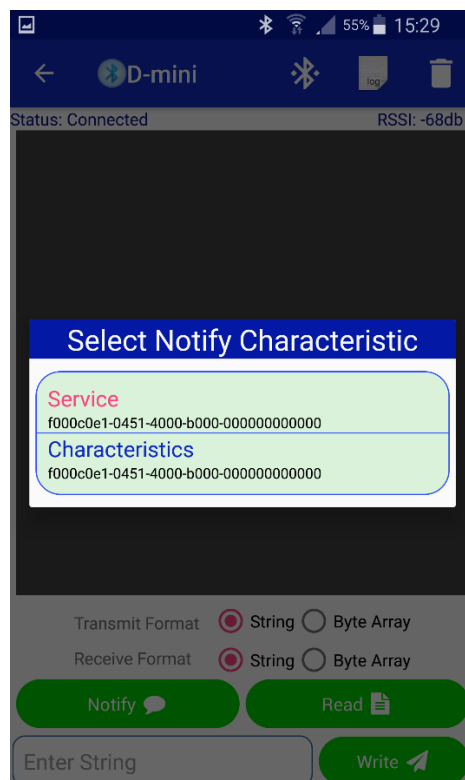
1. Open the app and find the device: the app shows the list of nearby devices. The Discovery mini is showed with the name D-mini.



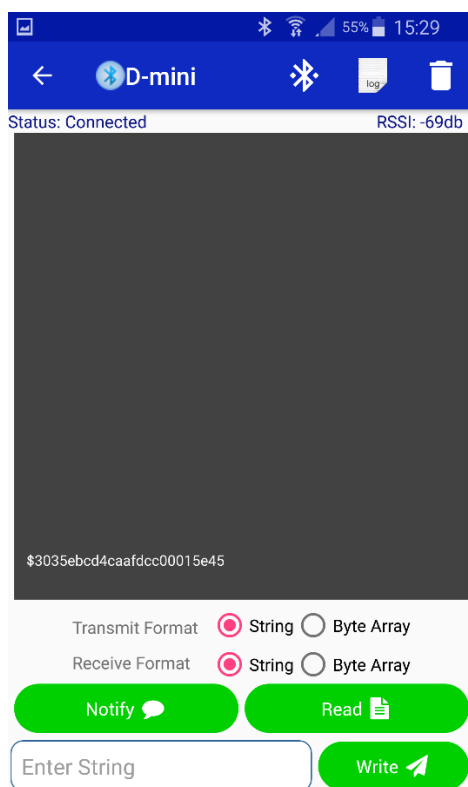
2. Connect to the device: when the app is connected to the Discovery Mini it shows the following screen



3. Enable the receiving of data by the device through the notify attribute: select the notify attribute of the service and characteristic F000C0E1-0451-4000-B000-000000000000



4. Read a tag: the tag EPC code is showed as the following screen:



9 Use with the I11BLE11 dongle

With the I11BLE11 dongle is possible to use the device emulating a simple serial device.



When the dongle is connected, it automatically discovers the device and establish a connection with it.

When a connection is established the led on the dongle changes color from RED to BLUE.

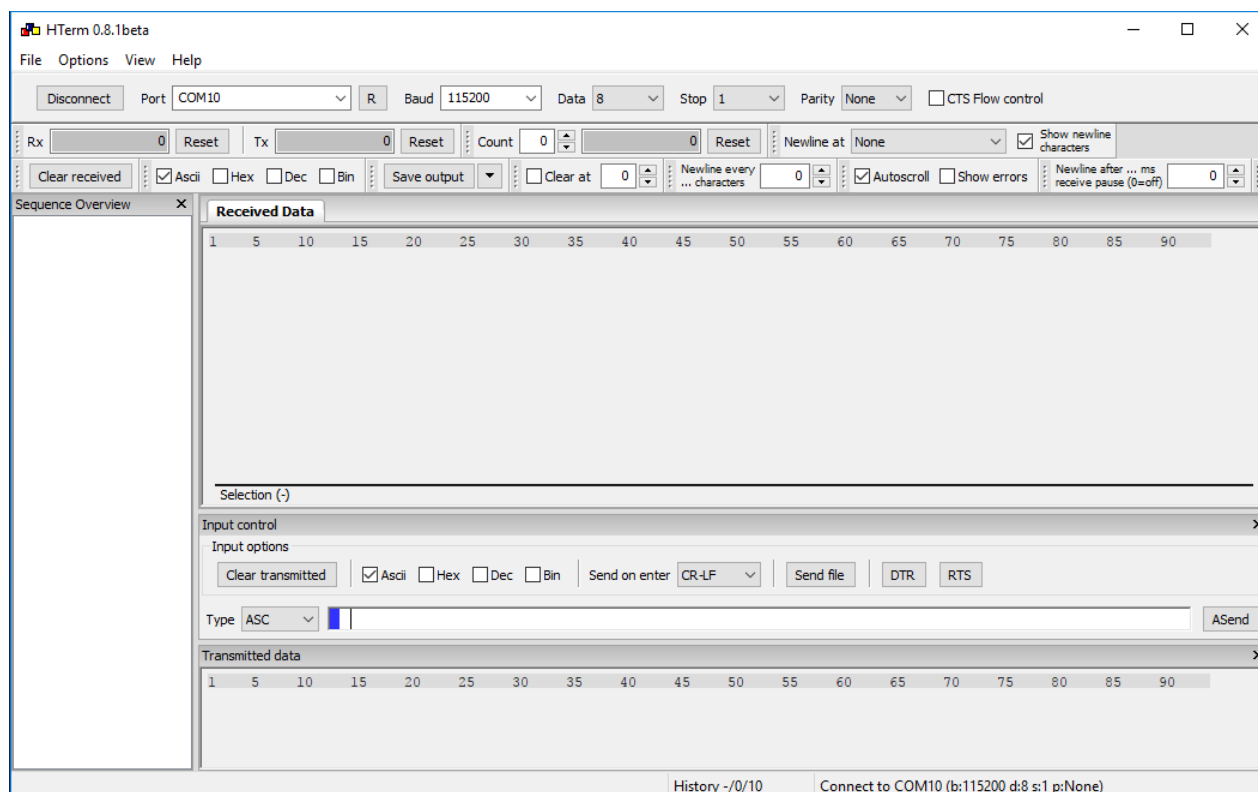
Opening the dongle COM port is possible to send commands and receive data directly to the device.

A useful terminal to send commands to the Dongle (e.g. to the Discovery Mini) is HTerm:

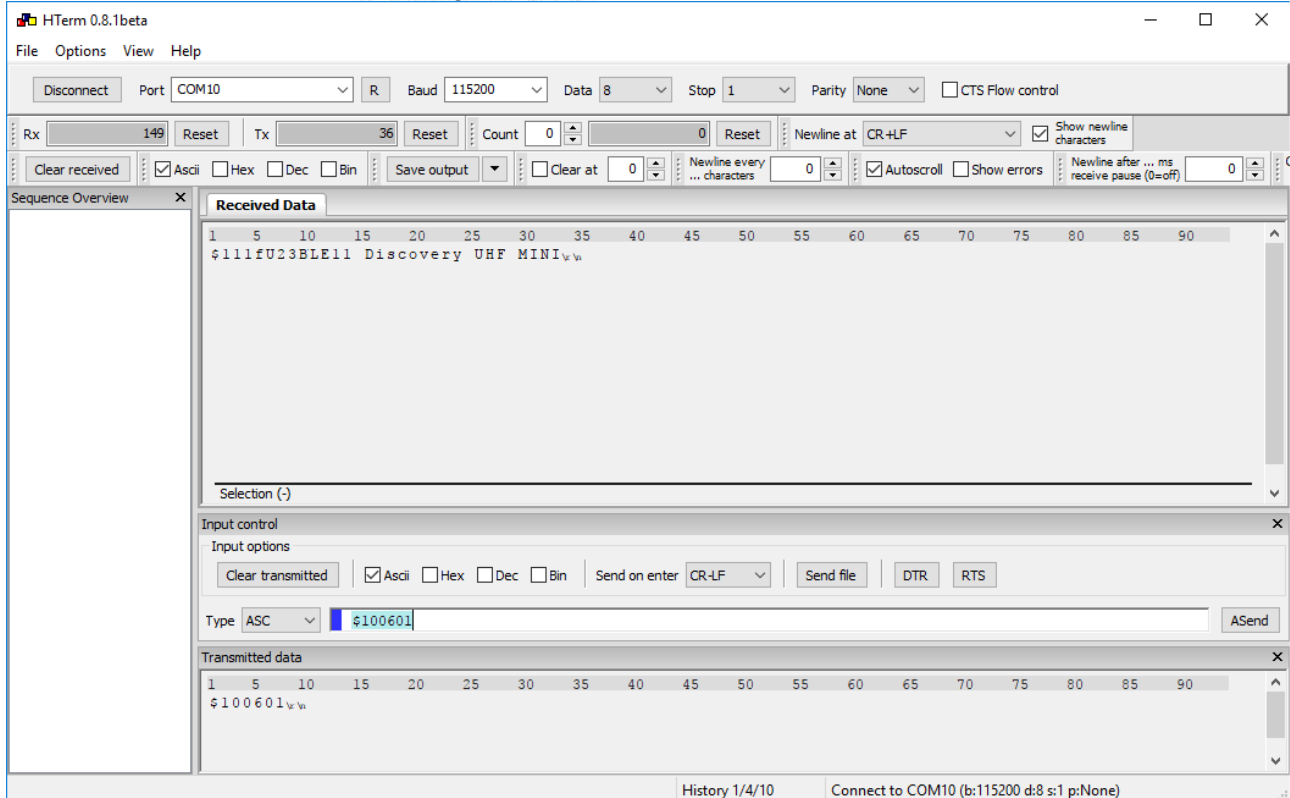
Sensor ID s.r.l.

To test the device the user has to perform the following steps:

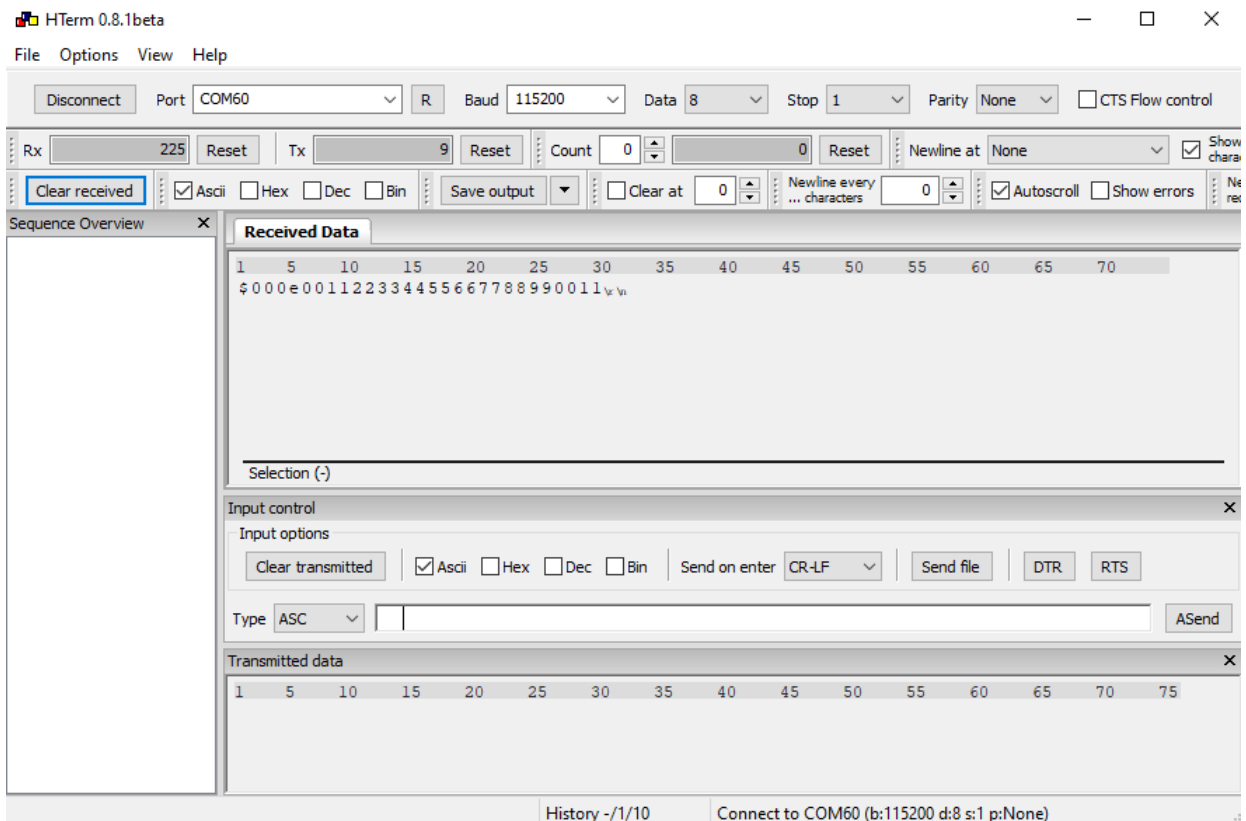
1. Connect the COM port associated with the USB dongle with:
 - 115200 baudrate;
 - Data 8;
 - Stop 1;
 - Parity None.



2. Send a command to the Discovery Mini:
 - select ASCII format (ASC) and Send on enter CR-LF;
 - type a command (for example \$100601 hardware release);
 - the answer is showed.



3. Read a Tag: the EPC code of the tag is showed



This device 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.

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 generates, 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 correct the interference by one or more of the following measures:

- Reorient 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 not expressly approved by the party responsible for compliance could void your authority to operate the equipment.