USER MANUAL

Free2move Configuration Software

Rev: 07 April 2004

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1 Installing the configuration software

A complimentary Free2move software package accompanies your serial port plug and can be installed on systems running Windows 98, ME, 2000 and XP. This Windows™ based software is used for configuration of the serial interfaces, connection rules and for the security of your device. The software is found on the CD-ROM delivered with your Serial Port Plug. The installation requires 3.6Mb of free space on the hard disc drive.

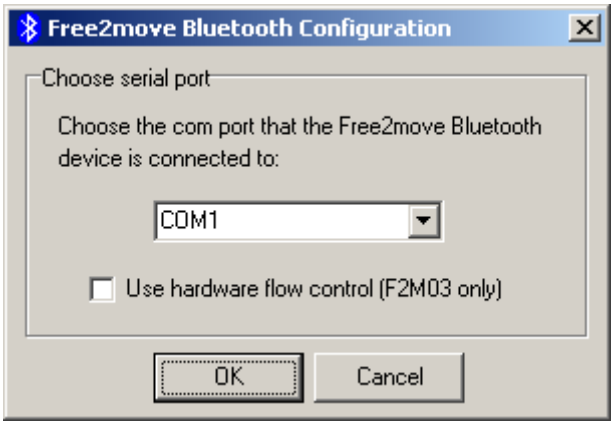
1. Insert the CD into your CD-ROM.
2. Follow the installation link on the getting started guide or use the explorer in Windows and double click the setup.exe file on the CD-ROM.
3. If you wish to continue the installation of the Free2move configuration software, click the **"Yes"** button.
4. When the welcome dialog box appears, click **"Next"** to continue.
5. Choose to accept the default folder by clicking **"Next"**, or change the location by using the browse window.
6. Choose to accept the default name of the start menu shortcut, by clicking **"Next"**, or change it by editing the text field.
7. Choose if you wish to create a shortcut and then click **"Next"**.
8. Start the installation of program files by clicking **"Finish"**.

When the install wizard is finished you are ready to use the Configuration Software.

2 Configuring your F2M01 serial port plug

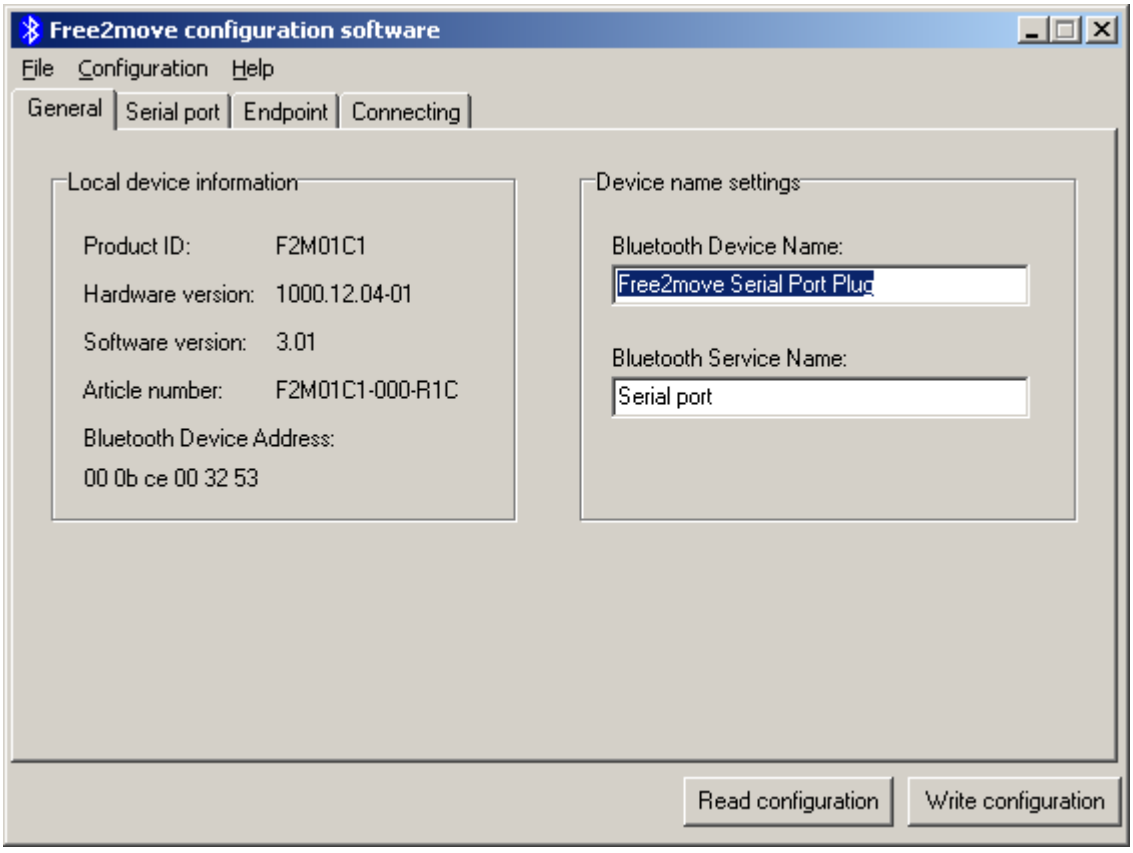
Before configuring your F2M01, you must make sure that there is no Bluetooth connection present, otherwise the plug cannot enter configuration mode, i.e. make sure that no other unit is connected to your endpoint or that a running corresponding slave unit is not within range of your connecting Serial Port Plug.

To configure your Serial Port Plug, attach the plug to a serial port on your windows based computer. Open the Free2move configuration program and when prompted, chose the serial port that the plug is connected to the drop down list as shown below. If the windows configuration is used to configure a Bluetooth module, enable the **"Use hardware flow control"** feature.



If the communication with the plug fails, check your power supply and make sure that the device has no active Bluetooth connection.

When the Serial Port Plug is detected the configuration software initializes, and the following screen becomes visible:



The configuration application is divided into four tabs:

1. General settings
2. Serial Settings
3. Endpoint settings
4. Connecting settings.

The General Settings tab includes version information and device name settings. By using the Serial settings tab you can configure the serial interface of the plug. The Endpoint and the Connecting settings tabs are used when configuring the connection management.

The Serial Port Plug can be configured to accept connections (endpoint mode) or to connect to other Bluetooth units (connecting mode).

When using the Free2move Configuration software, selecting a parameter field and pressing F1 will show context sensitive help.

2.1 General settings

At the left of the General settings tab, device version information is presented. This information is useful for support incidents and when looking for new software releases. The Bluetooth Device Address is a unique fixed number and is shown in some applications when searching for devices. The Product ID, Hardware and Software version numbers of the device cannot be changed.

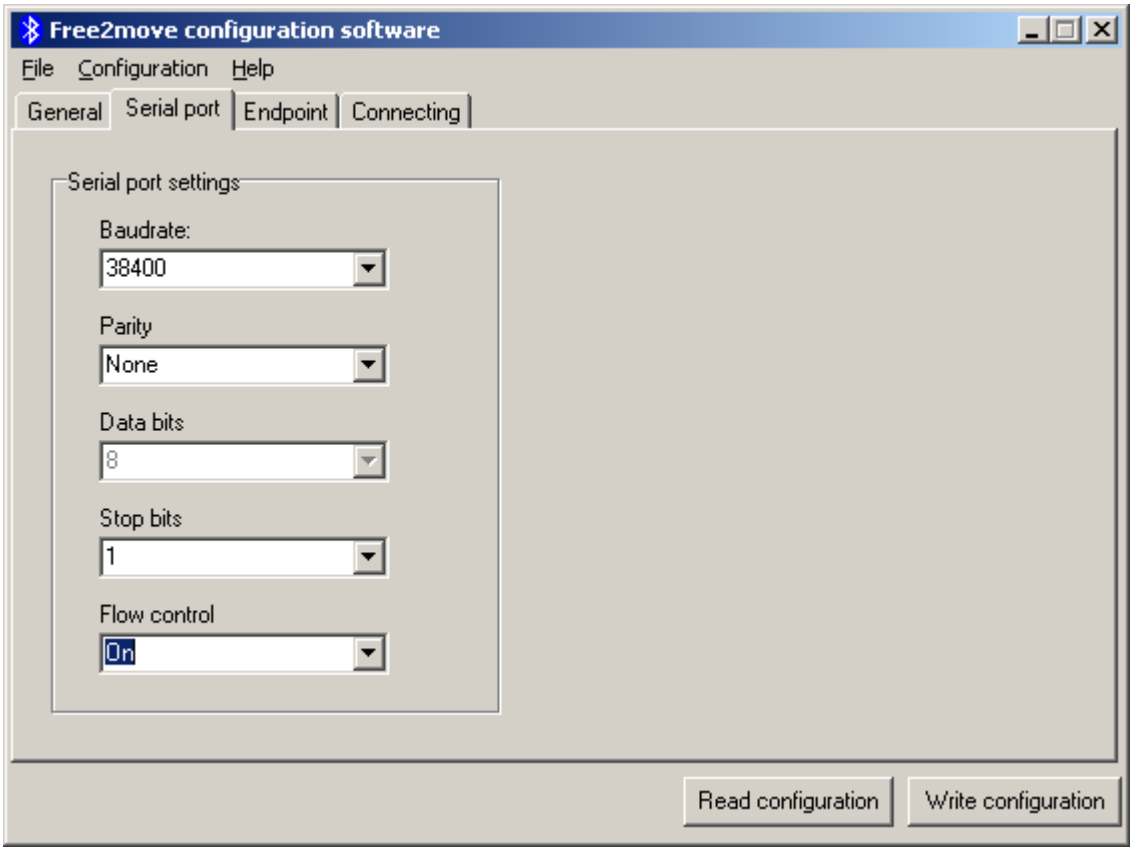
The Bluetooth Device Name is a user-friendly name that a Bluetooth device presents itself with when searching for other Bluetooth devices. It is often a good idea to change this name to simplify the identification of devices. However, if two or more devices have the same name it can complicate identification and connection to the correct device.

The Bluetooth Service Name is shown during the Service Discovery. This procedure is, in most cases, performed when a user initiates a connection to the Serial Port Plug. The Serial Port Plug supports one service (Serial Port Profile) and the Bluetooth Service Name is the name that represents this particular service.

2.2 Serial settings

The Serial settings tab is used when configuring the serial interface to the plug. The serial interface of the plug can be configured to work with almost every piece of equipment that uses a serial port.

These setting should be set to the same as those used by your communicating equipment.



The following serial port settings can be configured:

Baud rate:
The Baud rate in bauds per second

Parity:
You can select the type of parity to be used – none, even or odd

Stop bits:
The number of stop bits per word (1 or 2)

Flow control:
If you wish to use hardware flow control you can activate it here. It is recommended to use hardware flow control in order to prevent data loss and buffers from being full. (Not configurable for F2M03 customers, contact Free2move)

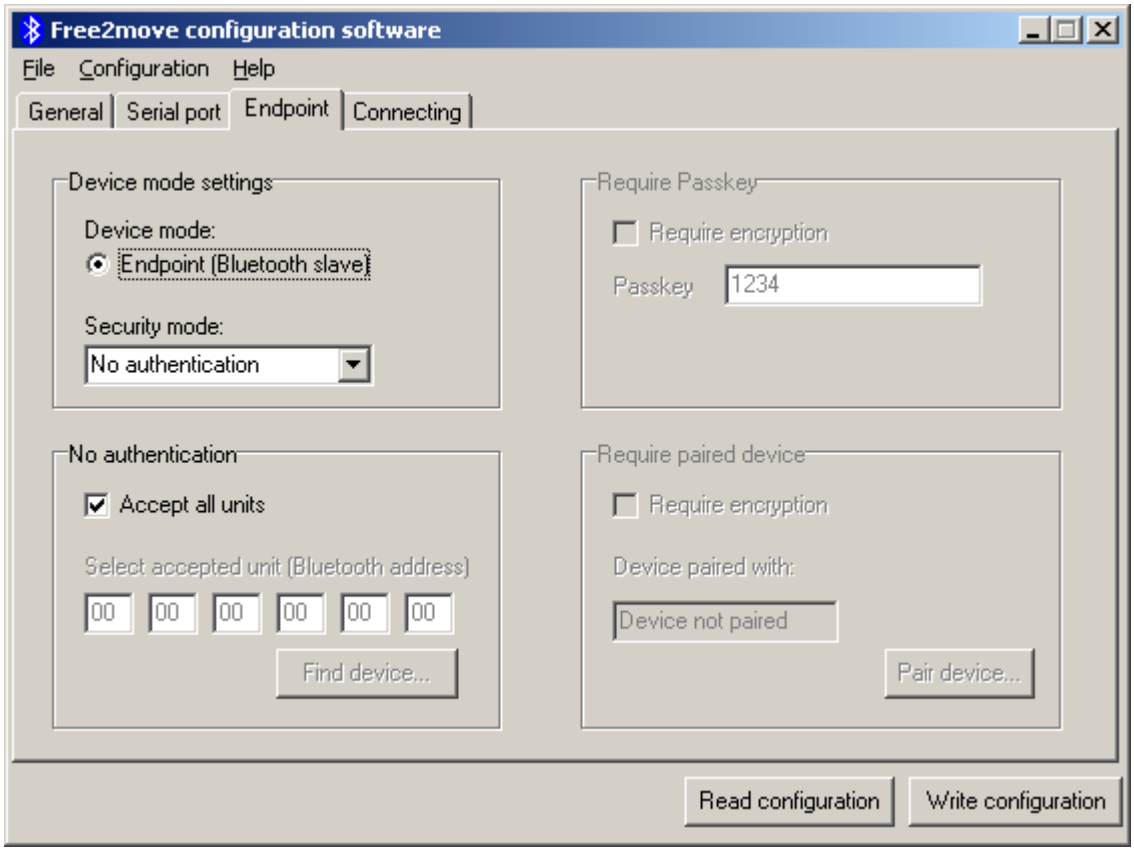
The number of data bits per word (8) is also shown on this tab. (Not configurable)

2.3 Connection management

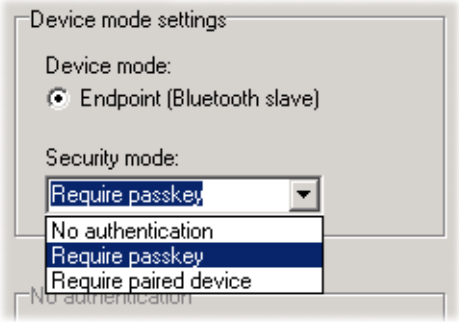
With the plug connected to the serial port of your PC and the configuration software running you can configure the plug to work in different situations and also to meet varying requirements for security. All settings related to configuring a device to accept connections (Bluetooth slave mode) are found under the Endpoint settings tab, whilst settings for configuring a device to connect other devices (Bluetooth master mode) are found under the Connecting settings tab.

2.4 Endpoint settings

Endpoint mode is used to configure the F2M01 as Bluetooth slave. This mode will only accept connections from other units. When configured in endpoint mode the plug can be detected by other Bluetooth equipped units and connected by units supporting the Serial Port Profile.



Three different levels of security make it possible to configure the plug to fit your demands for secure communication.



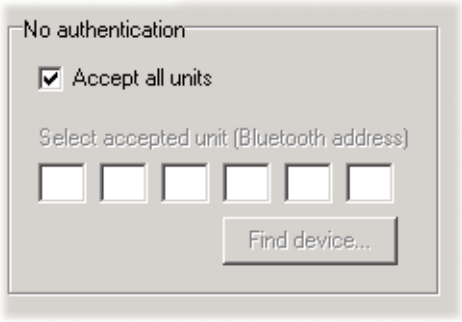
1. No authentication
2. Require passkey
3. Require paired device

You can choose between the three options in the Device mode settings frame.

When configured to require passkey or paired device, encryption can be used to ensure secure communication.

2.4.1 No authentication

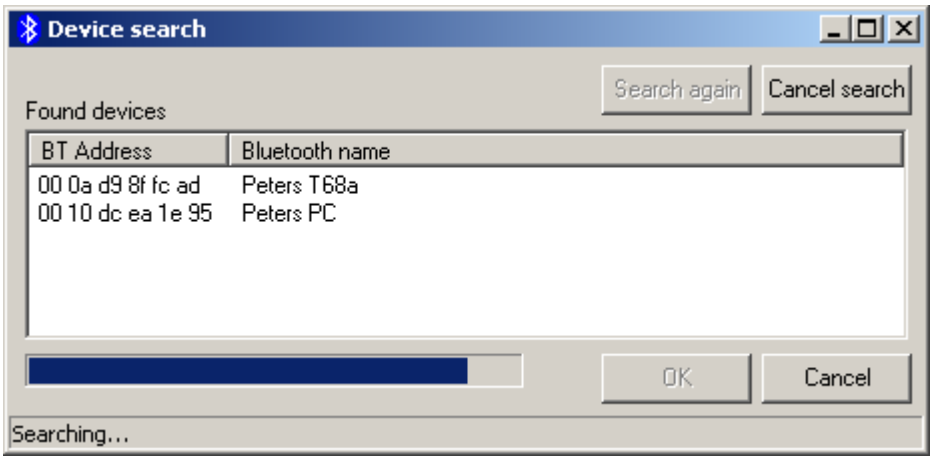
When the plug is used with a device that has no security sensitive information it can be configured to accept connections without authentication and allow all connections. This aim can be accomplished by selecting the **"No authentication"** option, in the Security mode combo box, and marking the **"Accept all units"** box in the No authentication frame



The endpoint can also be configured to accept connections from just one specific unit by choosing the **"Select accepted unit (Bluetooth address)"** option and specifying the Bluetooth address (in hexadecimal format), of the particular unit. Note that it is not possible to specify a Bluetooth address while the **"Accept all units"** box is checked.

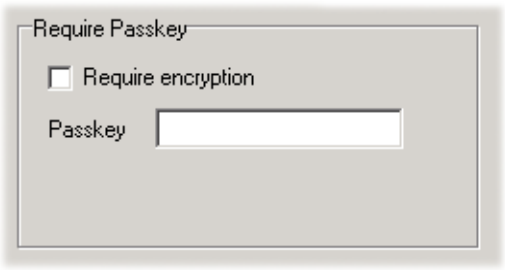
This is especially useful; to provide some means of security, when a remote device that does not support authentication is used.

The Bluetooth address can be manually entered or you may use the inbuilt Device search feature to receive a list of all available Bluetooth addresses within your range. To start the Device search feature press the **"Find device…"** button. Proceed by selecting the device you want to accept and click the OK button.



2.4.2 Require passkey

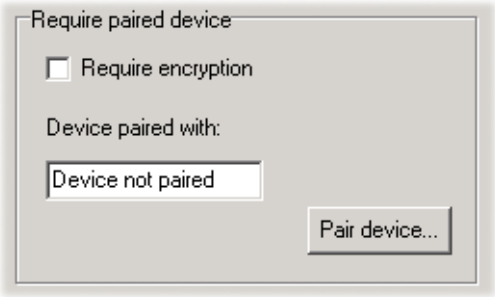
In many situations there is a need to limit the access of the Serial Port Plug and require authentication of the users that connect to that plug. This can be accomplished by configuring the plug to require a passkey before any communication is initiated. In this mode any user that initiates a connection has to know the passkey to complete a connection to the plug.



By selecting the **"Require passkey"** option, you can enter a personal passkey number in the Require Passkey frame. The passkey can be up to 16 characters in length. You may also select the **"Require encryption"** checkbox as an extra security measure.

2.4.3 Require paired device

If the communication with the plug should be restricted to one device only, it can be configured to only accept connections with a paired device. Paired Bluetooth devices have a complete pairing procedure with authentication. As a result they both know that the remote Bluetooth unit is a trusted device.



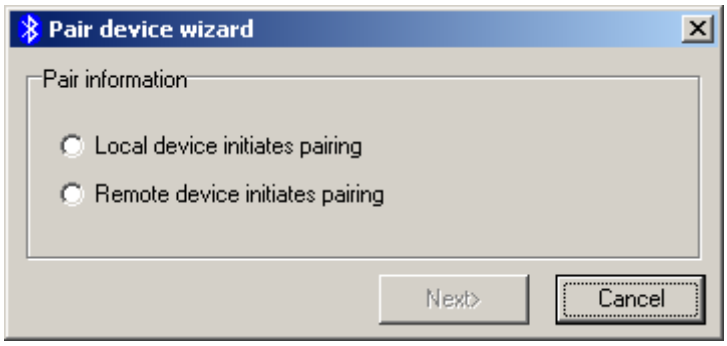
The **"Require encryption"** option may be used to ensure secure communication.

To simplify pairing a Pair device wizard is included. To start the wizard, click on the **"Pair device"** button.

When starting a pairing procedure existing pairing information will be lost.

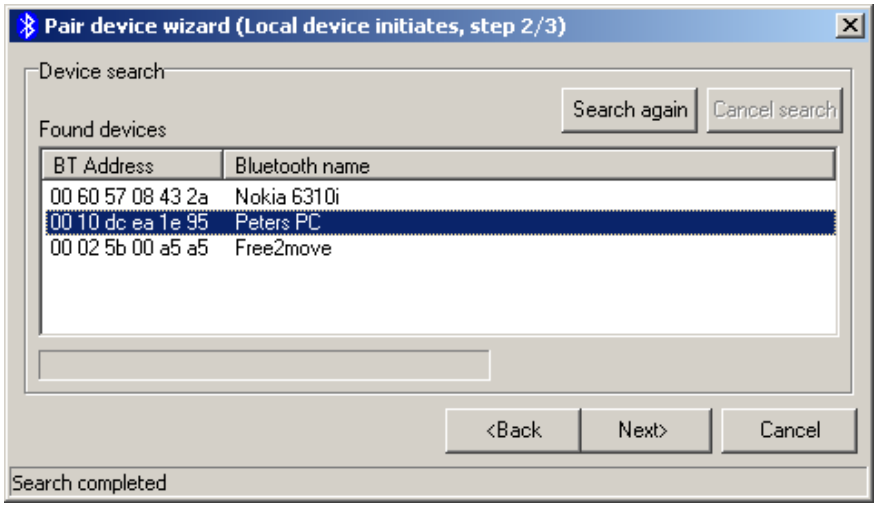
"Pair device wizard"

The wizard allows the plug the option to either initiate pairing or accept to be paired by another Bluetooth device. Pick the appropriate and click **"Next"** to continue.



"Local device initiates pairing"

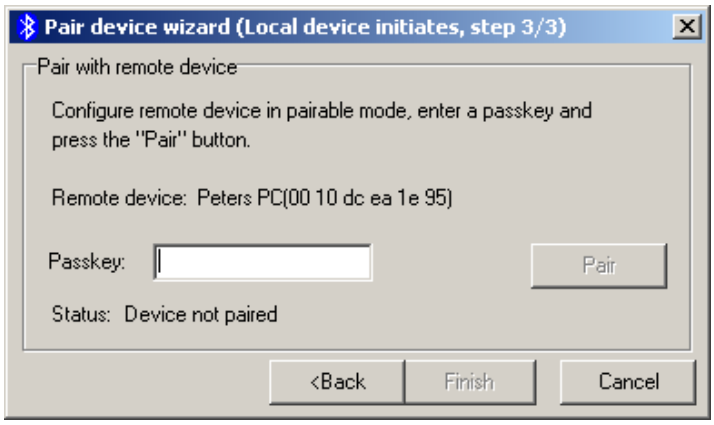
When **"Local device initiates pairing"** is chosen the device wizard builds a table of all available Bluetooth devices within range. Select the device to pair with and click **"Next"**



Note that you may have to prepare for the pairing procedure on the remote device, depending on the type and manufacturer of the device you are pairing with. Please consult the user manual of the remote device.

The pair device wizard continues with the last step, which shows the device status and prompts you to configure the remote device i.e., so that the pairing can continue.

When you have configured the other end, enter the Passkey and click on the **"Pair"** button and the serial port plug will initiate the pairing process. When pairing is completed the status of your device will automatically change to being paired. Click on the **"Finish"** button to complete the pairing process.



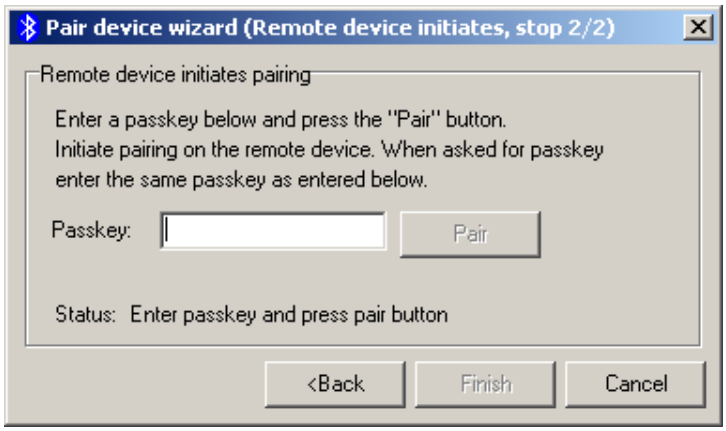
"Remote device initiates pairing"

Selecting **"Remote device initiates pairing"** is the first step to initiate the procedure where the remote device is responsible for initiating the pair process. Since the plug only accepts a pair request the only parameter needed is the Passkey that is shared between the two devices.

Enter a passkey, and press the **"Pair"** button to configure the local device in the mode where it waits to be paired from another device.

A status window informs you that the plug will wait for the remote device to initiate pairing. (Please consult the user manual of the remote device)

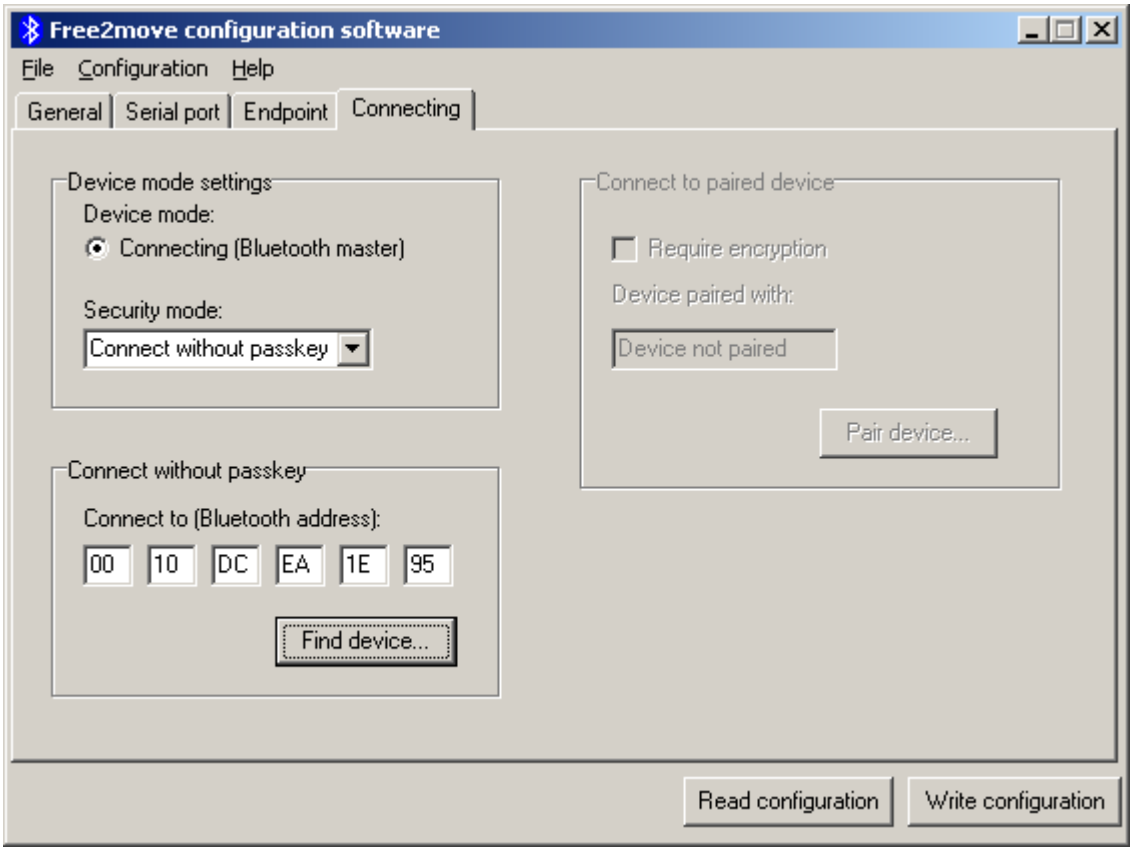
When the pairing has been completed, the Bluetooth address (unique hexadecimal number) of the paired partner will be shown.



Click **"Finish"** to exit the device wizard after a successful pairing procedure or quit by pressing the **"Cancel"** button.

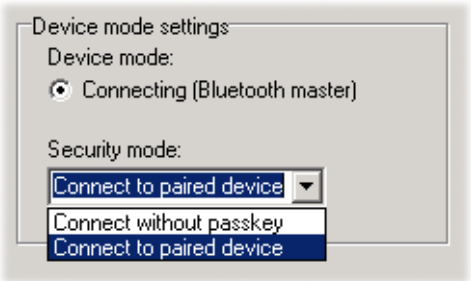
2.5 Connecting settings

In addition to accepting connections the Serial Port Plug can also be configured to connect to other Bluetooth units. Connecting mode is used to configure the F2M01 as Bluetooth master. This mode will initiate connections with other units that supports the serial port profile. If the plug fails to connect the remote device or the connecting is dropped it will continue to try establishing a connection until successful.



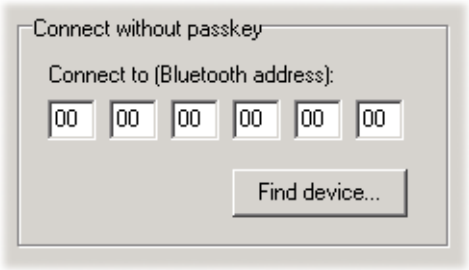
Two security modes are offered in the Device mode settings frame:

1. Connect without passkey
2. Connect to paired device

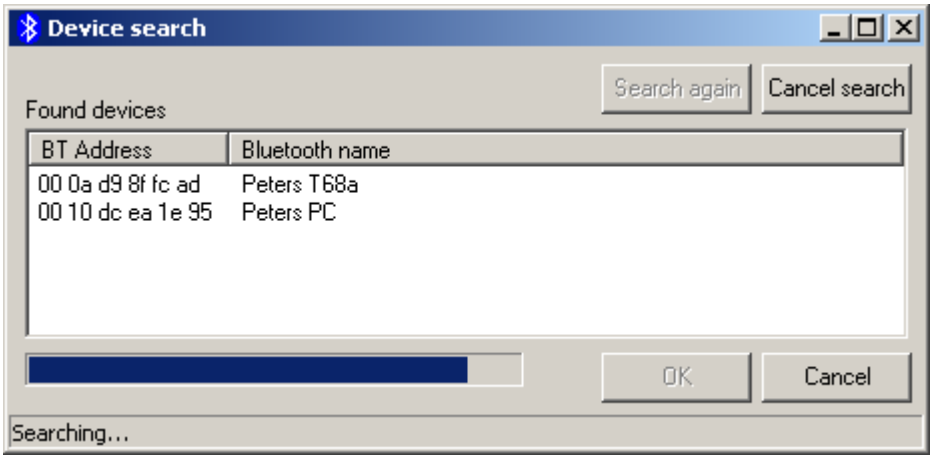


2.5.1 Connect without passkey

The connecting without passkey option offers minimal security between devices. It is not possible to connect to units requiring authentication or passkeys with this mode selected.



When selecting this choice you can manually enter the Bluetooth address (hexadecimal number) of the remote device that the plug shall connect to. Alternatively, you may use the device search feature to receive a list of all available Bluetooth devices within your range. Press the **"Find device…"** button to start this feature.



Devices found are presented by name and corresponding Bluetooth address. Select the relevant device and click **"OK"**.

2.5.2 Connect to paired device

When choosing the Connect to paired device option it is possible to connect to units requiring authentication and passkey. It is also possible to ensure secure communication by checking the **"Require encryption"** checkbox in the Connect to paired device frame.

To enable this mode you must pair to the remote device; initiate this procedure by clicking on the **"Pair device…"** button, which will start a wizard.

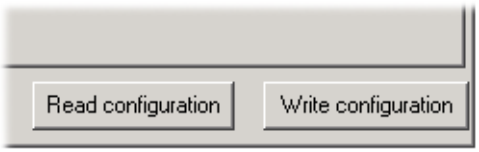
When starting a pairing procedure existing pairing information will be lost.

The rest of the pairing process is described in:
Section 2.4.3 Require paired device, in the "Pair device wizard" section.

2.6 Read and write settings

When changes have been made in the configuring software it is necessary to store the new settings in the plug. Pressing the **"Write configuration"** button in the lower right corner of the screen does this.

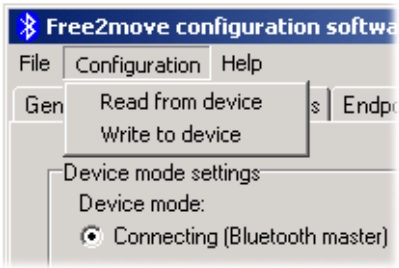
The settings are stored in persistent memory and are therefore not lost when the power is removed from the plug.



When saving new setting, the previous settings will be lost. If unsure, save a copy of the default configuration before changes are made (See section 2.7).

It is also possible to choose **"Write to device"** via the **"Configuration"** option of the pull down menu.

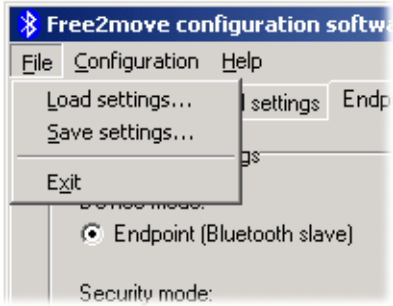
By clicking the **"Read configuration"** button or the **"Read from device"** menu option, you are enabled to upload the plugs current settings to the configuration program. This occurs automatically every time you start up a session with the plug.



When reading settings from the F2M01 eventually changed parameters in the Configuration Software will be overwritten.

2.7 Load and save settings to file

In the file menu you are presented with two options for either saving or loading settings.



The **"Load settings"** option allows you to load configuration setting from a pre-existing file on the computer into the Free2move Configuration Software.

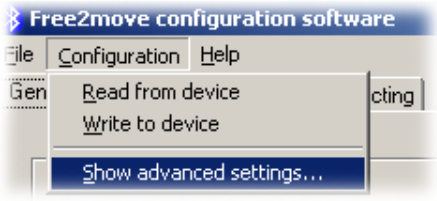
The **"Save setting"** option allows you to save the current configuration settings in the Configuration software to a file on your computer.

This option can be useful if you wish to apply similar settings to a number of serial port plugs. It can also be used for support matters.

Before contacting Free2move's or resellers support department, please save your configuration to file and attach this file in the email describing your problem.

3 Advanced settings

The Serial Port Plug and Bluetooth modules from Free2move with software version 3.0 or more include commands for fine-tuning the performance and power save modes available on the devices. Those settings are not visible as default.

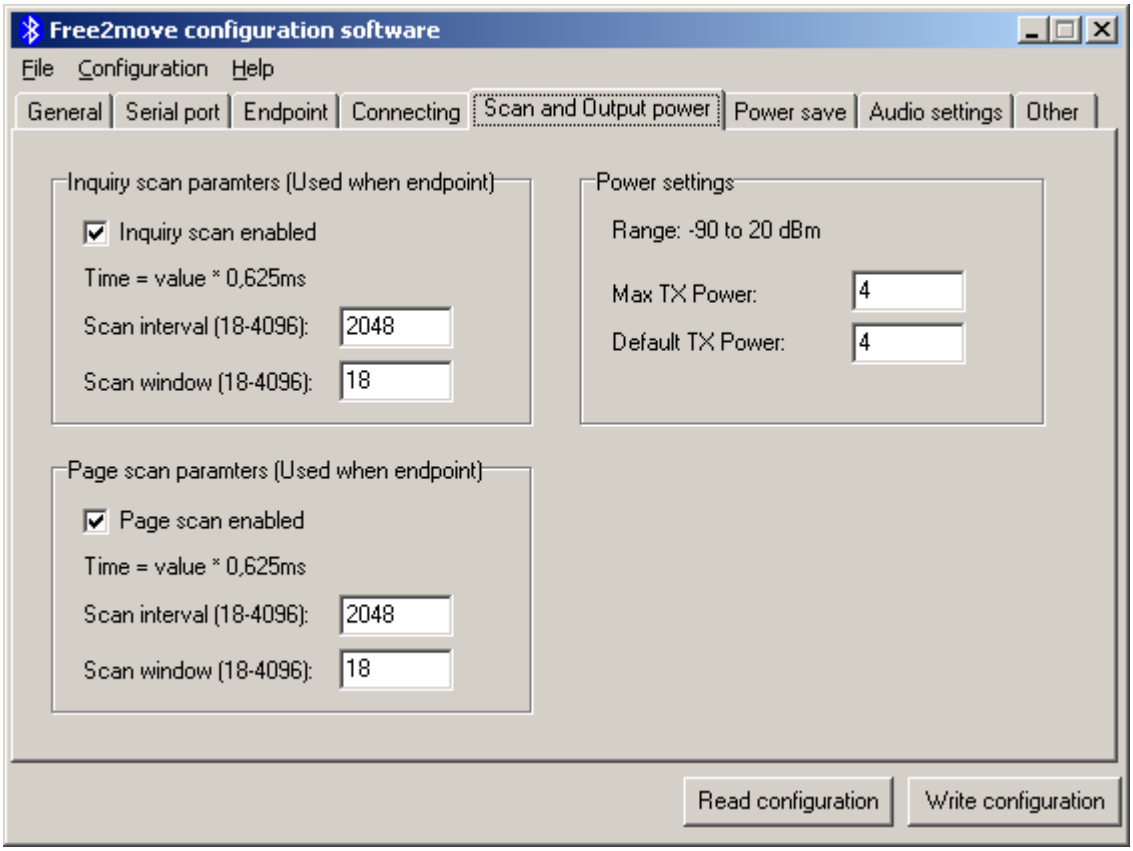


If you have a device that supports the advanced settings you can make these settings visible by choosing **"Show advanced settings..."** in the configuration menu.

Most of the advanced settings require that the user have in-depth knowledge of the Bluetooth technology. Please contact Free2move if you have questions about how the advanced settings can improve the performance in you application.

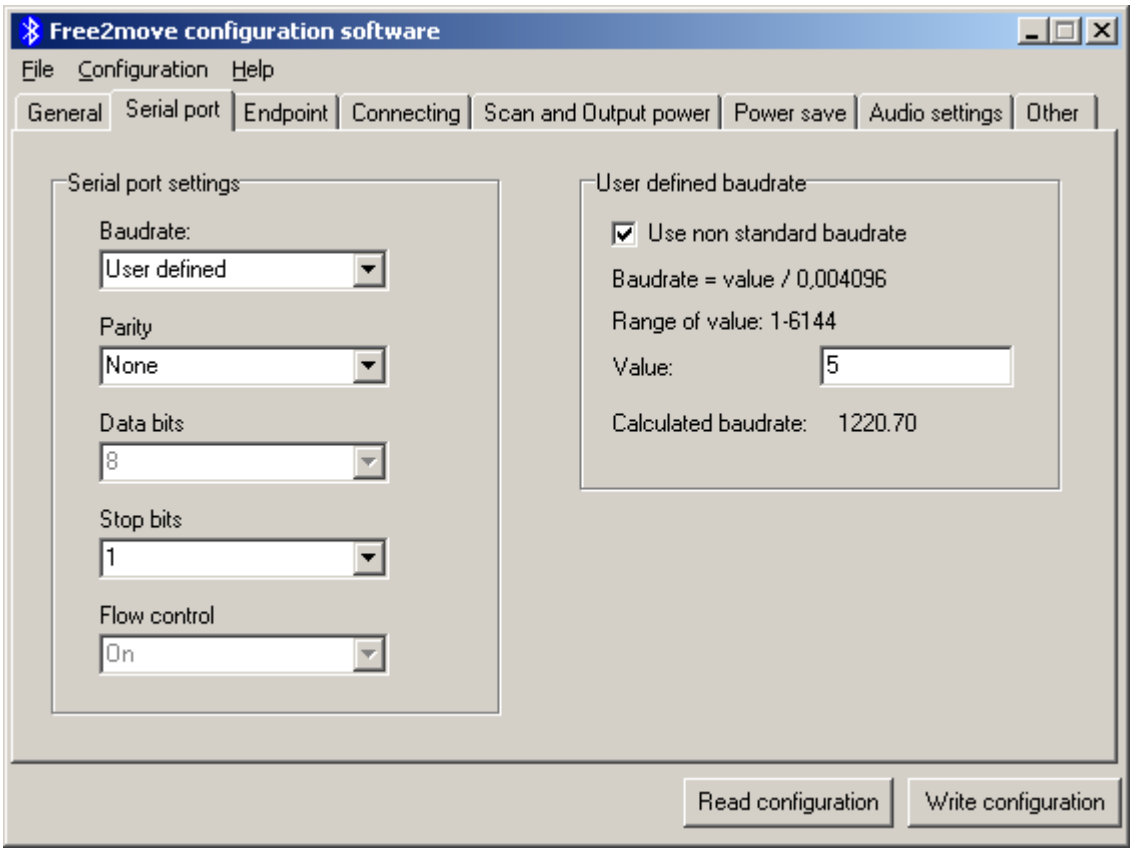
Note!
The advanced settings should be used with great care. Do not change anything unless you are absolutely sure of what the result of your change will be. Changing these parameters may affect the performance of the device.

When the advanced settings are enabled a number of additional tabs becomes visible in the configuration software. New settings are also added on the Serial Port Tab.



3.1 User defined baud rate

When the advanced settings are enabled in the configuration software, a new function appears on the Serial port tab. This function is used to define a baud rate that are not one of the standard ones found in the Baud rate drop-down list. The user defined baud rate can be used in the serial port plugs with software version 3.0 or higher.

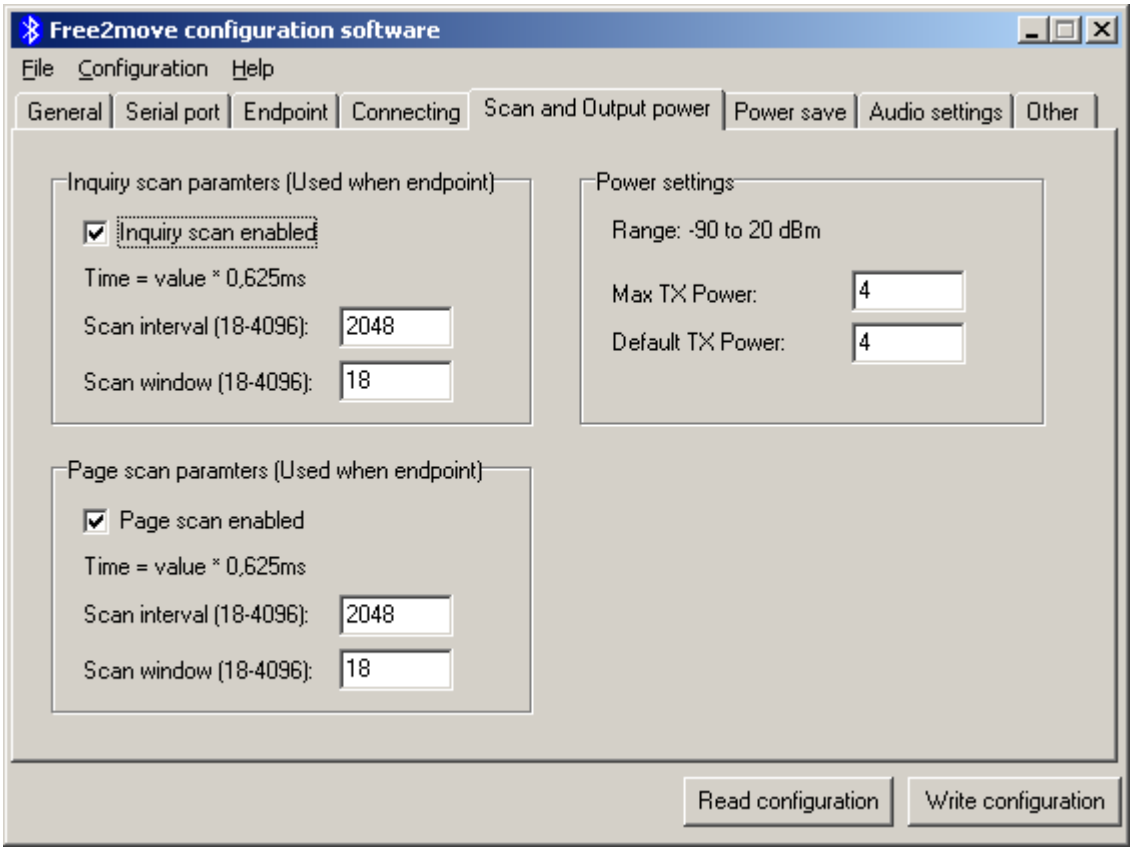


To use a non-standard baud rate, check the "Use non standard baudrate" checkbox and enter a value in the "Value" field. The calculated baud rate is shown in the application when values are entered. It is possible to set baud rates from 244 baud up to the maximum rated speed for the UART hardware of the serial port plug, 115200bps.

To disable the use of user-defined baud rate, choose a standard baud rate in the list or uncheck the "User define baud rate" checkbox.

3.2 Inquiry and page scan parameters

The inquiry scan parameters are found on the Scan and output power tab in the configuration software. These settings are available in all Serial port plugs with software version 3.0 or higher.



The inquiry scan and page scan parameters are only applied when the Bluetooth unit is configured to operate as an Endpoint and as long as there is no Bluetooth connection established. It is possible to enable and disable inquiry and page scan. The scan interval and scan window can be modified.

3.2.1 Inquiry scan

When inquiry scan is enabled, the Endpoint unit is discoverable for other Bluetooth units on inquiry(Device search).

The Scan Interval parameter defines the amount of time between consecutive inquiry scans. This is defined as the time interval from when the device started its last inquiry scans until it begins the next inquiry scan.

The Inquiry scan window parameter defines the amount of time for the duration of the inquiry scan. The Inquiry scan window can only be less than or equal to the Inquiry scan interval.

By choosing a long interval time and a short window time the average current consumption can be decreased at the cost of slow response time on inquiry.

By choosing a short interval time and a long window time faster response time on inquiry can be obtained at the cost of increased average current consumption.

3.2.2 Page scan

When page scan is enabled, the Endpoint unit is connectable for other Bluetooth units on page.

The Page scan interval parameter defines the amount of time between consecutive page scans. This is defined as the time interval from when the device started its last page scans until it begins the next page scan.

The Page scan window parameter defines the amount of time for the duration of the page scan. The Page scan window can only be less than or equal to the page scan interval.

By choosing a long interval time and a short window time the average current consumption can be decreased at the cost of slow response time on page.

By choosing a short interval time and a long window time faster response time on page can be obtained at the cost of increased average current consumption.

The inquiry and page scan parameters have a span of 11.25ms – 2.56s.

3.3 Power settings

The power settings are found on the Scan and output power tab and were added in the 3.0 version of the Serial port plug software.

The default transmit power, measured in dBm, is the power used by the Bluetooth radio for page, inquiry and their scan responses. This is also the initial power used for new connections.

The default transmit power has a valid range of –90dBm to +20dBm, however depending on the radio power class used and its radio power table, this range may not be fully used. It is up to the user to set the desired value for this parameter.

The recommended default value for Default TX power is +4dBm.

Setting a lower value than default will decrease the range for the unit. It may not be able to discover/connect to devices far away.

Setting a higher value than default will increase the range for the unit. It might be able to discover/connect to devices further away, however it may also interfere with devices at close range, due to sending with too much output power. The consequences might be that the device will have problems to discover/connect to devices at close range.

The maximum transmit power, measured in dBm, ensures that the local Bluetooth radio never transmits with higher power than this value.

Maximum transmit power control can be used to adapt the Bluetooth device to follow the rules and regulations regarding output power for certain countries but also be used for reducing the range of the unit.

Once a successful connection has been established, it is possible to control the remote device's transmit power (if the remote device supports this feature). The remote device can request an increase or decrease of transmit power depending on how "strong" the signal is. The maximum transmit power is only referenced when increasing the local transmit power. The serial port plug supports power control.

The maximum transmit power has a valid range of –90dBm to +20dBm, however depending on the radio power class used and its radio power table, this range may not be fully used. It is up to the user to set the desired value for this parameter. The table below shows an example with suggested value.

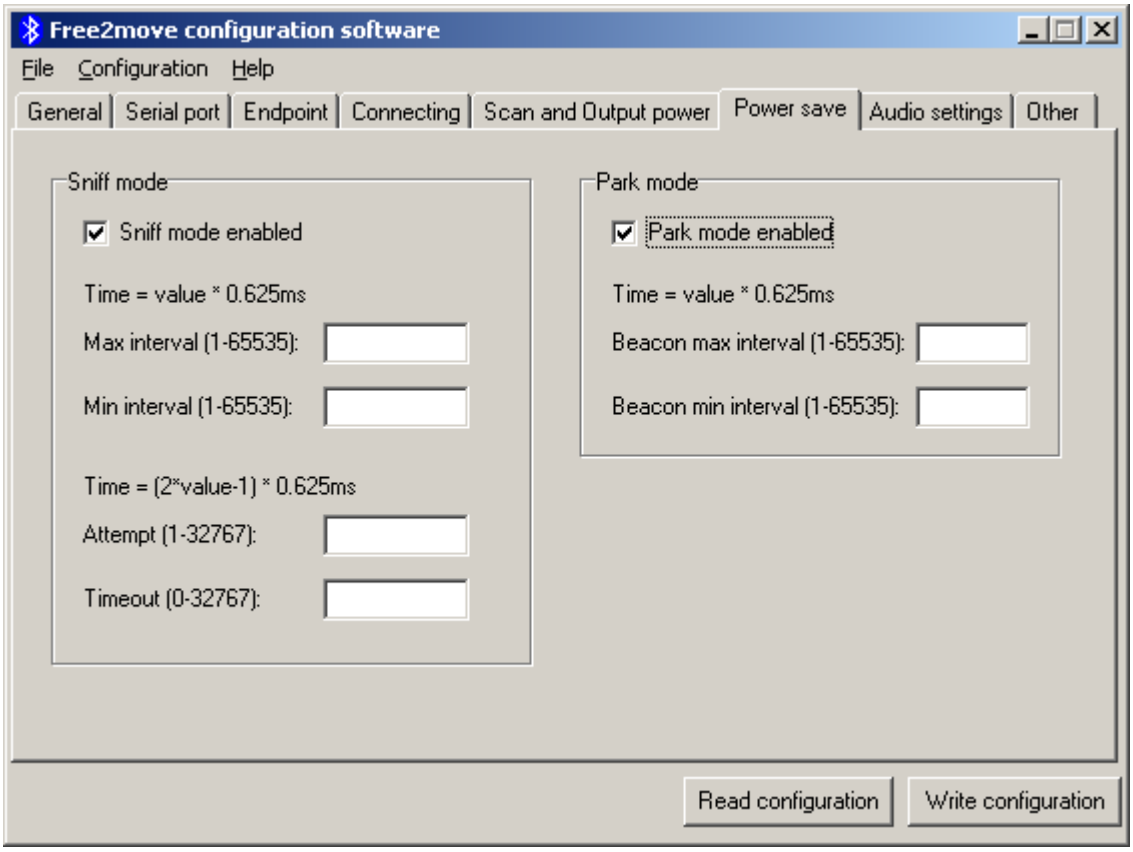
The values of the Default TX power and Maximum TX power parameters will be rounded down to the next available value when set, so the value set may be less than the requested. The Bluetooth device uses the highest value in the radio power table that is less than or equal to the requested default transmit power. The actual default transmit power used can be read after the settings are written to the device. The table below shows the radio power table used in the serial port plug.

Radio power table:

F2M01 power table (dBm)
+14
+9
+4
0
-4
-8

3.4 Sniff and park mode settings

The settings for sniff and park mode can be found on the power save tab. They can be used to reduce the power consumption of the serial port plug. The sniff and park mode settings were introduced in software version 3.0.



3.4.1 Sniff mode

Sniff mode is used to reduce traffic to periodic sniff slots. This mode can be used to save power on low data rate links. In sniff mode, the device wakes up periodically to receive and transmits data (if any). No special unpark messages are needed to communicate with it as in park mode described in the next section. Devices in sniff mode keep their active member address. Typically, sniffing devices will be active more often than parked devices.

The serial port plugs implement sniff mode, however, in order to use sniff mode, the remote device it is connected to must also support it. If the remote device does not support sniff mode the remote end will not allow the plug to go into low power mode. Sniff mode can be enabled and disabled.

The low power state machine built into the serial port plug software is responsible for entering and exiting sniff mode. It aims to spend as little time as possible in active mode.

There are three ways that a slave can enter sniff mode:

- The master forces a slave into sniff mode.
- The master requests a slave to enter sniff mode.
- The slave requests to be put into sniff mode.

Both master and slave can request that a connection shall enter sniff mode. The sniff mode parameters are negotiated so that the devices at each end of the connection share the same parameters for sniff mode. When one of the devices requests sniff mode, the other side has three choices: it can accept the sniff mode request with the proposed parameters, it can reject the sniff mode request, or it can return the request with different timing parameters. The sniff mode request messages can be sent back and forth until one side agrees to the proposed sniff mode parameters.

The sniff max interval and sniff min interval parameters are used to specify the requested acceptable maximum and minimum periods in the sniff interval. The sniff min interval parameter cannot be greater than the sniff max interval parameter. The sniff interval defines the amount of time between each consecutive sniff period. The Host can only set the requested minimum and maximum values for the sniff interval, it does not know the actual sniff interval negotiated.

Note: The sniff max interval must be less than the sniff window parameter.

In sniff mode the duty cycle of the slave's listen activity can be reduced. When a connection is established, it has to listen in every slot to the master's traffic. With sniff mode the time slots where the master can start transmission to a specific slave can be reduced. The master can only start transmission in specified time slots to the slave. These so called sniff slots are spaced regularly with a sniff interval. Two parameters control the listening activity in the slave: the sniff attempt and the sniff timeout. The slave starts listening at the sniff slots for N sniff attempts consecutive receive slots unless a packet with matching active member address is received. After every reception of a packet with matching active member address, the slave continues listening at the subsequent N sniff timeout or remaining of the receive slots, whichever is greater.

Note:

- For N sniff timeout > 0, the slave continues listening as long as it receives packets with matching active member address.
- That N sniff attempt = 1 and N sniff timeout = 0 cause the slave to listen only at the first sniff slot, irrespective of packets received from the master.
- That N sniff attempt = 0 is not allowed.

If the Host sends data to the serial port plug when the connection is in sniff mode, the plug will keep the data in its buffers until either the data can be transmitted or when a disconnection occurs.
Note: It is possible for the master to transmit data to a slave without exiting sniff mode.

There is a trade-off between the intervals selected and the current consumption. Longer intervals will reduce the current consumption. However, they will also increase the latency in communicating with the remote device. Users may perceive this as a lack of responsiveness.

There are no optimal default intervals that are suitable in every design. It is therefore up to the user to determine the intervals that is considered the most appropriate. (See the Bluetooth specification for more information).

3.4.2 Park mode

Park mode provides the greatest opportunities for power saving. The slave device only wakes up in periodic beacon slots, where it listens for unpark transmissions from the master. If it is not unparked, it goes back to sleep, switching off its receiver. A special unpark message is used to restore the device to normal activity. A parked device gives up its active member address and ceases to be an active member of the piconet. As long as it is parked it cannot transmit and since it has no active member address it cannot be addressed directly by the master. However, it wakes up periodically and listens for broadcasts so these can be used to unpark it, bringing it back to active mode.

The serial port plug implement park mode, however, in order to use park mode it must also be supported by the remote device it is connected to. If the remote device does not support park mode the remote end will not allow the serial port plug to go into low power mode. Park mode can be enabled and disabled.

The low power state machine built into the serial port plug firmware is responsible for entering and exiting park mode. It aims to spend as little time as possible in active mode.

The park mode command enables the Host to support a low-power policy for itself and other Bluetooth devices.

There are three ways that a slave can be parked:

- The master forces a slave into park mode.
- The master requests a slave to enter park mode.
- The slave requests to be put into park mode.

Both master and slave can request that a connection shall be parked. The park mode parameters are negotiated so that the devices at each end of the connection share the same parameters for park mode. When one side request park mode, the other side has three choices: it can accept the park mode request with the proposed parameters, it can reject the park mode request, or it can return the request with different timing parameters. The park mode request messages can be sent back and forth until both sides agrees to the proposed park mode parameters.

The park max interval and park min interval parameters are used to specify the requested acceptable maximum and minimum periods in the park interval. The park min interval parameter cannot be greater than the park max interval parameter. The park interval defines the amount of acceptable number of Baseband slots between each consecutive park period. The Host can only set the requested minimum and maximum values for the park interval, it does not know the actual park interval negotiated.

If the Host sends data to the serial port plug when the connection is in park mode, the plug will keep the data in its buffers until either the data can be transmitted (after unpark) or when a disconnection occurs.

There is a trade-off between the intervals selected and the current consumption. Longer intervals will reduce the current consumption. However, they will also increase the latency in communicating with the remote device. Users may perceive this as a lack of responsiveness.

There are no optimal default intervals that are suitable for every design and it is therefore up to the user to determine the values they consider most appropriate. (See Bluetooth specification for more information)

3.5 Class of device

The Class of device parameter was introduced in software version 3.0 of the serial port plug. It can be found under the “Other” tab in the configuration software.

The class of device parameter is used to indicate the capabilities of the serial port plug to other devices, i.e. indicating what type of device it is. For example, when searching for other devices with a Bluetooth mobile phone, each device discovered would have a symbol associated with it to give the user an easy overview of what type of device it is. A headset would appear with a symbol that looks like an earphone and a laptop or desktop workstation would appear as a computer.

A number of different device classes can be set using the drop-down lists in the configuration software. If a class of device cannot be created with the use of these lists, the user can manually enter a class of device value. This is done by enabling the **“Enter CoD value manually”** and enter a class of device value in the **“CoD Value”** field.

See Bluetooth Assigned Numbers for more information about the class of device.

The default class of device value of the serial port plug is set to uncategorized.

3.6 Link supervision timeout

The link supervision timeout parameter was introduced in software version 3.0 of the serial port plug. The setting can be found under the “Other” tab in the configuration software.

A Bluetooth connection may break down due to various reasons such as a device moving out of range or a power failure condition. Since this may happen without any prior warning, it is important to monitor the link on both the Connecting and the Endpoint side. To be able to supervise link loss, both the Connecting and the Endpoint use link supervision timers.

If at any time in connected state, the timer reaches the supervision timeout value, the connection is reset. The timeout period is negotiated when a successful Bluetooth connection is established. Its value must be chosen so that the supervision timeout is longer than the low power save modes sniff mode and park mode periods if they are used. Link supervision of a parked Endpoint will be done by unparking and re–parking the Endpoint.

The link supervision timeout has a span of 1– 41 seconds.

Note: Short list supervision timeout can make the connection unstable.

See Bluetooth specification for more information.

3.7 Performance parameters

When a successful Bluetooth connection has been established to a remote device; the serial port plug can be optimized for either throughput or latency mode. The throughput/latency mode configuration allows the user to fine-tune the low-level settings associated with the UART.

Throughput mode attempts to maximize the throughput at the cost of moderate latency. If low latency is more important than maximizing throughput, then latency mode may be selected instead.

When optimized for latency - the UART driver is more aggressive at looking for subsequent data bytes at the cost of an increased CPU load; hence the tradeoff against throughput.

Optimization of the plug for latency or throughput was added in the 3.0 version of the serial port plug software.

The Link Manager of the Serial port plug firmware also provides Quality of Service (QoS) capabilities. “Best effort” and “Guaranteed” service types are supported.

A poll interval, which is defined as the maximum time between subsequent transmissions from the master to a particular slave on the ACL link, is used to support bandwidth allocation and latency control. The poll interval is guaranteed in the active mode except when there are collisions with page, page scan, inquiry and inquiry scan. The poll interval is also known as Tpoll.

Connections are given a “Best effort” service type with a Tpoll value of 40 slots (25msec), by default, when created by serial port plug running as master (connecting).

If a different service type and/or Tpoll value for the established connection is desired, a QoS_Setup command must be sent to request other parameters to be used instead. The Quality Of Service parameters in the configuration software specify the parameters that will be used in the QoS_Setup command. The QoS_Setup command (if enabled) will be sent when a successful connection is established and can be sent by the master as well as the slave. The requested parameters can be rejected, e.g., if QoS_Setup is sent on a slave the master may reject the change. The user can only set the requested parameters for the link, it does not know the actual parameters negotiated.

Being able to adjust the link's Tpoll value allows reduction of the maximum latency for starting data transfers from slave to master at the cost of extra polling (and thus power consumption) on the master.

The service mode and latency parameters of the QoS_Setup command can be configured, the other parameters are not configurable and are set to its default values.

The latency parameter is translated from microseconds to piconet slots (rounded down) and used in an attempt to set the connection's Tpoll value. The Tpoll value is also subjected to some limits.

The service mode parameter indicates the level of service required.

If “Best effort” is selected, the service type does not require any guarantees. The fields of the QoS_Setup should be treated as hints by the remote device. The remote device may choose to ignore the fields, try to satisfy the hint or respond with the settings it will try to meet.

If “Guaranteed” is selected, the remote device will “guarantee” the latency. This allows the master to boost the connection's priority when using sniff mode, allowing for short, tight sniff timing.

4 Hints and tips

4.1 Establishing a connection between two Serial port plugs.

In order to use two F2M01 plugs as a serial link (replacing a serial cable), they must have a connection between each other. To ensure operating success, one device must be in connecting mode – Bluetooth master and the other device in endpoint mode – Bluetooth slave. The connecting unit issues a connection request and the endpoint unit accepts the connection request based on a connection rule. This implies that both units cannot be in connecting or endpoint settings mode simultaneously.

There are many different configuration options existing that will allow for the desired functionality. In this section two different options will be described, one is an easy to configure option whilst the other option is more secure. The secure option involves a complete Bluetooth pairing procedure, allowing encryption etc.

In this section the overall procedure is described. To get detailed information about each step please read the corresponding section of this user manual.

Also note that you may have to configure the serial port settings and the general settings in order to suit your needs.

4.1.1 “Non secure” connection

The easiest way to configure two Serial Port Plugs is probably to establish a connection without authentication. This option will not require two versions of the Free2move Configuration Software running simultaneously, i.e. only one serial port and one computer is needed.

By using the following configuration steps no other ordinary Bluetooth units will have the possibility to communicate with the two Serial Port Plugs. However it will be possible for one with in-depth Bluetooth knowledge to eavesdrop on the traffic and to connect to the units. If used in applications where security aspects are important please see the Paired secure connection section below.

The first step in configuring your devices is to determine which device will be master and corresponding slave. You also need to determine the Bluetooth device address of both units. The address can be seen on the label of the F2M01 or by using the configuration software (General settings tab).

Start by configuring the endpoint:

Attach the plug that will be the endpoint (Bluetooth slave) to the serial port and execute the configuration software.

Slave configuration settings are found under the “Endpoint settings” tab. Select “Endpoint (Bluetooth slave)” in the Device mode settings frame and choose the **“No authentication”** option. The next step is to enter the Bluetooth address of the Connecting unit in the **“Select accepted unit (Bluetooth address)”** boxes. It may be necessary to uncheck the **“Accept all units”** check box before entering the address

Click the **“Write configuration”** button to save the new settings to memory. Exit the configuration software.

Continue with the connecting unit

Attach the plug that will be the connecting unit (Bluetooth master) to the serial port and execute the configuration software.

Master configuration settings are found under the **"Connecting settings"** tab. Select **"Connecting (Bluetooth master)"** in the Device mode settings frame and choose the **"Connect without passkey"** option.

The next step is to enter the Bluetooth address of the Endpoint unit in the **"Connect to (Bluetooth address)"** boxes.

Click the **"Write configuration"** button to save the new settings to memory. Exit the configuration software.

Now your serial port plugs should be correctly configured to replace a serial cable.

4.1.2 Paired secure connection

When using this method to establish a connection between your two Serial port plugs; the configuration procedure is carried out in order to establish a link key. This key will be used both for the authorization of future connections and for the encryption/decryption of data flow between the devices.

The first step in configuring your devices is to determine which device will be master and corresponding slave. Also, make sure that both devices are powered on and connected to serial ports that have access to the Free2move Configuration Software. Note that you will need to have two instances of the configuration software running simultaneously connected to the different serial ports. It is possible to do this on the same computer or by using two computers.

Start by configuring the slave:

Slave configuration settings are found under the **"Endpoint settings"** tab. Select **"Endpoint (Bluetooth slave)"** in the Device mode settings frame and choose the **"Require paired device"** option. The next step is to click on the **"Pair device…"** button.

This will initiate a pair device wizard, which simplifies the pairing procedure.

The wizard allows the plug the option to either initiate pairing or accept to be paired by another Bluetooth device. Pick **"Remote device initiates pairing"** and enter the common passkey of the two devices.

Click **"Next"** to continue.

Now start configuration of the master:

Note that the configuration software of the slave unit should still be running.

Master configuration settings are found under the **"Connecting settings"** tab. Select **"Connecting (Bluetooth master)"** in the Device mode settings frame and choose the **"Connect to paired device"** option. The next step is to click on the **"Pair device…"** button.

The Pair device wizard builds a table of all available Bluetooth devices within range, highlight the relevant device (the endpoint) and click **"Next"**.

A status window appears and explains the device status, it also prompts you to configure the remote device i.e. endpoint, so that the pairing can continue. When using this guide this is already performed.

Continue by clicking the **"Pair"** button and the devices will initiate the pairing process. When pairing is completed the status of your device will automatically change to being paired. Click on the **"Finish"** button to complete the pairing process.

Save the new configuration to memory by clicking on the **"Write configuration"** button.

Continue configuration with the slave:

The status window in the "Pair device wizard" will indicate that pairing has been performed successfully. Click on the **"Finish"** button to complete the pairing process.

Save the new configuration to memory by clicking on the **"Write configuration"** button.

Now your serial port plugs should be correctly configured to replace a serial cable.

5 Frequently asked questions / troubleshooting guide

1. **My F2M01 plug does not enter configuration mode during the initial setup.**
   Before configuring your F2M01 plug you must make sure that it has no Bluetooth connection present, as this prevents the plug from entering configuration mode. Also make sure that you have a 5V external power supply

2. **Is it possible to connect my Serial Port Plug to Bluetooth units from other manufacturers?**
   Yes, if the other unit supports the Serial Port Profile it should work correctly. As a matter of fact this is one of the cornerstones of the Bluetooth technology.

3. **I want to connect to the Serial Port Plug from another Bluetooth equipped unit like a Laptop or PDA, What is the preferable configuration?**
   If security is unnecessary it is often preferable to configure the Serial Port Plug as an endpoint that allows all units to connect to it. Then you will be able to use the user interface of the Laptop or PDA to search and connect the Serial Port Plug.

4. **I cannot make a connection between my two serial port plugs.**
   To ensure operating success, one device must be in connecting mode – Bluetooth master and the other device in endpoint mode – Bluetooth slave. Both units cannot be in connecting or endpoint settings mode simultaneously. (Also se Hints and tips, Establishing a connection between two Serial port plugs. in chapter 3)

5. **I can connect the unit when using an authenticated connection but when configuring the plug to disable authentication, the connecting fails.**
   Make sure that the unit you are connecting the plug with is not configured to use a secure connection. Both devices must have authentication disabled.

6. **Why can I not see the advanced settings in my configuration software?**
   The advanced settings were introduced in the 3.0 version of the serial port plug software. You can find the software version used in your serial port plug on the General tab in the configuration software.

7. **When sending or receiving data it seems to be corrupted?**
   Ensure that the serial settings of the Serial Port Plug and your communicating equipment are the same.

8. **I miss some functionality or features, what can I do about this?**
   Additional settings, functionality and configuration may be introduced. Free2move can also offer customized solutions to fulfill your requirements.

Contact information

For support questions please contact your local dealer
For more information see our website: www.free2move.se/
For other purposes use: info@free2move.se

Local dealer/distributor