

bf1systems

Tyre Pressure Monitoring System – Mini Analyser

User Manual



F1-100-1451-003 – 433MHz TPMS Mini Analyser, Wireless

Version – 1.06

Wireless Mini Analyser User Manual

Revision History

1 Modifications

Date	Modifications	Author	Version	Modified Sheets	Approved		
					By	Date	Signed
03/07/2009	Document Creation	MRC	1_01	All	GMS	31/07/09	GMS
05/08/2009	Serial port configuration added Detailed description of 'last' command sequence added 'gencfg' command description added Setup menu details added MAC_Addr update command revised	MRC	1_02	8, 9, 10, 11, 12, 13, 15	JRS	06/08/2009	JRS
07/08/2009	Bootloader section covers change of Mini Analyser baudrate prior to bootloading	MRC	1_03	16	JRS	07/08/2009	JRS
27/08/2009	'last' response updated. Sensor data lines noe begin with position numbers 0:, 1:, 2:, 3: not 1:, 2:, 3:, 4:	MRC	1_04	9	GMS	27/08/09	GMS
26/10/2009	Front sheet added Addition of battery status splash screen to display, sections 2.3.1 & 3.2.3	MRC	1_05	1,7,11	GMS	3/11/09	GMS
18/05/2015	Logo changed to bf1systems on front page. Safety advice added for each device. Inventory table added Pictures of analyser & PC module added Battery charger section added. USB mains power supply section added. Mini analyser battery section added. Attaching the antenna section added. Charger mw6288gs spec page added. USB power supply spec page added. FCC ID & IC comments added to table	AE	1_06	1 4,5,6 7 12,13 8 9 11 12 31 31 28&30	AE	26/05/15	GU

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2 Safety Advice

2.1 MW6288 9V mains charger



 **WARNING!**

Risk of electric shock

- This product contains no serviceable parts and must not be opened.
- Do not charge any other type or chemistry of rechargeable battery cells other than Alkaline, NiMH and NiCad.
- This product must not be used outside.
- Do not expose the charger to rain or moisture to avoid the risk of fire or electrical shock.
- Always place the battery with the positive tip facing the top of the charger-Incorrect polarity may cause a fire or explosion.

 **CAUTION!**

- Do not short the charging terminals
- Do not operate the charger if it appears damaged in any way

2.2 EMSA 5W USB Series Power Supply



 **WARNING!**

Risk of electric shock

- **This product contains no serviceable parts and must not be opened.**
- **This product must not be used outside.**
- **Do not expose the power supply to rain or moisture to avoid the risk of fire or electrical shock.**

 **CAUTION!**

- **Do not use the power supply if it appears damaged in any way**
- **Avoid extreme conditions such as extreme heat, cold, humidity or direct exposure to the sun.**

2.3 Wireless mini analyser



CAUTION!

- Do not use the wireless mini analyser if there is any damage to the battery terminal or wire.
- Only use the power cables that have been supplied with the wireless mini analyser.

NOTE

- Remove battery from the device when not used for a long period of time.

3 Inventory

The system will arrive with the following items:

Description	Qty
Wireless Mini Analyser	1
9V Battery Snap to 2.5mm Jack Charging Cable	1
280 mAh Ni-MH PP3 Rechargeable Battery	1
Detachable Antenna	1
Carry Case	1
Carrying Strap	1
Wireless Analyser Module	1
Wireless PC Module	1
Retractable USB cable	2
EMSA 5W USB Power Supply with 4 adaptors	1
Intercept MW6288GS Battery Charger	1
CD loaded with manual and software	1

4 System Overview

The Wireless Mini Analyser tool is designed for use on a vehicle production line as an emergency aid when the standard wheel assignment process has failed. Under these circumstances the operator uses the Wireless Mini Analyser to pass wheel sensor data to the production database.

5 Components

The Wireless Mini Analyser consists of a modified version of the standard bf1systems Mini Analyser hardware, but using bespoke software.

The Wireless Analyser Module is a 2.4GHz-band radio modem that connects to the RS232 port located on the base of Mini Analyser.

The Wireless PC Module is a 2.4GHz-band radio modem that connects to a PC serial port.

A rechargeable NiMH cell is supplied with the Wireless Mini Analyser which is charged via a jack on the side of the analyser using the supplied charger.

5.1 Battery Charger

A 230V AC - 9/9.8 V DC Battery Charger is supplied with the Wireless Mini Analyser. The unit can charge 2 rechargeable 9V batteries and includes the following features: LED status display, micro controlling trickle charge mode, a discharge function, and delta V detection

Intended use:



**This product is intended for use only in dry interior rooms.
For use only with rechargeable Ni-Cd and Ni-MH batteries**

Failure to follow safety instructions may cause fatal accidents, injuries, and damages to persons and property.

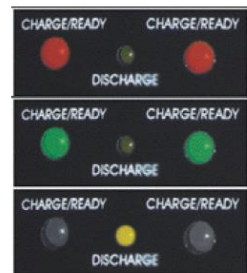
Connecting and operating

1. Connect either one or two PP3 Ni-Cd or Ni-MH batteries into the charging points. Ensure batteries to be charged are of the same type. **Do not mix battery types**
2. Plug the Charger into a 230 V AC mains socket, and switch on
3. Select the operation mode with the mode switch: DISCHARGE / CHARGE
Note: *Discharging is only available at the right charging point.*

Display: Red LEDs (CHARGE/READY) Illuminated
Batteries are charging.

Green LEDs (CHARGING/READY) illuminated.
Batteries are fully charged.

Yellow LED (DISCHARGE) illuminated
Batteries are discharging.



5.2 USB mains power supply

The USB mains power supply is supplied with the purpose of supplying power directly to the wireless modules that are used with the mini analyser.

The power supply converts 230V AC mains voltage into 5V DC at 1.0A

The power supply should only be used in conjunction with the USB cables that have been supplied with the mini analyser.

For all safety advice please refer to the safety advice page which can be found at the start of this document.

Once the correct pin adaptor has been selected, slot it in at around a 30-45° angle then press down until it is locked into place as shown in the images below



The USB cable should be inserted into the socket before the supply is connected to mains. See image 1 below.



The USB cable can now be plugged into the wireless module unit via the micro USB socket. See image 2 above.

Once everything is connected the plug can be connected to mains and power can be switched on.

The pin adaptor can be removed by pulling the release down as shown in the image below.





5.3 Wireless Mini Analyser

The Wireless Mini Analyser is fitted with a rechargeable battery in order to maximise the performance and versatility of the device. A jack socket on the side of the unit allows it to be charged using the mains charger provided.

Pin 9 of the 9-way D-type fitted to the Wireless Mini Analyser has been wired to provide power for the Analyser Module unit when in use.

5.4 Mini Analyser battery

<p>To remove the battery compartment lid Press the release clip and lift away.</p>	<p>The battery and antenna can be found stored within the battery compartment.</p>
	
<p>It is advised that the battery terminal cover is placed onto the battery during transit to avoid shorting of terminals.</p>	




The Wireless Mini Analyser will arrive with a rechargeable battery and detachable antenna placed within the battery compartment as can be seen in the above image. The battery is of the PP3 type and should always be replaced with one of the same type. Failure to do so may affect the performance of the device.

The battery will have a plastic terminal cover or rubber grommet attached to it.

The terminal cover should always be placed on the battery when it is not being used.

The battery may contain charge but it is advised that the battery is placed into the battery charger supplied and left until fully charged (Green LED illuminates).

Once the battery is fully charged and ready to be used, connect the battery to the battery snap ensuring the correct polarity is observed.

		
<p>To return the battery compartment lid, simply push down until the release button clicks back into place</p>	<p>Correct battery installation.</p>	<p>Battery snap polarity</p>



Batteries should be disposed in accordance with local waste regulations. **Do not incinerate.**

5.5 Attaching the Antenna

The wireless mini analyser is supplied with a detachable antenna which can be found and stored in the battery compartment.

Attach the antenna simply screw it clockwise onto the antenna connector located on top of the mini analyser.

The antenna should only be finger tight – Do not use any tools as this will result in damage to the antenna or connector.

It is advised that the antenna is removed and stored away in the battery compartment when not in use.

Attaching



Detaching



5.6 Wireless Modules

5.6.1 Wireless Module

The Wireless Module is fitted with a 9-way D-type, which connects directly to the 9-way D-type fitted to the bottom of the Mini Analyser. When connected in this way the Wireless Module is powered directly from the Mini Analyser.

In order to make changes to the internal settings of the device the unit must be connected to the serial port of a PC using a standard null modem serial cable (not supplied). When changing the internal settings the Wireless module unit must be powered via the micro-USB connector on the side of the module. NOTE: The USB connector is solely for the provision of power to the unit; no USB communication is supported.

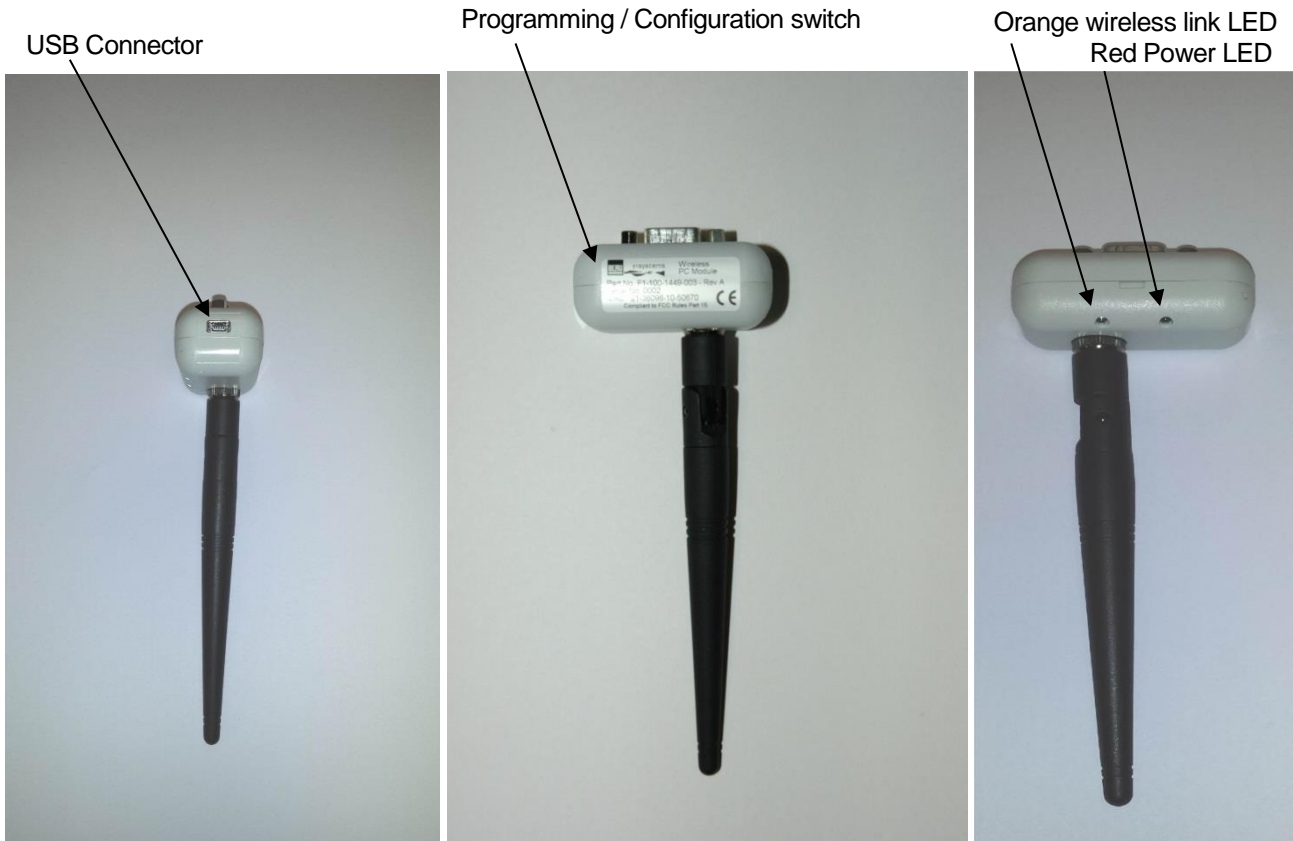


5.6.2 Wireless PC Module

The Wireless PC Module is fitted with a 9-way D-type, which can be connected directly to the 9-way D-type serial connector on a PC. A straight through serial extension lead should be used to remotely connect the Wireless PC module.

The Wireless PC Module settings may be updated with the unit connected to the PC serial port.

The Wireless PC Module is powered via the micro-USB connector on the side of the unit. NOTE: The USB connector is solely for the provision of power to the unit; no USB communication is supported.



5.6.3 Status Information

Both the Wireless PC Module and Wireless Analyser Module have 2 LEDs that are used for indicating the status to the user. The red LED pertains to power while the orange LED relates to wireless link status.

5.6.3.1 Power LED

The power LED has three modes of operation:

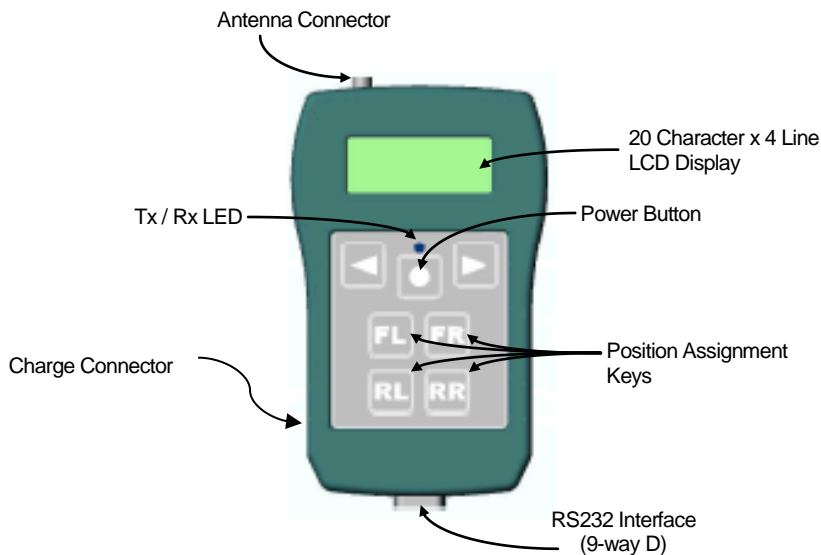
Continuously on	: Power on, unit initialising
Blink	: Power on, initialisation completed ok, operating normally (0.3s on – 2.7s off)
Off	: No power

5.6.3.2 Link LED

The link LED has four modes of operation:

Fast flash	: Initialising link, searching for device to pair with (0.5s on – 0.5s off)
Double blink	: Link established and operating correctly (0.2s on – 0.2s off – 0.2s on – 1.4s off)
Blink	: cParameter edit mode, no wireless activity (0.3s on – 1.7s off)

5.7 Analyser Overview



5.7.1 Power Button

The Power Button is used to power on and off the Wireless Mini Analyser unit. With the unit powered off, pressing and holding the Power Button will cause the unit to turn on. Upon power on the unit will display a number of information splash screens, before displaying the main Sensor Assignment screen. The Current battery status will be shown as part of the power on sequence, so that the user can verify the unit is suitably charged prior to use.

The unit is powered off by pressing and holding the Power Button for longer than 2 seconds.

5.7.2 Position Assignment Keys

The position assignment keys provide the operator with the means to associate a wheel sensor with a given location on the vehicle. For the Wireless Mini Analyser, the Position Assignment Keys are the only functional keys.

5.8 Connectivity Set Up

The Wireless Analyser set-up provides a point-to-point link between a single End Device (Wireless Mini Analyser) and a single Co-ordinator (Wireless PC Module). In order that units may automatically connect at power on devices contain details of the units to which they may connect. Each end device is configured with the MAC address of a single co-ordinator node, whilst co-ordinator nodes contain a list of up to 8 allowable end devices.

At power on the co-ordinator node (Wireless PC Module) enters pairing mode (fast flashing Link LED). In this mode it listens for any programmed device that is in range.

When an end device node (Wireless Analyser Module) is powered on it also enters pairing mode (fast flashing Link LED).

When a compatible co-ordinator node and end device node are operating in pairing mode are within range of each other, a link will be established. When the devices pair the link status LED on both devices will change from fast flashing to double blink to indicate this. Once established the link will remain valid until one or other of the devices times out due to lack of data transfer activity on the radio link.

By default the co-ordinator node Link_timeout is 15s, whereas the end device Link_timeout is 10s. It is intentional that the end device Link_timeout is shorter than that of the co-ordinator Link_timeout.

If the end device node fails for any reason, then the co-ordinator node will revert to pairing mode after its Link_timeout expires. This will allow a new end device node that is in the co-ordinator's allowed list to be accepted.

The link establishment strategy is fully fault tolerant, and will automatically handle power cycling of devices in any order, and will automatically re-establish a link in the event of an end device failure. If the co-ordinator node is lost through power failure, the link will automatically restart once power is re-applied.

6 Operation

Operation of the Wireless Mini Analyser falls into two parts, collection of the wheel sensor information using the Mini Analyser itself, and gathering of the information stored in the Mini Analyser via the wireless link to the host PC.

6.1 Wheel Assignment

The purpose of the Wireless Mini Analyser is to provide a convenient method for the assignment of wheel sensors to their appropriate location on the car, should the normal automated process fail for any reason.

In order to position a sensor the operator should LF trigger the sensor via one of the Position Assignment Keys on the analyser [FL] [FR] [RL] [RR]. When the sensor responds, and the Mini Analyser receives the RF datagram the data is automatically assigned it to the appropriate corner based on the Position Assignment Key used to trigger the sensor. When a sensor is positioned successfully a splash screen is displayed, together with a beep and flashing of the Tx/Rx LED.

		S	e	N	s	o	r			P	o	s	i	t	i	o	n				
										F	L										

If an RF datagram is not received within 500ms in response to the LF trigger, then the Mini Analyser will automatically reattempt to trigger the sensor again after a further 500ms (i.e.: 1s between LF trigger attempts). The Mini Analyser will make up to 5 retries to LF trigger the sensor. If no RF datagram has been received after the fifth retry, a splash screen will be displayed, accompanied by a beep and flashing of the Tx/Rx LED.

				L	F			T	r	i	g	g	e	r						
		!	!	!		F	A	I	L	E	D		!	!	!					

As each wheel is learned, the serial number of the sensor that has been assigned to the wheel will be shown on the Mini Analyser display. Unassigned locations will display serial number '0'.

▲			F	L	:		2	0	1	3	8	1	5	5	6	9	▲
▲			F	R	:											0	▲
▲			R	L	:											0	▲
▲			R	R	:											0	▲

This process is repeated for each corner of the vehicle.

▲			F	L	:		2	0	1	3	8	1	5	5	6	9	▲
▲			F	R	:		2	0	1	3	8	6	3	3	2	4	▲
▲			R	L	:											0	▲
▲			R	R	:											0	▲

▲			F	L	:		2	0	1	3	8	1	5	5	6	9	▲
▲			F	R	:		2	0	1	3	8	6	3	3	2	4	▲
▲			R	L	:		2	0	1	3	7	6	9	2	0	5	▲
▲			R	R	:											0	▲

▲			F	L	:		2	0	1	3	8	1	5	5	6	9	▲
▲			F	R	:		2	0	1	3	8	6	3	3	2	4	▲
▲			R	L	:		2	0	1	3	7	6	9	2	0	5	▲
▲			R	R	:		2	0	1	3	7	3	3	7	6	0	▲

Should the set assignment fail, due to duplicating a serial number between locations, a splash screen is displayed, together with a beep and flashing of the Tx/Rx LED. The operator need only relearn the corner in error to complete the set.

					S	e	T			E	r	r	o	r			
		D	u	p	l	i	C	a	t	e		S	e	r	i	a	l
						F	L				R	L					

6.2 Data Transfer

Transfer of the data collected by the Wireless Mini Analyser is achieved via the wireless serial link provided by the Wireless PC Module and Wireless Analyser Module. The wireless modules provide a transparent 19200-baud serial link between the host PC and the Mini Analyser. When operating with the Wireless Modules the serial port should be configured as follows:

```
Data Rate      :      19200 baud
Data bits      :          8
Parity         :         No
Stop bits      :          1
Flow control   :         None
```

6.2.1 Command Transmission

Due to the single RF channel link between the host PC and the Wireless Mini Analyser, full-duplex serial communication is not possible. The terminal interface within the Wireless Mini Analyser has been modified to suppress the remote echo that is present in the standard firmware. As a result there is no requirement for the terminal emulator, or other software, to wait for an echo character from the Wireless Mini Analyser.

If the Wireless Mini Analyser is used with a standard terminal program the entered characters will not be visible to the user unless the terminal program is configured to provide a local echo. If remote echo suppression strategy is not implemented then command transfers may fail due to clashes between transmitted and echoed characters on the RF link.

6.2.2 'last' Command

The current contents of the set buffer may be requested from the Mini Analyser at any time by use of the 'last' terminal command. In response to this command the Wireless Mini Analyser will transmit a fixed length data block containing the collected data. As the Wireless Mini Analyser is generally intended for connection to a terminal program, the data is transferred as ASCII characters.

The transferred data consists of 124 characters of header (2 lines of 62 characters), followed by 244 characters of data (4 lines of 61 characters), regardless of sensor generation (G2 or G3). Appended to the collected data is a 7-character line containing a checksum that is used to verify data integrity.

```
Pos Chan SerialNo  Pact  Tact  RSSI RBL Mode RLLRot TimeStamp      (62 chars)
-----
0: -- 1402246943  1000  23   54 236 0x41  0x00 1360360      (62 chars)
1: -- 1402246937  1025  24   54 236 0x41  0x00 1538230      (61 chars)
2: --                0 10000 -40    0  0 0x00  0x00    0      (61 chars)
3: --                0 10000 -40    0  0 0x00  0x00    0      (61 chars)
0xf372                                     (7 chars)
```

The CRC is generated by the CCITT algorithm $G(x) = x^{16} + x^{12} + x^5 + 1$ with a 0x0000 register preload value. The CRC is calculated over the 244 characters of the data payload.

On receipt of the data block at the host PC the data should be validated by means of the CRC. If the CRC validates correctly, then the host PC should complete the data transfer by sending an 'ack' packet back to the Wireless Mini Analyser. An 'ack' packet consists of the characters 'ack' followed by a linefeed. If the CRC fails to validate, then the data may be re-requested via the 'last' command.

The complete sequence for the 'last' command is shown as follows:

At the USER1> prompt, the host PC sends the 'last' command

On receipt of the 'last' command the Wireless Mini Analyser responds with the data and CRC block, followed by a USER1> prompt

The data block received by the PC is validated by a CRC check

If the check is successful the PC responds with an 'ack' message at the USER1> prompt

On receipt of the 'ack' message the Wireless Mini Analyser will return to the USER1>, ready for the next host command.

```
USER1> last
```

```
Pos Chan Serial No  Pact  Tact RSSI RBL Mode RLRot  Timestamp
-----
0:  --  1402246943  1000  23   54 236 0x41  0x00  1360360
1:  --  1402246937  1025  24   54 236 0x41  0x00  1538230
2:  --           0 10000  0    0  0 0x00  0x00    0
3:  --           0 10000  0    0  0 0x00  0x00    0
0xf372
```

```
USER1> ack
```

```
USER1>
```

Note that as remote echo of data received at the Wireless Mini Analyser is suppressed due to the half-duplex capability of the wireless link, the 'last' and 'ack' messages from the host PC will not appear on the terminal unless it is configured to provide local echo.

In order to provide user feedback of reception of the 'last' command, the characters at the ends of the Wireless Mini Analyser display screen toggle between up-arrow and down-arrow characters each time the command is received.

```
▲  ▲  ▲  F L  :  2 0 1 3 8 1 5 5 6 9  ▲
▲  ▲  ▲  F R  :  2 0 1 3 8 6 3 3 2 4  ▲
▲  ▲  ▲  R L  :  2 0 1 3 7 6 9 2 0 5  ▲
▲  ▲  ▲  R R  :  :  :  :  :  :  :  :  0  ▲
```

```
▼  ▼  ▼  F L  :  2 0 1 3 8 1 5 5 6 9  ▼
▼  ▼  ▼  F R  :  2 0 1 3 8 6 3 3 2 4  ▼
▼  ▼  ▼  R L  :  2 0 1 3 7 6 9 2 0 5  ▼
▼  ▼  ▼  R R  :  :  :  :  :  :  :  0  ▼
```

6.2.3 'setclear' Command

The contents of the set buffer may be cleared via the host PC at any time using the 'setclear' command.

This command is generally used once a complete set of wheel sensors has been learnt and transferred, in order to clear the buffer ready for next use. In order for the host PC to verify that the command has been correctly received and executed by the Wireless Mini Analyser it will respond with an 'ack' packet. An 'ack' packet consists of the characters 'ack' followed by a linefeed.

On receipt and execution of the 'setclear' command the unit first switches to the battery status display screen, which is splashed for 3 seconds. This allows the user to monitor the battery usage without the need to switch operating modes.

```
      B a t t e r y   S t a t u s
< # # # # # # # # # # # # # # >
U p           B a c k l i g h t   D o w N
```

The display will then return to the main sensor positioning screen, having had the displayed serial numbers reset to zeros.

```
▼  ▼  ▼  F L  :  :  :  :  :  :  :  :  0  ▼
▼  ▼  ▼  F R  :  :  :  :  :  :  :  0  ▼
▼  ▼  ▼  R L  :  :  :  :  :  :  :  0  ▼
▼  ▼  ▼  R R  :  :  :  :  :  :  :  0  ▼
```

6.2.4 'gencfg' Command

By default the Wireless Mini Analyser is configured to auto detect and decode RF datagrams from Ge1, Gen2 and Gen 3 sensors. In some situations the user may wish to configure the unit to receive only sensors of a specific type. This can be achieved via the 'gencfg' terminal command.

Sending the 'gencfg' command with no argument at the USER1> prompt will result in the current setting, and available options being returned by the Wireless Mini Analyser:

```
USER1> gencfg
Current sensor gen configuration 4
Sensor gen configuration 0 = GEN1
Sensor gen configuration 1 = GEN2
Sensor gen configuration 2 = GEN3
Sensor gen configuration 4 = Auto
USER1>
```

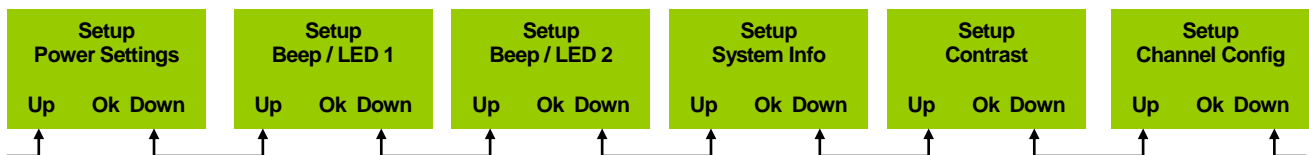
To modify the setting the 'gencfg' command should be sent with the appropriate argument. The Wireless Mini Analyser will respond with a message indicating the change has taken place.

```
USER1> gencfg 2
Sensor gen configuration 2 set
```

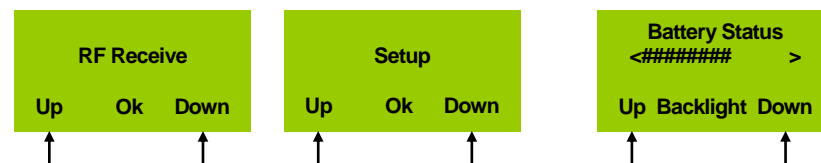
If the terminal is not configured for local echo then the information sent at the USER1> prompt will not be visible on the terminal.

6.3 Setup Menu

The setup menu gives access to status and configuration information for the Wireless Mini Analyser. Pressing the power button and left arrow button at the same time accesses the setup menu. The setup menu is entered at the <Power Settings> menu page. Other available pages are accessed using the Left Arrow / Right Arrow navigation buttons.



The setup menu can be exited by pressing and holding the Left Arrow navigation button. This will move the user to the top level menu.

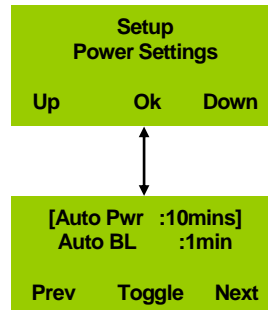


The <Battery Status> page indicates the current state of charge of the Mini Analyser internal battery, and also allows the user to turn on and off the display backlight. The backlight state is toggled by pressing the power button.

Pressing the power button at the <RF Receive> top level menu page returns the user to the default sensor display page.

6.3.1 Power Settings

The <Power Settings> selection page allows the user to configure the automatic power controls for the Mini Analyser. The <Power Settings> selection page is entered by pressing the power button at the <Setup – Power Settings> menu page.



Auto Pwr: The Mini Analyser will power off if no buttons are pressed or no serial data is received for greater than this time

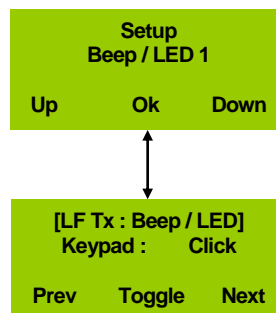
Auto BL: If enabled the Mini Analyser display backlight will be turned off if no buttons are pressed or no serial data is received for greater than this time

Within the <Power Settings> selection page the field to be changed is selected using the Left Arrow / Right Arrow navigation keys. With the required menu item highlighted by the square brackets [...] pressing the power button cycles through the available options.

The <Power Settings> selection page is exited by pressing and holding the Left Arrow navigation key. This returns the user to the <Setup – Power Settings> menu page.

6.3.2 Beep / LED 1

The <Beep / LED 1> selection page allows the user to configure the indicators for LF transmissions by the Mini Analyser. The <Beep / LED 1> selection page is entered by pressing the power button at the <Setup – Beep / LED 1> menu page.



LF Tx: Selects indication mode for LF transmissions, options are:

- Off – No indication
- Beep – Audible indication
- LED – Visual indication
- Beep/LED – Both

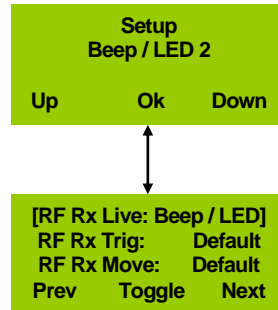
Keypad: Enables / disables keypad click

Within the <Beep / LED 1> selection page the field to be changed is selected using the Left Arrow / Right Arrow navigation keys. With the required menu item highlighted by the square brackets [...] pressing the power button cycles through the available options.

The <Beep / LED 1> selection page is exited by pressing and holding the Left Arrow navigation key. This returns the user to the <Setup – Beep / LED 1> menu page.

6.3.3 Beep / LED 2

The <Beep / LED 2> selection page allows the user to configure the indicators for LF transmissions by the Mini Analyser. The <Beep / LED 2> selection page is entered by pressing the power button at the <Setup – Beep / LED 2> menu page.



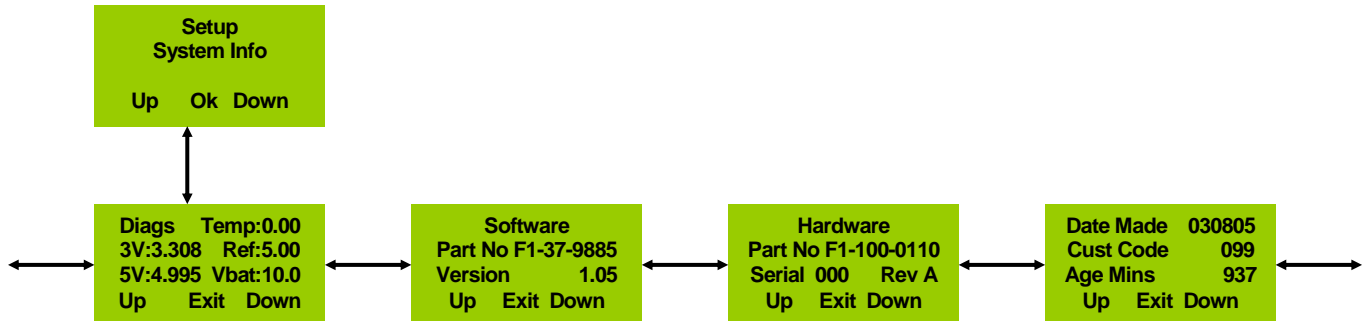
- RF Rx Live: Selects indication mode for general RF reception, options are:
- Off – No indication
 - Beep – Audible indication
 - LED – Visual indication
 - Beep/LED – Both
- RF Rx Trig: Selects indication mode for LF triggered RF reception, options are:
- Default – Indication as per RF Rx Live
 - Beep – Audible indication
 - LED – Visual indication
 - Beep/LED – Both
- RF Rx Move: Selects indication mode for moving sensor RF reception, options are:
- Default – Indication as per RF Rx Live
 - Beep – Audible indication
 - LED – Visual indication
 - Beep/LED – Both

Within the <Beep / LED 2> selection page the field to be changed is selected using the Left Arrow / Right Arrow navigation keys. With the required menu item highlighted by the square brackets [...] pressing the power button cycles through the available options.

The <Beep / LED 2> selection page is exited by pressing and holding the Left Arrow navigation key. This returns the user to the <Setup – Beep / LED 2> menu page.

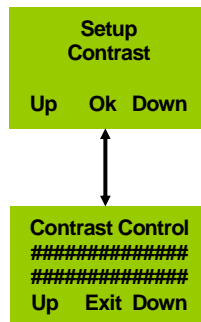
6.3.4 System Info

The System Info pages provide details regarding the Mini Analyser hardware and software. The <System Info> display pages are entered by pressing the power button at the <Setup – System Info> page.



6.3.5 Contrast

The <Contrast Control> page allows the user to adjust the display contrast of the Mini Analyser LCD. The <Contrast Control> page is entered by pressing the power button at the <Setup – Contrast> menu page.

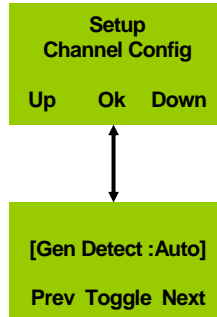


The contrast setting is adjusted using the Left Arrow / Right Arrow navigation keys.

The <Contrast Control> page is exited by pressing the power button. This returns the user to the <Setup – Contrast> menu page.

Channel Config

The <Channel Config> selection page allows the user to select the sensor types that the Mini Analyser is capable of decoding. The <Channel Config> selection page is entered by pressing the power button at the <Setup – Channel Config> menu page.



Gen Detect:	Selects the sensor types that can be decoded by the Mini Analyser
	G1 – Gen1 sensors ONLY
	G2 – Gen2 sensors ONLY
	G3 – Gen3 sensors ONLY
	Auto – Gen1, Gen 2, Gen3 sensors

Pressing the power button cycles through the available Gen Detect options.

The <Channel Config> selection page is exited by pressing and holding the Left Arrow navigation key. This returns the user to the <Setup – Channel Config> menu page.

7 cParameters

The Wireless Module firmware contains a number of configurable parameters (cParameters). Under normal circumstances there should be no need to modify these values. However, the end user may update these parameters if necessary. In order to update the parameters the module to be updated should be connected to the serial port of a PC running a terminal program.

The terminal program should be configured to operate at 19200 baud, 8 data bits, no parity, 1 stop bit. In order to connect a Wireless Analyser Module to a PC for cParameter update, a null modem cable is required. The Wireless PC Module may be connected directly to the serial port of the PC, or using a straight through male to female serial port extension lead. When performing cParameter updates power is provided via the micro-USB connector on the side of the module, regardless of the module type.

With the module connected to the PC and powered on, depressing the recessed button on the module for 0.5 seconds using a suitable implement (such as a paperclip) enters cParameter edit mode. On entering cParameter edit mode the Wireless Module will report part number and software version information to the terminal, followed by the USER> prompt.

7.1 Wireless Analyser Module

The cParameters in the Wireless Analyser Module that may be updated by the user are:

Network ID	[PAN_ID]
Co-ordinator MAC address	[C_MAC_Addr_1]
Link activity timeout	[Link_timeout]

To make changes to any of these parameters the commands detailed below may be used.

7.2 Wireless PC Module

The cParameters in the Wireless Analyser Module that may be updated by the user are:

Network ID	[PAN_ID]
End device MAC addresses	[ED_MAC_Addr_x] (x = 1..8)
Link activity timeout	[Link_timeout]

To make changes to any of these parameters the commands detailed below may be used.

7.3 Arguments

7.3.1 PAN_ID

The user command for changing the overall network ID shall have the following format:

```
PAN_ID <dddd>  
    <dddd> – 16 bit decimal value for PAN ID setting
```

eg: PAN_ID 56994

Result: PAN_ID is set to DEA2 (hex)

Typing the PAN_ID command with no argument shall report the current PAN_ID setting.

7.3.2 ED_MAC_Addr [n] / C_MAC_Addr 1

The user command for changing the end device MAC addresses held within the cParameter table shall have to following format:

```
ED_MAC_Addr [n] <dddd> <dddd> <dddd> <dddd>
```

Or

```
C_MAC_Addr 1 <dddd> <dddd> <dddd> <dddd>
```

n – ED_MAC address to change n = 1..8 (Wireless PC Module)

<dddd> – 16 bit decimal values for MAC address settings, most significant word first

eg: ED_MAC_Addr 3 21 39096 10 52171

Result: ED_MAC_Addr 3 is set to 0015-8D00-000A-CBCB (hex)

Typing the ED_MAC_Addr command with only the MAC address number argument [n] shall report the current setting of the specified ED_MAC_Addr.

Typing the C_MAC_Addr command with only the first argument [1] shall report the current setting of C_MAC_Addr 1.

7.3.3 Link_timeout

The user command for changing the link timeout held within the cParameter table shall have to following format:

```
Link_timeout <dddd>  
    <dddd> – 16 bit decimal value for Link_timeout setting, expressed in seconds
```

```
eg: Link_timeout 15  
Result: Link_timeout is set to 15 seconds
```

Typing the Link_timeout command with no argument shall report the current Link_timeout setting.

8 Bootloader

8.1 Mini Analyser Firmware Update

The Mini Analyser firmware may be upgraded using the bf1systems supplied Analyser Bootloader program. Loss of power or communications during the update process may leave the unit in an undefined (non-operating) state. The following precautions should be taken before beginning the firmware update process:

- Securely connect the RS232 cable to the Mini Analyser
- Securely connect the RS232 cable to the PC using the screw retainers
- Ensure the Mini Analyser battery is in a good state of charge

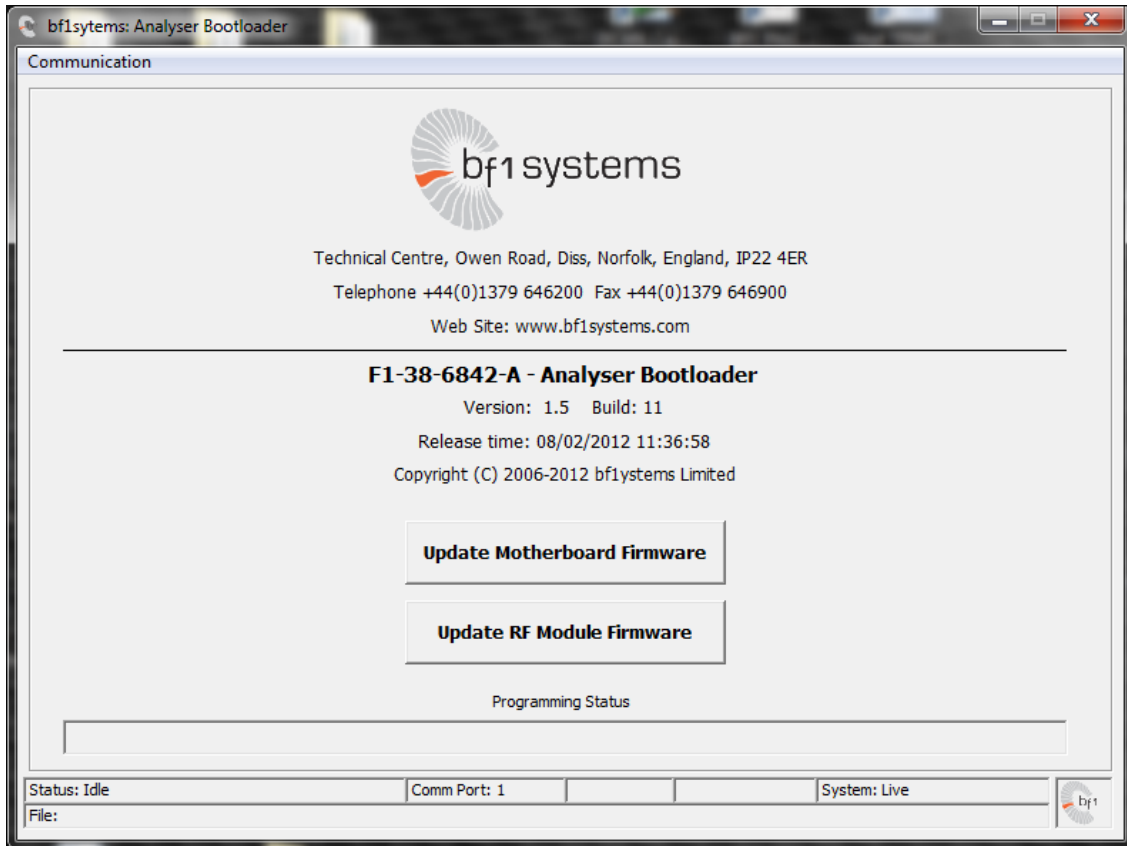
As the Wireless Mini Analyser has a default serial communication rate of 19200 baud, and the bootloader software operates at 57600 baud it will be necessary to modify the Wireless Mini Analyser communication speed in order for the bootloader to function.

With the Mini Analyser unit connected to the host PC serial port start a terminal emulator (HyperTerm, TeraTerm etc) and configure for 19200 baud communication and enable 'local echo' for the terminal. Pressing the enter key in the terminal will cause the USER1> prompt to be output by the Mini Analyser.

The 'baudrate' command can then be used to reconfigure the communication speed of the Mini Analyser:

```
USER1> baudrate 5  
  
Rates 1:4800 2:9600 3:19200 4:38400 5:57600 6:115200  
  
Change terminal baud rate, then press a key...
```

The Mini Analyser communication speed is now correct to function with the bf1systems Analyser Bootloader software. Close the terminal emulator and start the bootloader software. The screenshot below shows the bootloader software.



The following steps should be followed to update the firmware:

- Ensure a known good battery is used or the analyser is powered from the charger during the update.
- Confirm 'System: Live' is shown in the bottom right corner.
- Select the <Update Motherboard Firmware> button. This will call up a file dialog, where the required .fwr file can be selected.
- Once the file is selected the Mini Analyser will auto power off ready for update (Status : Starting Bootloader)
- Press the Action Key on the Mini Analyser to start the motherboard bootloader.
- The bootloader program will now erase the old firmware (Status : Erasing FLASH) and program in the selected firmware file (Status : Programming FLASH). The progress of the programming operation can be monitored via the Programming Status bar, and the Status field at the bottom of the screen.
- When programming completes (Status: Starting Firmware), the new firmware can be started by pressing the Action Key to power on the Mini Analyser

The firmware update is now complete.

9 Wireless Analyser Module Specifications

9.1 General

Parameter	Units	Conditions	Min	Typ	Max
Supply Voltage	V	Power supplied to module via Pin 9 on the 9-Way D Connector or by the Mini USB connector		5	
Supply Current	mA			50	

9.2 Communications

Parameter	Units	Conditions	Min	Typ	Max
Data Rate	kbaud			19.2	
Protocol		2.4GHz IEEE802.15.4 Compatible			
Communications Range	m			50	
Transmit Power Level	dBm				2.5
Receiver Sensitivity	dBm		-96		

9.3 Environmental

Parameter	Units	Conditions	Min	Typ	Max
Operating Temperature Range	°C		-20		70
Lead-Free and RoHS compliant					
Compliant with FCC part 15 rules, IC Canada, ETSI ETS 300-328 and Japan ARIB STD T66					
FCC ID: TYOJN5139M0 IC: 7438A-CYO5139M0					
<p>These modules have been designed to operate with antennas having a maximum gain of 4.4 dBi. Antennas having a gain greater than 4.4 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.</p> <p>As long as the above condition is met, further transmitter testing will not be required.</p>					

Important Notice

User information according to **FCC15.21**

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

b) Statement for Class B digital device acc. to FCC 15.105

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 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 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.*

c) Statement acc. RSS Gen Issue 3, Sect. 7.1.3

This device complies with Part 15 of the FCC Rules and with Industry Canada license-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Wireless PC Analyser Module Specifications

9.4 General

Parameter	Units	Conditions	Min	Typ	Max
Supply Voltage	V	Power supplied to module via Pin 9 on the 9-Way D Connector or by the Mini USB connector		5	
Supply Current	mA			50	

9.5 Communications

The implemented IEEE 802.15.4 based network operates in the 2400 MHz (2.4GHz) radio frequency band. This band has 16 channels available channels for general-purpose use. The channels used by the Wireless analyser Modules utilise the channels shown in the table below.

Frequency Band	Channel Number	Centre Frequency (MHz)	Geographical Area
2400MHz	11	2405	Worldwide
	12	2410	
	13	2415	
	14	2420	
	15	2425	
	16	2430	
	17	2435	
	18	2440	
	19	2445	
	20	2450	
	21	2455	
	22	2460	
	23	2465	
	24	2470	
	25	2475	
	26	2480	

Parameter	Units	Conditions	Min	Typ	Max
Data Rate	kbaud			19.2	
Communications Range	m			50	
Transmit Power Level	dBm				2.5
Receiver Sensitivity	dBm		-96		
Protocol	2.4GHz IEEE802.15.4 Compatible				

9.6 Environmental

Parameter	Units	Conditions	Min	Typ	Max
Operating Temperature Range	°C		-20		70

Lead-Free and RoHS compliant

Compliant with FCC part 15 rules, IC Canada, ETSI ETS 300-328 and Japan ARIB STD T66

**FCC ID: TYOJN5139M0
IC: 7438A-CYO5139M0**

These modules have been designed to operate with antennas having a maximum gain of 4.4 dBi. Antennas having a gain greater than 4.4 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

As long as the above condition is met, further transmitter testing will not be required.

Important Notice

User information according to **FCC15.21**

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

b) Statement for Class B digital device acc. to FCC 15.105

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 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 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.

c) Statement acc. RSS Gen Issue 3, Sect. 7.1.3

This device complies with Part 15 of the FCC Rules and with Industry Canada license-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

10 Charger MW 9V MW6288GS

10.1 Specifications

Input (VAC)	Output (VDC)	Output (W)	Output (mA)	Protection/IP Class	Tech	Fitting size
230 @ 50Hz	2x 9.8	1.4 Max	70	II / IP20	Ni-Cd Ni-MH	2x 9V Block

11 EMSA050100 USB power supply

11.1 Specifications

MODEL	output voltage		output current		output wattage	ripple*	efficiency level
	nominal (Vdc)		min (A)	max (A)	max (W)	max (mVp-p)	
EMSA050100	5		0	1	5	150	V

*at full load, 100 ~ 240 Vac input, 20 MHz bandwidth oscilloscope ,each output terminated with a 10 μ F aluminum electrolytic and 0.1 μ F ceramic capacitors.

INPUT

parameter	conditions/description	min	nom	max	units
rated input voltage		100		240	Vac
input voltage range		90		264	Vac
rated frequency		50		60	Hz
frequency range		47		63	Hz
input current				0.2	A RMS
inrush current	at 115 V ac, cool start at 230 V ac, cool start			15 30	A A
no load power consumption				0.3	W

OUTPUT

parameter	conditions/description	min	nom	max	units
line regulation			± 1		%
load regulation			± 5		%
over voltage protection	output voltage clamped by internal protection zener				
short circuit protection	output shut down and auto-restart				

SAFETY & COMPLIANCE

parameter	conditions/description	min	nom	max	units
HI-POT	input to output at 10 mA for 1 minute			3,000 4,242	Vac Vdc
insulation resistance	input to output at 500 V dc	100			M Ω
safety approvals	UL/cUL, GS, CE, FCC, RCM				
EMI standard	FCC class B, EN55022				
leakage current				0.25	mA
RoHS compliant	yes				

ENVIRONMENTAL

parameter	conditions/description	min	nom	max	units
operating temperature		0		40	$^{\circ}$ C
operating humidity		20		80	%
storage temperature		-10		70	$^{\circ}$ C
storage humidity		10		90	%