PAMS Technical Documentation
RPM-1 Series Transceivers

Tuning and flashing instructions

Issue 1 12/99

AMENDMENT RECORD SHEET

Amendment Number	Date	Inserted By	Comments
	12/99	OJuntune	Issue1

CONTENTS

RF Tuning Instructions

General

All tuning operations of the RPM–1 are carried out using the WinTesla service software. WinTesla interfaces with RPM–1 via the JBS–23 service adapter.

The tuning values of the phone are stored on the RPM–1's non–volatile memory. The contents of this memeory can be read by the service software and saved as a file. The program also enables writing the default tuning parameters, in which case all tuning steps should be carried out.

During tuning, proceed as follows:

- Take care not to damage sensitive measuring instruments with excessive RF power. A spectrum analyzer may require an attenuator. RPM–1 maximum output power may exceed 33 dBm (2 W) in GSM 900 band and 30 dBm (1 W) in GSM1800 band.
- Carry out all tuning steps in the shortest possible time to avoid excessive heating of RF units.
- Perform all tuning steps in the order presented.
- Never try to mask a fault by tuning it out!

Required Equipment

- PC/AT computer with WinTesla service software; see separate section for instructions on installation and use.
- Service accessories; see equipment setup lists.
- GSM radio telephone test station or separate measuring equipment as follows:
  - RF generator
  - pulse power meter
  - spectrum analyzer
  - attenuator

Equipment Setup

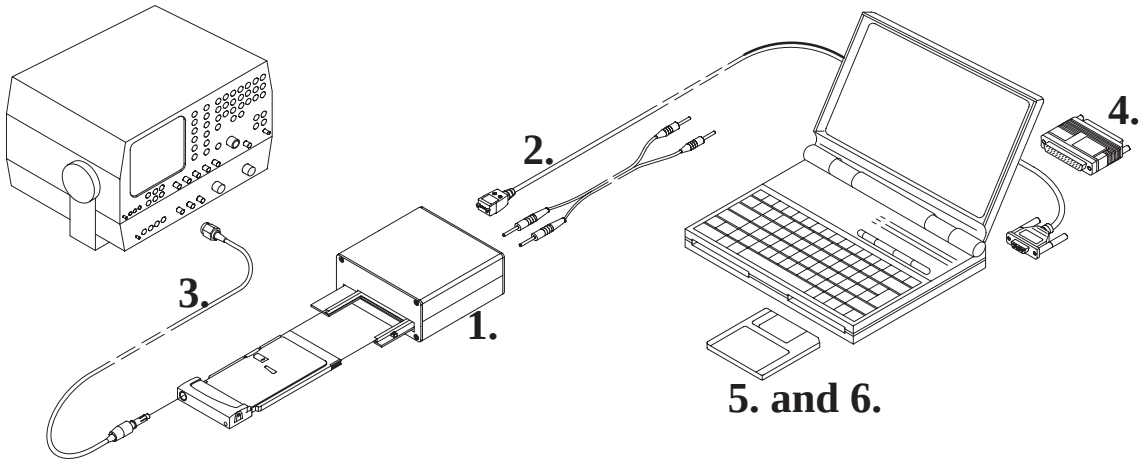
Caution: Make sure that you have switched off the PC and the printer before making connections !

Caution: Do not connect the PKD–1 key to the serial port. You may damage your PKD–1 !

Attach the protection key PKD–1 to parallel port one (25–pin female D–connector) of the PC. When connecting the PKD–1 to the parallel port be sure that you insert the PC end of the PKD–1 to the PC (male side). If you use a printer on parallel port one, place the PKD–1 between the PC and your printer cable.

Next see the following lists for correct equipment.

Equipment Setup for RF Tuning the RPM-1



Item:	Service accessory:	Product code:
1	Service adapter JBS–23	0770165
2	Service cable DAU–9P (or DAU–9M)	0730109
3	Service RF cable XRP–2S	0730176
4	Software protection key PKD–1	0750018
	SW protection key drivers	
	32 bit drivers for Win95/98/NT	0770125
	or 16 bit drivers for Win 3.1x	0770126
5	WinTesla Service SW V 6.03 or newer	0774046
6	WinTesla product specific DLL's for RPM–1	0774225

Power supply for JBS–23:
Laboratory power supply 3A/12V (adjustable)

4 mm standard test leads. One black and one red lead. In Europe these can be ordered for example from Farnell.

Farnell code for 500 mm long 4 mm red test lead:	523–719
Farnell code for 500 mm long 4 mm black test lead:	523–720

Tuning Steps

RX Calibration (AGC + AFC) for both bands

Reference values for the received signal strength meter are program tuned.
RSSI reference signal level programming:

– Select *Product –> Band –> GSM*
– Select *Tuning –> RX Calibration*
– Connect RF generator to RPM–1 antenna conn at 947.067710 MHz.
– Adjust signal generator level to –55 dBm + cable attenuation.
– Press *OK* button
– Adjust signal generator level to –80 dBm + cable attenuation.
– Press *OK* button.

Service software reports:

A Table of AFC Parameters:
AFC INIT Value
AFC Slope
PSW Slope

A Table for AGC Calibration:
AGC in 3 db steps 0...57 dB
DAC and voltage reading for each gain value

– Press *SAVE* button
– Select *Product –> Band –> PCN*
– Select *Tuning –> RX Calibration*
– Adjust signal generator level to –55 dBm + cable attenuation.
– Press *OK* button
– Adjust signal generator level to –80 dBm + cable attenuation.
– Press *OK* button.

Service software reports:

A Table of AFC Parameters:
AFC INIT Value
AFC Slope
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A Table for AGC Calibration:
AGC in 3 db steps 0...57 dB
DAC and voltage reading for each gain value

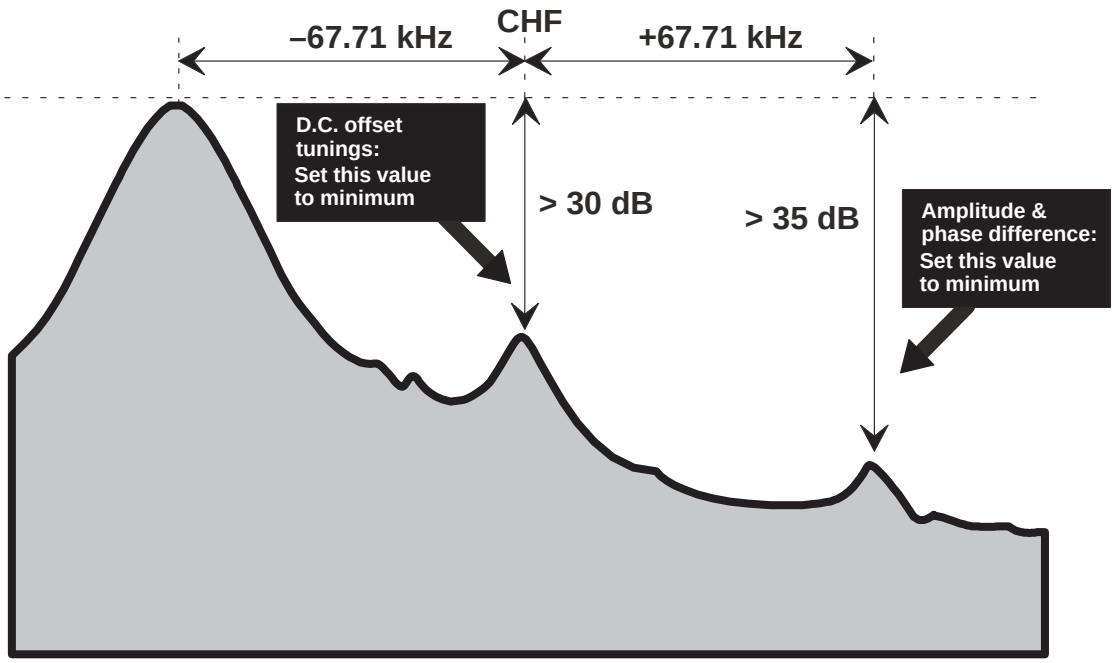
– Press *SAVE* button

I/Q Modulator Amplitude Balance and Phase Shift Tuning

The purpose of this tuning operation is to adjust the I/Q modulator d.c. offsets and the I/Q modulator amplitude balance and phase shift.

I/Q modulator d.c. offsets, amplitude balance and phase shift tuning:

– Select *Product –> Band –> GSM*
– Select *Tuning –> TX I/Q...*
– Select I/Q tuning values from PC's memory, phone's EEPROM or factory default values.
– Connect spectrum analyzer (with attenuator if needed) to RPM–1 antenna connector.
– Check that TX power level is level 10, channel is 60 and TX data type is Cont1.
– Adjust spectrum analyzer centre frequency to 902 MHz, Span 200kHz, Res BW 10 kHz, Video BW 1 kHz and Sweep time at least 0.5 s.



– Select the "TX I d.c. offset" option.
– Adjust the level of centre frequency (CHF signal) to minimum by varying D/A converter value with <– and –> buttons.
– The amplitude difference between CHF–67.7 kHz and CHF must be >30 dB.
– Select option "TX Q d.c. offset".
– Adjust the level of signal CHF to minimum by varying D/A converter value with <– and –> keys.
– Use the "Amplitude Difference" option.

– Adjust the level of signal CHF+67.7 kHz (902.06777 MHz) to minimum by varying D/A converter value with <– and –> keys.
– The amplitude difference between CHF+67.7 kHz and CHF–67 kHz should be >35 dB.
– Select the ”Phase Difference” option.
– Adjust the level of signal CHF+67.7 kHz to minimum by varying D/A converter value with <– and –> keys.
– When values are correct press *SAVE* button.

And the same steps for **GSM 1800 band**.

– Select *Product –> Band –> PCN*
– Select *Tuning –> TX I/Q...*
– Select I/Q tuning values from PC’s memory, phone’s EEPROM or factory default values.
– Check that TX power level is level 10, channel is 700 and TX data type is Cont1.
– Adjust spectrum analyzer centre frequency to 1747.8 MHz, Span 200kHz, Res BW 10 kHz, Video BW 1 kHz and Sweep time at least 0.5 s.
– Select the ”TX I d.c. offset” option.
– Adjust the level of centre frequency (CHF signal) to minimum by varying D/A converter value with <– and –> buttons.
– The amplitude difference between CHF–67.7 kHz and CHF should be >30 dB.
– Select option ”TX Q d.c. offset”.
– Adjust the level of signal CHF to minimum by varying D/A converter value with <– and –> keys.
– Use the ”Amplitude Difference” option.
– Adjust the level of signal CHF+67.7 kHz (1747.86777 MHz) to minimum by varying D/A converter value with <– and –> keys.
– The amplitude difference between CHF+67.7 kHz and CHF–67 kHz must be >35 dB.
– Select the ”Phase Difference” option.
– Adjust the level of signal CHF+67.7 kHz to minimum by varying D/A converter value with <– and –> keys.
– When values are correct press *SAVE* button.

Tuning of Transmitter Power Levels

This adjustment loads the power levels of the phone transmitter into the EEPROM. When doing this, a pulse power meter or spectrum analyzer must be used.

Power levels programming:

– Select *Product –> Band –> GSM*
– Select *Tuning –> TX Power...*
– Select TX Power tuning values from PC's memory, phone's EEPROM or factory default values.
– Connect pulse power meter or spectrum analyzer to antenna connector.
– Check that channel is 60.
– Adjust the power level (levels 5, 15, 19 and Base) by clicking the + and – buttons, and change levels with ↑ and ↓ keys.

Table 1. GSM 900 TX Tuning Values

Power level	Output Power [dBm]		
	BAND=GSM 900		
	CH=1	CH=60	CH=124
5	32.5	32.5	32.5
12	19	19	19
15		13	
19	6.5	6.5	6.0
BASE		–15	

Note: If the base calculation feature is enabled, then the base level is calculated automatically.

– Press *Calculate* button to calculate all other levels.
– Check all TX levels and adjust them is necessary. Refer to TX power level table at the end of this chapter.
– Once all TX levels for channel 60 are correct, press *SAVE* button.
– Tune power levels 5,12 and 19 for channels 1 and 124 according to table.
– Once TX levels 5, 12 and 19 for channels 1 and 24 are correct, press *SAVE* button.

And the same steps for **GSM 1800 band.**

– Select *Product –> Band –> PCN*
– Select *Tuning –> TX Power...*
– Select TX Power tuning values from PC's memory, phone's EEPROM or factory default values.

– Check that channel is 700.
– Adjust the power level (levels 0, 11, 15 and Base) by clicking the + and – buttons, and change levels with ↑ and ↓ keys.

Table 2. GSM 1800 TX Tuning Values

Power level	Output Power [dBm]		
	BAND=GSM 1800		
	CH=512	CH=700	CH=885
0	29.5	29.5	29.5
7	16	16	16
11		8	
15	2	2	2
BASE		–23	

Note: If the base calculation feature is enabled, then the base level is calculated automatically.

– Press *Calculate* button to calculate all other levels.
– Check all TX levels and adjust them is necessary. Refer to TX power level table at the end of this chapter.
– Once all TX levels for channel 700 are correct, press *SAVE* button.
– Tune power levels 0, 7 and 15 for channels 512 and 885 according to table.
– Once TX levels 0, 7 and 15 for channels 512 and 885 are correct, press *SAVE* button.

Table next page: RPM–1 RF output power levels

Table 3. RPM–1 RF Output Powers

Power level	Output Power [dBm]					
	BAND=GSM 900			BAND=GSM 1800		
	CH=1	CH=60	CH=124	CH=512	CH=700	CH=885
0	——	——	——	+ 29.5	+ 29.5	+ 29.5
1	——	——	——		+ 28	
2	——	——	——		+ 26	
3	——	——	——		+ 24	
4	——	——	——		+ 22	
5	+ 32.5	+ 32.5	+ 32.5		+ 20	
6		+ 31			+ 18	
7		+ 29		+ 16	+ 16	+ 16
8		+ 27			+ 14	
9		+ 25			+ 12	
10		+ 23			+ 10	
11		+ 21			+ 8	
12	+ 19	+ 19	+ 19		+ 6.5	
13		+ 17			+ 5	
14		+ 15			+ 3.5	
15		+ 13		+ 2	+ 2	+ 2
16		+ 11		——	——	——
17		+ 9.5		——	——	——
18		+ 8		——	——	——
19	+ 6.5	+ 6.5	+ 6.0	——	——	——
Base		– 15			– 23	

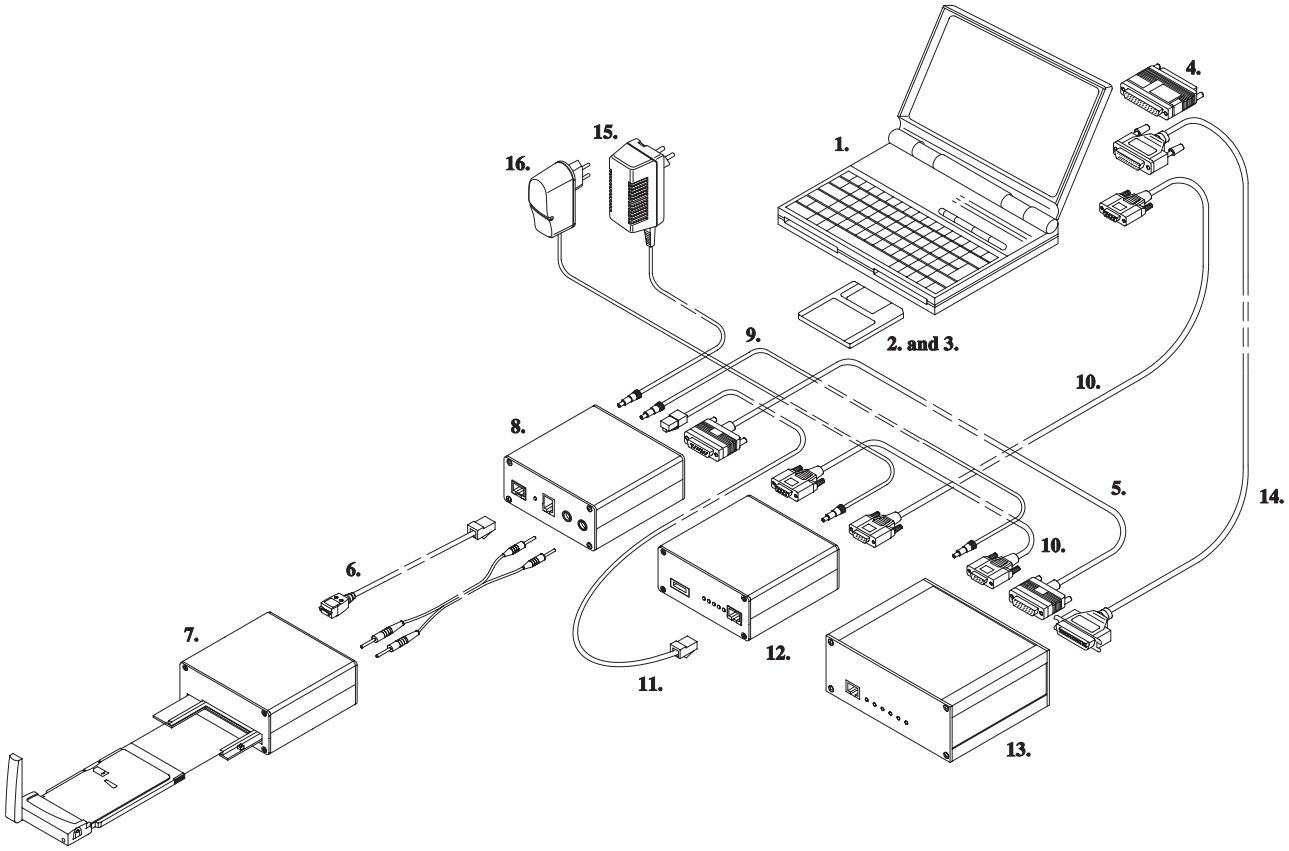
RPM–1 SW Upgrade (flashing)

Complete Equipment for RPM–1 SW Upgrade

NOTE!

If you already have DCT3 SW upgrade equipment and you want to change it to be capable to perform RPM–1 SW upgrade: Then you already have most of the equipment on your desk.

The complete equipment list and the list of equipment which is needed to change DCT3 SW upgrade equipment to perform RPM–1 SW upgrade are illustrated in the next two figures.



Complete equipment list

Item:	Service accessory:	Product code:
1	PC environment	
	486 processor or newer	
	Win3.1x/95/98/NT	
2	WinTesla service SW V 6.03 or newer	0774046
3	RPM–1 Service SW, 3.5” diskette	0774225
4	PKD–1 SW protection key	0750018
	SW protection key drivers	
	32 bit drivers for Win95/98/NT	0770125
	or 16 bit drivers for Win 3.1x	0770126
6	SCH–5A cable	0730166
7	Service adapter JBS–23	0770165
10	AXS–4 cable (first)	0730090
11	Modular cable XCM–1	4626131
12	Flash security box TDF–4	0770106
16	ACH–6E power supply (TDF–4’s power supply)	0675084

Power supply cables for JBS–23:
4 mm standard test leads. One black and one red lead. In Europe these can be ordered for example from Farnell.

	Farnell code for 500 mm long 4 mm red test lead:	523–719
	Farnell code for 500 mm long 4 mm black test lead:	523–720

FLA–7 Flash loading adapter sales pack 0080326
The following items are included in FLA–7 sales pack:

5	AXS–5 cable
8	FLA 7 flash loading adapter
9	DC power cable SCF–7

Flash prommer FPS–4 sales package 0085095
The following items are included in FPS–4 sales package:

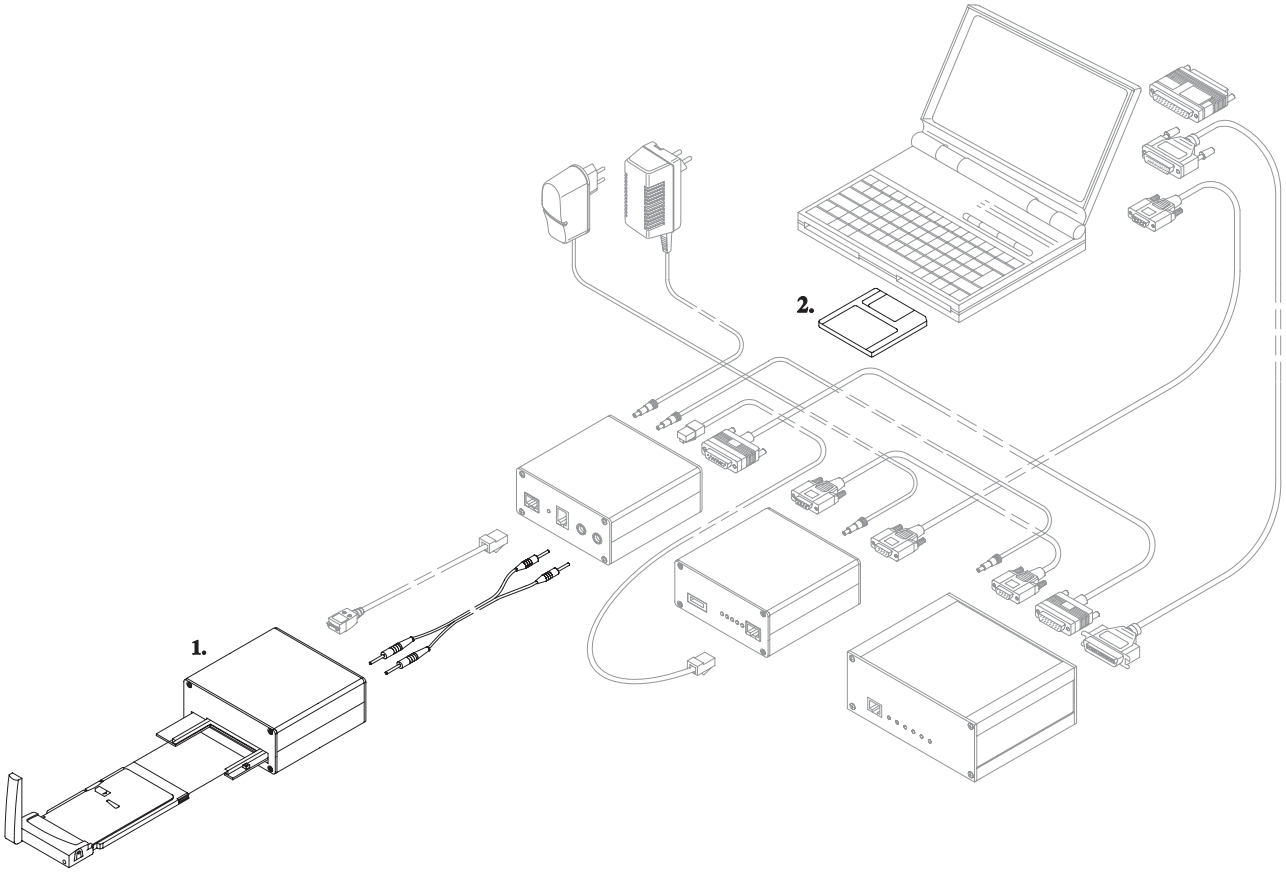
10	AXS–4 cable (second)
13	FPS–4 Flash prommer
14	Centronics cable
15	ACL–3E power supply

NOTE! FPS–4 Must be ordered with memory extension module:

1*SRAM type SF6	0200742
FPS–4 must include sw version 2.22 or newer	
SW Diskette for FPS–4, 3.5” floppy	0774043
FPS–4 SW requires Flash Device Support pack v. 1.11	
or newer	
SW Diskette for Flash Device Support pack	0774228

Upgrade Equipment for RPM–1 SW Upgrade

Here is the equipment list in case you already have Nokia 61XX/51XX SW update capability.



Item:	Service accessory:	Product code:
1	Service Adapter JBS–23	0770165
2	RPM–1 Service SW, 3.5” diskette	0774225

Power supply cables for JBS–23:
4 mm standard test leads. One black and one red lead. In Europe these can be ordered for example from Farnell.

	Farnell code for 500 mm long 4 mm red test lead:	523–719
	Farnell code for 500 mm long 4 mm black test lead:	523–720

NOTE!	FPS–4 Must be ordered with memory extension module:	
	1*SRAM type SF6	0200742
	FPS–4 must include sw version 2.22 or newer	
	SW Diskette for FPS–4, 3.5” floppy	0774043
	FPS–4 SW requires Flash Device Support pack v. 1.11 or newer	
	SW Diskette for Flash Device Support pack	0774228

Software Update Instructions

Previous pages introduced all possible configurations that can be used in RPM–1 software upgrade. The following chapters contain detailed step–by–step instructions how to perform this upgrade.

In case that equipment is not working properly:

– Check that connections are made according to insructions.

– Switch the power off from the boxes and PC and restart the whole system.

– Clean the contact surfaces.

Software Upgrade

General

Software upgrade is currently possible only by using software upgrade equipment described earlier.

Equipment Setup instructions

1 Once TDF–4 box is first time used it has to be activated according to instructions which come inside the TDF–4 package.

2 Connect boxes, cables and PC according to the connection diagram.

3 Install FPS4 Prommer SW (release 2.22 or newer). Install also device files which are included on a separate floppy in the newest FPS4 sales package.

4 Run setup (type ”setup c:\fps4”) at DOS prompt, where c:\fps4 is the directory where files will be installed.

5 Answer setup program’s questions according to your environment.

Setting up the PC

1 Install WinTesla version 6.03 or newer.

2 Install dongle drivers.

3 Install RPM–1 DLLs

Programming with Wintesla interface

When the system has been set up, SW upgrade can be performed according to the following instructions.

1 Insert RPM–1 in JBS–23's PC Card slot.

2 Connect SCH–5 in FLA–7's (or FLA–5's) "service cable" connector and other end in JBS–23's "SCH–5/DAU–9P" connector.

3 Connect banana cables for power supply between FLA–7 (or FLA–5) and JBS–23. Be sure to use corret polarity. One cable from red connector to red connetor and the other cable from black connector to black connector.

4 Start WinTesla software.

5 Select "Product –> Open –> RPM–1".

6 Select "Dealer –> Flash Phone".

7 New dialog opens.

8 Select MCU file or use default.

9 Press "Flash" button.

10 Once program is prompting for restoring user data choose the selection appropriate for your purposes

11 Programming starts.

12 Flash authority ID, Factory setup values and user settings (optional) are updated.

13 After "Flash programming is completed" message you can close the flash dialog.

14 RPM–1 SW has been upgraded, disconnect the product from JBS–23.

Troubleshooting for SW upgrade

If something went wrong during flashing:

If you have a dead RPM–1:

1 Use "Product –> Open –> RPM–1". WinTesla will prompt you 'Found COMBOX without phone, open flash only menu?' Answer Yes and then use "Dealer –> Flash Phone".

2 This time user settings can not be read. After flashing 'Restore Default User Settings' dialog is opened and you can select which default settings you want to download to RPM–1.

[] 1