



Trackit Mk3

User Manual



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V2.5 (August 2019)

- EMC warnings and information updated

V2.4 (February 2018)

- Added disinfection information in section 2.7.
- Changed N.B. to 0086 (BSI).

V2.3 (May 2014)

- Latest 4th Generation internal Bluetooth details added in Appendix 5
- Bluetooth recording times and range details added
- Latest version low-power XPOD Pulse Oximeter details added in Appendix 2

V2.2 (September 2011)

- Trackit Mk3 introduced: USB Interface detail added to Sections 1.2, 1.3, 3.1, 3.2 and 4.2.
- Large memory cards (FAT32) added in Section 5.6.
- Aux Box 2 added in Appendix 2.
- More Setup parameters added to Appendix 5.
- Quick Setup Guide adjusted in Appendix 6.
- Troubleshooting adjusted in Appendix 8.

V2.1 (June 2010)

- Added Bluetooth indicator to Figure 6
- Added 'Internal Bluetooth' paragraph to Appendix 5
- Minor amendments to section 5.7 'Reading an ambulatory recording'
- Minor amendments to Appendix 4 'Network Connection'

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- Reformatted to A4 page size
- Added full documentation to Appendix 4:
 - Section 1 Record to PC
 - Section 2 Network Connection
 - Section 3 Video
- Added full documentation to Appendix 5: Bluetooth Wireless
- Appendix 7: Troubleshooting guide moved to Appendix 8
- Appendix 8: Manufacturer's Declaration moved to Appendix 9
- Added Appendix 7: Trackit Setup Wizard

V1.8 (28 January 2010)

- Virus protection recommendations added, Page 5.
- Lifelines logo adjusted, Page 3.
- References to Windows 98 and ME removed, Sections 1.4 and 4.
- Check with distributor for later software version added, Section 4.
- Picture of latest main Toolbar updated, Figure 16, and table below updated.
- Picture of main ongoing display window updated, Figure 23.
- Appendix 3 added, Photic and Hyperventilation. Photic refers to separate documentation. Old Appendix 3 now Appendix 4.
- Appendix 4 added, Trackit Plus and Plus with Video Software. Both refer to separate documentation. Old Appendix 4 now Appendix 5.
- Appendix 5 added, Bluetooth Wireless. Refer to separate documentation. Old Appendix 5 now Appendix 6.



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The manufacturer and distributor consider themselves responsible for the equipment's safety, reliability and performance only if:

- any peripheral equipment to be used with Trackit is supplied by third-party providers recommended by the manufacturer;
- assembly operations, extensions, readjustments, modifications, or repairs are carried out by persons authorised by the manufacturer;
- the electrical installation of the relevant room complies with the appropriate requirements;
- the equipment is used by a health-care professional and in accordance with the instructions for use.

Note: the manufacturer has a policy of continual product improvement; hence the equipment specifications are subject to change without notice.

Check with Lifelines or your distributor if a software update is available.

Note: Medical electrical equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in the Appendix.

Software and Virus Protection

Lifelines takes all reasonable steps to ensure that its software is virus-free. In line with modern computing practice, it is advisable that continual protection against viruses, trojans, malware, adware etc. is provided on the PC used for installation and the surrounding systems. Please note the following recommendations which should be supported by your internal IT/Computing department procedures and practices:

1. Virus protection software should be installed on every computer at risk of infection. This software should have a resident (online) shield and provide email scanning if appropriate.
2. Virus scanning should be set to manual mode or automatic if desired but at a time when the system is not being used.
3. All programs offering auto-update features, including Windows, should be set to manual or automatic if desired but at a time when the system is not being used.
4. Adopt formal departmental or organisational procedures to ensure the integrity and safe operation of the medical equipment and supporting systems.

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1 System Overview

1.1 General description

Intended use

The Trackit Mk3 is intended to measure and record EEG signals.

Indications for use

The Trackit Mk3 is used as an aid in the diagnosis of neurophysiological disorders such as epilepsy.

General description

The Trackit Mk3 is a multi-channel, ambulatory, electroencephalograph recorder. It is a compact body-worn device that is battery powered and the data is stored on a Compact Flash card.

The device is suitable for use in a clinical environment and in an outpatient setting. The EEG electrodes are fitted to the patient by a trained clinician prior to the patient being sent home. No subsequent intervention is required by the patient.

Upon completion of the recording, the data which is stored on a Compact Flash card is reviewed by a clinician using review and analysis software on a PC.

This device is intended only as an adjunct device in patient assessment; it must be used in conjunction with other methods of patient diagnosis.

The device does not sustain or support life.

Intended User

The intended user of the device is a healthcare professional who has the training and knowledge to undertake EEG examinations and is familiar with EEG equipment and practice.

1.2 Cautions and Warnings

CONTRAINDICATIONS: Do not use the Trackit Mk3 in an MRI environment, in an explosive atmosphere or during defibrillation.

WARNING: This device is intended to be used by a healthcare professional and in accordance with these instructions for use which must be read in their entirety before the device is used.

WARNING: This device is intended only as an adjunct device in patient assessment; it must be used in conjunction with other methods of patient diagnosis.

WARNING: Lifelines does not supply EEG electrodes. The unit accepts standard 1.5 mm touchproof electrodes using DIN 42802-style connectors. To ensure patient safety, the electrodes used must be approved to the Medical Device Directive 93/42/EEC in Europe or to the relevant local standards outside Europe.

CAUTION: The conductive part of electrodes and their connectors, including the Neutral electrode, should not contact other conductive parts including earth.

WARNING: Lifelines does not supply the Nonin sensor. Only use the 'PureLight' sensors specified by Nonin to be used with their Oximeters.

WARNING: Strangulation hazard due to long cables. As with all medical equipment, carefully route patient cabling to reduce the possibility of patient entanglement or strangulation.

CAUTION: When in close proximity to the recorder, do not use mobile phones, transmitters, power transformers, motors, or other equipment that generates magnetic fields. Refer to the Appendix for more information. Medical electrical equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in the Appendix.

CAUTION: Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the Trackit, including cables specified by Lifelines Ltd. Otherwise, degradation of the performance of this equipment could result.

WARNING: The function or safety of the equipment could be impaired if it has been subjected to unfavourable conditions in storage or in transit. If at any time function or safety is thought to be impaired, the instrument should be taken out of operation and secured against unintended use.

WARNING: Do not open the equipment.

WARNING: Do not modify this equipment without the authorization of the manufacturer.

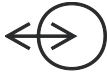
1.3 Explanation of symbols



Type BF equipment



Follow operating instructions



Input/output connection



Input connection



Special recycling required, do not dispose of in landfill. When this equipment has reached the end of its useful life, it must be disposed of in an environmentally-friendly way. Waste electrical and electronic equipment (WEEE) requires special procedures for recycling or disposal. This includes batteries, printed circuit boards, electronic components, wiring and other elements of electronic devices. Follow all of your respective local laws and regulations for the proper disposal of such equipment. Contact your local distributor for information concerning this.



Consult warnings in User Manual



Bluetooth

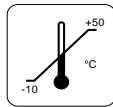


Push to eject Compact Flash card



Manufacturer

Storage and transport symbols



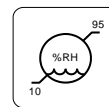
Temperature limits



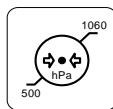
Fragile



Keep dry



Relative humidity limits



Barometric pressure limits

IP22

International protection code

Protected against ingress of solid object 12.5 mm diameter.

Protected against access to hazardous parts with finger.

Protected against ingress of water dripping (15° tilted).

1.4 The system and its parts

The Trackit Mk3 recorder is a multi-channel¹ ambulatory electroencephalograph designed for use in a variety of monitoring applications, including those concerned with neurological and sleep disorders.

Note ¹ : Trackit Mk3 is available in a number of versions, including a 32-channel (Trackit-32/0 or Trackit-24/8), a 24-channel (Trackit 24/0) and a 12-channel (Trackit-24/0). The version is displayed on the Trackit Mk3 LCD at switch-on. This manual applies to all versions, the only difference being the number of channels.

The Trackit Mk3 recorder comprises the following components:

Recorder

Trackit-32/0 (32 EEG)	part number 1186
Trackit-24/0 (24 EEG)	part number 1187
Trackit-12/0 (12 EEG)	part number 1189
Trackit-20/4 (20 EEG, 4 POLYGRAPHIC)	part number 1184
Trackit-18/8 (18 EEG, 8 POLYGRAPHIC)	part number 1185
Trackit-24/8 (24 EEG, 8 POLYGRAPHIC)	part number 1188

Recorder with internally fitted wireless Bluetooth option

Trackit-32/0 (32 EEG)	part number 1171
Trackit-24/0 (24 EEG)	part number 1172
Trackit-12/0 (12 EEG)	part number 1174
Trackit-20/4 (20 EEG, 4 POLYGRAPHIC)	part number 1169
Trackit-18/8 (18 EEG, 8 POLYGRAPHIC)	part number 1170
Trackit-24/8 (24 EEG, 8 POLYGRAPHIC)	part number 1173

Patient connection unit (PCU) Clickon

PCU-clickon Short	part number 1181
-------------------	------------------

Patient connection unit (PCU) Cabled

PCU-cabled 24/0	part number 1104
PCU-cabled-Extended 32/0 (universal)	part number 1136
Cable, PCU 32ch 1m	part number 1106
Cable, PCU 32ch 0.5m	part number 1105

Cable, USB 3m

	part number 1277
--	------------------

Trackit Mk3 strap, adult

	part number 1117
--	------------------

Trackit Mk3 strap, child	part number 1118
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Trackit Mk3 bag with PCU-clickon	part number 1259
----------------------------------	------------------

Trackit Mk3 set up software	part number 1009
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Trackit Mk3 User Manual	part number 1114
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Battery Box PP3	part number 1111
-----------------	------------------

Battery Box PP3-Small	part number 1140
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Battery Box Li	part number 1112
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1.5 Specifications and safety

Refer to Appendix 1 for specifications.

The system has been certified and complies with the following standards:

EN60601-1 and EN60601-2-26 UL60601-1	European standard for medical electrical equipment, general requirements and EEG systems. USA standard for medical electrical equipment, general requirements.
CAN/CSA 22.2 No 601.1 M90	Canadian standard for medical electrical equipment, general requirements.
EN60601-1-2	European standard for medical electrical equipment, EMC requirements, calling:
EN55011	Conducted Emissions, Group 1, Class B
EN55011	Radiated Emissions, Group 1, Class B
EN61000-4-2	Electrostatic Discharges

EN61000-4-3	Immunity - Radiated RF Field
EN61000-4-4	Immunity - Transients Bursts
EN61000-4-5	Immunity - Surges
EN61000-4-6	Immunity - Conducted
EN61000-4-8	Immunity - Power frequency fields
EN61000-4-11	Immunity - Voltage dips, interruptions
EN61000-3-2	Harmonic Emissions
EN61000-3-3	Voltage Fluctuations/flicker

Degree of protection against electrical shock (when connected to host system)	Type BF
Type of protection against electrical shock (when connected to host system)	Internally powered or Mains powered Class 1 or 2 (Mk2) or USB powered (Mk3)
Degree of protection against harmful ingress of water	Ordinary (no protection)
Mode of operation	Continuous
Degree of safety of application in the presence of a flammable anaesthetic mixture with air or with oxygen or nitrous oxide	Not suitable

Description of the components

The Trackit Mk3 recorder

The Trackit Mk3 is a multi-channel recording device designed for use in recording a patient's EEG signals. It comprises a 24-channel EEG (monopolar) amplifier acquisition board, an 8-channel polygraphic acquisition board and control board with all the I/O interface for serial and patient communication. When connected to a host PC, the device has built-in isolation for patient safety. The device may be powered either by its own batteries or a PC USB port. EEG data is stored on an internal CF card. The data format is native European Data Format (EDF), allowing the EEG files to be reviewed by any EDF-compatible EEG reader.

Patient Connection Unit

The Patient Connection Unit (PCU) connects the standard 1.5mm touchproof EEG recording electrodes attached to the patient to the Trackit Mk3 unit. It is available either as a 'Cabled' type which is connected via a screened cable or a 'Clickon' type which fits on the Trackit Mk3 directly without needing a cable.

WARNING: Lifelines does not supply EEG electrodes. The PCU accepts standard 1.5 mm touchproof electrodes using DIN 42802-style connectors. To ensure patient safety, the electrodes used must be approved to the Medical Device Directive 93/42/EEC in Europe or to the relevant local standards outside Europe.

CAUTION: The conductive part of electrodes and their connectors, including the Neutral electrode, should not contact other conductive parts including earth.

PC Connection Cable

The Trackit Mk3 plugs directly into a USB port on the PC.

Batteries

3 PP3 disposable alkaline batteries are optionally supplied with the Trackit Mk3 recorder. Alternatively, a rechargeable Lithium battery option is available and a small (single) PP3 option.

CF flash card

A Compact Flash ('CF') card is used to store the EEG data recorded by Trackit Mk3. Storage cards of varying capacity are available in the CF format.

Trackit setup software

The Trackit setup software runs under Microsoft Windows 2000 (with SP2), Windows XP, Windows Vista or Windows 7 on the host PC and is used to setup and review the Trackit Mk3 recorder for an ambulatory recording session.

The Trackit Mk3 recorder is connected to the PC via the connection cable or wirelessly with Bluetooth. The recording setup/montage, and patient information/ID is downloaded to the device, and a short review is made to verify that all the electrodes have been attached correctly.

The recorder is then disconnected from the PC and the ambulatory recording is started.

Functions of the setup software:

- Download the recording template. This includes:
 - which electrodes are turned on or off;
 - the recording montage;
 - any timed recording modes.
- Download the unique patient identifier onto the card so that no confusion can arise as to whom the recording belongs to.
- Perform a calibration of the Trackit Mk3 device
- Synchronise the Trackit Mk3 time and date to that of the host.
- Perform a routine EEG recording prior to the patient's ambulatory EEG recording.

What does a recording consist of?

- 2–36 channels of recorded EEG/polygraphic signals
- Signals recorded over a period usually not less than 24 hours
- Patient event markers correlated in time with the real time clock displayed on Trackit Mk3 LCD display
- Data and results stored to card for future evaluation
- Data review post-recording using any compatible EDF review program

2 Installation and Maintenance

WARNING: The following section must be read and understood before the equipment is switched ON.

Note: Medical electrical equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in the Appendix.

The function or safety of the equipment could be impaired if it has been subjected to unfavourable conditions in storage or in transit. If at any time function or safety is thought to be impaired, the instrument should be taken out of operation and secured against unintended use.

The manufacturer should be contacted (details on page 3) for assistance, if needed, in setting up, using or maintaining the equipment; or to report unexpected operation or events.

2.1 Checks for completeness and integrity

- 1 Remove the equipment from the packaging case(s).
- 2 Use the parts list to check that all ordered items have been received.
- 3 Assembly instructions for third-party products will be found in their packing cases. It is recommended that these instructions be filed with Trackit Mk3 technical reference materials.
- 4 Check for signs of damage that may have occurred during transit or storage. If any damage is found, do not use the instrument; contact your distributor.

2.2 Environmental parameters for operation

Operation

The instrument is designed to operate within the following ranges:

Temperature	+10°C to +40°C
Relative humidity	25% to 95% non-condensing
Atmospheric pressure	700mB to 1060mB

Do not obstruct any cooling slots.

Position the instrument so that air flows freely.

Storage and transport

When the instrument is in store or being transported, the following ranges are tolerated:

Temperature	-10°C to +50°C
Relative humidity	10% to 95% non-condensing
Atmospheric pressure	500mB to 1060mB

2.3 Use in the home environment

The equipment is intended to be operated in its bag where it is protected against ingress of solid objects and water to a degree of IP22.

Keep the equipment away from sources of heat.

Do not use mobile phones.

Do not allow pets or children to interfere with the sensor cables.

2.4 Power supply connections

Power requirements

Standard PC USB port or 9V PP3 batteries when operating independently.

No protective earth required.

Power consumption

Maximum power from USB port: 2.5W

Leakage current

This instrument is designed to comply with IEC 601-1, the international standard for medical electronic equipment, which specifies the permissible levels of leakage current from individual products. A potential hazard exists in the summation of leakage currents caused by connecting several pieces of equipment together. Because this instrument can be used in conjunction with standard electronic devices, the total leakage current should be tested at regular intervals.

2.5 Use with other equipment

Defibrillators and HF surgical equipment

The equipment is not defibrillator proof and should not be used in situations where a defibrillator is likely to be used.

The equipment should not be used with high frequency surgical equipment.

Other patient-connected equipment

When used simultaneously with other patient-connected equipment, for example a cardiac pace-maker or other electrical stimulator, it is unlikely that a safety hazard will arise. However always consult the documentation supplied with the other patient-connected equipment to ensure that all hazards, warnings and cautions are considered before the equipment is used together.

2.6 Interference

Trackit Mk3 will continue to operate in the presence of radio frequency magnetic fields (RF) and the effects of electrostatic discharges (ESD) and other interference, in accordance with the requirements of EN60601-1-2. However, Trackit Mk3 records signals of very low amplitude, and these signals themselves are not immune to the effects of RF, ESD and low-frequency magnetic field interference. Such interference may cause signal artefacts.

Caution: when in close proximity to the recorder, do not use mobile phones, transmitters, power transformers, motors, or other equipment that generates magnetic fields. Refer to the Appendix for more information.

Note: Medical electrical equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in the Appendix.

2.7 Maintenance and cleaning

The Trackit Mk3 contains no user-serviceable parts (apart from replaceable batteries). The system uses solid-state components and requires no routine testing or maintenance procedures apart from occasional cleaning and checking for wear and damage to all parts including the accessories.

All the outer surfaces of the individual pieces of equipment of the Trackit system may be cleaned using a soft cloth moistened with water and a mild detergent. Each item may also be cleaned using a low-pressure air-line or a vacuum cleaner.

Disinfection of the equipment can be carried out by the use of QAC-based disinfectants. Wipes are recommended in order to prevent the ingress of any liquid into the equipment. Suitable products include Mikrozid Sensitive Wipes (Schülke & Mayr GmbH), Microbac forte (Paul Hartmann AG), Distel Wipes (Tristel Ltd.).

Caution: Do not allow any liquid to enter the case of any instrument or connector. Do not use acetone on any of the instruments.

2.8 Disposal of equipment

The expected service life of the equipment is five years. When it has reached the end of its operating life, it should be disposed of in accordance with local waste regulation authority that is typically within the local government office.

Caution: do not dispose of batteries by incineration.

3 Connections for Trackit Mk3 setup

3.1 Overview

Below is an overview diagram showing the principal components when connected to a PC during system set up.

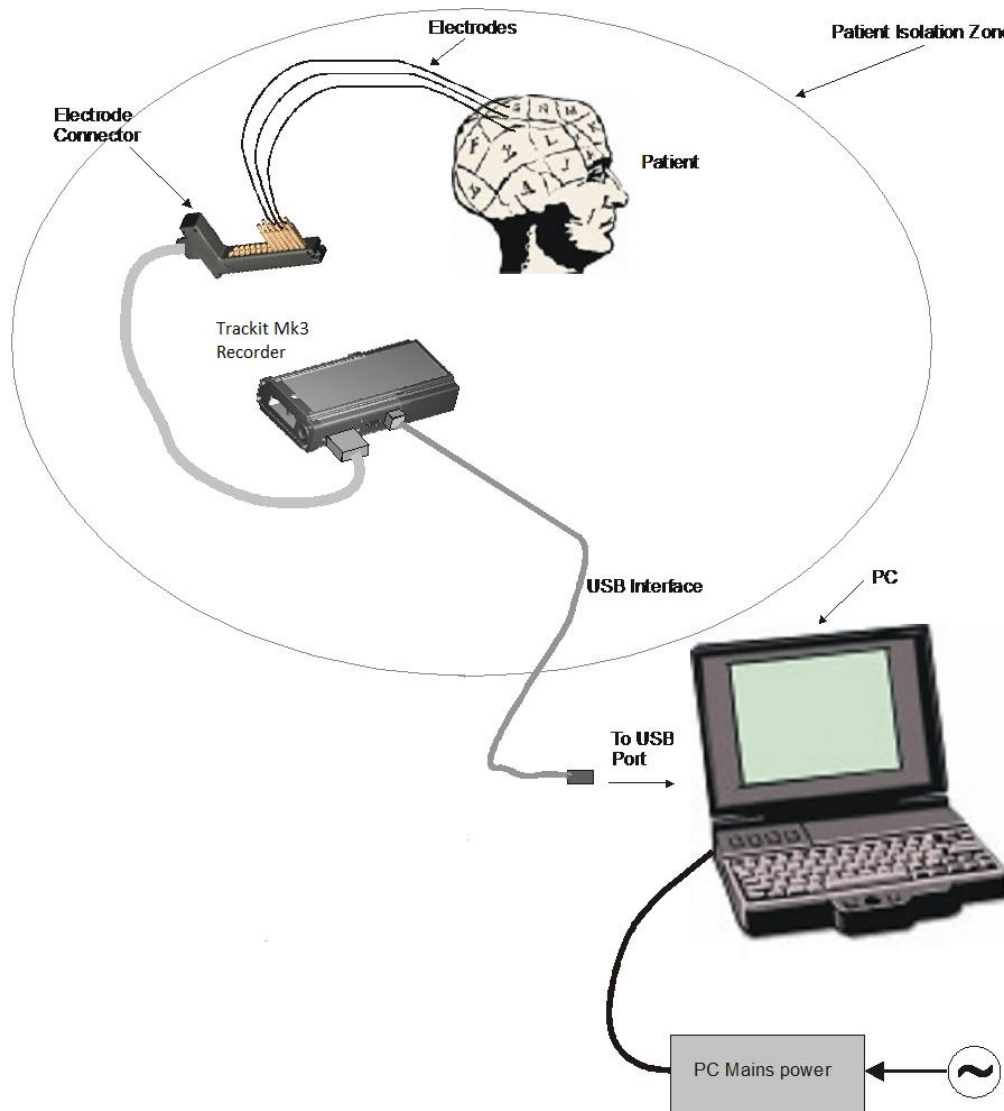


Figure 1 Connecting the Trackit Mk3 for recorder set-up

List of parts supplied by Lifelines:

Trackit Mk3 recorder plus bag
 Patient Connection Unit (PCU), for electrode connection
 1 x CF flash card (optional)
 3 x PP3 batteries (optional)
 PC USB cables

List of optional parts supplied by third parties:

Host PC/laptop with power cable
 CF cards
 Batteries
 Battery charger

3.2 Connecting the Trackit Mk3

The Trackit Mk3 is simply plugged into the PC USB port using the cable supplied. Note: only use the USB cable part number 1277 (with the red tip) for the Trackit Mk3 as shown below:

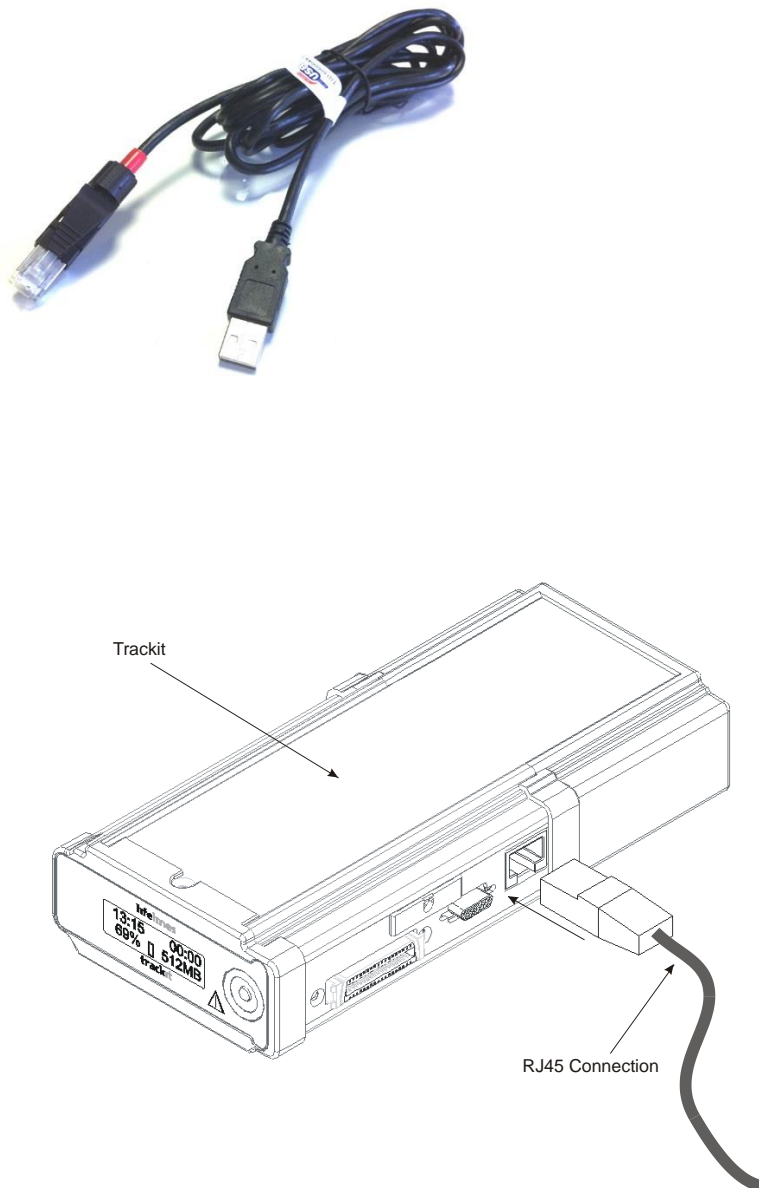


Figure 2 Connecting to the Trackit Mk3 recorder

The necessary USB drivers will be found on the installation CD. Upon first connection of the Trackit Mk3 to the PC USB port, at the Windows prompt, browse to the folder CD Drive:\USB Drivers. From there, Windows will find the correct drivers for the version of Windows being used.

- Note that the mains power cord serves as a power disconnect device. It should be installed near the equipment and be easily accessible.
- For laptop installation and operation refer to the manufacturer's instructions supplied with it.
- If the USB cable is used in the home, the laptop and power supply must be placed 1.5m away from the patient. This is to prevent EMC disturbances on the EEG signals caused by the laptop or power supply.

3.3 Switching on

Turn on the unit by pressing the button on the right of the LCD display on the front panel of the recorder.

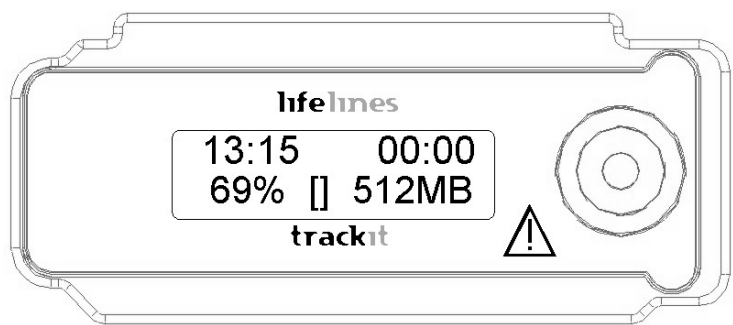


Figure 3 Trackit Mk3 recorder: front panel

After several seconds the LCD display indicates that Trackit Mk3 is performing a self-test for system integrity. On completion of the self-test the LCD indicates the status of the Trackit Mk3 recorder.

Indicators

The following indicators are available depending on Trackit Mk3 status:

1	2	Key: 1 Time of day 2 Recording time 3 Battery capacity remaining 4 Internal Bluetooth on/off 5 Rear door open warning 6 CF Card capacity remaining
<div><div>⌚~11:49 ⌚~00:00</div><div>⌚~71 %⌚ ⌚~2049M</div></div>		
3	4 5	6

Figure 4 The Trackit Mk3 display

Time of day	The battery-backed, real time clock which is synchronized to the host during setup.
Recording time of this recording	If not recording, '00:00' is displayed.
Disk capacity	Remaining storage capacity in MB. If there is no card present, '0' is displayed.
Battery capacity	Approximate battery capacity remaining (as % of full battery capacity).
Rear-door open warning symbol	Flashes when the rear battery door is open.
Internal beeper	Warning of low battery or rear-door open.

3.4 Warning symbols on the display

Low card capacity	Symbol L accompanied by beeping every 30 seconds.
Special recording mode	Timed or sampled recordings are indicated by the symbol S.
Recording to card	The symbol R next to card capacity.

Internal Bluetooth on/off

When the Internal Bluetooth option is fitted to the Trackit Mk3, the unit will display whether it is enabled or disabled with a large 'B' (enabled) or small 'β' (disabled) next to the '%' indication. To toggle the current selection the pushbutton is pressed 5 times within 3 seconds. The display will change to indicate the new state. Refer to Appendix 5 for further information on Bluetooth.

4 The setup software

The setup software is available on CD. A readme file describes installation. Check with your distributor or Lifelines if a newer version of software is available.

Trackit setup software is supported on Microsoft Windows 2000 (with SP2), Windows XP, Windows Vista and Windows 7.

When Trackit Mk3 is connected to the host PC, the software allows the user to define parameters for the recording, such as recording montage, start time and stop time, mode of recording etc.

The setup software has the following functions:

- Define signal types: create labels to attach to inputs
- Attach the desired signal type (label) to the recording input. For example, input 1 with a signal type FP1
- Create a recording montage and download it to the recorder
- Perform a calibration of the inputs
- View signals online and adjust display parameters such as chart speed and display sensitivity
- Start and stop a Trackit recording session

4.1 Setting up a recording protocol

Summary

- Step 1 Define the patient ID
- Step 2 Define the signals
- Step 3 Define the inputs
- Step 4 Define the recording channels
- Step 5 Activate the recording control
- Step 6 Connect the Trackit Mk3 for setup
- Step 7 Check Trackit Mk3 status
- Step 8 Start a recording
- Step 9 View the ongoing EEG traces

Step 1 Define the patient ID

- 1 Select the New patient icon on the toolbar.



New Patient icon

- 2 Enter the patient name and Recording ID into the New Patient dialog.

This information is saved with the recording setup for download to the recorder in a future recording.

Figure 5 New Patient dialog

It is possible to configure the system to use a patient database (Figure 6) instead of the simple dialog shown above.

New Patient

Patient Details

Last Name: Another

First Name: A Middle Name: A ☒ Male

Date of birth: 12/02/99 (Format = 01/01/00)

Patient Ref: 7747477891n

Address 1: Address 2: Town: City: Region: Country: Post/Zip Code: Phone:

Comments: PMH of transient ischemic attacks. Recently was witnessed to have what appeared to be a GM type seizure

Recording ID: 17-05-20010-01

Search Last Name: Find

OK Edit New Save Delete Previous Next Exit

Figure 6 New Patient database

The database allows you to enter more extensive information about the patient and recording, and save it for future reference. See the section entitled 'Advanced options'.

Step 2 Define the signals

Defining signals is usually done once only – before using Trackit Mk3 for the first time. The Trackit Mk3 recorder arrives with a default set of signals that should suffice for most applications in ambulatory EEG, hence it may only necessary to add signal types for polygraphic recordings (airflow, respiration etc).

If for any reason the signals have not been created, it is necessary to define all the signals (labels) that are to be used for montage creation in Step 3. The signal editor allows the creation of up to 64 distinct signals ranging from the standard 10/20 EEG signals such as FP1 O2, to Respiration, Pulse and other polygraphy inputs.

Step 3 explains how to calibrate an AUX input.

To define a signal:

- 1 Click the View all signals tab in the Signal editor dialog box. See Figure 7.

Signal editor

Save Exit

View all signals Signal editor

Name	Type	Units	Sensitivity	Transducer	DigMin	DigMax	PhyMin	PhyMax	A
Air nose	AC	uV	Master	Unknown	-32768	32767	-5000	5000	
Snore	AC	uV	Master	Unknown	-32768	32767	-5000	5000	
SaO2	SD2	%	Special	Nonin	-32768	32767	-32768%N	32768%N	
SpO2	DC	uV	Special	Unknown	-32768	32767	-5000uV/N	5000uV/N	
pCO2	DC	uV	Special	Unknown	-32768	32767	-5000uV/N	5000uV/N	
CPAP	DC	uV	Special	Unknown	-32768	32767	-5000uV/N	5000uV/N	
iPAP	DC	uV	Special	Unknown	-32768	32767	-5000uV/N	5000uV/N	
ePAP	DC	uV	Special	Unknown	-32768	32767	-5000uV/N	5000uV/N	
BiPAP	DC	uV	Special	Unknown	-32768	32767	-5000uV/N	5000uV/N	
Move	AC	uV	Master	Unknown	-32768	32767	-5000	5000	
Tremor	AC	uV	Master	Unknown	-32768	32767	-5000	5000	
Light	DC	uV	Special	Unknown	-32768	32767	-5000uV/N	5000uV/N	
Temp	DC	uV	Special	Unknown	-32768	32767	-5000uV/N	5000uV/N	
Temp Amb	DC	uV	Special	Unknown	-32768	32767	-5000uV/N	5000uV/N	
Pressure	DC	uV	Special	Unknown	-32768	32767	-5000uV/N	5000uV/N	
Position	DC	uV	Special	Unknown	-32768	32767	-1uV/N	1uV/N	
Ch15	Eeg	uV	Master	Unknown	-32768	32767	-5000	5000	
Ch16B	Eeg	uV	Master	Unknown	-32768	32767	-5000	5000	
Ch17b	Eeg	uV	Master	Unknown	-32768	32767	-5000	5000	

Figure 7 Signal list

- 2 Double click on the signal you want to edit. This brings up the Signal editor tab), allowing you to create a relevant signal or label to be entered into the signal list.

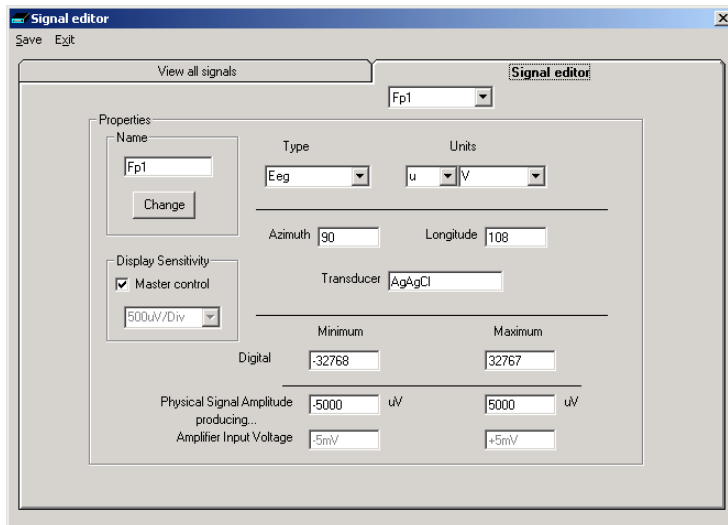


Figure 8 Signal editing tool

- 3 Type in the Signal name (e.g. Fp1). Note that for EEG signals this must be case-sensitive.
- 4 Select a signal type (in this case EEG).
- 5 Click on the Change button. The signal is now entered into the list under the View all signals tab.
- 6 If the signal is not an EEG signal, it may be necessary to insert a display sensitivity value by un-checking the Master control check box. Signals that have been defined with their own independent sensitivities appear in red in the trace display. Further editing and changes to these sensitivity values in the trace display will be saved back into the signal library.

Caution: editing signals that are already used in an active montage may render that montage invalid. You will need to re-enter the original montage in the Set-up recording tabbed dialog box – see steps 3, 4 and 5.

Step 3 Define the inputs

- 1 Select the Spanner icon on the toolbar. This opens the tabbed Setup Recording dialog.



Spanner icon

- 2 Under the Amplifier Channels tab select the signals (labels) to be attached to the physical inputs.
For example, EEG input 1 may require the label Fp1 and so on according to the standard 10/20 nomenclature.
Double click the channel name and select the relevant signal label from the Setup Hardware EEG channel dialog.

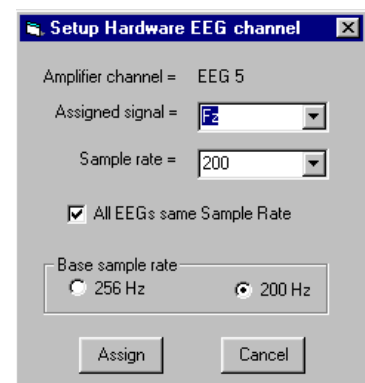


Figure 9 EEG setup

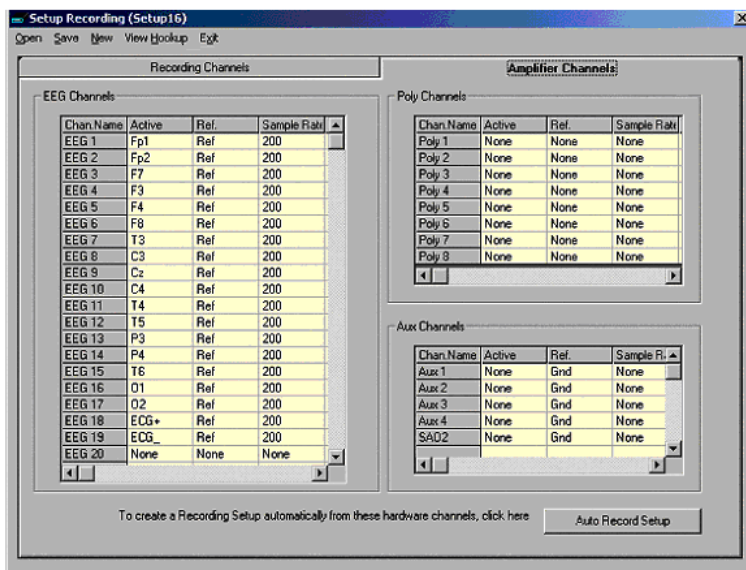


Figure 10 Setup Recording dialog

The order of the signal labels in the pull down list is the same as the order of the signals in the signal list defined using the signal-editing tool.

To see the user-defined labels (signals) on the inputs, click on View Hook-up in the Menu Bar. See Figure 11.

The View Hookup display shows all the currently available PCU options. Click on the appropriate tab to access the specific type.

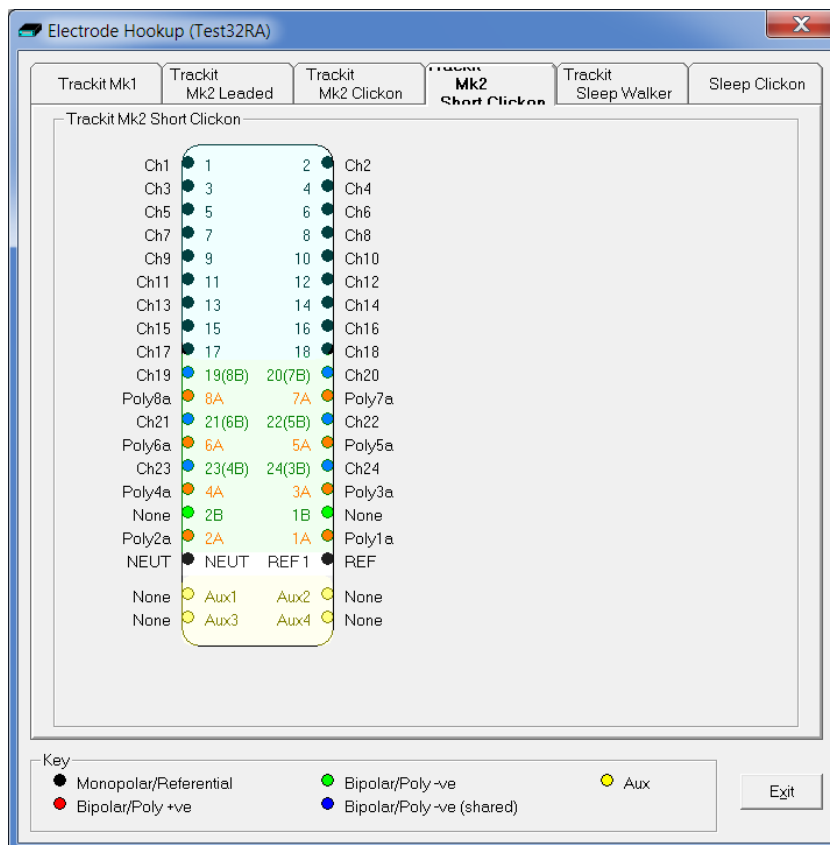


Figure 11 View Hookup

Amplifier setup: amplifier setup activates the recording inputs in preparation for a recording. For most applications you need perform amplifier setup only once – when the system is first installed – since the amplifier setup is saved with the recording montage for future recall and usage. See Step 4 below.

If you want to use the recording channel order defined in amplifier setup, click on Auto Record Setup in the Setup Recording dialog box. You can then skip Step 4 (Define the recording channels).

Overall sampling rate: you can select the overall sampling rate for EEG channels from the Setup Hardware EEG dialog (Figure 9). Once a sampling rate has been selected for one EEG input, you can apply it to all EEG inputs by putting a checkmark against 'All EEGs same Sample Rate'. If there is no checkmark, you can select different sample rates on each EEG input – useful if you want to apply an EOG signal to an EEG input.

Independent sample rates: if the independent sample rates feature is enabled in the Trackit Mk3 firmware, it may be activated when required from a checkbox in the Options dialog box (choose View > Other Options).

Notes:

- 1 Not all review software supports independent sample rates. Check with the vendor that your review software does support them.
- 2 The Trackit Mk3 firmware must be revision 2.1.X or later.
- 3 It may be necessary to enter an unlock code into Trackit Mk3 to enable this feature. If the feature is not enabled, a warning message appears when a setup is sent to the recorder.

To enable multiple independent sample rates in the recorder:

- 1 Click on Trackit Control Panel in the Trackit toolbar.
- 2 Click on Advanced Operations, then choose Configuration from the Settings Menu.
- 3 Copy the key code and email it to your Lifelines representative stating that you wish to have the multiple independent sample rate feature enabled. You will then receive back an activation code that you should copy and paste into the empty Trackit configuration string field.
- 4 Press the Set Trackit button to enable the feature.
- 5 Choose Other Options from the View Menu, and put a checkmark in the Allow Multi-sample rates check box.

Poly and AUX inputs: poly inputs are low-level inputs, just like the EEG inputs, but differ in that they can be set to either referential (EEG mode), bipolar AC or bipolar DC. They are ideal for poly-graphic signals such as respiration, airflow, EKG, body position (DC mode) etc. See the table in appendix 2 describing the inputs and their application.

The AUX inputs are high-level DC, and should not be used for low-level signals obtained from transducers such as passive respiration sensors (piezo electric), airflow thermocouples etc. The AUX inputs are designed to receive a high-level isolated DC signal (calibrated output from a CPAP machine, oxygen saturation meter etc).

To calibrate an AUX input to reflect a required unit of scale for a given voltage input use the signal editor - see Figure 8). Select the appropriate units, e.g. %, or mm Hg, and enter the Physical Signal Amplitude required to generate the Amplifier Input Voltage.

Step 4 Define the recording channels

Step 4 can usually be skipped, since the Auto Record Setup button will copy what you have defined under the inputs in Step 3 into the list of recording channels.

However, you can define and save recording montages for specific recording needs, and recall them for future usage. You can define up to 40 recording channels in a montage.

Creating a montage follows the same principle as the signal creation and input definition tool: click on the channel number to define the active and reference label of choice. See Figure 12.



Figure 12 Channel setup

An example of a recording montage is shown in Figure 13 below.

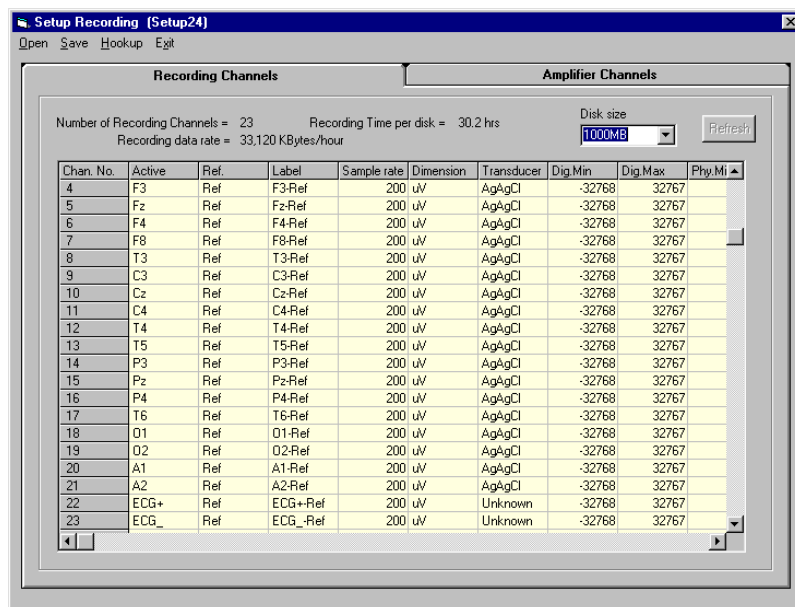


Figure 13 Recording Channel editing

4.2 Configuring the recorder

When you have finished setting up the recording protocol, connect the Trackit Mk3 recorder to the host computer. Steps 5 to 9 describe configuration and set-up of an ambulatory EEG.

Step 5 Activate the recording control

From the Trackit toolbar (Figure 14) select the Trackit Control Panel ('handshake') icon.



Figure 14 Trackit software toolbar

Key:

- | | | |
|--------------------------|-----------------------|----------------------------|
| 1 New Patient | 2 Setup Recording | 3 Trackit Control Panel |
| 4 Ongoing On | 5 Ongoing Off | 6 Impedance Check On |
| 7 Calibration On | 8 Calibration Off | 9 Page Down |
| 10 Page Up | 11 Get Trackit Events | 12 Email Events List |
| 13 Notch Filter On/Off | 14 PC Record On | 15 PC Record Off |
| 16 Videometry (optional) | 17 Photic Stimulation | 18 Hyperventilation |
| 19 Vertical sensitivity | 20 Chart speed | 21 Open files for playback |
| 22 Stop playback | 23 Start playback | 24 Page back |
| 25 Stop paging | 26 Page forward | 27 Paging speed |
| 28 Playback time | 29 Montage selection | 30 Lo-filter selection |
| 31 Hi-filter selection | | |

Clicking on the 'handshake' icon brings up the Trackit Control Panel dialog box (Figure 15).

Step 6 Connect Trackit Mk3 for setup

Check that the Trackit Mk3 recorder is switched on and that the cables are all connected properly. In the Trackit Control Panel either select the USB option for the Mk3 Trackit or check that the correct COM port is selected and click on the Connect button.

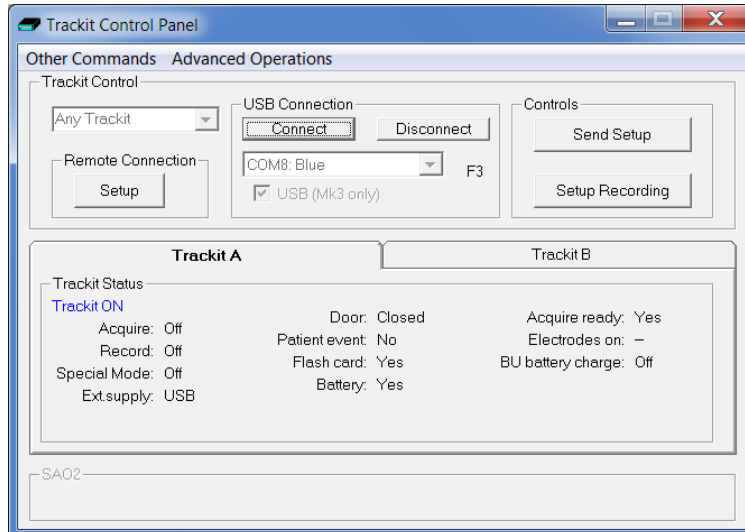


Figure 15 Trackit Control Panel

After a couple of seconds Trackit Status shows 'Trackit Online' and the software displays the recording parameters loaded into Trackit Mk3 in the status bar at the bottom of the screen.

Trackit Status also shows whether the battery and PC card are present, whether the door is open or closed, whether the electrode connector is attached, and the recording status of the device.

The 'F' or 'F1' next to the port selection box indicates that the fast connection speed, which is available with the Trackit Mk2, is being used. This will be automatically enabled as long as the PC serial port hardware is capable of operating at 230 kBaud. 'F2' and 'F3' are displayed to indicate the substantially faster connection speeds available for the Mk3 USB interface.

Step 7 Check Trackit status

Use the Trackit Control Panel to check that the Trackit Mk3 recorder is correctly online. The Trackit Status part of the Control Panel gives you the following information:

Acquire – on or off	Shows whether an online view of the data on the host PC is taking place or not.
Record – on or off	Shows whether or not the Trackit Mk3 is recording data to flash card.
Ext Supply	Shows whether the Trackit Mk3 is being powered by the medical grade DC power supply.
Battery	Shows if a battery is present or not.
Status	Shows how much battery life is left.
Patient event	Shows that the external patient event marker is connected.
CF card	Shows whether a CF card is present and its capacity.
Door	Shows whether the door to the CF card and battery is open or closed.
Electrodes connected	Shows that the Patient Connection Unit is connected to the recorder (Mk1).
Acquire ready	Shows that a valid recording setup has been loaded to the Trackit Mk3 recorder.

Note that further status information is available on the 2nd tab shown below. This includes Trackit Mk3 time, Battery capacity, Recording time and CF card MB total and MB remaining.

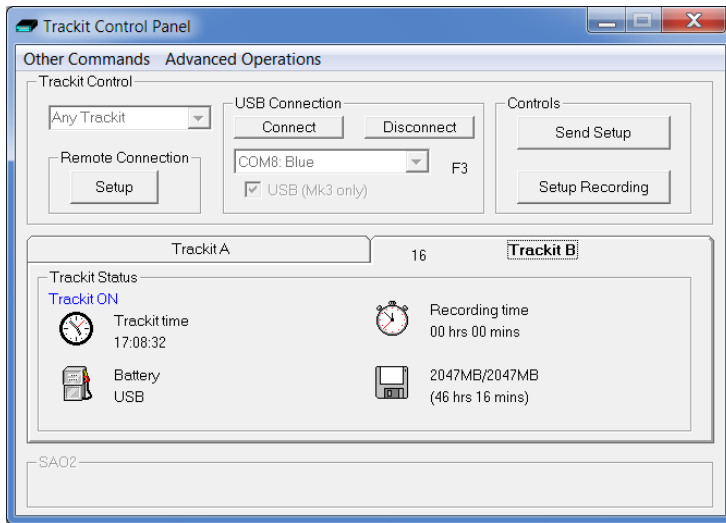


Figure 16 Trackit status 'B'

Step 8 Start a recording

Click on the Setup Recording button in the Trackit Control Panel to open the Recording Control dialog box (Figure 17). The patient's name and the file name for the recording are displayed.

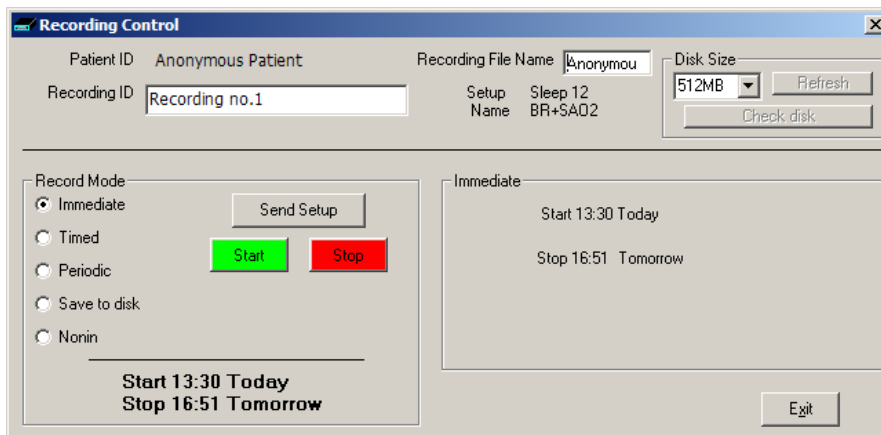


Figure 17 Recording Control

You can accept the default filename, or you can insert a filename (up to 8 characters long) of your own choosing.

Default file names

To make the recording file name the same as the patient name:

- 1 Choose Other Options from the View Menu.
- 2 Put a checkmark by Default to Patient Name.
- 3 Click on Exit.

Ways of starting a recording

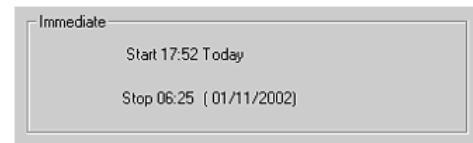
You now have four ways to start a recording:

- Immediate
- Timed

- Periodic
- Save to Disk
- Nonin

Immediate: the recording starts as soon as you click Send Setup, then Start (see Figure 17). Recording finishes when the Trackit Mk3 is turned off.

- 1 Under Record Mode, choose Immediate.
- 2 Click the Send Setup button, then the Start button.



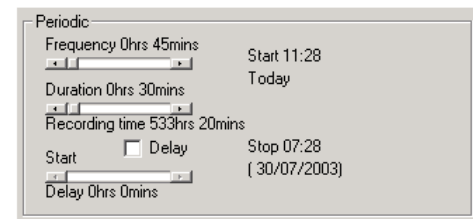
Timed: Trackit Mk3 records for a specified period of time.

- 1 Under Record Mode, choose Timed.
- 2 In the Recording Control dialog box, set a start time for the recording using the Start slider.
- 3 Either put a checkmark by 'Fill Disk', or use the Duration slider to tell Trackit Mk3 how long to record for.
- 4 Click the Send Setup button.

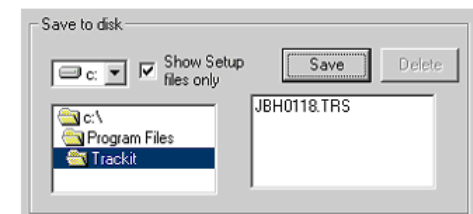


Periodic: Trackit Mk3 records for specified periods of time at a defined interval (eg for periods of 30 minutes, with a 45-minute interval):

- 1 Under Record Mode, choose Periodic.
- 2 Use the frequency and duration sliders to define the length of the recording period, and the interval between periods.
- 3 For a delayed start (eg in an MSLT study), put a checkmark by the Delay box, and use the Start slider to set a start time for the recording.
- 4 Click the Send Setup button, then the Start button.




Save to disk: a setup is created, then saved on the flash card for use in a later recording. This is particularly useful for home sleep recordings where the patient can switch on the recorder (and so start the recording) just before going to bed.



- 1 Create a setup in the normal way, with patient name and recording channels.
- 2 Place the flash card in the flash card reader in the host PC.
- 3 Under Record Mode, choose Save to disk. The setup is saved on the flash card as a *.trs (trackit recording setup) file. The name of the setup file is the patient's last name.
- 4 The Trackit Mk3 recorder starts recording automatically, using this setup file, when it is switched on.



Nonin: Recording starts as soon as the Nonin SaO2 probe is connected and attached.

To initiate an immediate online recording

- 1 Click on the Send Setup button. Wait for the setup to upload to the Trackit Mk3 recorder. This should take a few seconds.
- 2  In the Trackit toolbar, click the Ongoing On icon to view the traces.
- 3 Make sure what is seen is what should be recorded.


Depending on the sample rate and number of channels selected it may be necessary to observe groups of channels separately, e.g. with 256 Hz sampling with 24 recording channels it is only possible to view 12 channels at a time.

To switch from the upper to the lower group, use the up and down arrow keys on the toolbar, or choose Trace Page from the Trackit Menu.

- 4  To perform an impedance check, click on the Impedance Check icon 1n the Trackit toolbar.
- 5  To perform a calibration, click on the Calibration icon in the Trackit toolbar.
- 6 Click the Start button in the Recording Control dialog. Wait for the prompts to start a recording. If there is an old file on the card the system asks you whether the file should be overwritten. If there is a file on the card belonging to the same patient, and the file is < 24 hours old, the recording will be appended to the existing file. (To enable or disable this feature, > Trackit Control Panel > Advanced Operations > Settings > Set Trackit defaults)

The Trackit Mk3 is now recording to the flash card and will continue until the card is full or the batteries have run low on power.

Step 9 View the ongoing EEG traces

-  To view the ongoing EEG traces before or after recording to card has started, click on the Ongoing On icon in the Trackit toolbar

When you do this, one of three things occur:

- If the Trackit Mk3 is connected to the PC, and has been sent a valid recording setup, the traces appear wiping from left to right across the display.
- If the Trackit Mk3 is already recording and still connected to the PC, the traces appear as soon as the Ongoing On icon is pressed.
- If the Trackit Mk3 is already recording and is then reconnected to the PC, the system asks for the recording setup held in the Trackit Mk3 recorder before displaying the traces.

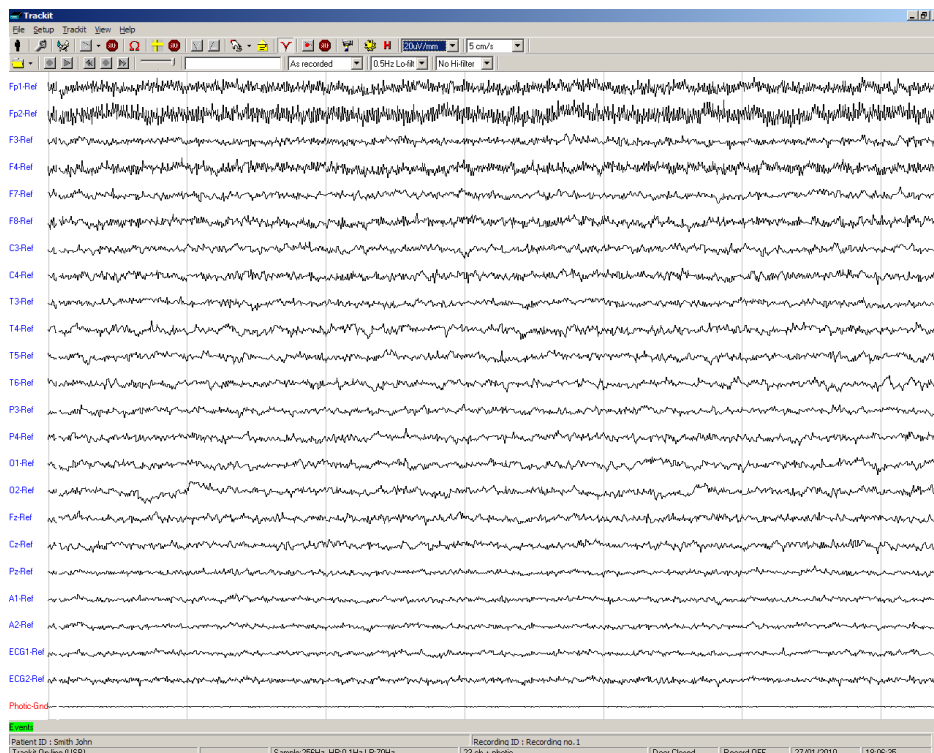


Figure 18 Ongoing trace display

The primary purpose of viewing the ongoing traces is to verify that the signals are correct before starting an ambulatory recording.

You can view selected traces in blocks of 12 channels (at 256Hz or 200Hz) or 16 channels (at 128Hz) for the Mk 1 or up to 40 channels with the Mk 2. Or select the number of traces for display by choosing Number of Traces from the Trackit Menu.

Page Up and Page Down on the toolbar allow you to switch between the top and bottom group of traces.

Sensitivity, Chart speed and Hi/Lo filters: as is often the case when viewing a live trace display, the sensitivity, chart speed and filters need be adjusted for optimal viewing. Use the drop down lists on the toolbar.

To adjust the display parameters for an individual channel, click on the channel label. This displays a dialog box for that channel, with a check-box for master control, trace On or Off, and Numeric. Click on Numeric if you want the numeric value displayed under the label. This can be useful when for displaying units such as mmHg or degrees C.

When a channel is under individual channel control the label is depicted in red. When display of that channel is turned off, the label is greyed out.

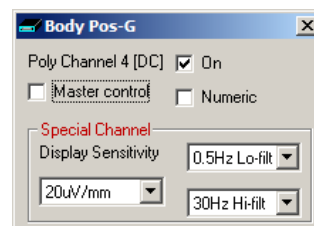


Figure 19 Adjust display parameters

Impedance check: to carry out an impedance check, click on the impedance check icon on the Trackit toolbar.



If recording to card has started, the impedance check is displayed on the trace display with an impedance check event.

The impedance check works via pass/fail threshold selection. See Figure 20. Impedance values above the selected threshold (fail) are displayed on a red background. Values below (pass) are displayed on a green background.

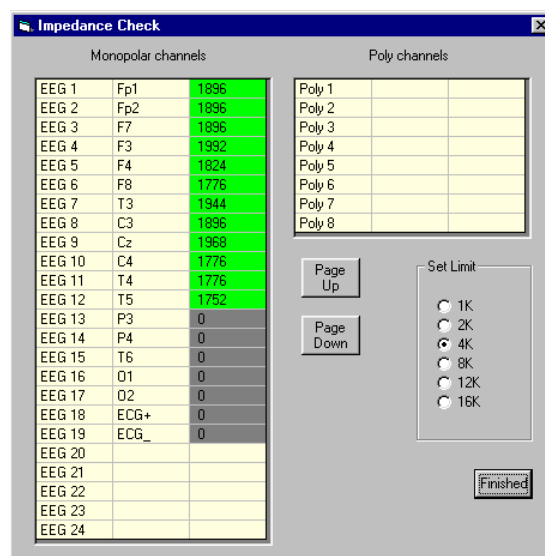


Figure 20 Impedance check

Notch filter: to set a notch filter, use Other Options from the View Menu. Notch filters are either 50Hz or 60Hz depending on where the system is to be used (USA 60Hz; Europe 50Hz).

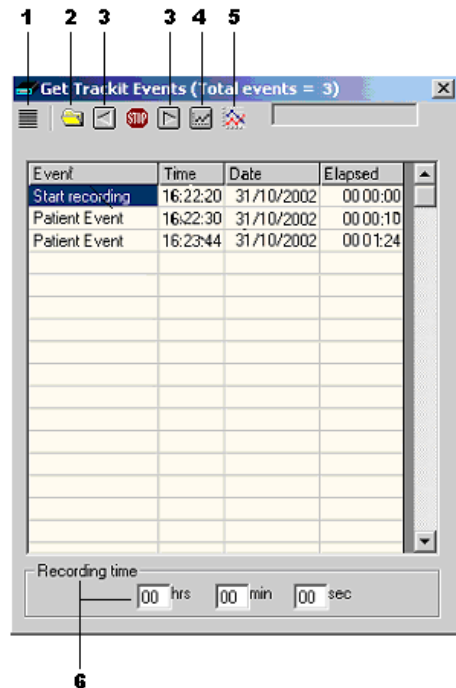
To activate the notch filter, click on the Notch Filter icon in the Trackit toolbar.



Trackit events: to view all recorded events online, click on the Get Trackit Events icon in the Trackit toolbar.



Events are displayed in the online event viewer with a description and time.



Key:

- 1 Opens the list of event types
- 2 Opens an event file for an older re-recording
- 3 Navigate forwards or backwards
- 4 Selects the best trace resolution
- 5 Selects the max. number of traces
- 6 Enter a 'Go to' time here

Figure 21 The online event viewer

The event list allows the user not only to see when events took place, but to also view the data behind those events.

To display a page of EEG around an event of interest, double click on the event in the list. The speed with which the data is displayed depends on whether the Maximum Number of Traces and Best Trace Resolution icons are selected. If no buttons are selected, the displayed traces are the same as in the live trace display. If both buttons are selected then the maximum number of recording channels with best trace resolution will be displayed.

To navigate forwards or backwards, press the forward or backward arrow buttons. Or you can go to a particular time in the recording by entering the time (as hrs, min, sec) in the recording time fields. See Figure 21 above.

You can replay EEG live from the event list while a recording is taking place or offline by opening an event file from a previous recording.

4.3 Montage Editor

This is available via the Setup | Montage menu on the main screen, and displays the Montage Editor as shown in Figure 22 below.

The Montage Editor allows the setting-up of 16 user montages and the As-recorded montage. Note that the As-recorded montage can only have its channel on/off and channel master/special control

edited (and if special, the channel sensitivity and filters). All the other 16 user montages are fully definable and can have the following parameters set for each channel:

1. Active channel name. This is either chosen from the drop-down list representing the current Signal Library signals, or typed in directly.
2. Ref. channel name. This is either chosen from the drop-down list representing the current Signal Library signals, plus Ref and Gnd, or typed in directly.
3. Channel On or Off. If off, the channel label is greyed-out and no trace is displayed.
4. Master or Special Control. If Special, then the Sensitivity, Low Filter and High Filter can be set.

Additional controls are provided to allow:

5. Update. Copies the current settings into the currently selected channel.
6. Add. This adds a channel to the end of the Montage list.
7. Insert. This insert a channel above the currently selected channel.
8. Remove. This removes the currently selected channel.
9. Montage name.

If anything is changed, an option is presented to save all changes to disk or not. If not saved, changes are only temporary.

Note that some of the montage parameters can be changed outside the Montage Editor, by clicking on a channel label to bring up the Channel Information window. These changes are only temporary (although you can save them later by subsequently going into the Montage Editor).

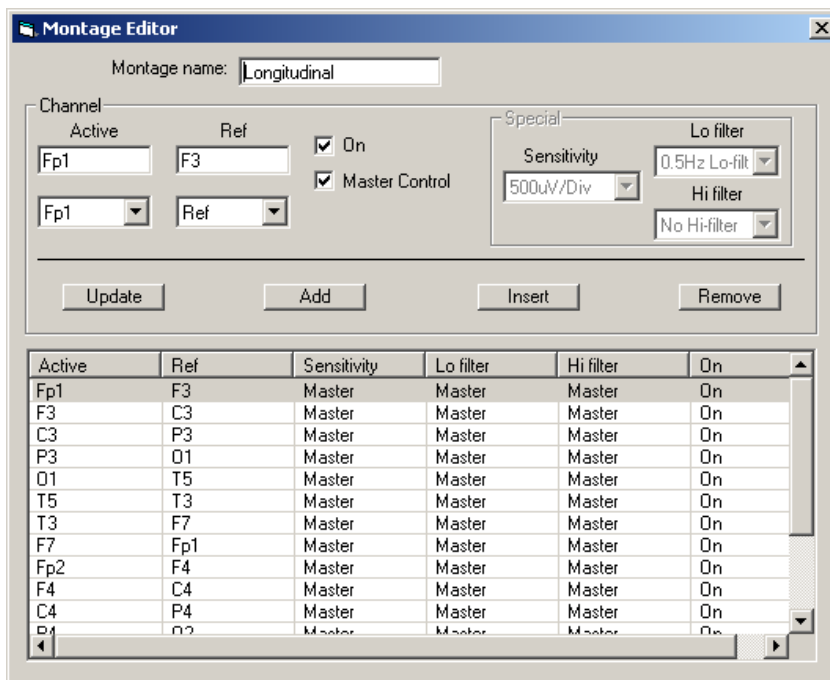


Figure 22 Montage Editor

5 The ambulatory recording

Once Trackit Mk3 has been set up for an ambulatory recording, and a recording has been initiated, you can change batteries and cards without interfering with the recording, so long as you observe the rules for changing batteries and cards outlined below.

5.1 Changing batteries and cards

WARNING. if the Trackit Mk3 recorder is not likely to be used for some time, the batteries should be removed.

To change cards and batteries during a recording, following a low battery or card warning, carry out the following procedures.

Changing batteries

- 1 Open the Trackit Mk3 rear Battery box/door with the special tool provided. The unit's warning beeper will sound and the Door Open symbol will flash on the display.

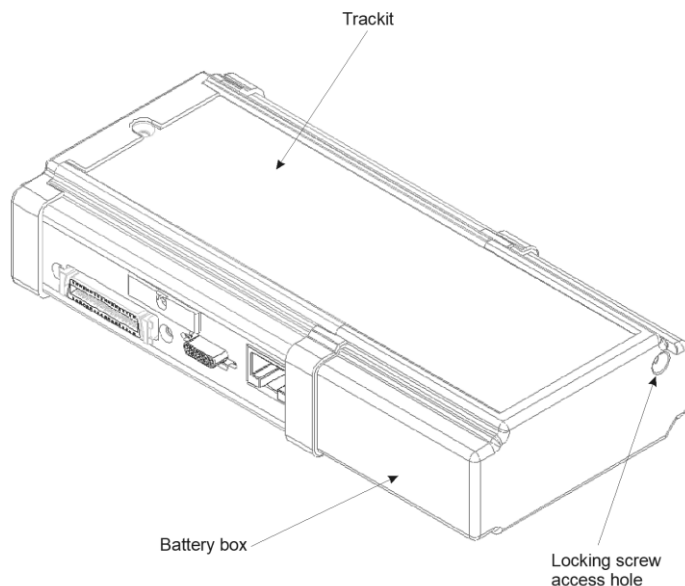


Figure 23 Opening the rear battery box/door

- 2 Different battery types

PP3 Battery

CAUTION: follow the following procedures for replacing and removing batteries.

Replacement:

Replace the batteries one at a time, making sure they are orientated correctly and firmly seated onto their terminals. Do not continue to push the battery if there is any misalignment between the mating terminals. See Figure 24.

Removal:

If 1 or 2 batteries are fitted ensure that each is removed by carefully pushing sideways at the base of each battery until the terminals disengage at the front. If 3 batteries are fitted, remove the centre one first by carefully lifting it at its base until it disengages. Now remove the remaining batteries as described above.

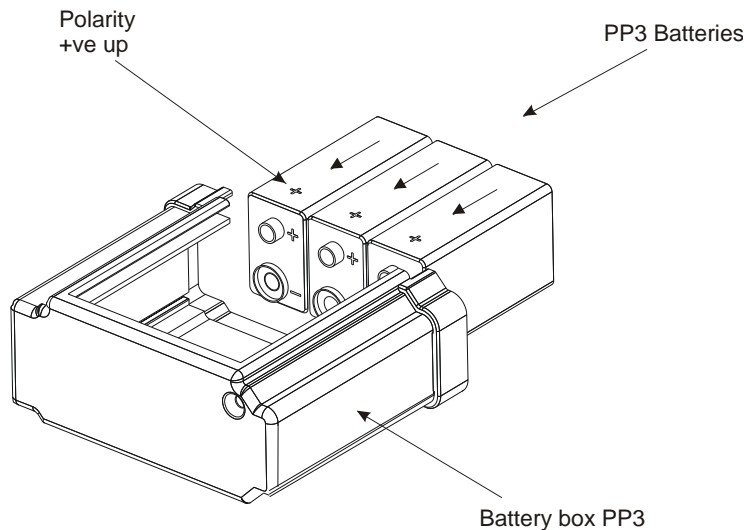


Figure 24 Removing and replacing PP3 batteries

Lithium Rechargeable Battery

For the Lithium rechargeable option, firstly slide out the tray that holds the battery inside the box. Note that the Trackit Mk3 will continue recording for a couple of minutes, depending on the number of channels, before shutting down. To slide out the Tray, push the battery gently towards the open end of the Battery Box. This will slide out the battery and the Tray simultaneously. Now separate the battery from the Tray by pushing it sideways along the Tray to disengage the bayonet tabs.

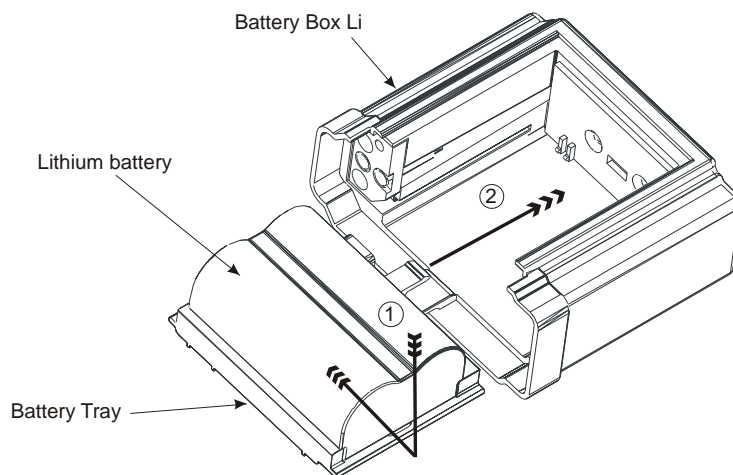


Figure 25 Removing and replacing Lithium rechargeable battery

To fit a fresh battery, either charge the original battery first or replace with another previously charged battery. Fitting is a reverse of the removal process. Firstly slide the Battery onto the Tray to engage the bayonet fittings. Then slide the entire Tray plus battery assembly back into the Battery Box by engaging the Tray slides into the slots in the Battery Box. Note that there is a tab on the Tray which engages into a slot in the back of the Battery Box.

Special Lithium Battery Instructions for Use

- The battery pack is a Canon Type BP511 and uses rechargeable lithium ion batteries. Always refer to the documentation that accompanies the battery for more information.
- The battery can only be charged outside the Trackit Mk3. Only the specific Canon charger for the BP511 must be used. Lifelines do not supply the charger; this is available from your local camera or video stockist. Always refer to the documentation that accompanies the charger for charging instructions.

- Operating time will be shorter than usual at low temperatures. The battery can be used between 0 C and 40 C, but will give best performance between 10 C and 30 C.
- If the battery starts to give less operating times than usual, it has reached the end of its life and must be replaced.
- The battery can be recharged at any time. However, since the battery will naturally discharge itself over a period of time, it is best to charge the battery a day or two before planning to use it.
- Always attach the battery terminal cover when not in use. Do not allow any metal objects to touch the battery terminals.

WARNINGS:

- **Only use the Canon Type BP511 with the Trackit Mk3**
- **Keep the battery pack away from fire**
- **Do not expose the battery pack to temperatures greater than 60°C**
- **Do not disassemble or modify the battery pack**
- **Do not drop the battery pack or allow it to become wet**
- **Only use the specific Canon battery charger for use with the BP511 type battery**

- 3 When the batteries have been replaced, and if the flash card does not need replacing, refit the rear Battery box/door and screw it down with the special tool provided. The warning beeper will stop.

CAUTION: do not over-tighten the locking screw – finger tight is all that is required.

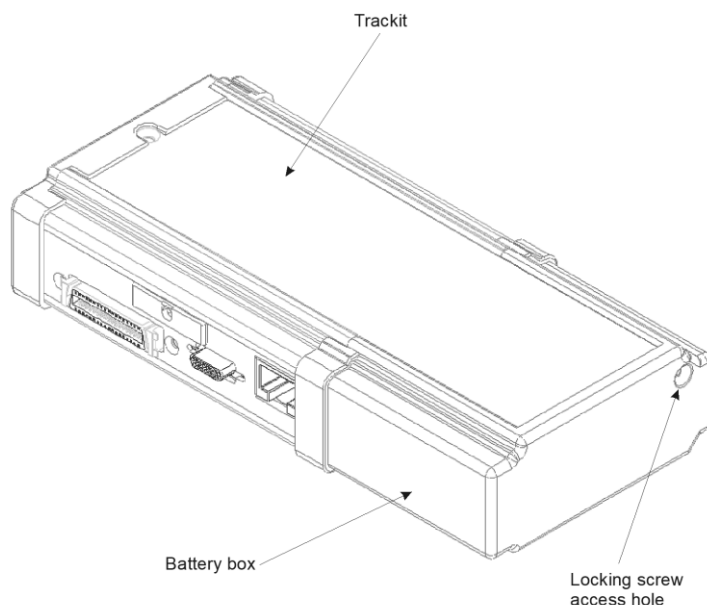


Figure 26 Closing the rear Battery box/door

Changing the flash card

- 1 Open the Trackit Mk3 rear Battery box/door with the special tool provided. See Figure 23. The unit's warning beeper will sound for a few seconds and the Door Open symbol on the display will flash.
- 2 Watch the yellow Light Emitting Diode (LED) indicating CF Card activity. When it is on, this means the Trackit Mk3 is writing data to the PC Card.

CAUTION: do not remove the CF Card when the LED is lit.

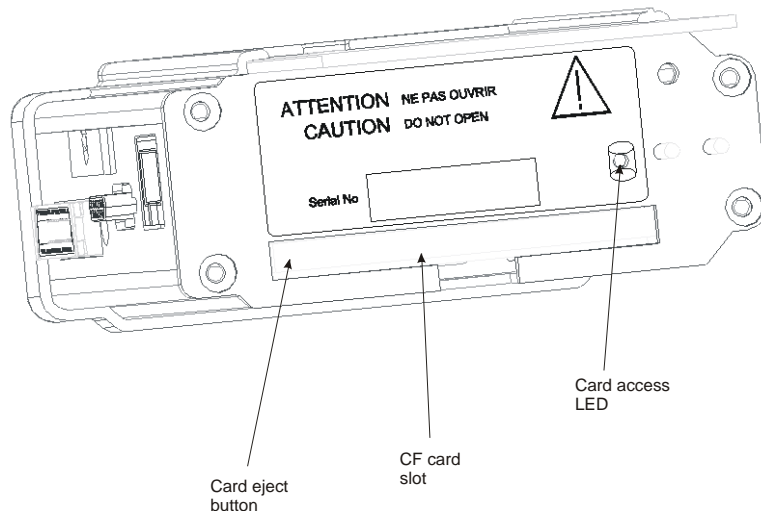


Figure 27 Removing and replacing the flash card

- 3 When the yellow LED is not lit, remove the card by carefully pressing the black eject button on the left edge of the card slot with a plastic ball-point pen or similar. Keep the pen straight and avoid pushing at an angle or inserting too far into the unit and causing damage.

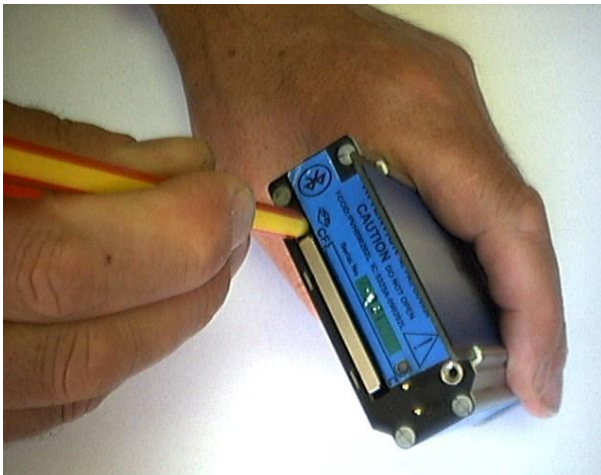


Figure 28 Removing the flash card

CAUTION: Use only a plastic ball-point pen or similar to eject the flash card. **DO NOT** use the special Trackit Access Tool supplied with the unit or any similar thin, pointed object for this purpose, since it is possible to slip and damage the inside of the unit.

- 4 Replace the card with a blank one.
- 5 Refit the rear Battery box/door, and screw it down with the special tool provided. See Figure 29.
CAUTION: do not over-tighten the locking screw – finger tight is all that is required.

5.2 Fitting the Clickon PCU

Retaining screw location

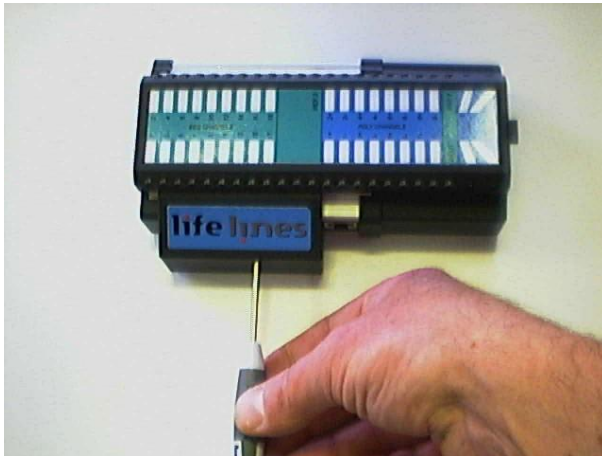


Figure 29 Clickon PCU Retaining screw location

- 1 Release the Clickon PCU by unscrewing the retaining screw as shown with the special tool provided.
- 2 Lock by screwing up the retaining screw.

CAUTION: do not over-tighten the locking screw – finger tight is all that is required.

Detaching the Clickon PCU

- 3 Ensure that the retaining screw is released as described above. Squeeze as shown below between fingers and thumb of each hand until the PCU moves by about 5mm and unplugs from the Trackit Mk3.

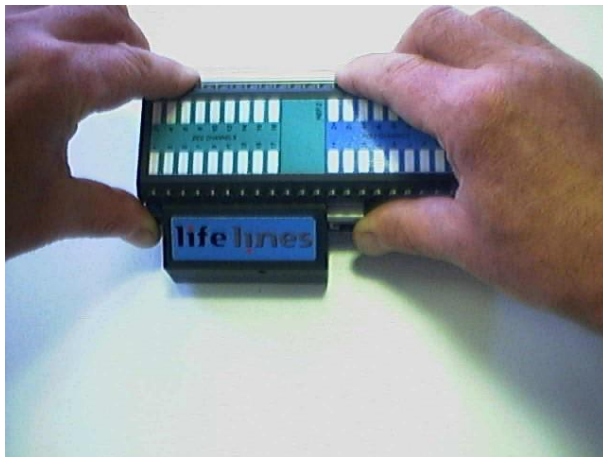


Figure 30 Detach the PCU

- 4 Lift the PCU away from the Trackit Mk3.

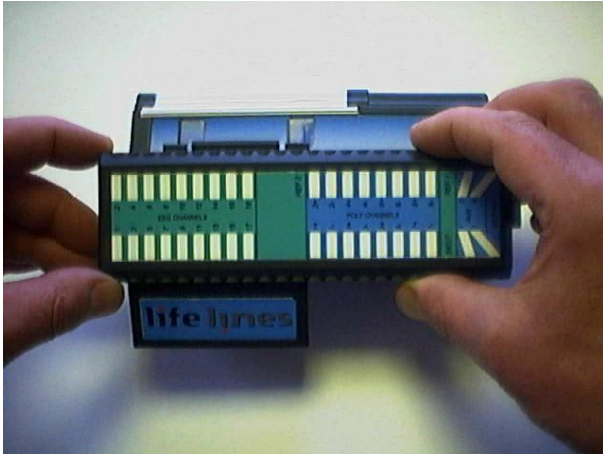


Figure 31 Lift the PCU away from the Trackit Mk3

Attaching the PCU

- 5 Position the PCU above the Trackit Mk3 as shown above in Figure 31 and lower it down ensuring that the two tabs locate fully into the slots in the top of the Trackit Mk3.
- 6 Squeeze as shown below between fingers and thumb of each hand until the PCU locates fully on the Trackit Mk3. Make sure the two tabs of the PCU are located correctly inside the slots in the top of the Trackit Mk3. Lock the PCU with the retaining screw as described above.

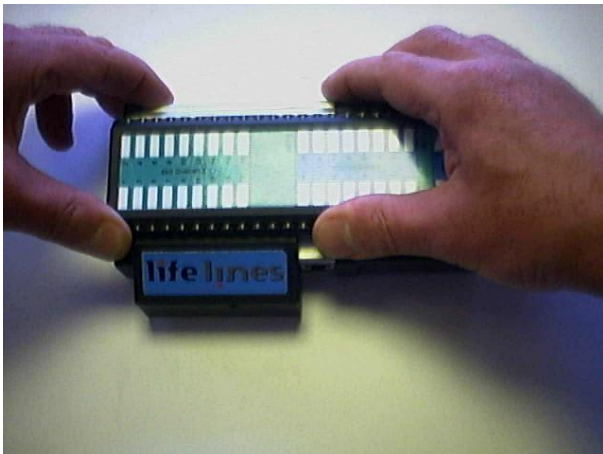


Figure 32 Locating the PCU

5.3 Event marking

Once a recording has commenced, the button on the front panel of Trackit Mk3 acts as an event marker. Events are stored in an event file (filename.tev), from which on review the events are inserted into the displayed data.

You can view events before replaying the recording using your EEG review program or the Eventit.exe program that comes with the Trackit installation.

Trackit Mk3 can record 15 different event types. These can be seen by looking at the Trackit event types in the online event viewer. See Trackit Events, in Step 9.

5.4 Ending a recording

To stop a recording:

- 1 Connect the Trackit Mk3 to the host software.
- 2 Click on the Stop Recording button in the Trackit control panel.

Alternatively, to stop the Trackit Mk3 recording in the field:

Either press the button on the front panel and hold it for approximately 5 seconds;

Or simply remove the card and do not replace it. The idle time by default is only 5 minutes and can be set in increments up to 255 minutes – see Advanced Settings, below.

5.5 Identifying a recording

It is not possible to record more than one test on a single card. This test is uniquely identified by the Patient ID entered during the setup procedure, and by the user-definable file name.

5.6 Advanced Settings

There are two menus under the Trackit Control Panel:

- Other Commands
- Advanced Operations

Other Commands

Other Commands duplicates some of the controls on the Trackit toolbar and recording control.

There are also miscellaneous controls for:

Set Trackit Time/Date: if the Trackit Mk3 is not recording, this manually sets the Trackit's time and date to that of the PC. Note: this function is normally done automatically when recording is started.

Get Trackit Set-up: this manually retrieves the setup from the Trackit's memory and overwrites the currently loaded setup on the PC. Note: this function is normally done automatically whenever the software detects a mismatch between the Trackit's setup and the PC setup.

Quiet On: if a host PC is connected, this temporarily disables the warning beep if the battery door is opened while the Trackit Mk3 is turned on. It is automatically re-enabled after the PC is disconnected.

Quiet Off: if a host PC is connected, this re-enables the warning beep if the battery door is opened while the Trackit Mk3 is turned on.

Advanced Operations

Advanced Operations contains entries, some password-protected, that change the way a Trackit Mk3 records its data. These settings include:

- Compensation for DC offsets
- Adjusting the idle and record time
- Enabling Auto start mode
- etc.

To see the available options under Advanced Operations:

- 1 Click on the Trackit Control Panel in the Trackit toolbar.
- 2 Click on Advanced Operations.
- 3 Click on Settings.

Set Trackit Defaults

[> Advanced Operations > Settings > Set trackit Defaults]

Caution: please read the manual carefully before changing or updating the Trackit Defaults. If you want to enable auto-start from flash card or append features, make sure all the checkboxes in Trackit Defaults are checked.

Trackit Defaults Tab 1

This menu item activates a control dialog that adjusts how the Trackit Mk3 behaves during a recording. See Figure 33.

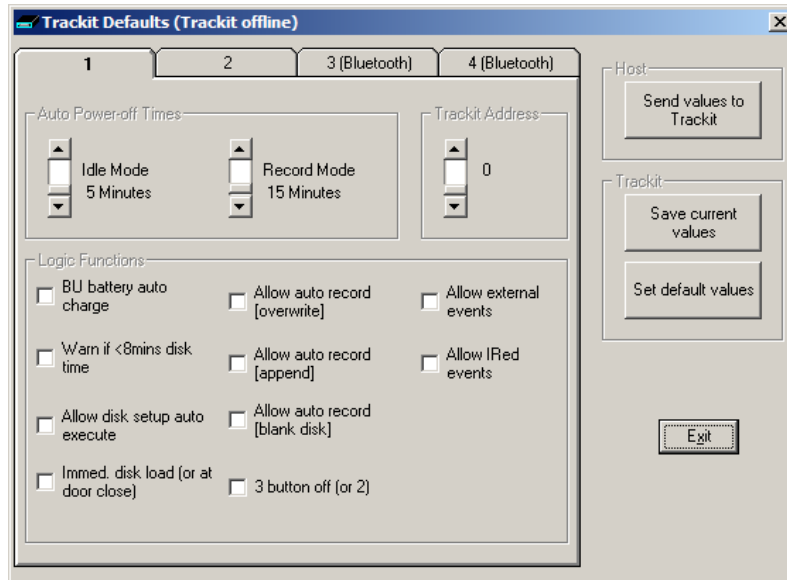


Figure 33 Trackit Defaults Tab 1

To save new defaults to Trackit Mk3, press 'Send these values to Trackit', followed by 'Save current values'.

The following functions are supported:

Idle Mode: Trackit Mk3 turns itself off after a defined period when not recording.

Record Mode: Trackit Mk3 turns itself off after a defined period after having recorded. Trackit Mk3 waits for a defined period for a card to be reinserted to append to an existing file which is <24 hours old. Otherwise it starts a new recording on a blank card. 60 minutes is enough for a user to remove a card, read it and reinsert it to continue recording until the card is full.

Trackit Address: sets the serial address of the Trackit Mk3 if a simple serial network is configured with several Trackits connected to one PC.

BU battery auto charge: enables fast-charging of the backup battery when the Trackit Mk3 is connected to its external power supply.

Warn if <8 mins card time: the Trackit Mk3 starts beeping when the card has room for only another 8 minutes of recording.

Allow card setup auto execute: allows a setup to be stored onto a flash card for a recording to start automatically only when the Trackit Mk3 is switched on. See Ways to start a recording, in Step 8.

Allow auto record (overwrite): when this box is checked the Trackit Mk3 automatically overwrites any data on a card inserted during a recording (e.g. when changing cards during a recording).

Allow auto record (append): if a card is inserted with a file which has the same patient name and is less than 24 hours old, Trackit Mk3 appends to rather than overwrites the data. This is a very useful feature if a recording is interrupted, say for a quick review of the data. Trackit Mk3 waits in record mode, and when the card is reinserted it carries on recording to the existing file on the card.

Allow auto record (blank card): check the box if you routinely want recordings to take place over several blank cards. This is a very useful feature if a recording over several days is required.

Allow external events: an external event marker can be attached to the Aux. port.

Allow IRed events: the optional Trackit infra-red event marker (Trackit Mk 1 only) can be used to annotate a recording.

Immed. card load (or at door close): off by default, allowing the card to be loaded only when the rear door is shut. Leave this box unchecked if you want to make recordings over several cards on a regular basis.

3 button Off (or 2): unchecked by default, allowing Trackit Mk3 to be turned off using only two button presses (on/off button and down arrow button simultaneously). Trackit Mk 1 only.

All new Trackits have all the logic functions enabled by default except Immed. card load and 3 button Off. To update the logic functions in the Trackit Mk3 recorder when changes are made, click on **Send values to Trackit**, followed by **Save current values**. This saves the values in the Trackit Mk3's non-volatile memory. See Figure 33 above.

Trackit Defaults Tab 2 (Mk2 and Mk3 only)

The Trackit Mk2 and Mk3 have additional optional parameters. These are accessed via Tab 2 of Trackit Defaults, as shown in Figure 34 below.

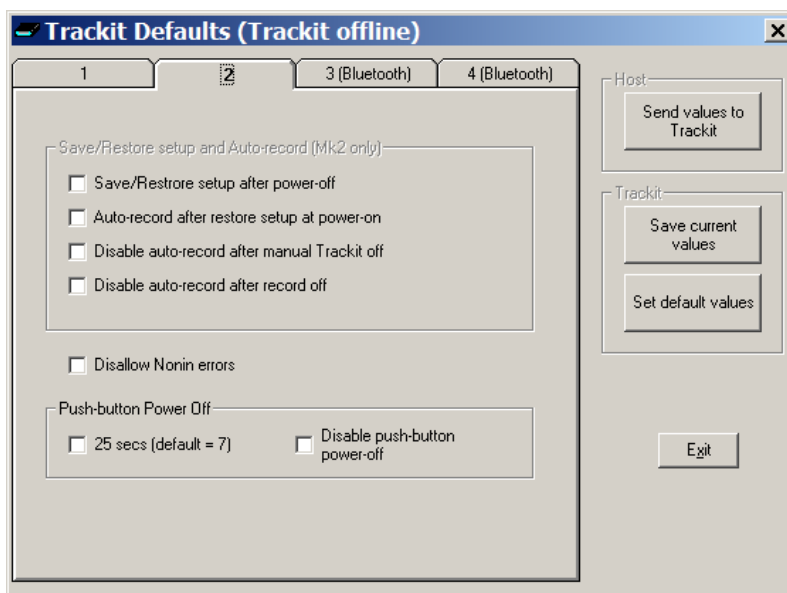


Figure 34 Trackit Defaults | Tab 2

Save/Restore setup and Auto-record

The Trackit Mk2 and Mk3 have much increased internal non-volatile memory. This memory allows it to save its entire Setup before powering-off. When next powered-on, it is able to restore its last saved Setup. This feature can significantly speed-up the download of a Setup to the Trackit because the Host software automatically determines if the Trackit is already Setup correctly.

Another benefit to this save/recall of Setup is that the Trackit can resume recording in exactly the same state it was in the last time it was powered-off. This is especially useful if, during a recording, the User takes a long time to replace the batteries. To control this feature, the following options are available:

- **Save/Restore setup after power-off.** When checked, this enables the Trackit Mk3 to save its entire Setup including Patient Name and Recording ID after power-off and recall it at power-on. Note that the Patient Name and Recording ID are only retained for 15 minutes after power-off (refer below).
- **Auto-record after restore setup at power-on.** When checked, this enables the Trackit Mk3 to continue recording if it was recording the last time it was powered-off, using the recalled Setup and Patient Name and Recording ID, but only if it has been powered-off for 15 minutes or less. If the Trackit Mk3 has been powered-off for longer than 15 minutes, then the Patient Name and Recording ID are overwritten with defaults (the current Setup remains). Note that the parameter above must also be checked to use this feature.
- **Disable auto-record after manual Trackit off.** When checked, this causes a potential Auto-record situation to be cancelled whenever the Trackit Mk3 is powered-off either from its own front-panel pushbutton or from the Host.
- **Disable auto-record after record off.** When checked, this causes a potential Auto-record situation to be cancelled whenever the Host instructs the Trackit Mk3 to stop recording.

Note that in all these Auto-record situations, the same rules apply to data storage on the flash card as defined in the User Manual for the current Trackit Default Options | Tab 1. To summarise these rules:

- The Trackit Mk3 will not record over a data file on the card which is less than 24 hours old.
- The Trackit Mk3 will append new data, if enabled, if the data file on the flash card is less than 24 hours old and the Trackit Mk3's Setup and Patient Name and Recording ID are identical to that on the card.
- The Trackit Mk3 will overwrite data on the flash card, if enabled, if the data on the card is more than 24 hours old.
- The Trackit Mk3 will write new data to a blank flash card, if enabled.

Disallow Nonin Errors

This is a feature available to all Trackits running firmware Vx.13.x or later. Normally, the SaO₂ data stored to the flash card is set to an invalid value (127) to mark any of the following Nonin errors:

1. Sensor disconnected
2. Out of track
3. Low perfusion
4. Marginal perfusion
5. Bad pulse

Errors 1 and 2 are serious and do cause invalid data. However, short-term errors 3 to 5 are not so serious and the Nonin device is still able to produce meaningful data. The available option is as follows:

- **Disallow Nonin Errors.** When checked, all errors 1 – 5 produce invalid data (127). When unchecked, it is only errors 1 and 2 which cause the data to be marked as invalid, otherwise the Nonin data is unmodified.

Get Card Info

[> Advanced Operations > Settings > Get Card Info]

Selecting Get Card Info opens a dialog showing the current status of the flash card, including the file name and any error codes ('Disk OK' is displayed to indicate a properly functioning card). Should any problem occur with the flash card, copy and paste this dialog and send it to your Life-lines distributor.

To format a flash card:

- 1 Insert the flash card into the Trackit Mk3 and connect to the host computer. See Step 6 Connect Trackit for Setup.
- 2 Open the Get Card Info dialog box.
- 3 Choose Format Disk from the Disk Utilities Menu.
- 4 Click on the Format button.
- 5 Wait for the format complete message to appear. A 1GB card will take around 5 seconds to format, larger cards will take longer to format.

Caution: in normal operation, flash cards rarely require formatting. If formatting is done on the PC it is easy to inadvertently create the wrong card format.

Earlier Trackits with V4.19 firmware and earlier use FAT16 cards only (referred to in Windows as 'FAT'). If for any reason you wish to format a flash card, make absolutely certain you know what you are doing! It is easy to convert from FAT16 to FAT32, but very difficult to convert the other way (the card has to be manually re-partitioned and re-formatted). In the rare circumstances that it is necessary to format a flash card, use the inbuilt Trackit format utility.

Later Trackits fitted with firmware V4.21 and later use FAT16 or FAT32 cards and there are format facilities in the Trackit to support both types.

Factory Settings

[> Advanced Operations > Settings > Factory Settings]

Factory settings are protected by a password (via Other Options in the View Menu). Only trained support staff should have access to factory settings.

Factory settings also allow you to compensate for any DC offsets that may be present on any of the recording inputs and save the values in the Trackit's non-volatile memory.

Configuration

[> Advanced Operations > Settings > Configuration]

Configuration gives access to the optional pulse Oximeter and the independent sample rate and headbox mode features. The code displayed can be copied and emailed to Lifelines for an activation code to be sent back.

5.7 Reading an ambulatory recording

Click the 'Open all playback files' button on the left hand side of the Trackit software toolbar (refer to Figure 14 on page 26) to playback a recording.

It is possible to launch a second instance of the Trackit software and view an on-going 'Record to PC' file. If the on-going file is located in a shared folder it is possible to view the file across a local network.

As an alternative to the Trackit software which offers basic playback features, any EDF-compatible viewer can be used to read the standard EDF files recorded by the Trackit Mk3.

All Trackit recordings have a user-definable 8-character file name. They are stored in EDF format, readable in all EDF-compatible EEG browsers. In an EDF-compatible browser, the patient's name and recording ID are displayed in the test properties.

Lifelines currently recommends:

- Nihon Kohden 1100 and 1200 EEG
- Neurotronics Polysmith Sleep software
- Nicolet One EEG
- Natus Coherence EEG (formerly Deltamed/Itmed)
- Persyst Insight EEG

Appendix 1: Trackit Mk3 Specifications

Note: Lifelines reserves the right to change product specifications at any time without notice. This is in-line with the company's policy of continual product development.

EEG inputs

Number of EEG channels	24 monopolar touchproof inputs
ADC Resolution	16 bits
Sampling	1 to 256Hz or 25 to 200Hz rate, simultaneous sampling all channels
Differential input impedance	>20 Mohms
Common mode input impedance	>100 Mohms
Common mode rejection ratio	>100dB @ 0.16Hz to 70Hz with active ground connected
Equivalent input noise	<3.5 μ V pk-pk @ 0.16Hz to 70Hz
Hardware gain	500 \pm 2%
Max differential AC input before clipping	10mV pk-pk
Max operational DC input voltage (electrode offset)	\pm 500mV
Bandwidth	0.16Hz to 70Hz (-6dB)
Max common mode input voltage	2V pk-pk
Input bias current	< \pm 25nA

Polygraphy inputs

Number of polygraphy inputs	8 bipolar touchproof inputs
ADC Resolution	16 bits
Sampling	1 to 256Hz or 25 to 200Hz rate, simultaneous sampling all channels
Differential input impedance	>20 Mohms
Common mode input impedance	>100 Mohms
Common Mode Rejection Ratio	>100dB @ 0.16Hz-70Hz with active ground connected
Equivalent input noise	<3.5 μ V pk-pk @ 0.16Hz to 70Hz
Hardware gain, AC setting	500 \pm 2%
Max differential AC input before clipping	10mV pk-pk
Max operational DC input voltage (electrode offset), AC setting	\pm 500mV
Hardware gain, DC setting	10.1 \pm 2%
Max differential input before clipping, DC setting	\pm 250mV
Bandwidth	0.16Hz to 70Hz (-6dB) or DC to 70Hz
Max common mode input voltage	2V pk-pk
Input bias current	< \pm 25nA

Aux. high-level DC Inputs

Number of Aux channels	4 on Aux. connector
ADC Resolution	16 bits
Sampling	1 to 256Hz or 25 to 200Hz rate, simultaneous sampling all channels
Input impedance	47 Kohms
Hardware gain	1 \pm 2%
Max input before clipping	\pm 2.5 V
Bandwidth	DC to 70Hz (-6dB)

Modes of operation

Impedance	< 2 to > 90 KOhm, measured with 0.075uA p-p, 5Hz signal. Measurement accuracy \pm 15%.
Calibration	0.5mV p-p square wave @ 1Hz at ADC input. Amplitude accuracy \pm 5%.

Connections, ports and controls

Patient Connection Unit (36 pin MDR connector)	Connector for touch-proof Patient Connection Unit (PCU), either Leaded or Clickon
Front-panel push-buttons	1 on/off push-button Patient Event during record
Aux. Connector 1 (RJ45 connector)	USB port (isolated from patient)
Aux. Connector 2 (15 pin Micro-D connector)	External Patient Event input Bluetooth Module I/O Nonin XPOD SaO2 probe input 4 Aux. High-level DC inputs
CF card port	1 TypeII socket (3.3V)
Batteries	3 type PP3/MN1604 1 type BP511 Lithium rechargeable
Internal beeper sounds when:	door open battery low card storage low Patient Event

Back-light display

Current Time and Date
Recording Time
Battery Life remaining
Disk Storage remaining
Door open warning

Recording format

Native European Data Format (EDF)
Native MSDOS/Windows card data structure

Physical characteristics

Weight	500g including card and 3 PP3 batteries 450g including card and Li rechargeable battery
Size	16cm x 8cm x 3.5cm

Safety and EMC standards

EN60601-1 and EN60601-2-26 UL60601-1:2003	European standard for medical electrical equipment, general requirements and EEG systems. USA standard for medical electrical equipment, general requirements.
CAN/CSA 22.2 No 601.1 M90	Canadian standard for medical electrical equipment, general requirements.
EN60601-1-2:2001	European standard for medical electrical equipment, EMC requirements, calling:
EN55011	Conducted Emissions, Group 1, Class B
EN55011	Radiated Emissions, Group 1, Class B
EN61000-4-2	Electrostatic Discharges
EN61000-4-3	Immunity - Radiated RF Field
EN61000-4-4	Immunity - Transients Bursts
EN61000-4-5	Immunity - Surges
EN61000-4-6	Immunity - Conducted
EN61000-4-8	Immunity - Power frequency fields
EN61000-4-11	Immunity - Voltage dips, interruptions
EN61000-3-2	Harmonic Emissions
EN61000-3-3	Voltage Fluctuations/flicker

Degree of protection against electrical shock (when connected to host system)	Type BF
Type of protection against electrical shock (when connected to host system)	Internally powered or mains powered Class 1 or 2 or USB
Degree of protection against harmful ingress of water	Ordinary (no protection)
Mode of operation	Continuous
Degree of safety of application in the presence of a flammable anaesthetic mixture with air or with oxygen or nitrous oxide	Not suitable

Appendix 2: Trackit Mk3 options

Nonin XPOD pulse oximeter

The Nonin XPOD is an in-line pulse oximeter that connects to the second serial port on the side of the Trackit Mk3, or the optional AUX input box. Finger probes may be purchased locally from Nonin.

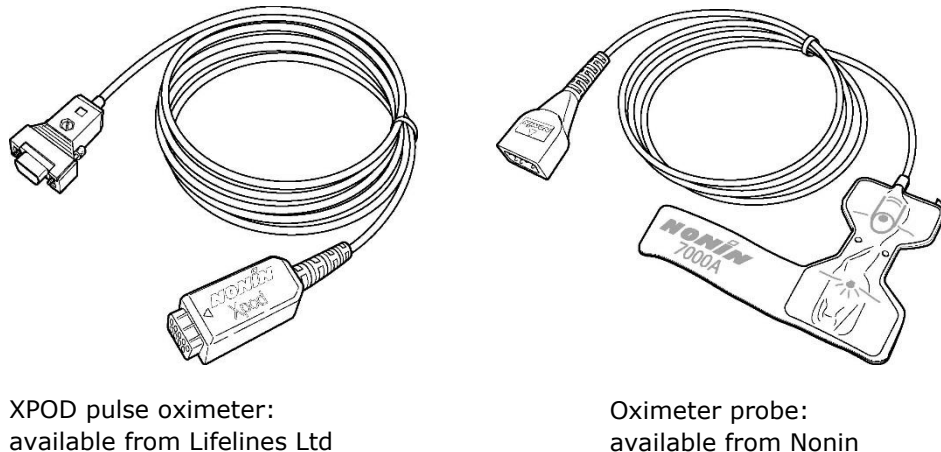


Figure 35 Pulse oximeter and oximeter probe

Trackit Mk3 takes the digital output from the XPOD, and displays it as a DC-analogue signal, along with a real-time numeric display of O₂ saturation and pulse rate. The data stored is displayed in the range 0–100%.

Additionally, for the Trackit Mk2 and 3 only, an enhanced XPOD will be available that offers Plethysmographic pulse data.

Note that the XPOD oximeter and Probe take power from the Trackit Mk3 and the typical recording time will be reduced by approximately 22%. The later version of the XPOD which is coloured blue instead of grey, is lower-power and only reduces the recording time by approximately 13%.

Ideal applications

The XPOD pulse oximeter can be used extensively in sleep studies while monitoring patients who suffer from sleep apnoea. The pulse oximeter is used to correlate the corresponding dip in the blood's O₂ saturation with an apnoea attack.

Pulse oximetry is also used in a wide variety of applications such as hypoxia in children with central breathing disorders, hypoxic events during epileptic seizures, etc.

Ordering information

Description	XPOD pulse oximeter
Requires	Version 2.1.x EPROMS, and will work with all Trackit variants. Will also work with optional AUX Input Box.
Part Number	1022 or enhanced 1119 (Plethysmographic data for Trackit Mk2 only)

Operation

To enable the pulse oximeter:

- 1 Open the Trackit Control Panel.
- 2 Click on Advanced Operations.
- 3 Choose Configuration from the Settings Menu.
- 4 Copy the code displayed in the configuration dialog and email it to your nearest Lifelines distributor.
- 5 You will receive by return an unlock code that will enable this feature.

Setup as follows:

- 1 Connect the pulse oximeter (see Figure 36) to the second 15-pin serial connector (AUX connector) on the side of the Trackit Mk3.

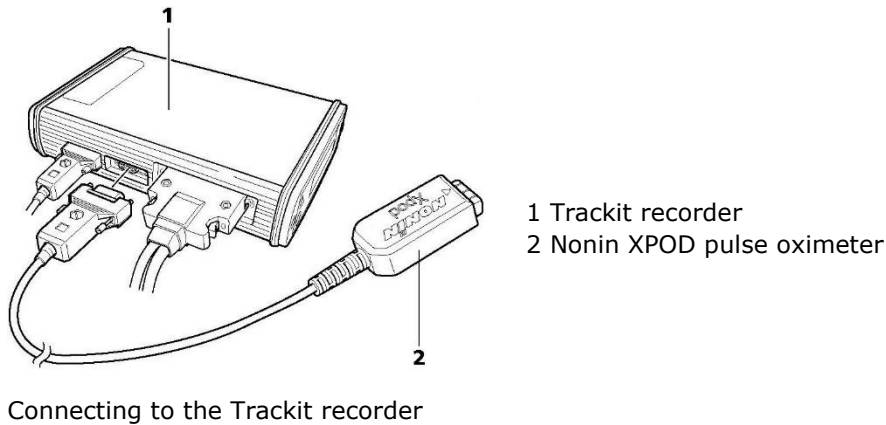


Figure 36 Connecting the oximeter to Trackit Mk3

- 2 Connect the oximeter probe, which can be purchased from Nonin via their local distributors – <http://www.nonin.com/sensors.html>.

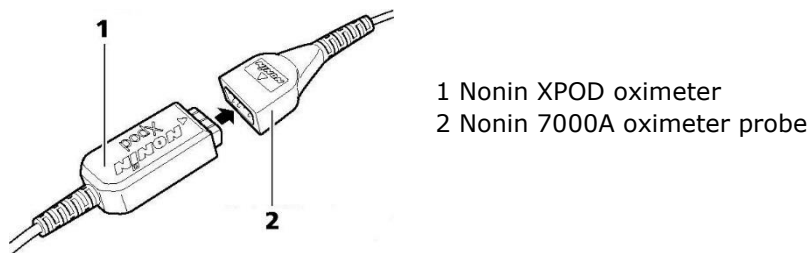


Figure 37 Connecting the oximeter to the oximeter probe

- 3 Remove the paper backing from the oximeter probe (see 1 in Figure 38). Attach the probe to the index finger of the patient's non-dominant hand, as shown below.

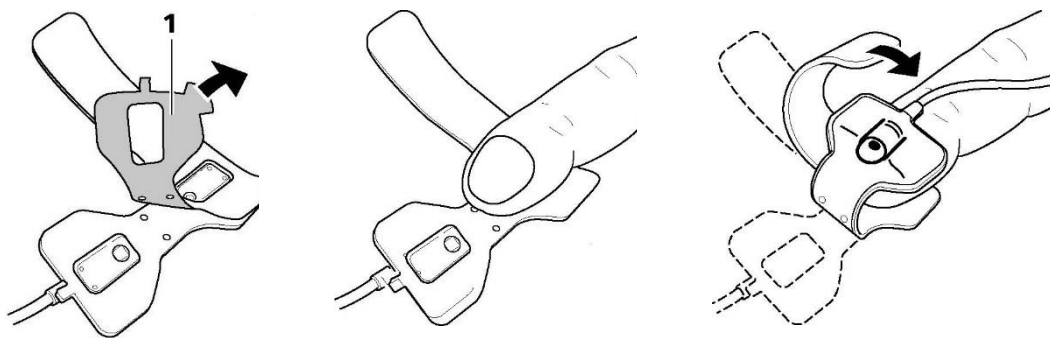


Figure 38 Attaching the oximeter probe to the finger

- 4 Include the SaO₂ signal in the amplifier setup using one of the AUX inputs and create a recording channel as per normal.
- 5 Connect the Trackit Mk3 to the host PC. Switch on, and click on Connect in the Trackit Control Panel.
- 6 Observe the display of SaO₂ and pulse rate on the Trackit Control Panel. Probe off, and XPOD disconnect information is displayed.

- 7 Start the recording. SaO₂ is stored as an analogue DC signal with a scale 0-100%.
- 8 To display O₂ Saturation values on the trace display, under the channel label, click the SaO₂ channel label, and put a checkmark by Numeric.

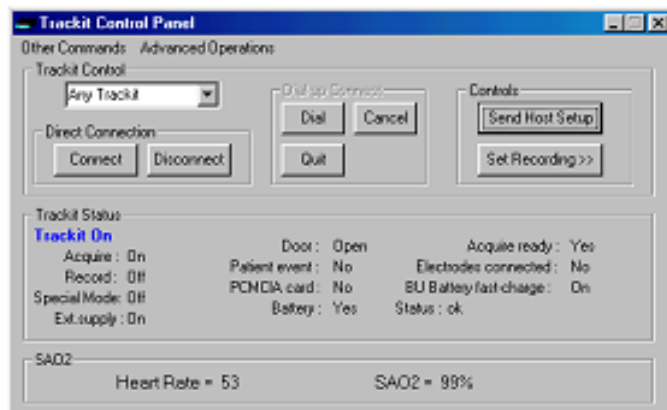


Figure 39 Display of SaO2

Appendix 3: Photic Stimulator and Hyperventilation

Photic Stimulation

An optional Lifelines Photic Stimulator is available which can be used with the Trackit Mk3 to assess patient photosensitivity in EEG studies. For a detailed description of operation, connection and specifications please refer to the separate documentation "Lifelines Photic User Manual".

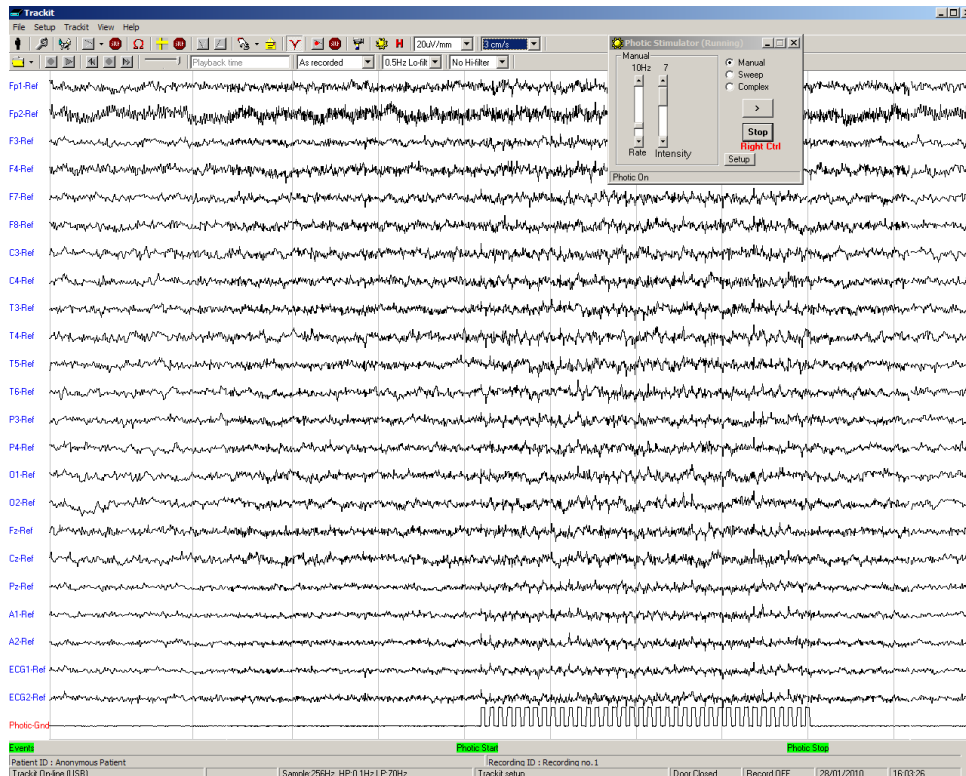


Figure 40 Photic Stimulation

Click on the Photic Stimulation icon in the top toolbar to bring up the Photic Stimulation control panel, shown below.



Figure 41 Photic Stimulation control window

This window allows single, manual, sweep and complex sequences of Photic stimulation to be produced. Photic start/stop events are recorded as shown above. By using the Trigger output from the Photic Stimulator and connecting to an Aux input on the Trackit Mk3, the actual Photic flash 'ticks' are produced in the recording.

Note: to setup a suitable Photic trigger signal definition open the Signal library as described in section 4.1, and define a signal with a name "Photic", set it to type DC, units mV and Physical Signal Amplitude of +- 1000mV/V. Set the sensitivity to non-master and 10mV/mm. Set the sensitivity to non-master and 10mV/mm.

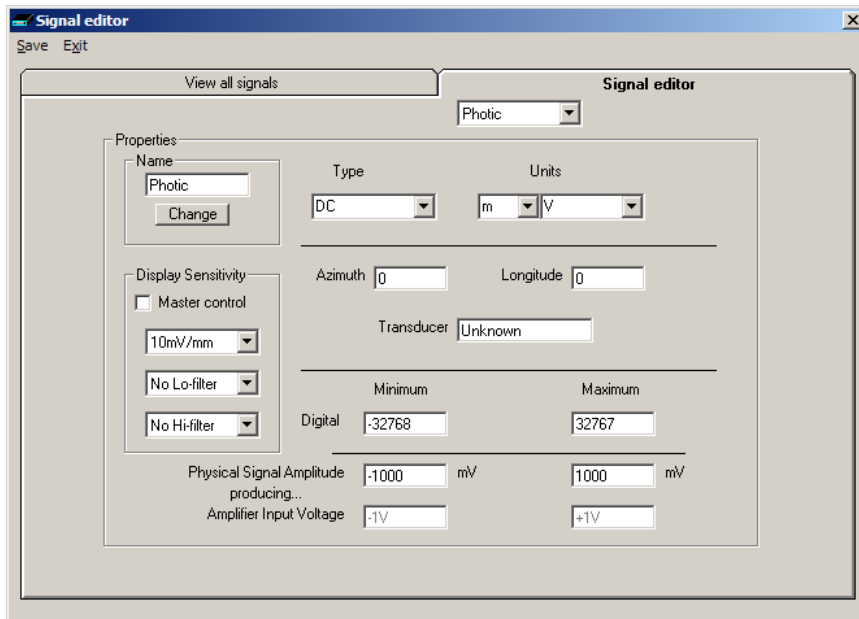


Figure 42 Photic trigger signal definition

Hyperventilation

A method of timing and marking a Hyperventilation and post-Hyperventilation activation sequence is provided.

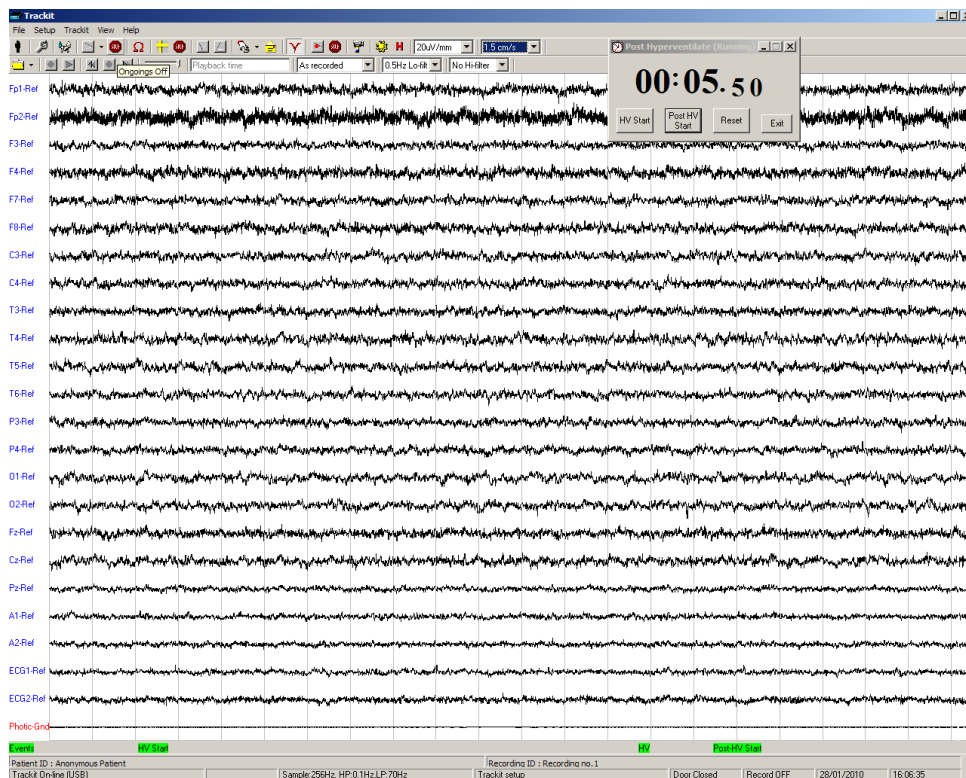


Figure 43 Hyperventilation

Click on the Hyperventilation icon on the top toolbar to bring up the control window as shown below.



Figure 44 Hyperventilation control window

This provides a digital timer, which is used as follows:


- Click on HV Start to start the HV period and the timer starts running. An 'HV Start' event is recorded.
- Thereafter an 'HV' event is automatically generated every 10 seconds.
- Click on Post HV Start to start the post HV period. A 'Post HV Start' event is recorded.
- Thereafter a 'Post HV' event is automatically generated every 10 seconds.
- Click on Reset or Exit to end the hyperventilate activation.

Note that the Post HV Start will not work unless HV is in progress. Likewise, HV Start will not work if Post HV is in progress.

Appendix 4: Record to PC and Synchronised Video

1 Record to PC

This facility enables EEG data from the Trackit Mk3 to be recorded directly to the PC. Headbox mode must be enabled in Advanced Operations in the Trackit Control Panel.

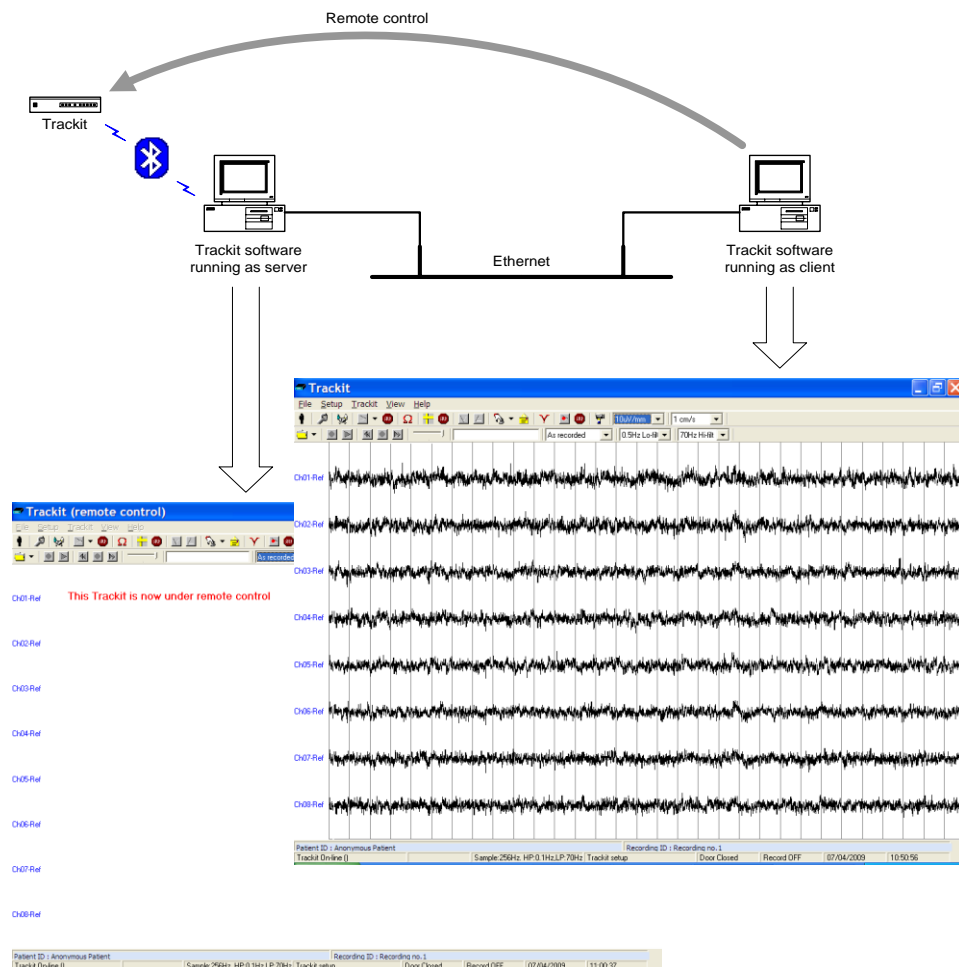
1. Connect to the Trackit Mk3 and setup in the normal way. Connection can be either USB, or Bluetooth.
2. Click the Record to PC button .
3. Specify a storage location on the PC for the EEG data file.
4. Enable, if desired, 'Trackit auto-record when host comms lost'. The Trackit Mk3 will automatically commence recording to its own CF card when the communication link is lost. This can be particularly useful when a Bluetooth link is being used.

2 Network Connection

There follows an explanation of how to remotely connect to the Trackit Mk3 and acquire data over a TCP network.

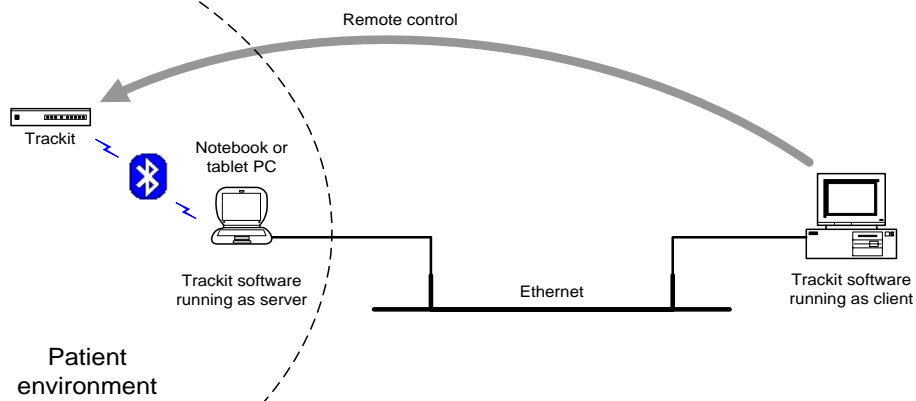
Overview

The diagram below shows how the system works. The Trackit application runs on the *server* PC which is connected via serial or Bluetooth to a Trackit Mk3 device. A remote *client* PC which is also running the Trackit application opens a TCP connection to the server which enables the client to take over control of the Trackit Mk3.

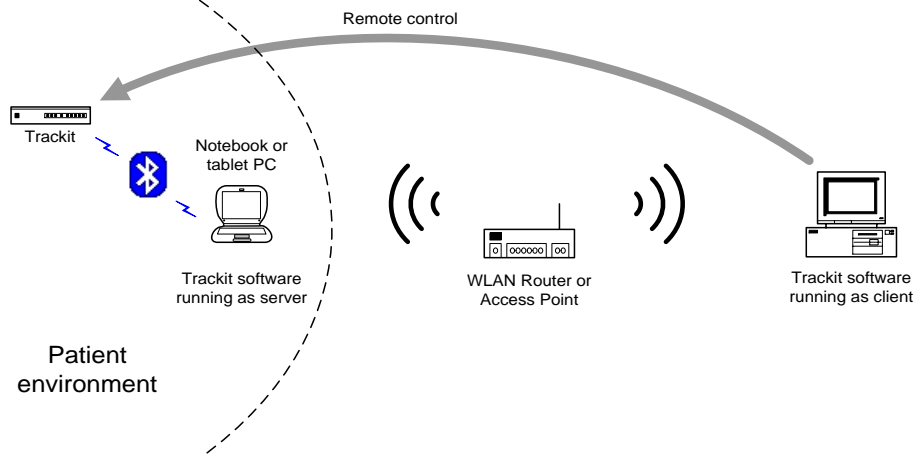


The server PC can be located locally to the patient, in the bedroom for example, and a wireless Bluetooth link configured to provide untethered communication with the Trackit. After any initial setting up on the server, local control can be relinquished and subsequently acquired by a client anywhere on the network. In this scenario the server computer could be one of the miniature PC

platforms such as a notebook or a tablet which could be easily accommodated within the patient environment, as shown below.

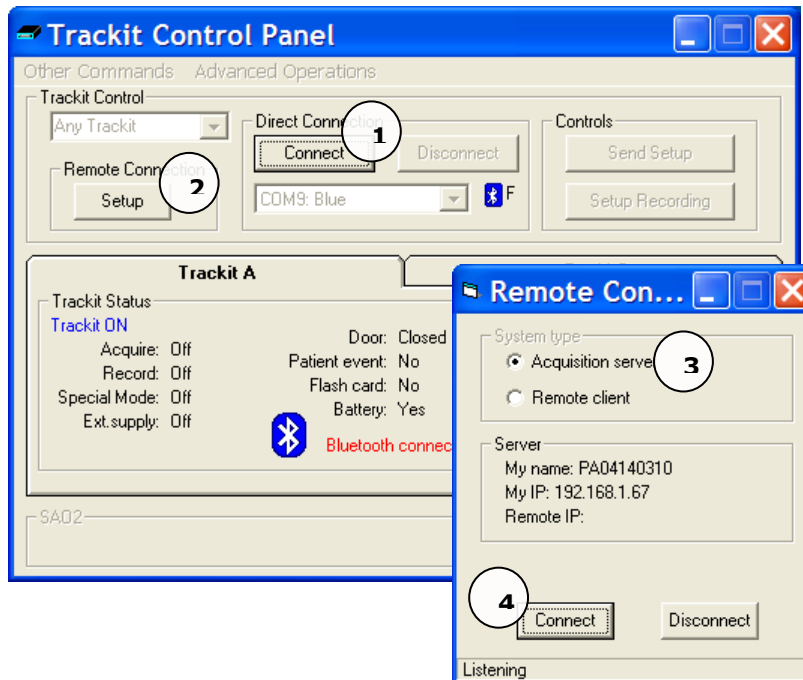


The Ethernet connection shown above can be replaced with WLAN technology, which connects the server and client as shown below.



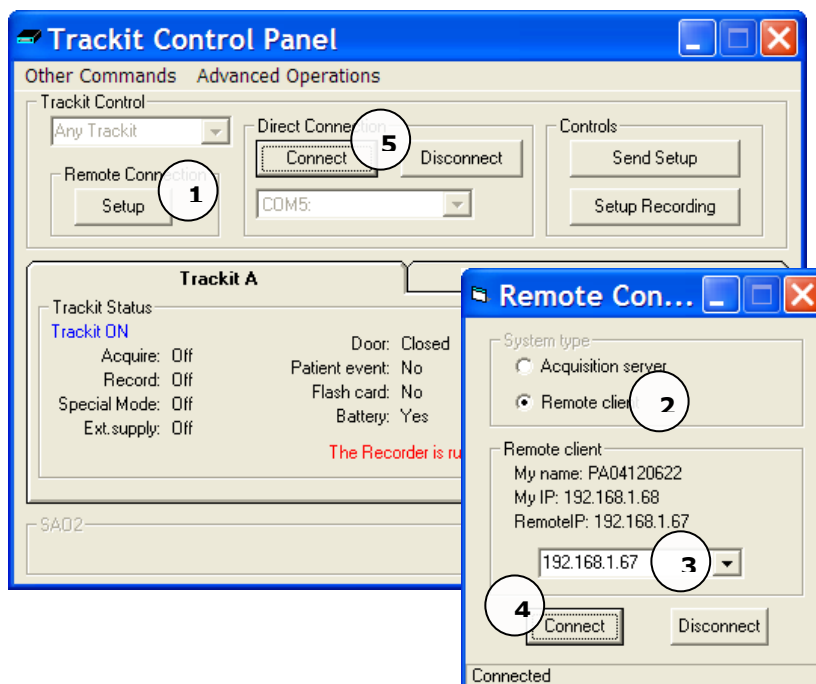
Note that in all these scenarios Trackit Video can be recorded on the client PC but only from a local camera connected directly to the client PC.

Server Set-up



1. In the normal way, connect to the Trackit device via either serial connection or Bluetooth. See Trackit Control Panel above.
2. Click the Remote Connection Setup button to display the Remote Connection window as shown above.
3. Select Acquisition Server.
4. Click the Connect Button. Make a note of the 'My IP' address which will be required by the client.
5. The program will now listen for a connection from a remote client.

Client Set-up



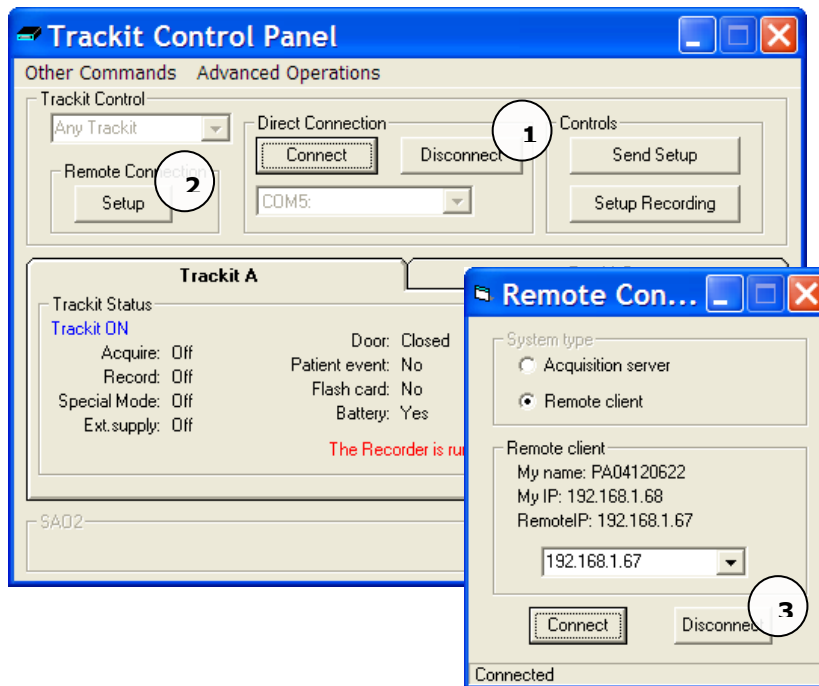
1. Click the Remote Connection Setup button to display the Remote Connection window as shown above.

2. Select Remote Client.
3. Enter the IP address of the server as shown in the previous section.
4. Click the Connect button and leave the Remote Connection window open.
5. Click the Connect button in Control Panel.

At this point the client will have complete control over the remote Trackit just as if it were connected locally.

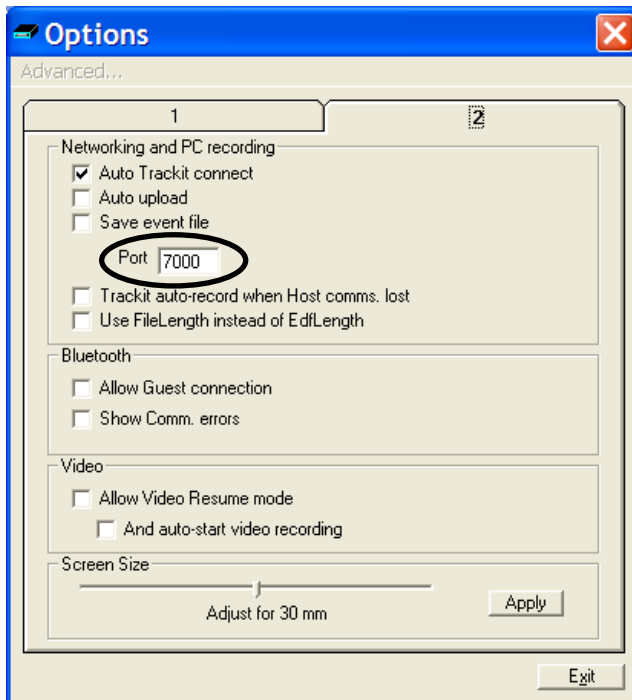
The server will display 'This Trackit is now under remote control' to indicate that control has been transferred to the client.

Client Shut-down



1. Click Disconnect in the Control Panel.
2. Click the Remote Connection Setup button to display the Remote Connection window as shown above.
3. Click Disconnect.

Selecting IP Port



In order for the client and server to open a communication channel it is important that they both use the same port. This is set up in the Trackit application View|Other Options|Tab 2 as shown above.

Do not use the range 0 through 1023 which are pre-allocated for special purposes in the TCP/IP protocol.

3 Video

Overview

Trackit Video provides an unobtrusive solution for the ambulatory monitoring of EEG with time synchronised video. The Trackit Mk3 provides time sync information to the video file to ensure accuracy down to the nearest frame: essential to correlate behavioural and physiological information.

Modes of operation

- Synchronized video acquisition and recording
- EEG recorded on the Trackit Mk3 with time sync information sent via cable or Bluetooth wireless to the video acquisition PC
- EEG and video recorded on the PC with the Trackit Mk3 in 'headbox' mode
- As above with selective video recording via user intervention where each video segment is time synchronized to the corresponding EEG
- Synchronized video playback

Main features

- Support for a wide range of video capture codecs including MPEG-4 and Windows Media Video
- Selectable frame rates and video compression
- Accuracy down to one frame when used with the sync file
- Automatic re-synchronization of the video when the Trackit Mk3 goes in and out of range
- User definable video file length to provide increased security and more manageable files for copying over a network. It also allows video files with no interesting findings to be easily deleted thus reducing the amount of data.
- Time, date and patient ID stamp on the video
- Video zoom feature in playback

- Snapshot capture mode for a record of the patient image
- Live monitoring of EEG and video on the host PC when recording in ambulatory mode

Video codecs

A video codec is a device or software that enables video compression and/or decompression for digital video. This allows faster transmission over computer networks or more efficient storage on computer disks. Video information that is not important for human perception is removed in order to achieve very high compression rates while still keeping very good visual quality.

There is a complex balance between the video quality, the quantity of the data needed to represent it (also known as the bit rate), the complexity of the encoding and decoding algorithms, robustness to data losses and errors, ease of editing, random access, the state of the art of compression algorithm design, end-to-end delay, and a number of other factors.

MPEG-4 codecs

MPEG-4 is a multimedia standard, delivering professional-quality audio and video streams over a wide range of bandwidths, from cell phone to broadband and beyond. MPEG-4 was defined by the Moving Picture Experts Group (MPEG), the working group within the International Organization for Standardization (ISO) that specified the widely adopted MPEG-1 and MPEG-2. Hundreds of researchers around the world contributed to MPEG-4, which was finalized in 1998 and became an international standard in 2000.

Microsoft was involved in the early development of MPEG-4 but is no longer actively supporting the standard, choosing instead to concentrate on the Windows Media format. MPEG-4 can only be played in Windows Media Player with a special MPEG-4 decoder pack.

Xvid¹ is a popular free/open source MPEG-4 Part 2 codec which works well with the Trackit video application.

Windows Media Video 9 series codecs

In 2006, the Society of Motion Picture and Television Engineers (SMPTE) formally published the Final Specification for SMPTE 421M, also known as VC-1. Formal standardization of VC-1 represents the culmination of years of technical scrutiny by over 75 companies, leading to a codec that is well-documented, extremely stable, easily licensable, and accepted by the industry. The comprehensive specification delivers high definition content across any medium and to any capable device.

Windows Media Player as part of its installation, includes WMV codecs.


AVI

Audio Video Interleave is a multimedia container format which allows synchronous audio-with-video playback. The AVI file contains data which can be encoded by almost any codec, including Full Frame (uncompressed), Intel Real Time (Indeo), Cinepak, RealVideo and MPEG-4.

ASF

Windows Media Video files are in most circumstances encapsulated in the Advanced Systems Format (ASF) container format. The file extension .WMV typically describes ASF files that use Windows Media Video codecs.

Trackit Video

With a camera connected to the PC, click the video icon on the Trackit toolbar  and the video preview window will appear as shown in Figure 45. Click on the setup icon to display the five setup tabs.

¹ [Xvid.org: Home of the Xvid Codec](http://Xvid.org)

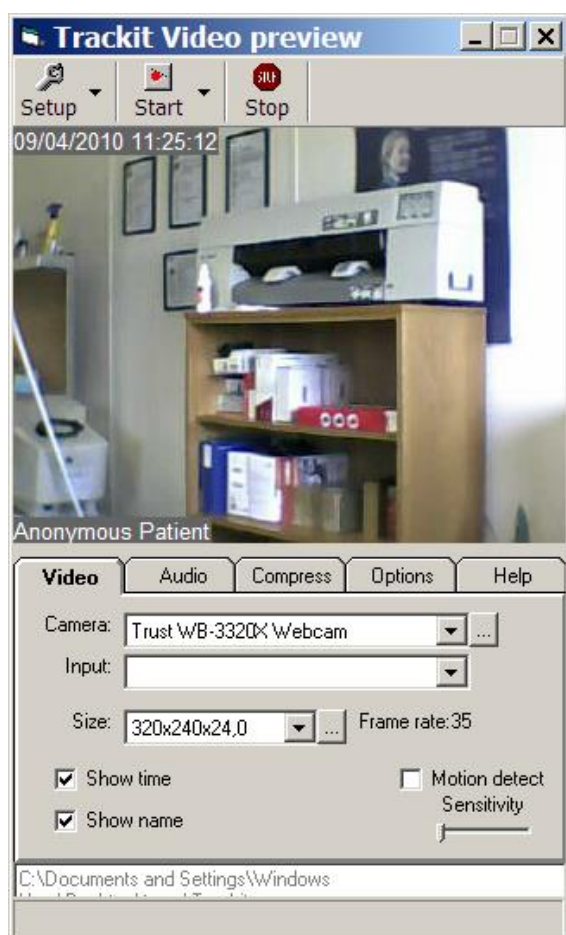


Figure 45 Trackit video preview

Video tab

The Video tab allows the camera to be selected and also the picture size and frame rate. If an excessively large picture size is inadvertently selected, the setup tabs can become inaccessible off-screen thus making re-sizing impossible. Under these circumstances the Setup button has a drop-down option which can be used to reset the video resolution.

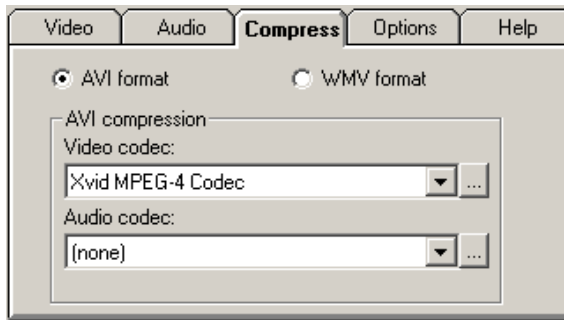
Audio tab

The Audio tab allows an optional microphone to be selected.



Compress tab

The Compress tab allows the compression codec to be selected.

**Options tab**

The Options tab allows various options to be selected as shown below.



Video can automatically resume after an interruption and will use only the original camera.

Video file segment size can be selected or disabled.

Unlock PW makes a password necessary to unlock the controls. The password is the Recording ID.

Help tab

The Help tab provides a single large button which the patient can use to start and stop the recording.



Lock controls prevents access to the setup settings. It is reset from the Setup drop-down.

Start recording

At the commencement of a recording, the video file name and destination need to be entered.

Appendix 5: Bluetooth Wireless

Introduction

Using a single plug-in Bluetooth interface module on the Trackit Mk3, wireless connections can be established with it from any Bluetooth-enabled PC, Laptop or PDA. This allows the Trackit Mk3 to be controlled or monitored remotely over a secure wireless link up to a range of about 100m or greater (dependent on hardware and environmental factors).

Bluetooth primer

It is not intended here to provide a full introduction to Bluetooth technology, how it works and how to use it. There is a huge amount of information elsewhere that is available for this purpose. Nevertheless, a short description will be given to identify some of the common terms that will be used later in the document.

The term "Bluetooth" refers to a worldwide standard for the wireless exchange of data between two devices.

In order to exchange data, two Bluetooth devices must establish a connection. Before a connection is established, one device must request a connection with another. The second device accepts (or rejects) the connection.

The originator of the request is known as the client. The device that accepts (or rejects) the request is known as the server. Many Bluetooth devices can act as both client and server.

A client Bluetooth device runs a software program that requests a connection to another device as part of its normal operation. For example, the program may request a connection to a remote computer, a printer, a modem or a Trackit Mk3.

Becoming a Bluetooth client normally requires an action by the device operator, such as an attempt to browse a remote computer, print a file, dial out on a modem or connect to a Trackit Mk3.

Every Bluetooth device that provides a service must be prepared to respond to a connection request. Bluetooth software is normally running in the background on the server, ready to respond to connection requests.

Specification Summary

- The devices in a piconet share a common communication data channel. The channel has a total capacity of 1 megabit per second (Mbps). Headers and handshaking information consume about 20 percent of this capacity.
- In the United States and Europe, the frequency range is 2,400 to 2,483.5 MHz, with 79 1-MHz radio frequency (RF) channels.
- A data channel hops randomly 1,600 times per second between the 79 RF channels.
- Bluetooth can transmit up to 721 kilobits per second (Kbps) in one direction, with 57.6 Kbps in the other. If the use calls for the same speed in both directions, a link with 432.6-Kbps capacity in each direction can be made.
- Each channel is divided into time slots 625 microseconds long.
- A piconet has a master and up to seven slaves.
- Packets can be up to five time slots wide.
- Data in a packet can be up to 2,745 bits in length.
- There are currently two types of data transfer between devices: SCO (synchronous connection oriented for voice and audio) and ACL (asynchronous connectionless).
- In a piconet, there can be up to three SCO links of 64,000 bits per second each.
- Masters can support up to three SCO links with one, two or three slaves.
- Slots not reserved for SCO links can be used for ACL links.
- One master and slave can have a single ACL link.
- ACL is either point-to-point (master to one slave) or broadcast to all the slaves.
- ACL slaves can only transmit when requested by the master.
- A Class 1 device has a maximum output power of 100mW (20dBm) and has a range of about 100m.

- A Class 2 device has a maximum output power of 2.5mW (4dBm) and has a range of about 20m.
- A Class 3 device has a maximum output power of 1mW (0dBm) and has a range of about 10m.

System overview

The system and its parts



Figure 46 Trackit Mk3 with Internal Bluetooth Module

Internal Bluetooth

Trackit Mk3 has built-in Bluetooth capability which can be ordered as an option. When present there is a small 'B' on the display as shown in Figure 4 on page 19. This internal Bluetooth can be enabled by pressing the pushbutton 5 times within 3 seconds whereupon the display will change to a 'B'. Note that when enabled, the normal serial cable communication with the host PC becomes inoperative. At any time the Bluetooth can be disabled by again pressing the pushbutton 5 times within 3 seconds. This will restore the serial cable communication.

The module is qualified against Bluetooth specification V1.1 or V2.0 (later modules) and it will communicate with any similarly qualified Bluetooth device elsewhere. This means that the Bluetooth host (client) can be any standard qualified Bluetooth peripheral device bought off-the-shelf. Life-lines does not supply the device at the host end and the User can make his own choice from the wide range available. Note that to achieve the maximum transmission range, this Bluetooth device should be of the High Power (Class 1) type to match the Trackit Module. Lower power devices (Class 2 and Class 3) will still work, but the range will be less. The receiver sensitivity should also be as good as possible because this also helps to maximise the transmission range. Look for a sensitivity figure of at least -80 dBm (for 0.1% BER) or better.

These standard qualified Bluetooth devices are available as USB converters, PC-card or CF-card converters, Serial Port converters and even built-in to PDA devices, Laptops and desktops. The Trackit Mk3 will communicate with all these devices through the standard Trackit Setup or Wizard Setup programs that have been enhanced to provide transparent Bluetooth functionality. These programs will work over a direct connection, over a Bluetooth wireless connection or over a network or even over a combination of connections.

What you can do with a Trackit Bluetooth link:

- Connect wirelessly to any Trackit within range equipped with a Bluetooth Module
- Control the Trackit wirelessly (Acquire on/off, Ongoing on/off, Impedance Check on/off, Recording on/off, Calibration on/off etc.)
- Send setups to the Trackit wirelessly
- Review the Trackit status wirelessly (general system status as well as Trackit time, recording time, battery level, disk level, SaO2 level, heartrate etc.)
- Monitor the Trackit Ongoing traces wirelessly
- Acquire wirelessly and record on a PC (this is using the Trackit as a wireless Headbox)

- Connect wirelessly as a second user (a Guest) and review Trackit status and also monitor Ongoing traces, Imp.Check, Events etc.
- Mark an event over the wireless link
- Optionally configure the Trackit to automatically record locally whenever the wireless link is lost
- Connect wirelessly and directly to several Trackits simultaneously from the same PC. These Trackits are also simultaneously available for Guest connections

Connection and use

The Trackit Setup and Trackit Wizard programs have been enhanced to provide transparent Bluetooth support. All the functionality of the programs is available over a direct connection or a Bluetooth connection. Note that the Trackit should be fitted with V2.10.x or later firmware.

Figure 47 below shows the new Trackit Control Panel with the additional Bluetooth features.

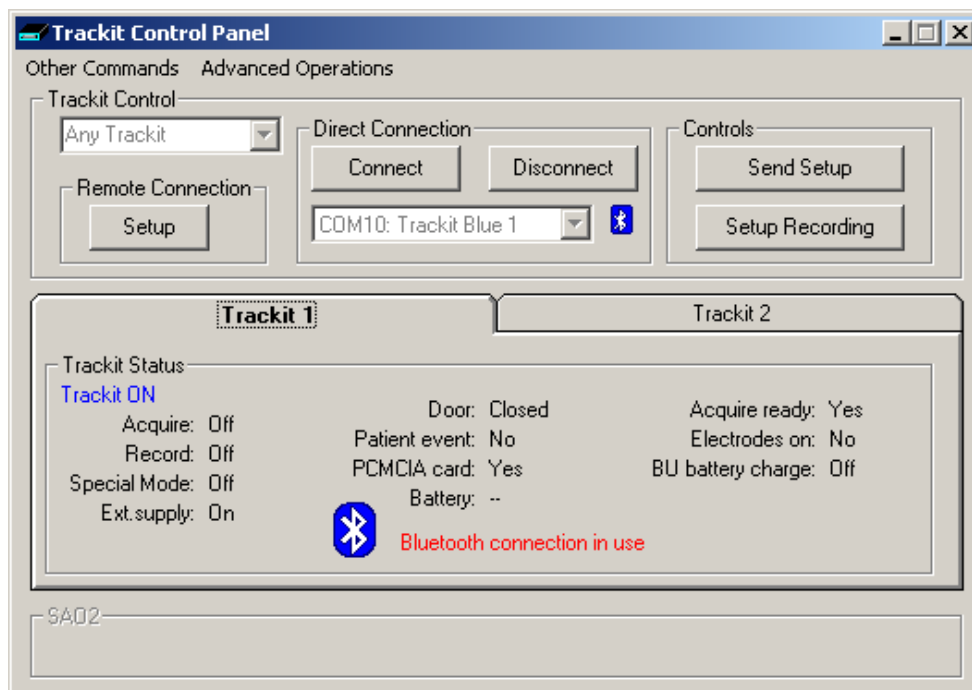


Figure 47 The Trackit Control Panel

The Port number selection drop-down list now supports a short description of the port. This can be a direct hardware port (e.g. Com 1) or any of the virtual serial ports provided by Bluetooth (e.g. Com 10). These Bluetooth ports are setup within the Bluetooth application running on the PC. The connection is first established with the Trackit via a search, a Comm. port number is assigned and various encryption and pairing options defined. The Trackit is always the server and provides the serial port connection service to the PC acting as a client. Thereafter, the particular Trackit can be connected to by reference to its Comm. port number only – opening the port from the Trackit application automatically opens and establishes the Bluetooth link.

Figure 48 below shows a typical My Bluetooth Places view from the application on the PC and shows two available Trackit Bluetooth connections. For additional information about setting up connections, refer to your application documentation.

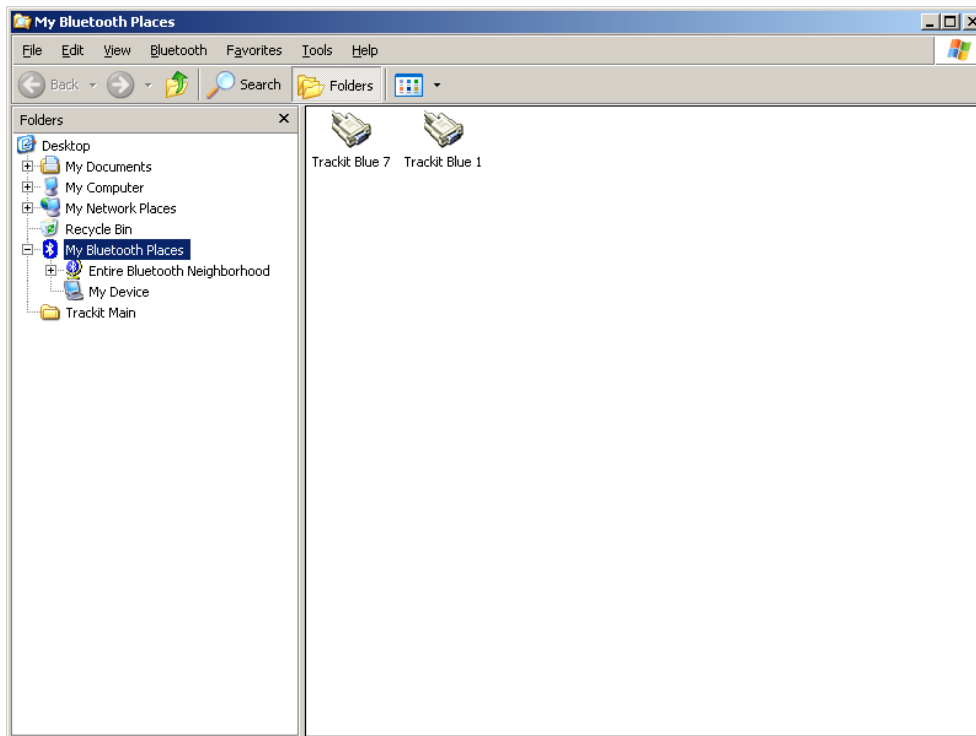


Figure 48 A typical Bluetooth Places view

Once a Bluetooth connection is established, the Bluetooth icon is displayed on the Control Panel and also against the port number. If the particular Trackit is off or out of range or the PC Bluetooth adapter is unplugged, the connection attempt will be unsuccessful. If a connection already exists with the particular Trackit from another PC (the MASTER), then the word "GUEST" appears next to the Bluetooth icon. A GUEST has limited control functionality but can review most aspects of the Trackit and its recording. If the MASTER disconnects, then all GUESTs are also disconnected. One of these GUESTs can then, of course, attempt reconnection as a new MASTER. This functionality is an example of the Bluetooth piconet feature (in serial port terms it is sometimes referred to as multi-drop in the same way that a hardware RS485 link can be multi-drop). In theory, there can be 7 devices in a piconet, although in practice this is very dependent on data volume between the devices. Multi-drop is also sometimes referred to as point-to-multi-point.

This piconet and multi-drop feature of Bluetooth offers very powerful and flexible connection capabilities to the Trackit system. Not only can a single PC connect to any Trackit in range, but another PC (or perhaps PDA) can also connect simultaneously to the same Trackit or any one of the other Trackits. It is also possible to configure a Trackit Bluetooth connection as a network server – in which case a Trackit client can connect to it anywhere on the network (the fact that it is ultimately a Bluetooth connection to the Trackit is transparent to the client).

When the Trackit application has established the Bluetooth connection, a connection quality monitor labelled "Comms.Q" is displayed in the status bar at the bottom of the main screen, as shown in Figure 49.

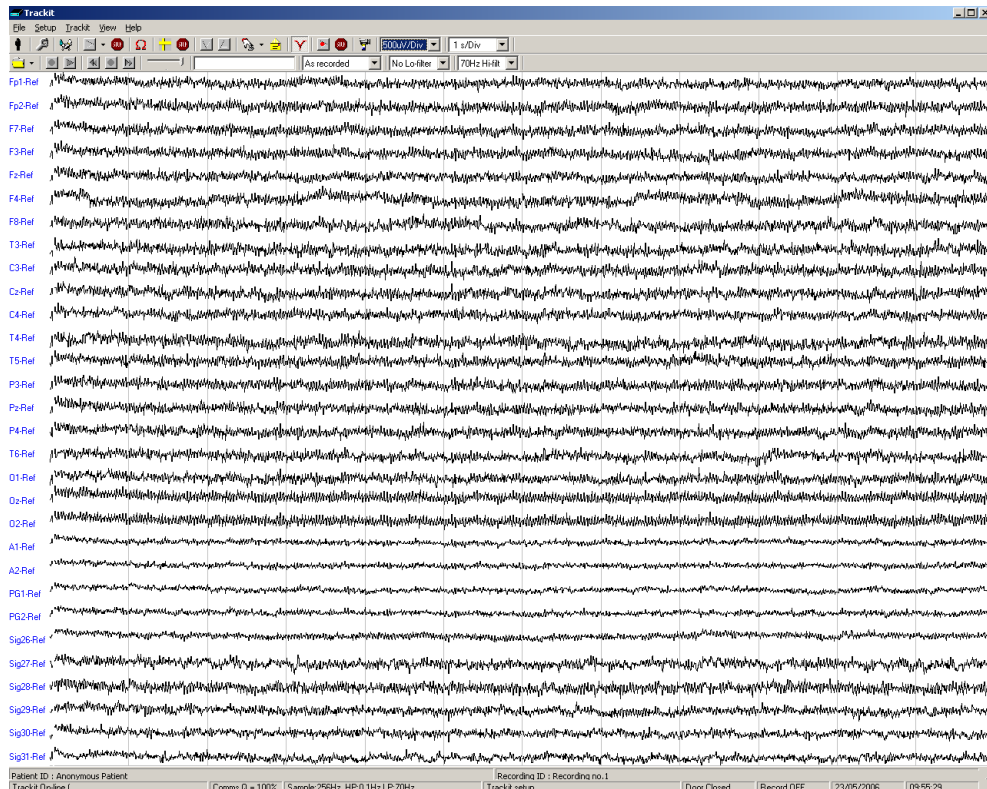


Figure 49 Trackit Main Screen

This number given as a percentage is an approximate indication of the amount of data received as a ratio to that expected, calculated every second. It is most likely to drop below 100% during the transfer of many ongoing traces. It can also drop when either device is at the limit of the transmission range or when either antenna is adversely obscured. It will be noticed that the Bluetooth transmission will use its available bandwidth to try to “catch-up” after a drop in signal quality and the indication can read more than 100% momentarily. A reading, therefore, of less than 100% does not necessarily mean a permanent bad connection since data flow can increase shortly afterwards. A sustained low value over several seconds will cause the Trackit application to close the connection. If the Autoconnect feature has been enabled in Options, the application will automatically attempt to reconnect to the designated Trackit every 10 seconds.

Note: Under certain circumstances the Bluetooth comm port is not identified by the software as a Bluetooth port and the Bluetooth icon will not appear in Figure 47 The Trackit Control Panel, when connected. This can happen depending on which Bluetooth stack is installed and the version of Windows. It is important that the software does identify Bluetooth virtual comm ports correctly since various internal parameters are optimised. See next section for a solution to this problem.

Application PC Setup

There are two aspects to Setting Up – firstly, the Application running on the PC and secondly, the Trackit and its Bluetooth Module. Both parts of the setup are accomplished from the PC. This section covers the Application setup, the next section the Trackit setup.

Options | Tab 1

The Options panel now includes two tabs as shown in Figure 50 below. Tab 1 contains the same option settings as before but with some additions concerning the Comm. Port assignment. By clicking on the Edit button, each Comm. Port can be assigned a description. This description helps in the identification of which Trackit is to be connected to (and thereafter which Trackit is being controlled). It applies to the Trackit Bluetooth Module and if this is moved from one Trackit to another, the connection follows the Module not the Trackit. Each Module has a unique name that can be repeated here if desired, or some other naming convention used. Note that there may well be hardware ports, USB ports and Bluetooth ports – all of which can be used by the Trackit application. All descriptions for all Comm. Ports are saved in the registry, so they only need setting once.

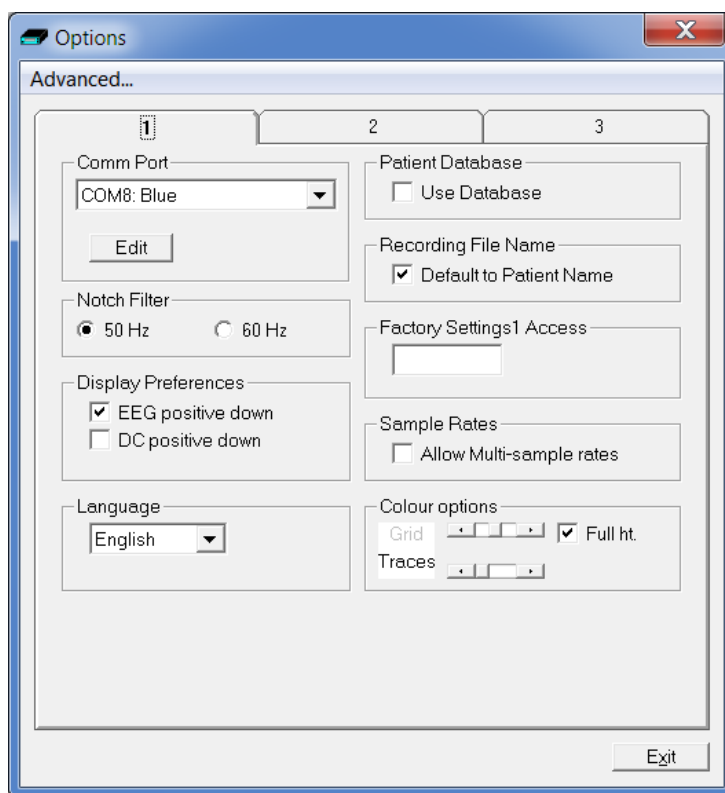


Figure 50 Options Tab 1

Note: When the Bluetooth comm port is not identified correctly by the software as a Bluetooth port (see previous section), the port name can be edited and the word 'Blue' added to the description as shown above.

Options | Tab 2

The second tab in Options is shown in Figure 51 below.

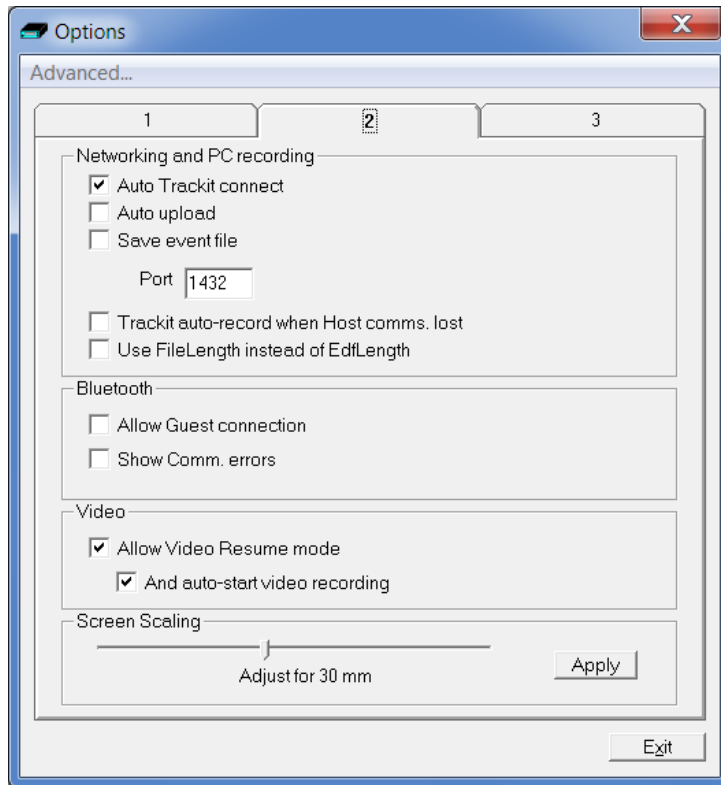


Figure 51 Options Tab 2

Networking and PC recording Options (Trackit plus only)

- **Auto Trackit connect.** If ticked this will cause the application to attempt to reconnect to the designated Trackit after a disconnect. The disconnect can be loss of Bluetooth link or unplugged cable etc. Note that it is not a manual disconnect, which cancels the Autoconnect feature. Autoconnect starts after the first manual connection.
- **Autoupload.** If ticked this will cause the application to automatically upload the Trackit's setup immediately after a connection is established. It is only enabled if Auto Trackit Connect is enabled.
- **Save Event File.** If ticked this will cause the application to automatically upload the Trackit's event file immediately after a connection is established and save it in a temporary file called TempEve1.tev in the default application path. This file can be viewed or emailed out at a later time with or without the Trackit connected. It is only enabled if Auto Trackit Connect and Autoupload are enabled.
- **Port.** This is the port number that the application uses for its TCP networking connection. For the client, this designates the local port to send data from. For the server, this is the local port to listen on.
- **Trackit auto-record when Host comms. lost.** If ticked the Trackit will automatically start recording when the Host communication is lost if it has been in Headbox mode (Host PC recording). This feature is most useful with a wireless Bluetooth connection, but it will work for any type of connection. If there is already a file on the Trackit disk, then the usual rules apply :
 1. The Trackit will not overwrite a file less than 24 hours old
 2. The Trackit will append new data to a file less than 24 hours old if the Patient Name, ID, recording setup and all other details are identical to its current setup
 3. The Trackit will overwrite in all other cases

Note that the Trackit will not automatically stop recording upon reconnection. This must be done manually from the Host if required.

- **Use File Length instead of EDF Length.** This is a playback feature and if ticked, the file length is used instead of the edf length parameter embedded in the edf header. Due to the fact that the Trackit's memory card can be removed at any time, there can be a partial 1s data block at the end of the file and so the actual size may not be an exact multiple of 1s.

Bluetooth Options

- **Allow Guest connection.** If ticked this will allow the application to become a Bluetooth GUEST. Before actual connection the application will listen on the connection to ascertain whether a MASTER is already in control of the designated Trackit. In these situations, the new application becomes a GUEST connection if allowed. Note that this option concerns the application only. There are other options that configure the Trackit and the Bluetooth module as regards GUEST connections (see below).
- **Show Comm. errors.** This allows any Comm. errors to be displayed on the main screen status bar below the Patient ID. This applies to all connections, whether direct, USB or Bluetooth. It can be useful when assessing signal quality.

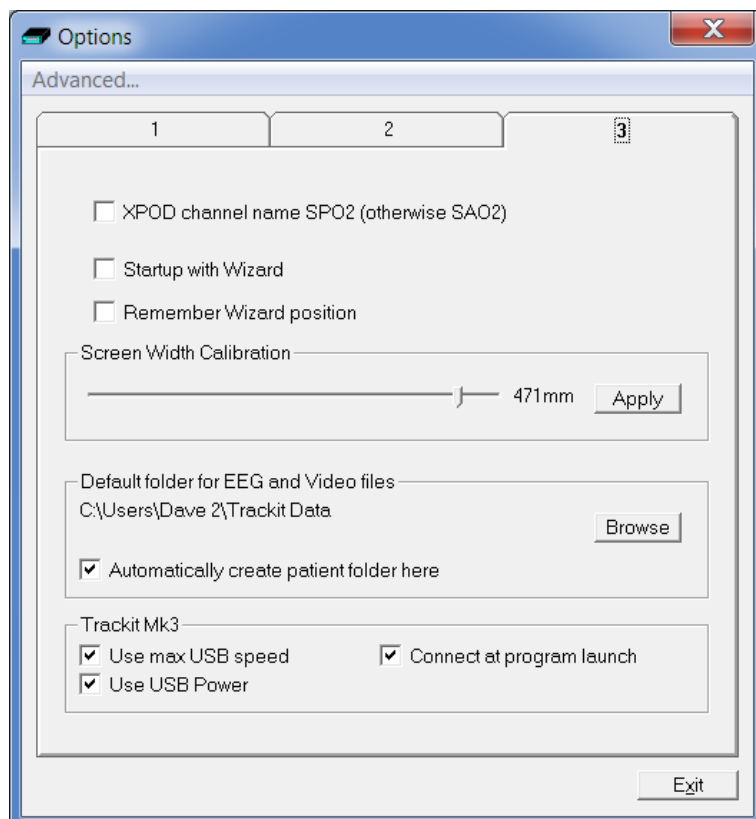
Video

- **Allow Video Resume mode.** This allows Video synchronised recordings to be resumed after the PC has been powered-off.
 - **And auto start video recording.** This allows the video to automatically start recording after a Video Resume has occurred.

Screen Size

This Slider Bar allows the screen size to be set so that the Chart Speed for the traces exactly matches the cm/s selected. To use, adjust the slider so that it is 30 mm from the left-hand end.

Options | Tab 3



- **XPOD channel name SPO2 (otherwise SAO2).** This option allows the XPOD channel name to be either SPO2 or SAO2. This is because some playback software requires a specific label to enable recognition.
- **Startup with Wizard.** If checked, the Trackit program will next start with the Wizard.
- **Remember Wizard position.** If checked, the last Wizard window position will be remembered and recalled. Otherwise it will appear centrally.
- **Screen Width Calibration.** This allows the program to be calibrated to the screen width.
- **Default folder for EEG and Video files.** This allows the program to always record EEG and/or video files to the same default folder. Use Browse to find and/or create the default folder for recordings.
 - **Automatically create patient folder here.** If checked, the program will automatically create a patient folder in the default recording folder set above without any user intervention. If not set, the user chooses where to save the recording using the standard save file dialogue window.

Trackit Mk3

- **Use max USB speed.** Normally this would be checked. Can be used to only allow a slower speed to overcome connection problems.
- **Connect at program launch.** If checked, the program will automatically connect to the Trackit at launch. Only applied to the Trackit Mk3 USB interface.
- **Use USB Power.** Normally checked. Can be used to stop the Trackit using USB power and use its batteries instead.

Trackit and Bluetooth Module Setup

The Trackit and the Bluetooth Module are setup from the Trackit Defaults screens. These have been enhanced to include 4 tabs as shown in Figure 52 below. Tab 1 contains the same options as before.

Trackit Default Options | Tab 1 (General)

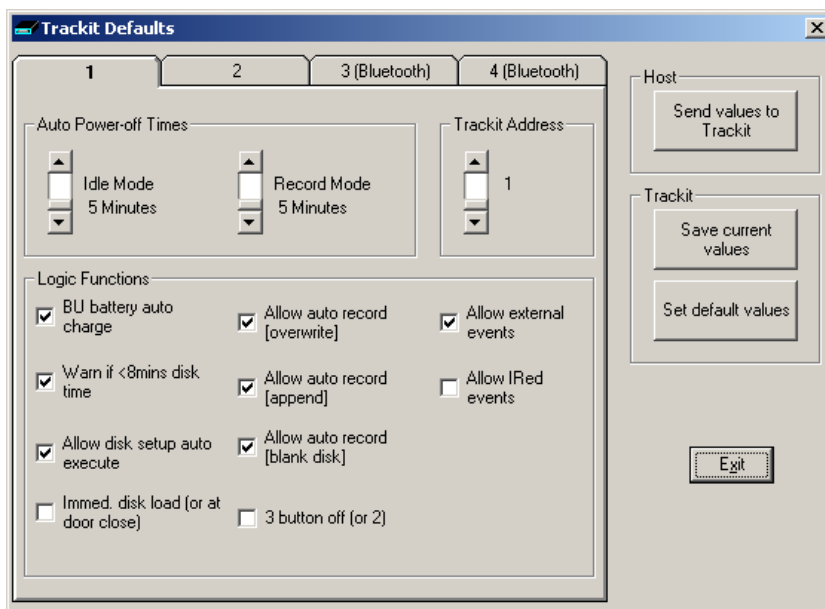


Figure 52 Trackit Defaults Tab1

Trackit Default Options | Tab 2 (General)

These are additional options not specifically related to Bluetooth. Please refer to section 5.6 for details.

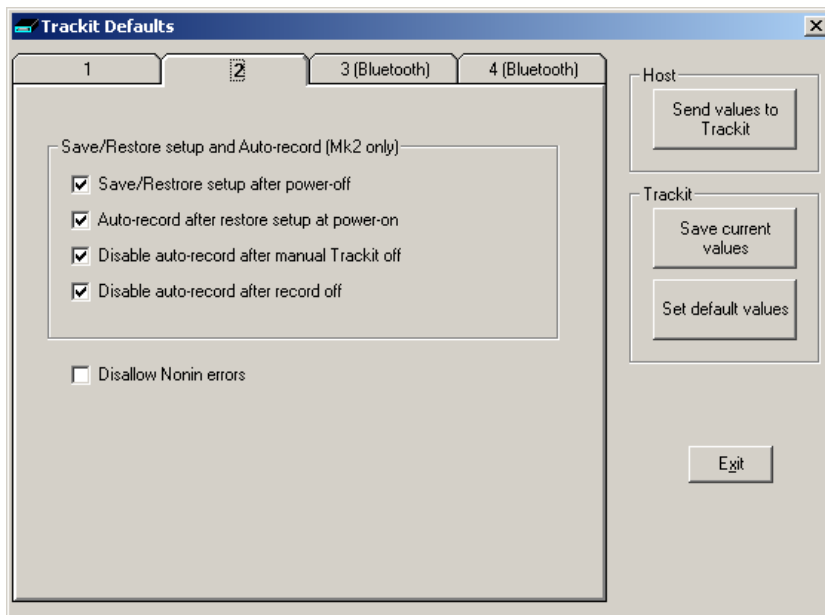


Figure 53 Trackit Defaults Tab2

Trackit Default Options | Tab 3 (Bluetooth Trackit)

Tab 3 contains the first set of Bluetooth options as shown in Figure 54 below.

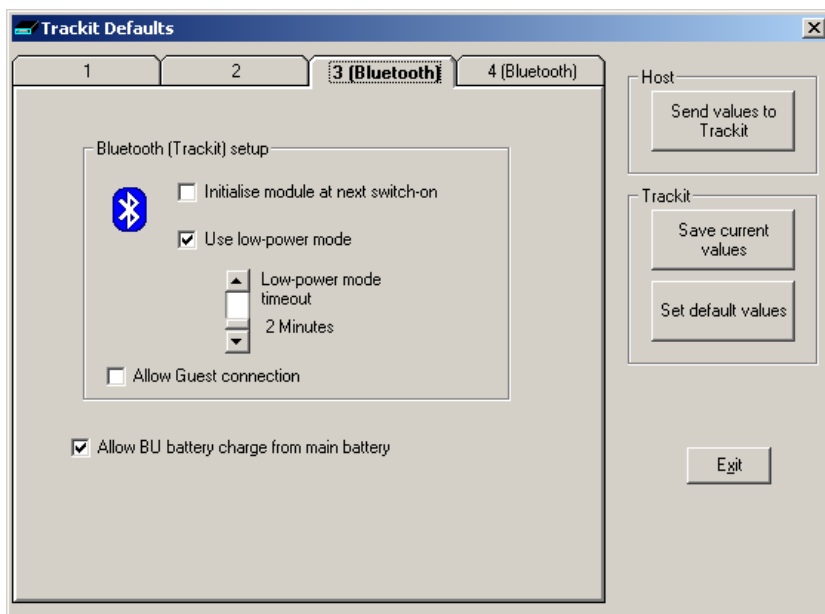


Figure 54 Trackit Defaults Tab 3

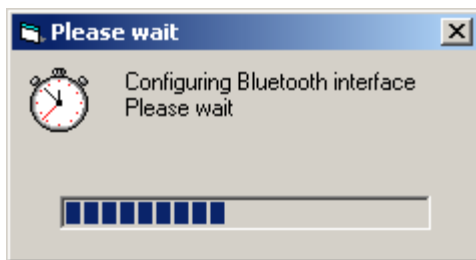
Bluetooth (Trackit) setup

- **Initialise module at next switch on.** If at any time the Bluetooth Module setup becomes corrupted, this option will instruct the Trackit to initialise it with default settings when it is next switched on. The usual method would be to use a direct connection for setting the option (if

the Bluetooth link would not work), switch-off the Trackit, connect the Bluetooth Module to the Trackit and switch-on. The Trackit will remember its initialisation task, will detect the Bluetooth Module and initialise it with default values (sufficient to enable it to work). Note that it can take several seconds for the Trackit to do this – do not change anything until the Trackit is ready. The Trackit will only do this initialisation once – even if powered off and on again, until instructed again to do it. Also note that at switch-on, if the Trackit does not detect the Bluetooth Module, the remembered instruction is cleared.

The situations whereby a Bluetooth Module might become corrupted are very rare, however due to the complexity of Bluetooth and the full access given to all the setup parameters, it is possible that inadvertent or inexperienced operation may cause incorrect settings. It should also be noted that it is possible to allow the setup of the Bluetooth Module to occur over a Bluetooth connection (refer later). This could allow unexpected connections to interfere with the Module setup.

- **Use low-power mode.** Only use this option for the early external first generation Bluetooth Module. If ticked this option instructs the Trackit to put the Bluetooth Module into a low-power state after a period of no connection (the configurable timer is described below). This low power state contributes significantly to extending the Trackit's battery life whilst still offering all the desirable features of Bluetooth. In this state the Module is still discoverable and connectable, but upon connection it must be taken out of the low-power state. The application detects whether the Module is in low-power state and if so instructs the Trackit to set the Module to normal mode. To accomplish this, the Bluetooth connection must be dropped momentarily and then re-connected. The entire process is automatic and takes about 5 seconds. Refer to the Appendix for details of the low-power mode power savings. Note that when using the new Generation Bluetooth Modules (OEMSPA332i and OBS433i) there is no benefit to using low power mode, so the option should be left off. During the connection time, the application displays the following :



- **Low-power mode timeout.** This option allows the setting of how many minutes of no connection must elapse before the low-power mode comes into operation.
- **Allow Guest connection.** If ticked this option instructs the Trackit to accept more than one simultaneous Bluetooth connection. Note that there is a separate enable for the application (described on page 68).

General

- **Allow BU battery charge from main battery.** Now that it is possible to connect to the Trackit wirelessly, it is no longer possible in these situations to charge the Trackit's backup battery from the Isolator, as was previously possible with a direct wired connection. It is important that the backup battery is charged because it provides power to the Trackit's internal clock/calendar chip and also provides power to enable the Trackit to continue recording for a short while during main battery replacement. This option, if ticked, enables the Trackit to use its main battery for charging its backup battery. The Trackit only ever charges its backup battery once at switch-on and only after a 10 minute rest period (in case the Trackit is switched on and off repeatedly in quick succession). Additionally, the Trackit will only use power from its main batteries if they are within 75 – 100% of their capacity, i.e. fresh batteries. Furthermore, the Trackit will only charge its backup battery for a period of 10 minutes. All this means that the backup battery will receive a 5% charge at every Trackit switch-on at the expense of a 0.5% drop in main battery capacity (assuming a single alkaline battery – it will obviously be proportionately less of a reduction for more main batteries). Using this option it is possible to disable

this feature if a regular connection to the Isolator is made. Also note that it is possible to manually initiate a backup battery charge sequence.

Trackit Default Options | Tab 4 (Bluetooth Module)

Tab 4 contains the third set of Bluetooth options as shown in Figure 55 below.

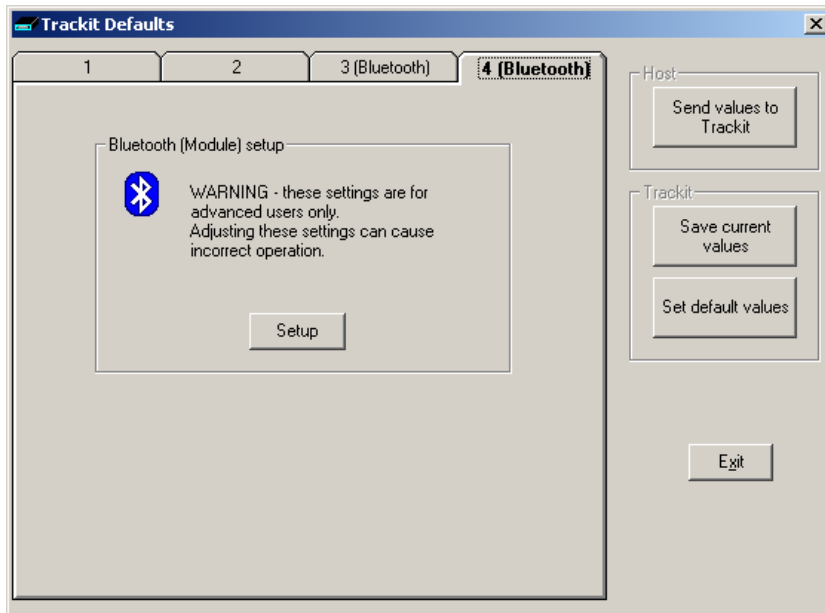


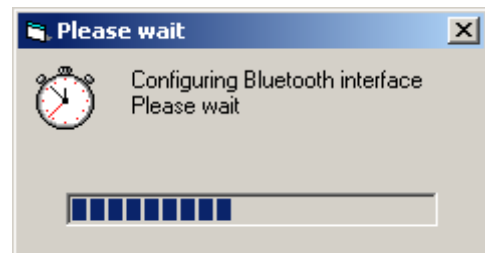
Figure 55 Trackit Defaults Tab 4

CAUTION : Access is provided here to the full set of Bluetooth configuration parameters in the Module. Adjusting these settings can cause incorrect operation. Please contact your Trackit Service Representative before adjusting these settings.

The setup of the Bluetooth Module itself is accomplished over the Bluetooth link currently established. This means that no extra hardware is required to connect in some other way to the Module – it remains connected to the Trackit.

Clicking on the Setup button instructs the Trackit to enter a special mode to enable the setup-over-Bluetooth function. During this time the connection must be dropped momentarily and then re-connected. The entire process is automatic and takes about 5 seconds.

After the configuration process has finished, access is provided to the main Bluetooth Setup panels shown below.



Bluetooth Setup | Tab 1 (General)

The Bluetooth Setup screen is shown in Figure 56 below. It should be noted that even though the Trackit has put the Bluetooth Module into the special Setup-over-Bluetooth mode, no changes are allowed until a special command sequence has been sent to the module. This procedure guards against casual browsers being able to adjust settings (there is much more information about security later on). Clicking on the **Connect** button sends the special command and also reads from the Bluetooth Module all its current settings which are displayed in the various tab panels. Clicking on the **Read** button causes a re-read of all the Module's parameters.

Clicking on the **Write** button causes all values currently being displayed to be written across to the Module which stores them in its non-volatile memory.

Clicking on the **Set defaults** button loads default values into all displayed settings (these are not sent to the Module until a **Write** occurs).

Clicking on the **Disconnect** button finishes the setup session and issues commands to disable changes to the Module setup and also to take it out of Setup-over-Bluetooth mode. The Module is now ready for use with the new settings.

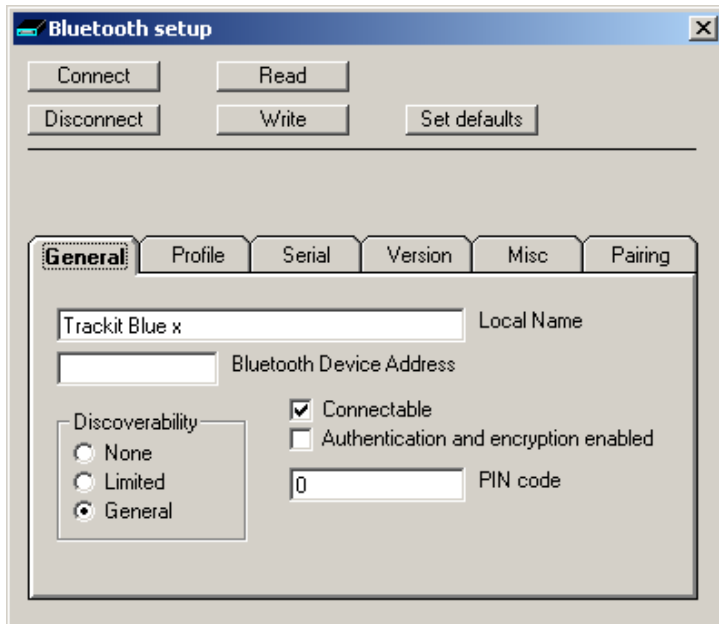


Figure 56 Trackit Defaults | Bluetooth Setup Tab 1 (General)

- **Local Name.** This allows the Module to be given a 'friendly name' (in a similar way to a networked computer). This name is the one reported by other computers during a search or connection. If there are several Trackit Bluetooth devices on-site, it is important that each has a unique name. As supplied, every Module will be uniquely named and this will be in the form of 'Trackit Blue x' where x is numeric. Do not change the name unless there is a good reason to do so.
- **Bluetooth Device Address.** Every Bluetooth device is assigned a unique address (in a similar way to the IP address of a network adapter). The address is read-only and cannot be changed. The Module can be referred to from a remote device by either its local name or in some situations by its Bluetooth Device Address.

Discoverability

- **None.** If selected the Module cannot be discovered by other devices during a search – it becomes invisible.
- **Limited.** If selected the module becomes only partially discoverable.
- **General.** If selected the Module can be discovered by other devices.
- **Connectable.** If ticked the Module can be connected to by another device. Otherwise a connection is not allowed. The application forces Connectable.
- **Authentication and encryption enabled.** If ticked the remote device must know the Module's PIN code passkey to be able to connect. The Module undergoes a 'pairing' procedure with the remote device. Additionally in this mode, all data transfers are encrypted using the same PIN code as a passkey.
- **PIN code.** This is the code that must be known to the remote connecting device to enable a connection to be made. The code is entered once only during the 'pairing' procedure on the host (client). It can be set here in the module to any numeric sequence. It is only used if **Authentication and encryption** is enabled in the Module or the remote device requires authentication.

Bluetooth Setup | Tab 2 (Profile)

Tab 2 contains the second set of Bluetooth options as shown in Figure 57 below.

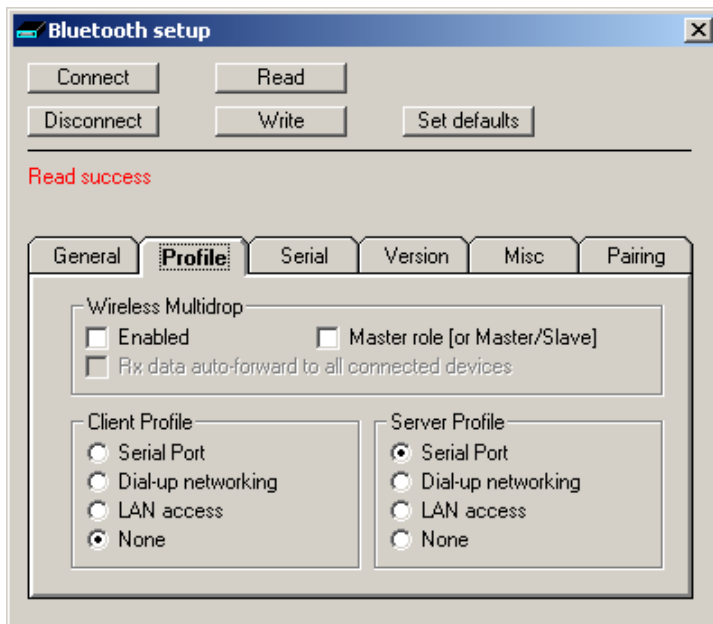


Figure 57 Trackit Defaults | Bluetooth Setup Tab 2 (Profile)

Wireless Multidrop

This section covers the multiple-connection capabilities of the Module. It is possible for several Bluetooth devices within range of each other to set up a 'piconet' amongst themselves, whereby each device can have connections to several other devices simultaneously. In this mode several remote devices can connect simultaneously to the same Trackit. All data transmitted by the Trackit is transmitted to all connected clients (the individual applications filter out the specific data of interest). For received data, the Trackit receives all data transmitted by all clients (the Trackit maintains a separate data flow path for each client).

In Trackit terms, the first connection is the MASTER and it has full control capabilities. Subsequent connections become GUESTs and they have limited control capabilities. It is possible to individually enable each client application as to whether it can become a Guest connection or not.

It should be noted that not all remote Bluetooth devices handle multidrop/piconet connections very well and some will experience dropped connections and loss of data. Refer to the Knowledge Base for additional information.

It should be noted that within the Bluetooth specification there is provision for such piconets to themselves connect to other piconets – the combination being called a 'scatternet'. In such a situation, each piconet must designate a Master device with all the others in the piconet being Slaves. It is the Masters in each piconet which maintain the scatternet. Such a complex topology is beyond the scope of this document but the brief description is given for completeness. It is the reason for providing the **Master role [or Master/Slave]** option in the panel.

- **Enabled.** If ticked several remote devices can connect simultaneously to the same Trackit. Otherwise multiple connections are disabled. Note that if ticked then the **Master role [or Master/Slave]** should also be ticked. If unticked then the **Master role [or Master/Slave]** should also be unticked.
- **Master role [or Master/Slave].** In some of the more complex topological arrangements it is sometimes necessary for a device to switch from being a Master to a Slave and vice-versa. In the Trackit situation this parameter should have the same setting as that for the **Enabled** parameter. If **Enabled** is ticked then **Master role [or Master/Slave]** should also be ticked. If **Enabled** is unticked then **Master role [or Master/Slave]** should also be unticked.

Client Profile

- Serial Port
- Dial-up networking
- LAN access
- None

This lists all the possible services offered by the Module when operating as a client. In the Trackit situation, the Module is always the server (it accepts incoming connections) and never a client. This option should only be set to **None**.

Server Profile

- Serial Port
- Dial-up networking
- LAN access
- None

This lists all the possible services offered by the Module when operating as a Server. In the Trackit situation, the Module provides a Serial Port Protocol service (SPP) and this is the only option that should be selected.

Bluetooth Setup | Tab 3 (Serial)

Tab 3 contains the third set of Bluetooth options as shown in Figure 58 below.

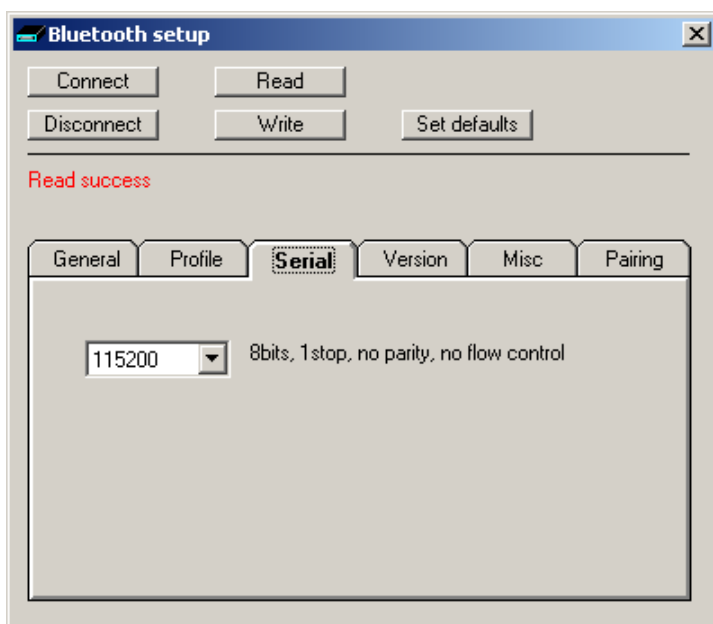


Figure 58 Trackit Defaults | Bluetooth Setup Tab 3 (Serial)

This option displays the current Baud rate of the Module. The application defaults it to 115200 Baud which is suitable for Trackit Mk1 applications. For Trackit Mk2 applications, the connection speed is 230400 Baud. Note, however, that when configuring over a Bluetooth connection, it is not necessary to change this parameter from the default.

Bluetooth Setup | Tab 4 (Version)

Tab 4 contains the fourth set of Bluetooth options as shown in Figure 59 below.

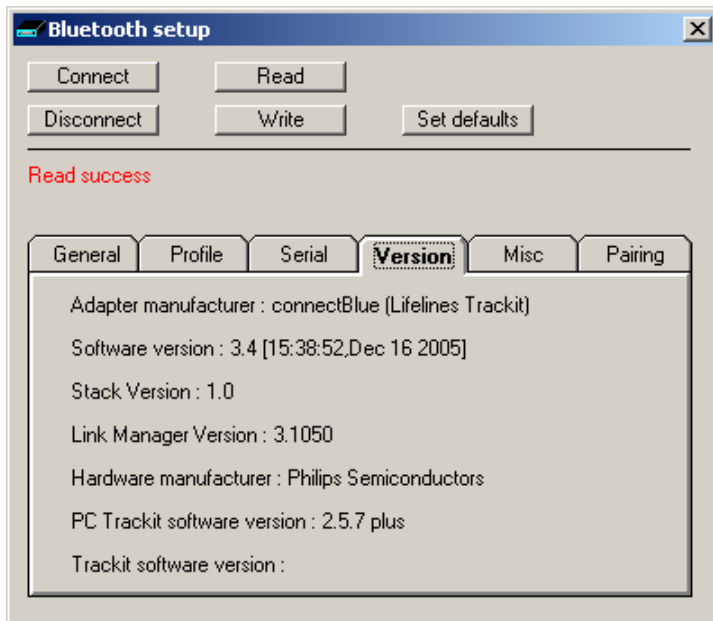


Figure 59 Trackit Defaults | Bluetooth Setup Tab 4 (Version)

Here is listed all the versions of the various hardware and software components in the system.

Bluetooth Setup | Tab 5 (Misc)

Tab 5 contains the fifth set of Bluetooth options as shown in Figure 60 below.

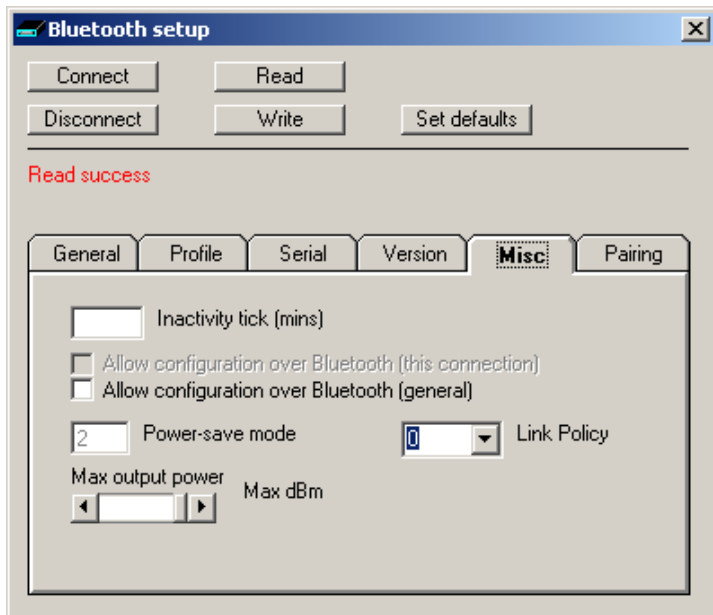


Figure 60 Trackit Defaults | Bluetooth Setup Tab 5 (Misc)

- **Inactivity tick.** This option allows the Module to disconnect after a defined period of no data activity. The Trackit application always transmits heartbeat (keep-alive) packets during connection, so this option really only applies to connections from other types of remote device. To enable the option the desired timeout period in minutes should be entered. To disable the option a zero should be entered. In normal situations the option should be disabled.

- **Allow configuration over Bluetooth (this connection).** This is a read only parameter and simply indicates the fact that the current connection is allowing configuration over Bluetooth.
- **Allow configuration over Bluetooth (general).** In contrast to the above, this option allows the Module to be permanently enabled for configuration over Bluetooth (after this session is closed). This is normally only used for advanced and debugging purposes and the option should be unticked.
- **Power-save mode.** This option defines the power-save mode for the Module. Currently this is fixed at an optimum setting.
- **Max. output power.** This option defines the maximum Radio Frequency (RF) output power from the Module. Currently this is fixed at an optimum setting.
- **Link Policy.** This is an advanced option and should not be changed.

Bluetooth Setup | Tab 6 (Pairing)

Tab 6 contains the fifth set of Bluetooth options as shown in Figure 61 below.

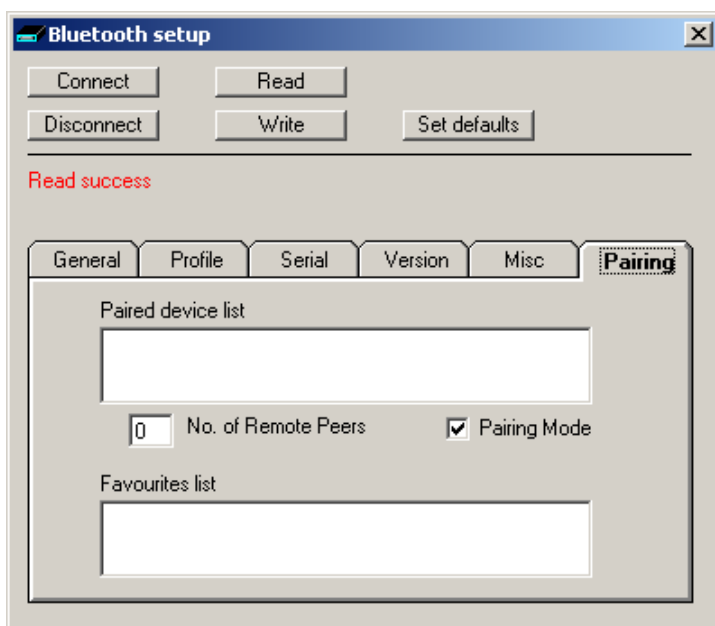


Figure 61 Trackit Defaults | Bluetooth Setup Tab 6 (Pairing)

- **Paired device list.** This lists the current Paired device addresses stored in the module.
- **No. of Remote Peers.** This is fixed at 0.
- **Pairing Mode.** Sets Pairing Mode on or off. The default is on.
- **Favourites list.** This lists the current Favourites device addresses stored in the module.

Trackit Bluetooth Module Specifications

Note: Lifelines reserves the right to change product specifications at any time without notice. This is in-line with the company's policy of continual product development.

There are several versions of the Bluetooth Module: Type 1 is designed to be connected to the Trackit Mk1 or Mk1+ and Type 2 the Trackit Mk2. These have a 9-pin and 15-pin micro-D connector fitted respectively. Additionally, there are two versions of the internal Bluetooth circuitry: Original (OEMSPA33i) and 3rd Generation (OEMSPA332i) and the latest 4th Generation (OBS433i). The 3rd and 4th generations are significantly smaller and lower power consumption than the Original. The 3rd Generation was introduced in May 2006, the 4th in January 2012. These versions are identified as follows:

1. Original Type 1 for Trackit Mk1. Part number marked on cable 6738-000. Lifelines part 1048.
2. Original Type 2 for Trackit Mk2. Part number marked on cable 6738-100. Lifelines part 1121.
3. 3rd Generation Type 1 for Trackit Mk1. Part number marked on cable 6738-200. Lifelines part 1048.
4. 3rd Generation Type 2 for Trackit Mk2. Part number marked on cable 6738-300. Lifelines part 1121.
5. 3rd Generation Internal for Trackit Mk2 and Mk3 only.
6. 4th Generation Internal for Trackit Mk3 only.

Note that the 4th Generation module has a much improved range, refer below.

Parameter Data

Original (OEMSPA33i)

Bluetooth Module manufacturer : connectBlue AB, Sweden
 Bluetooth radio : Infineon/Ericsson PBD 313 02 (MIRIAN)
 Bluetooth base band controller : Infineon/Ericsson PBM 990 90 (BLINK)
 RF output power : Class 1, min -28dBm, max +16dBm
 Note : 0 dBm = 1 mW, 20 dBm = 100 mW
 Receive sensitive level : -80dBm (0.1% BER)
 Receive input level (max) : Max +15 dBm
 Output frequency : 2.402 -2.480 GHz, ISM band.
 Point to multi-point operation : Yes
 Bluetooth stack : Embedded host stack
 Bluetooth qualification : 1.1

3rd Generation (OEMSPA332i)

Bluetooth Module manufacturer : connectBlue AB, Sweden
 Bluetooth radio : Philips BGB203
 Bluetooth base band controller : Philips BGB203
 RF output power : Class 1, min -28dBm, max +16.9dBm (49mW)
 Note : 0 dBm = 1 mW, 20 dBm = 100 mW
 Receive sensitive level : -89dBm (0.1% BER)
 Receive input level (max) : Max +16dBm
 Output frequency : 2.402 -2.480 GHz, ISM band.
 Point to multi-point operation : Yes
 Bluetooth stack : Embedded host stack
 Bluetooth qualification : 2.0

4th Generation (OBS433i)

Bluetooth Module manufacturer : connectBlue AB, Sweden
 Bluetooth radio : ST-Ericsson STLC2500DB
 Bluetooth base band controller : ST Microelectronics STM32F10x

RF output power : Class 1, min -28dBm, max +17dBm (50mW)

Note : 0 dBm = 1 mW, 20 dBm = 100 mW

Receive sensitive level : -94dBm EIRP (0.1% BER)

Receive input level (max) : Max +5dBm

Output frequency : 2.402 –2.480 GHz, ISM band.

Point to multi-point operation : Yes

Bluetooth stack : Embedded host stack

Bluetooth qualification : 2.1 + EDR

Regulatory

Original (OEMSPA33i)

R&TTE Directive 1999/5/EC

EN 300 328-2 V1.1.1 (2000-07)

EMC Directive: 89/336/EEC

EN 301 489-1 V1.3.1 (2001-09)

EN 301 489-17 V1.1.1 (2000-09)

EN 61000-6-2 (1999)

Low Voltage Directive: 73/23/EEC

EN 61131-2

Medical Electrical Equipment

IEC 60601-1-2

3rd Generation (OEMSPA332i)

R&TTE Directive 1999/5/EC

EN 300 328 V1.6.1 (2004-11)

EMC Directive: 89/336/EEC

EN 301 489-1 V1.4.1 (2002-08)

EN 301 489-17 V1.2.1 (2002-08)

EN 61000-6-2 (2001)

Safety Compliance

EN 60950-1:2001 and/or IEC 60950-1:2001 (1st Edition)

EN 60950-1/A11:2004 + Corrigendum:2004

Medical Electrical Equipment

IEC 60601-1-2 (2001)

4th Generation (OBS433i)

R&TTE Directive 1999/5/EC

EN 300 328 V1.7.1 (2006-05)

EMC Directive: 89/336/EEC

EN 301 489-1 V1.8.1 (2008-04)

EN 301 489-17 V1.3.2 (2008-04)

EN 61000-6-2 (2005)

Safety Compliance

EN 50371:2002

EN 60950-1:2006 and/or IEC 60950-1:2005 (2nd Edition)

Medical Electrical Equipment

IEC 60601-1-2 (2007)

If the module is used within EU a notification must be made to each of the national authorities responsible for radio spectrum management of the intention to place radio equipment that uses frequency bands whose use is not harmonized throughout the EU, on its national market.

More information at: <http://europa.eu.int/comm/enterprise/rte/gener.htm>

FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

IC Compliance

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This device has been designed to operate with an antenna having a maximum gain of 8dBi dBi. Having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website www.hc-sc.gc.ca/rpb

Labelling Requirements for End Product

For an end product using the OEM Serial Port Adapter or the OEM Bluetooth Enabler there must be a label containing, at least, the following information:

Original (OEMSPA33i)

This device contains
FCC ID: PVH070201

3rd Generation (OEMSPA332i)

This device contains
FCC ID: PVH090202L
IC: 5325A-090202L

4th Generation (OBS433i)

This device contains
FCC ID: PVH0939
IC: 5325A-0939

The label must be affixed on an exterior surface of the end product such that it will be visible upon inspection in compliance with the modular approval guidelines developed by the FCC.

RF-exposure Statement

This portable modular transmitter MUST have a separation distance of at least 2.5cm between the antenna and the body of the user or nearby persons, excluding hands, wrists, feet, and ankles.

Bluetooth Qualification

Original (OEMSPA33i)

The Serial Port Adapter has been qualified according to Bluetooth 1.1 specification, QPLN reference GRA 001 03, qualification date 2003-01-31.

The following Bluetooth profiles are supported (covered functionality):

- Generic Access Profile
- Serial Port Profile
- Dial-up Networking Profile
- LAN Access Profile

3rd Generation (OEMSPA332i)

The Serial Port Adapter has been qualified according to Bluetooth 2.0 specification, QPLN reference B02993, qualification date 2006-03-17.

The following Bluetooth profiles are supported (covered functionality):

- Generic Access Profile
- Serial Port Profile
- Dial-up Networking Profile

4th Generation (OBS433i)

The Serial Port Adapter has been qualified according to Bluetooth 2.1+EDR specification, QDID reference B016927 combined with B015102.

The following Bluetooth profiles are supported (covered functionality):

- Generic Access Profile
- Serial Port Profile
- Dial-up Networking Profile
- Personal Area Networking Profile

Guidelines for Efficient and Safe Use

Read this information before using your Serial Port Adapter.

For any exceptions, due to national requirements or limitations, when using your Serial Port Adapter, please visit www.bluetooth.com.

Product Care

- Do not expose your product to liquid or moisture.
- Do not expose your product to extreme hot or cold temperature
- Do not expose your product to lit candles, cigarettes, cigars, open flames, etc.
- Do not drop, throw or try to bend your product since rough treatment could damage your product.
- Do not attempt to disassemble your product. Doing so will void warranty. The product does not contain consumer serviceable or replaceable components.
- Do not paint your product as the paint could prevent normal use.
- If you will not be using your product for a while, store it in a place that is dry, free from damp, dust and extreme heat and cold.

Radio Frequency Exposure

The Serial Port Adapter contains a small radio transmitter and receiver. During communication with other Bluetooth products the Serial Port Adapter receives and transmits radio frequency (RF) electromagnetic fields (microwaves) in the frequency range 2400 to 2500 MHz. The output power of the radio transmitter is very low.

When using the Serial Port Adapter, you will be exposed to some of the transmitted RF energy. This exposure is well below the prescribed limits in all national and international RF safety standards and regulations.

Electronic Equipment

Most modern electronic equipment, for example, in hospitals and cars, is shielded from RF energy. However, certain electronic equipment is not. Therefore:

Note: This equipment emits RF energy in the ISM (Industrial, Scientific, Medical) band. Please ensure that all medical devices used in proximity to this device meet appropriate susceptibility specifications for this type of RF energy.

Potentially Explosive Atmospheres

Turn off your electronic device when in any area with potentially explosive atmosphere. It is rare, but your electronic device could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fuelling areas, such as petrol station, below deck on boats, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles, such as grain, dust, or metal powders.

Trackit Bluetooth Battery Power Consumption

The Trackit Bluetooth Module takes its power from the Trackit's main batteries. All the circuitry has been designed to consume as little power as possible and to utilise low-power modes whenever possible, however certain parts of the module are always on in order that searches and connection requests from other devices are serviced. In the tables below will be found an approximate indication of the reduction in battery life according to the Trackit main operating modes.

The Trackit modes are as follows :

1. Trackit Idle (not recording)
2. Trackit Acquire On (not recording) in Headbox mode
3. Trackit Recording
4. Trackit recording with Ongoing on

The Bluetooth modes are as follows :

1. No Bluetooth
2. Bluetooth power-down (discoverable and connectable) – only applicable to original module
3. Bluetooth normal not connected (discoverable and connectable)
4. Bluetooth normal connected
5. Bluetooth normal connected and transmitting

4th Generation Bluetooth Module (OBS433i) Internal (Trackit Mk3)

Trackit operating mode	Battery life reduced to %	Typical battery life (1 alkaline) Hours
	Trackit Mk3	Trackit Mk3
Trackit idle (not recording), no Bluetooth	100	20.2
Trackit idle (not recording), Bluetooth not-connected	90	18.1
Trackit idle (not recording), Bluetooth connected	54	11.0
Trackit acquire (not recording), Bluetooth connected, Headbox on	63	7.2 [#]
Trackit (recording), no Bluetooth	100	12.0 [#]
Trackit (recording), Bluetooth not-connected	95	11.4 [#]
Trackit (recording), Bluetooth connected	72	8.6 [#]
Trackit (recording), Bluetooth connected, ongoing on	60	7.2 [#]

Notes:

1. Acquisition: 24 channels at 200 Hz using a Trackit T18/8 variant (fitted with 8 Poly Channels).
[#] Add approximately 10% to battery life if internal 8 Poly Channels not fitted (T24/0 and T12/0)
2. Connected/not-connected refers to wireless Bluetooth connection present or not present
3. When using the New Generation 3 and 4 Bluetooth Modules (OEMSPA332i and OBS433i) there is no benefit to using low power mode, so the option should be left off.

Bluetooth Range

The latest 4th Generation Bluetooth Module has a significantly longer range than all the earlier modules. The biggest benefit is achieved when a similarly high-performance Bluetooth device is used at the PC end of the wireless link. The typical range figures here were obtained with the following types of Bluetooth device installed in the PC:

1. Internal Class 3 fitted to laptop
2. External Class 1 USB-type fitted to laptop (this is the type with an external rotateable antenna approximately 60mm long)

3. External Class 1 USB-type (long range) fitted either with a stub antenna, manufactured by Sena (Parani UD100 USB/Bluetooth device)
4. As above (long range) but fitted with long range 180mm dipole antenna, manufactured by Sena (DAT5-G01R)

The best results are obtained when the PC-end antenna is orientated at 45 degrees to the horizontal.

Range (typical) direct line-of-sight, no obstacles

Trackit and Module type	PC Bluetooth device type			
	<u>1</u> Class 3 Internal laptop	<u>2</u> Class 1 external with 60mm an- tenna	<u>3</u> Class 1 long-range with stub antenna	<u>4</u> Class 1 long-range with 180mm an- tenna
Trackit Mk2 + 3 rd Generation Bluetooth module	10m	44m	60m	110m
Trackit Mk3 + 4 th Generation module	12m	85m	90m	190m

Bluetooth Knowledge Base

1. The list of adapter hardware used by Lifelines so far is as follows :
 - Belkin Bluetooth USB adapter F8T001
 - Ezurio/TDK Bluetooth USB adapter "go blue"
 - Newlink Bluetooth USB adapter USBBTC1A-N-CDL
 - Anycom Bluetooth Compact Flash Card CF-2001
 - Bluemonkey Bluetooth Compact Flash Card BlueCF
 - Linksys USBBT100
2. It has been found that some 3rd party Bluetooth adapters will drop a connection for no apparent reason. This effect can be tested by connecting to the Trackit and switching ongoings on. This produces a lot of predominantly one-way traffic. The connection should never be dropped. This effect has been found using the Belkin F8T001 Bluetooth USB Adapter. The problem has been fixed by installing a later version of the WidcommSdk.dll in the system32 folder. Version 1.4.1.6 or later seems to fix the problem.
3. It has been found that some 3rd party Bluetooth adapters will drop a connection when the Trackit Bluetooth is set up for multi-drop support, even when there is only one connection. This effect has been found using the Belkin F8T001. The solution is to either disable multi-drop on the Trackit Bluetooth Module or to make the Belkin device Undiscoverable AND Unconnectable. This effect has not been found on other devices so far – the TDK and Newlink adapters are ok.
4. It has been found that some 3rd party Bluetooth adapters will not support several simultaneous connections. This has been found on the Belkin F8T001 which only seems to support a single connection. The TDK adapter does allow several simultaneous connections. In any event, you should expect data transfers to slow when using several simultaneous connections.
5. Sometimes it may appear that your Bluetooth connections in **My Bluetooth Places** or **Entire Bluetooth Neighbourhood** seem to be forgotten when the Bluetooth adapter is unplugged or after a power-off. Also, you may find that you cannot allocate a Comm Port to your connection (each Trackit Blue x connection needs its own Comm Port). The reason for this is that you have set up a temporary connection in **Entire Bluetooth Neighbourhood** rather than a shortcut reference in **My Bluetooth Places**. Here, connection definitions are permanent and you can allocate Comm Ports at will. When setting up a Trackit connection for the first time, you should use the proper Wizard or other method as provided by the adapter manufacturer. If you find that you can allocate a Comm Port to a connection, but there are not enough virtual Comm Ports to select from in the list, check in Device Manager that there are enough ports called "Bluetooth Communications Port (COM x)" for your use. If not, either use your adapter application to add some more or use the Windows Add/Remove Hardware Wizard to add "Ports (COM & LPT)" followed by WIDCOMM.
6. There can be problems installing Bluetooth adapters in **Windows XP SP2** computers. Refer to the article in the following link for more information: <http://support.microsoft.com/?kbid=840635> . Basically, rename the %WINDIR%\inf\Bth.inf file to Bth.bak before installing the Bluetooth adapter.

Appendix 6: Trackit quick setup and operation guide

Caution: Do not remove Trackit's CF card while the access LED is on.

- 1 For the Mk3 Trackit, connect the special USB cable to the Trackit and to the PC USB port.
- 2 Open the back of the Trackit unit with the special tool provided. Make sure a battery and flash card are inserted.
- 5 Start the Trackit setup software on the PC. Switch on the Trackit recorder.
- 6 Activate the Trackit Control Panel dialog box via the handshake symbol on the Trackit toolbar. Click on the Connect button. The Trackit Status shows that the Trackit is online.
- 7 Go to the View Menu and select Other Options. If you want the name of the recorded file to default to the patient's name, put a checkmark by Recording File Name. Decide also whether to use a patient database or a simple file name and recording ID for entering patient info.
- 8 Choose Patient Details from the File Menu or the leftmost button on the toolbar (Patient icon). Enter the patient's name, ID and recording ID. Click the Edit button if in the database or simply enter the information if this option is not used. The patient's name and ID will then be seen on the Status Bar.
- 9 Choose Recording from the Setup Menu, or click on the spanner icon on the toolbar, to create or select the recording montage. Under the Recording Channels tab, select the size of the card in use to see the available recording time with the montage selected. Once selected, the montage appears on the left of the trace window.
- 10 In the Trackit control panel dialog select the Set Recording button and click on Send Setup. This downloads the recording setup to the Trackit recorder in preparation for a recording.
- 11 View the EEG prior to recording by selecting the Ongoing On icon from the Trackit toolbar. You can only view as many traces as can be transferred across the serial link at any one time – 12 or 16 channels depending on the sampling rate used for the Mk1 and up to 40 for the Mk2. To look at the traces that are not displayed, click the up and down arrow keys on the right hand side of the toolbar.
- 12 Perform an impedance check. If this is done after a recording has started, an impedance check event will be recorded. After viewing the impedance values, cancel the impedance check.
- 13 Go back to the Set Recording dialog that should still be open (activated from the Trackit Control Panel), and click on the Start button. The Trackit is now recording data to card.
- 14 Disconnect the RJ45 cable to the Trackit. Put the recorder in the pouch with shoulder strap provided.

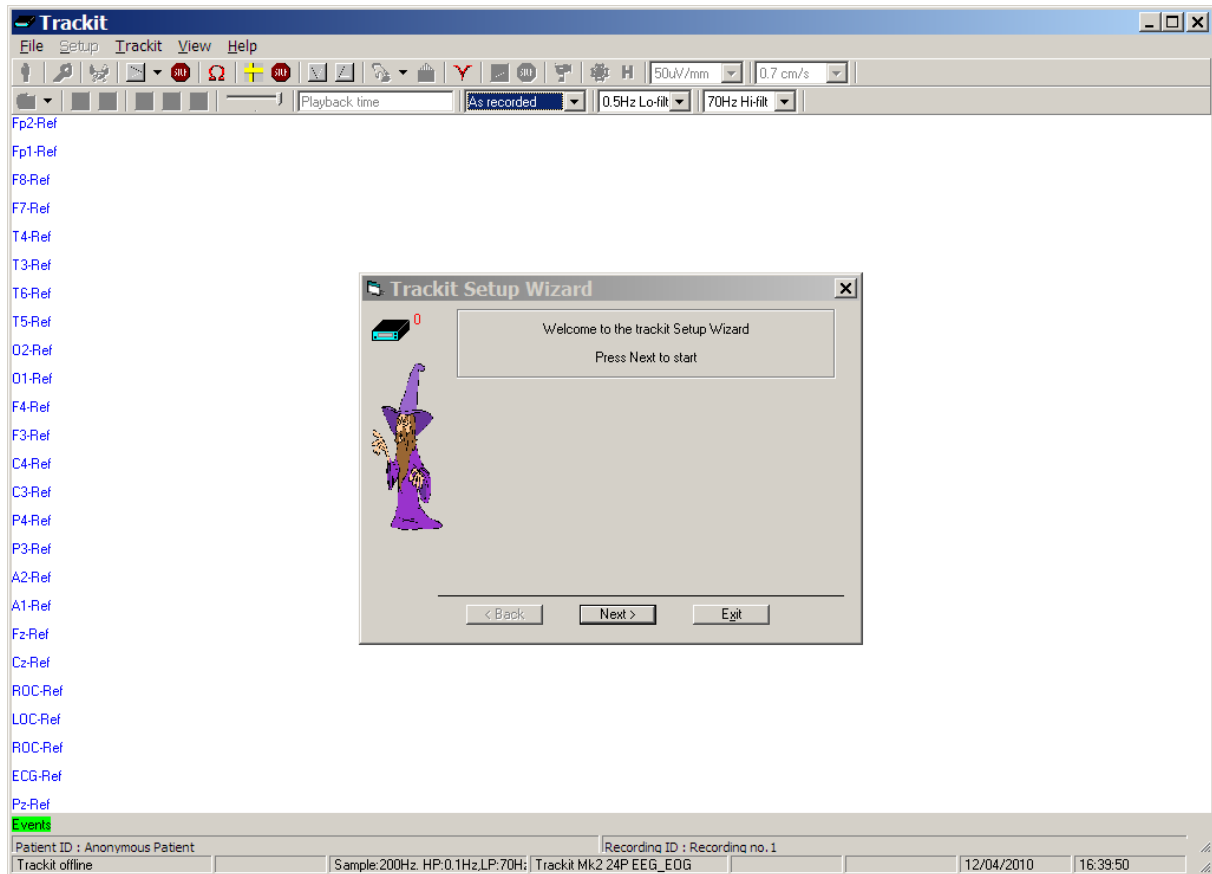
At the end of the ambulatory recording

- 15 Connect the Trackit once again to the RJ45 cable, and for Mk2 Trackit make sure that the RJ45/D9 Converter is powered and connected to the PC.
- 16 Restart the Trackit software. Open the Trackit Control Panel as previously described. Select the Set Recording button again.
- 17 Click on the Record Off button. The recording now stops.
- 18 Detach the Trackit. Open the rear door with the tool provided. Remove the flash card.
- 19 Insert the flash card into the PC card reader attached to the PC. Commence review using an EEG browser.

Note: there are two files on the card; an EDF data file and an event file with the extension *.tev. If the EEG browser does not support the reading of Trackit events, install Eventit.exe from the Trackit software CD. This program allows the event log to be reviewed separately from the EEG review application.

Appendix 7: Trackit Setup Wizard

There is a Setup Wizard which some users may prefer as a simplified setup method. It is enabled via the Help menu and appears the next time (and every time, until disabled) the Trackit program is invoked.



The Wizard can be dismissed at any time by using the top right close button: setup and control can then continue using the normal Trackit program. Exit from the Wizard exits the program.

Appendix 8: Troubleshooting guide

COM port problems with Bluetooth communication to Trackit Mk3

The COM port is available but is being used by another application.

This could well be the case if an application such as Microsoft Active Synchronisation is installed and polling the COM port for a Windows CE device. Make sure Connection Mode for Active Synchronisation is set to Only When Device is Connected, and not to Continuous.

Make sure other applications such as virus protection software and personal firewalls (ZoneAlarm) are not accessing the COM port while a connection to Trackit is being made.

Problems starting the recording

The setup has not been sent correctly

Under Trackit Status, in the Control Panel, check that Acquire Ready shows Yes. If it is not ready, acquisition cannot begin. This could be caused by incomplete transmission of the Trackit setup. Try to adjust the transmission delay for serial communication in the Trackit software as described above.

An incorrect setup has been sent

If an incompatible setup has been sent to the Trackit the message; "unable to comply" will indicate that. The usual cause for this is if a T36 or T24P setup has been sent to a Trackit 24: the presence of poly channels resulting in the setup being rejected. If an incorrect setup has been sent, the Trackit Control Panel will show 'Acquire Ready: No'.

The card is not formatted correctly

If the card is not formatted with a correct 16-bit FAT, a recording cannot commence. Format the flash card using the inbuilt Trackit format utility under Get Card Info. See 'Get Card Info', in 5.5 Advanced Settings.

Caution: do not attempt to do a low-level format, or do a standard format using a SCSI or USB card reader.

The card is corrupted

Disk corruption can be caused when a flash card is removed from Trackit or the Card reader while data is being written or accessed.

Trackit: always stop a recording, or if hot swapping wait for the write LED to go out, before removing the card.

Card reader: make sure the device is stopped, in Card Services, before removing the Card. This is especially important in Win2000 systems using a USB card reader, where the activity LED stays on for several seconds after deleting an old file. If the card is removed when this LED is on, the card will be corrupted and a reformat will be necessary. Always stop and eject the card using the icon in the Windows system tray before physically ejecting it.

The card is not inserted correctly

If the flash card is not pushed in far enough, the card will not engage the pins on the card reader. 'No CF card present', in the Status section of the Trackit Control Panel, will evidence this.

File review problems

The card is not formatted in FAT16

When a recording is made on a card formatted in FAT32 it will appear to be severely truncated and most probably unreadable. If you know a recording has a duration of >24 hours but it only shows up as several minutes in review, the most likely cause is that the card is not formatted in FAT16.

Notes:

- 1 This problem does not occur if the format has been performed using the inbuilt Trackit format utility.
- 2 Trackit software detects corrupted or incorrectly formatted cards prior to recording.

Appendix 9: Manufacturer's Declaration

EMC Compatibility

This section contains specific information regarding the device's compliance with EN 60601-1-2.

Note: Medical electrical equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided here.

WARNING: The use of accessories, transducers and cables other than those specified, with the exception of transducers and cables sold by the manufacturer of the equipment as replacement parts for internal components, may result in increased emissions or decreased immunity of the equipment.

Accessory name	Type	Length	Manufacturer
PCU cable 32ch	IEEE 1284 C-C shielded	1 m	Shielded IEEE 1284 C-C cable
USB Interface Cable	USB	2.8 m	USB shielded cable
RJ45 cable	Cat 5 UTP Patch Cable	2 m	Cat 5 UTP Patch Cable
Input electrodes	EEG disc electrodes	1 m	Unshielded EEG disc electrodes
Aux. Connector cable	Shielded	1 m	Shielded cable

WARNING: The equipment or system should not be used adjacent to or stacked with other equipment and that if adjacent or stacked use is necessary, the equipment or system should be observed to verify normal operation in the configuration in which it will be used.

Guidance and Manufacturer's Declaration

Electromagnetic Emissions

EN 60601-1-2

The Trackit Mk3 is intended for use in the electromagnetic environment specified below. The customer or user of the Trackit should assure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment Guidance
RF emissions CISPR11/EN55011	Group 1	The Trackit uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR11/EN55011	Class B	The Trackit is suitable for use in all establishments, including domestic establishments and those directly connected to the public low voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions EN 61000-3-2	Class A	
Voltage fluctuations/ Flicker emissions EN 61000-3-3	Complies	

Immunity Test	EN 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
Electrostatic discharges (ESD) EN 61000-4-2	+/- 6 kV:Contact +/- 15 kV:Air	+/- 6 kV:Contact +/- 15 kV:Air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30% In home environments and portable or transport situations, the Trackit should be housed in the Trackit bag to protect it from high ESD disturbances.
Electrical fast Transients/burst EN 61000-4-4	+/- 2 kV:AC mains +/- 1 kV:Signal lines	+/- 2 kV:AC mains +/- 1 kV:Signal lines	Mains power should be that of a typical commercial and/or hospital environment
Surge EN 61000-4-5	+/- 2 kV:Common mode +/- 1kV:Differential mode	+/- 2 kV:Common mode +/- 1kV:Differential mode	Mains power should be that of a typical commercial and/or hospital environment
Voltage dips,short interruptions and voltage variations on power supply input lines EN 61000-4-11	<5% 230 V (>95% dip in 230 V) for 0.5 cycle 40% 230 V (60% dip in 230 V) for 5 cycles 70% 230 V (30% dip in 230 V) for 25 cycles <5% 230 V (>95% dip in 230 V) for 5 sec	<5% 230 V (>95% dip in 230 V) for 0.5 cycle 40% 230 V (60% dip in 230 V) for 5 cycles 70% 230 V (30% dip in 230 V) for 25 cycles <5% 230 V (>95% dip in 230 V) for 5 sec	Mains power should be that of a typical commercial and/or hospital environment. If the user of the Trackit requires continued operation during power mains interruptions, it is recommended that the Trackit be powered from an uninterruptible power supply or a battery
Power frequency (50/60 Hz) magnetic field EN 61000-4-8	3 A/m	3 A/m See Note e.	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial and/or hospital environment

Immunity Test	EN 60601 Test Level	Compliance Level	Electromagnetic Environment Guidance
			<p>Portable and mobile RF communications equipment should be used no closer to any part of the Trackit, including cables than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</p> <p>Recommended separation distance</p>
RF Common mode/ Conducted Susceptibility EN 61000-4-6	3 Vrms 150 kHz to 80 MHz 6V in ISM bands	1 Vrms See Note f.	<p>$d=3.5 \sqrt{P}$</p> <p>Note: using unshielded input leads ^c</p>
Radiated RF Electromag- netic Fields EN 61000-4-3	3 V/m 80 MHz to 2.5 GHz 10V/m (Home Environ- ment)	1 V/m See Note f.	<p>$d=3.5 \sqrt{P}$: 80 MHz to 800 MHz $d=7 \sqrt{P}$: 800 MHz to 2.5 GHz</p> <p>Note: using unshielded input leads ^d</p>
			<p>Where P is the maximum output power rating of the transmitter in watts (W) according to the manufacturer and d is the recommended separation distance in meters (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey^a, should be less than the compliance level in each frequency range ^b.</p> <p>Interference may occur in the vicinity of equipment marked with the following symbol:</p>
<p>NOTE 1. At 80 MHz and 800 MHz, the higher frequency range applies.</p> <p>NOTE 2. These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</p>			

^a Field strength from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Trackit is used exceeds the applicable RF compliance level above, the Trackit should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Trackit.

^b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

^c The immunity levels for conducted RF are for unscreened input electrode leads 1 m in length and worse-case coupling, including any resonances across the frequency band. The interference is less when the coupling plane of the interference source is not in the same plane as the electrode leads.

^d The immunity levels for radiated RF are for unscreened input electrode leads 1 m in length and worse-case coupling, including any resonances across the frequency band. The interference is less when the polarisation plane of the interference source is not in the same plane as the electrode leads.

^e The Trackit does not contain magnetic components and is not susceptible to power frequency magnetic field interference.

^f The conditions of intended use justify lower immunity test levels. The hazards and risk analysis associated with these lower limits have been documented in the Risk Management file

The Trackit Mk3 is intended for use in the electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Trackit Mk3 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Trackit Mk3 as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150 kHz to 80 MHz $d=1.2\sqrt{P}$ at 3 Vrms $d=(3.5/V1)\sqrt{P}$ otherwise	80 MHz to 800 MHz $d=3.5\sqrt{P}$ at 3 V/m $d=(3.5/E1)\sqrt{P}$ otherwise	800 MHz to 2.5 GHz $d=2.3\sqrt{P}$ at 3 V/m $d=(7/E1)\sqrt{P}$ otherwise
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1. At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2. These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.