Universal Battery Charger II. For Trauma Recon System, Small Battery Drive and Battery Power Line.

User's Manual

SYNTHES® Instruments and implants approved by the AO Foundation

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Universal Battery Charger II

Application
The Universal Battery Charger II accepts the following Synthes batteries/power modules to be charged, refreshed and/or tested:

Small Battery Drive
– 12 V Battery
– 14.4 V Battery

Battery Power Line
– Battery

Trauma Recon System
– Power Module

Safety precautions
– The charger may only be used with the supplied power cord.
– Place the charger on a hard, non-slip, stable base. Ensure that the ventilation holes in the base of the device are not covered by towels or other objects.
– Do not cover the side ventilation holes on the device.
– Do not expose the device to direct sunlight or moisture.
– Ensure that liquids cannot seep into the device.
– Do not operate the charger in the direct vicinity of radiators or other heat emitting devices, as these can affect the device.
– The device may only be used for the authorized Synthes batteries/power modules.
– Please refer to page 18 for information on the electromagnetic compatibility.

Important:
– Do not open device. Risk of fatal injury due to electric shock!
– Do not use the device in the sterile area of the operating room.
– The device may not come into direct or indirect contact with the patient (see Figure 1 for required clearances).
– Do not wash the device in a washer/disinfector. The device may not be sterilized. Please refer to page 13 for information on care and maintenance.
– Do not operate the device in potentially explosive areas.

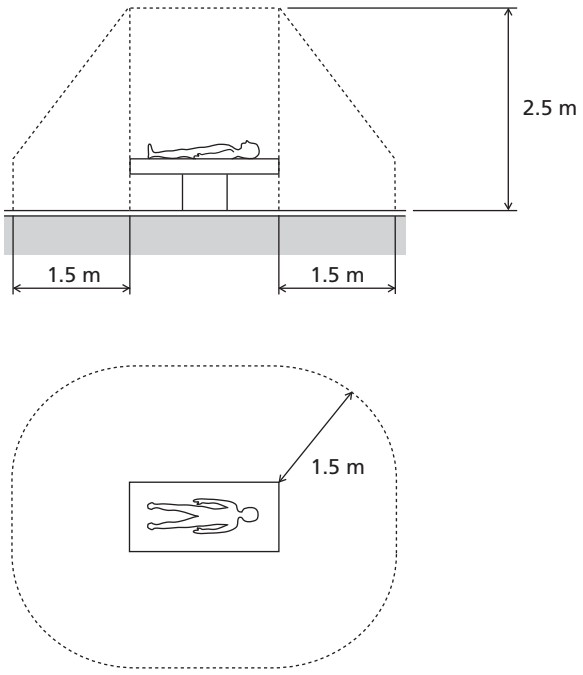


Figure 1

Storage and transport
All batteries/power modules should be removed when transporting the charger.

Use the original packaging for shipping and transport. If this is no longer available, please contact your local Synthes sales consultant.

The same environmental conditions apply for transport as for storage (see page 12).

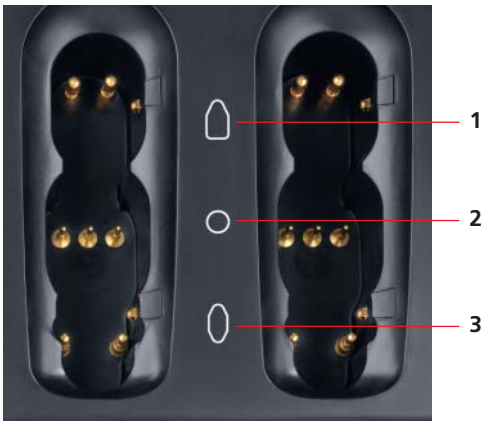
Warranty
The warranty for the device is null and void if the device has not been used properly or the guarantee seal has been broken. The manufacturer does not accept liability for damage resulting from repairs or maintenance carried out by unauthorized sites.

Specifications

Universal Battery Charger II (05.001.204)
The Universal Battery Charger II includes four independent charging bays. Each charging bay has three slots for the following batteries/power module:

– Battery Power Line Battery
– Trauma Recon System Power Module
– Small Battery Drive Battery

Note: The maximum charging time, depending on the charge status and type of battery/power module, is 15 to 80 minutes.



1 Battery Power Line Battery (530.620)
2 Trauma Recon System Power Module (05.001.202)
3 Small Battery Drive Battery (532.003 or 532.033)

Complies with standards:
UL 60601-1, 1st Edition
IEC 60601-1, 2nd Edition

Universal Battery Charger II
With respect to electrical shock, fire and mechanical hazards only in accordance with UL 60601-1/CAN/CSA C22.2 No. 601.1

IEC 60601-1-2
IEC 60601-1-4

Front view

1 Charging bays (4)
2 Symbols for battery/power module type
3 ON/OFF display
4 Control display for each charging bay
5 Ventilation holes

Rear view

6 Ventilation holes
7 Power switch
8 Fuses: 2 × 5 AT
9 Power cord connection

Compatible power module / batteries

Batteries for Small Battery Drive

Part numbers:	532.003/532.033
Operating voltage:	12 V (532.003) 14.4 V (532.033)
Battery capacity:	0.5 Ah
Battery/type:	NiCd
Typical charging time:	<60 min.

Battery for Battery Power Line

Part number:	530.620
Operating voltage:	14.4 V
Battery capacity:	2 Ah
Battery/type	NiMH
Typical charging time:	<80 min.

Power Module for Trauma Recon System

Part number:	05.001.202
Operating voltage:	25.2 V
Battery capacity:	1.2 Ah
Battery/type	Li-Ion
Typical charging time:	<60 min.

Subject to technical modifications

Connect the electrical cord to the charger, and plug the cord into a grounded 110/120 VAC outlet.

Turn on the charger by pressing the "I" on the power switch (Figure 1).

The ON/OFF display light on the front of the charger will illuminate (Figure 2).*

Note: If the red caution display light for a single charging bay illuminates before the power module/battery is inserted, this charging bay is damaged (Figure 3). The power modules/batteries can still be charged in the other charging bays, but it is recommended that the device be sent to the Synthes Service Department for repair.

Important: Do not operate the charger in the direct vicinity of radiators or other heat emitting devices, as these can affect the device.

Place the charger on a hard, non-slip, stable base. Ensure that the ventilation holes in the base of the device are not covered by towels or other objects.

Do not expose the device to direct sunlight or moisture.

Do not cover the side ventilation holes on the device.

Figure 1

Figure 2

Figure 3

*If LEDs do not follow this sequence, refer to the troubleshooting section, page 14.

Insert the power module/battery into one of the appropriate charging bays. The yellow LED should remain illuminated, indicating that the battery is charging (Figure 4).*

When the green LED illuminates, the power module/battery is fully charged (Figure 5).*

Note: The power modules/batteries can be removed during the charging process; however, they may not be fully charged and operational time may be shorter.

Important: Always leave the charger switched on when a power module/battery is inserted in a charging bay.

The battery cells of the power module do not discharge if not used; however, it is still good practice to check if it is fully charged prior to use by pressing the information button and reading the battery charge status display.

Never attempt to insert more than one power module or battery in the same charging bay.

Figure 4

Figure 5

*If LEDs do not follow this sequence, refer to the troubleshooting section, page 14.

Temperature monitoring
The battery and the charger heat up during the charging process. Therefore, the ventilation holes should not be covered.

If the temperature is too high, the yellow battery symbol will flash (Figure 1). To protect the battery, the device stops charging until the battery has cooled down. If this occurs, do not remove the battery from the charger until the yellow battery symbol stays illuminated. The charging time will be longer in this case.

Charging new batteries or batteries not recently used
New Small Battery Drive or Battery Power Line batteries that have not been used for longer than 6 weeks and that have not been stored in an activated charger may require 3 to 5 charging cycles to reach their full capacity. When in doubt, the charger can be used to check the battery status and to refresh the battery (see page 10).

Errors during charging
The following errors may occur when charging a battery:

Yellow display light flashes (Figure 1):
The battery is too hot and must cool down before the charging process can automatically resume. The battery can be left in the charger.

Red display light illuminates (Figure 2):
The battery is damaged and must be replaced.

No display light:
The battery has not engaged in the charging bay or has not been recognized by the device. Remove the battery and insert again or use another charging bay.

Figure 1


Figure 2

Power Module Diagnostic Test

The flashing yellow arrow on the charger display indicates that it is time for the power module to undergo a diagnostic test within the next 3 charging cycles (Figure 1).

Note: Please choose a convenient time for the diagnostic test as it can take up to 4 hours to complete. If the diagnostic test is not initiated within the next 3 charging cycles, the device will carry out the diagnostic test automatically. The charger will indicate the need for a diagnostic test when 50 charging cycles have been completed since the last diagnostic test.

To perform the diagnostic test:

1 Insert the power module in an open charging bay.

2 Press the exclamation mark button on the charger display for that charging bay and hold for at least 2 seconds. The yellow arrow light will turn off, then illuminate while the diagnostic test is in process.

Figure 1

Diagnosis

Green battery symbol illuminates (Figure 2): Power module has been tested, charged and is ready to use.

Figure 2

Red caution symbol illuminates (Figure 3): Power module has been checked, is not charged and cannot be used. The red service indicator (wrench) on the power module will also illuminate. Send power module to the Synthes Service Department.

Notes:

If the power module is inserted in the charger, the service indicator will remain illuminated. If the power module is removed from the charger, the service indicator turns off after a few seconds to save the battery.

Power modules can be charged or undergo diagnostic tests independently in each charging bay.

Important: Only press the exclamation mark to initiate the diagnostic test. This test should only be initiated when the yellow arrow flashes.

Figure 3

Small Battery Drive and Battery Power Line Batteries Diagnostic Test

The Small Battery Drive and Battery Power Line batteries can be tested for remaining capacity or, if they have not been used for some time, can be refreshed with the Universal Battery Charger II.

The following can affect battery performance:
– new, unused battery
– battery not used for long period of time
– old battery

Important: The diagnostic test takes up to 10 hours and should only be carried out if there is enough time to do so.

After the battery is inserted, the yellow battery symbol illuminates. To refresh and check the battery, press the button with the exclamation mark on the charger display of the charging bay for at least 2 seconds (Figure 1) until the yellow arrow illuminates (Figure 2). The device then carries out the diagnostic test. The yellow arrow remains illuminated throughout the diagnostic process.

Figure 1

Figure 2

Diagnosis
Green battery symbol illuminates (Figure 3): Battery has been tested, charged and is ready to use. Small Battery Drive battery is charged with at least 80% capacity remaining and Battery Power Line battery is charged with at least 70% capacity remaining.

Red caution symbol illuminates (Figure 4): Battery has been checked, is not charged and cannot be used. The battery must be replaced.

Important: The diagnostic test takes up to 10 hours and should only be carried out if there is enough time to do so.

Note: Batteries can be charged or undergo diagnostic tests independently in each charging bay.

Important:
- To recharge batteries normally, do not press the exclamation mark button.
- Checking the battery status and refreshing the battery have an impact on the battery. If this is carried out frequently, the lifespan of the battery may be affected.
- Do not remove the battery from the charging bay while the yellow display is illuminated. Wait until the diagnostic process has ended and the green or red display illuminates. Only then is the battery status clearly assessed.
- If the diagnostic process is interrupted, such as a power outage or a switch to the hospital's emergency power system, the diagnostic process must be restarted.

Figure 3

Figure 4

Storing Batteries and Power Modules

Immediately recharge batteries and the power module after each use.

Small Battery Drive or Battery Power Line batteries that are not used should always be stored in a Synthes Universal Battery Charger II that is plugged in and turned on (maintenance charge). This guarantees that the batteries are always fully charged.

It is not necessary to store Trauma Recon System power modules in the charger. Once charged, they can be stored outside the charger without any noticeable charge difference.

Note: Do not use batteries/power modules that are not fully charged. A partial charge may not be sufficient for the intended use.

Unusable or damaged batteries/power modules should not be used.

Care and Maintenance

Cleaning
The device must be unplugged before it is cleaned. Occasionally wipe down the device with a dry cloth. If it is very dirty, the device can be cleaned with a slightly damp cloth. Dry well. Do not use solvents.

Whenever the charger is cleaned, ensure it is working properly and is not damaged.

Maintenance of the device is not required.

If there are any damages, please send the device to the Synthes Service Department.

Important:
- Danger of electric shock! Unplug before cleaning.
- Do not wash the device in a washer/disinfector.
- Do not sterilize the device.
- Make sure that no solution enters the device.
- If necessary, clean the contacts in the charging bays using extreme care.

Repairs and technical service
The device should be sent to the Synthes Service Department for repair if:
- the charger is damaged
- the charger malfunctions
- the ON/OFF display does not illuminate when the device is switched on
- the ON/OFF display flashes when the device is switched on

Users or third parties should not carry out repairs themselves.

Note: The manufacturer shall assume no responsibility for damage resulting from unauthorized repair.

Troubleshooting

Problem	Possible Causes	Remedy
ON/OFF display does not illuminate.	Charger is switched off.	Turn charger power switch on.
	Power cord is not plugged in.	Connect power cord to charger, plug into wall outlet, and switch on.
	Power supply is interrupted (e.g., damaged fuse).	Check power supply. Replace fuse if necessary.
	Charger is damaged.	Send to Synthes Service Department.
ON/OFF display flashes.	Charger is damaged.	Send to Synthes Service Department.
Power module/battery is inserted and charge display status does not illuminate.	Power module/battery is not fully inserted.	Ensure the power module/battery is inserted properly.
	Contacts in the charging bay are dirty.	Carefully clean contacts with soft brush.
	Power module/battery was not recognized by the charger.	Remove power module/battery and reinsert in an open charging bay.
	Power module/battery is damaged.	Replace power module/battery.
	Charging bay is damaged.	Send to Synthes Service Department.
Red caution display ⚠ illuminates when no power module/battery is inserted.	Charging bay is damaged.	Send to Synthes Service Department.
Yellow battery display ▭ flashes when charging.	Power module/battery is too hot.	Leave power module/battery inserted in charging bay. Charger automatically restarts the charging process once the battery has cooled.

Problem	Possible Causes	Remedy
Arrow display ⟲ does not illuminate when exclamation button ⓘ is pressed.	Button was released too soon.	Press button and hold for at least 2 seconds.
	Charging bay is damaged.	Send to Synthes Service Department.
	Charger has an error.	Switch off charger, wait 5 seconds, and switch charger on. If the ON/OFF display flashes, send to Synthes Service Department.
Power module/battery is impossible to insert.	Power module/battery is being inserted into wrong slot in charging bay.	Insert power module/battery into correct slot in charging bay.
	Contacts in charging bay are bent.	Send to Synthes Service Department.
Charger is noisy.	Vents on sides, back or base are covered.	Position charger so that vents are exposed.
	Charger positioned next to heat source.	Position charger away from heat source.
Power module/battery performance is low.	Insufficient battery status.	Refresh battery (see page 10). Only possible with Small Battery Drive and Battery Power Line batteries.
	Expected battery life is reached.	Test power module/battery (see pages 9 and 10). If the red display ⚠ illuminates, replace battery or send power module to Synthes Service Department for battery replacement.
	Battery is not ready for use.	Charge power module/battery until green display ▬ illuminates.
	Drive unit or attachment is compromised. (i.e. due to insufficient maintenance)	Send drive unit or power module to Synthes Service Department for repair.

If the suggested solutions are unsuccessful, please contact the Synthes Service Department at 1 (800) 288-6698.

Synthes recommends an annual preventive maintenance service by qualified Synthes personnel.

Technical Data

Device specifications	
Dimensions (L X W x H)	310 mm X 220 mm X 175 mm
Weight	4.8 kg
Operating voltage	100 VAC–240 VAC, 50 Hz–60 Hz
Operating current	0.8–2.8 A (AC)
Power input rating	250 W
Protection class	I, EN 60601-1, paragraph 5.1
Protection type by casing	IP X0, EN 60601-1, paragraph 5.3
Protection degree	Type B, EN 60601-1, paragraph 5.2
Fuse	2 x 5 AT; slow-blow
Operating mode	Continuous
Sterilization	Device cannot be sterilized

Subject to technical modifications.

Environmental conditions

	Operation	Transportation and storage
Temperature	10°C – 40°C 	–20°C – 50°C 
Relative humidity	30% – 90% 	10% – 90% 
Atmospheric pressure	500 hPA – 1060 hPA 	500 hPA – 1060 hPA 

Important: The device is not suitable for use in the presence of a flammable anesthetics mixture with air or oxygen, or with nitrous oxide.

Applicable Standards
The device meets the following standards:

UL 60601-1, 1st Edition
IEC 60601-1, 2nd Edition
CSA C22.2 601.1

Universal Battery Charger II
With respect to electrical shock, fire and mechanical hazards only in accordance with UL 60601-1/CAN/CSA C22.2 No. 601.1

IEC 60601-1-2
IEC 60601-1-4

Electromagnetic compatibility
Accompanying Documents in Accordance with EN/IEC 60601-1-2, Clause 5.2.2

Table 1: Emissions

Guidelines and manufacturer's declaration–electromagnetic emissions

The Synthes Universal Battery Charger II is intended for use in the electromagnetic environment specified below. The customer or the user of the Synthes Universal Battery Charger II should assure that it is used in such an environment.

Emission tests	Compliance	Electromagnetic environment–guidance
RF emissions CISPR 11	Group 1	The Synthes Universal Battery Charger II uses RF energy only for its internal function. Therefore its RF emission is very low and it is not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The Synthes Universal Battery Charger II is suitable for use in all establishments, excluding domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Complies	

Table 2: Immunity (all devices)

Guidelines and manufacturer's declaration – electromagnetic immunity

The Synthes Universal Battery Charger II is intended for use in the electromagnetic environment specified below. The customer or the user of the Synthes Universal Battery Charger II should assure that it is used in such an environment.

Immunity test standard	IEC 60601 test level	Compliance level	Electromagnetic environment – guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±8 kV contact ±15 kV air	Floors should be wood, concrete or ceramic tile. If the flooring is a synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for signal lines	±2kV for power supply lines ±2kV for signal lines	Electrical power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV line to line ±2 kV line to earth	±1 kV line to line ±2 kV line to earth	Electrical power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply lines IEC 61000-4-11	<5% U_T (0.5 cycle) 40% U_T (5 cycles) 70% U_T (25 cycles) <5% U_T for 5s	<5% U_T (0.5 cycle) 40% U_T (5 cycles) 70% U_T (25 cycles) <5% U_T for 5s	Electrical power quality should be that of a typical commercial or hospital environment. If the user of the Synthes Universal Battery Charger II requires continued operation during electrical power interruptions, it is recommended that the Synthes Universal Battery Charger II is powered from a UPS.
Note: U_T is the AC voltage prior to application of the test level.			
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Table 4: Immunity (not life-supporting devices)

Guidelines and manufacturer's declaration–electromagnetic immunity

The Synthes Universal Battery Charger II is intended for use in the electromagnetic environment specified below. The customer or the user of the Synthes Universal Battery Charger II should ensure that it is used in such an environment.

Electromagnetic environment–guidance

Portable and mobile RF communications equipment should be used no closer to any part of the Synthes Universal Battery Charger II, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.

Immunity test standard	IEC 60601 test level	Compliance level	Recommended separation distance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	V1 = 10 Vrms 150 kHz to 80 MHz	$d = 0.35 \sqrt{P}$ 150 kHz to 80 MHz
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 800 MHz	E1 = 10 V/m 80 MHz to 800 MHz	$d = 0.35 \sqrt{P}$ 80 MHz to 800 MHz
Radiated RF IEC 61000-4-3	3 V/m 800 MHz to 2.5 GHz	E2 = 7 V/m 800 MHz to 2.7 GHz	$d = \sqrt{P}$ 800 MHz to 2.7 GHz

Where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and *d* is the recommended separation distance in meters (m).

Field strengths from fixed RF transmitters as determined by an electromagnetic site survey* should be less than the compliance level in each frequency range.**

Interference may occur in the vicinity of equipment marked with the following symbol:

Notes:
At 80 MHz and 800 MHz, the higher frequency range applies.

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

* Field strengths 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 Synthes Universal Battery Charger II is used exceeds the applicable RF compliance level above, the Synthes Universal Battery Charger II should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Synthes Universal Battery Charger II.

** Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 10 V/m.

Table 6: Recommended separation distances (not life-supporting devices)

Recommended separation distances between portable and mobile RF communications equipment and the Synthes Universal Battery Charger II

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

Rated maximum output power of transmitter	Separation distance according to frequency of transmitter		
W	150 kHz to 80 MHz $d = 0.35 \sqrt{P}$	80 MHz to 800 MHz $d = 0.35 \sqrt{P}$	800 MHz to 2.7 GHz $d = \sqrt{P}$
0.01	3.5 cm	3.5 cm	10 cm
0.1	7.8 cm	7.8 cm	35 cm
1	35 cm	35 cm	1 m
10	78 cm	78 cm	3.5 m
100	3.5 m	3.5 m	10 m

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.

Notes:
At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

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

Explanation of Symbols

The following symbols are for operating the Universal Battery Charger II.

Battery is charged. The charger has switched to maintenance charge and checks that the battery is always fully charged and ready to use.

Illuminated display: the battery is partially charged. The charging process is not completed. Flashing display: the battery is too hot (see page 8).

The battery is damaged and has to be replaced (see page 8) or the charging bay is damaged (see page 8).

Button to perform diagnostic test for power module (see page 9) or to refresh or test batteries (see page 10).

Illuminated display: the diagnostic test for power modules (see page 9) or refresh/test cycles for batteries (see page 10) is in process. Flashing display: the connected Trauma Recon System power module requires the diagnostic test to be performed (see page 9).

Symbol for Battery Power Line Battery.

Symbol for Trauma Recon System Power Module.

Symbol for Small Battery Drive Battery.

Caution. Read the provided instructions for use before operating the device.

Date of manufacture.

The device fulfills the UL requirements for USA and Canada.

Compliance
The device meets the following standards:
UL 60601-1
IEC 60601-1

Ordering Information

Battery Charger

05.001.204	Universal Battery Charger II

Batteries

05.001.202	Power Module, for Trauma Recon System
530.620	Battery, for Battery Power Line
532.003	Small Battery Drive 12 V Battery
532.033	Small Battery Drive 14.4 V Battery

Also Available

05.001.140	Medical Grade Power Cord

SYNTHES®

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