



# EPS320 CARDIAC STIMULATOR

## INSTALLATION PROCEDURE

Micropace Document Part No. MP3069  
Ver 5.2  
19 Dec 2013  
For  
MP3102B-US & EU

**Caution for USA:**  
**Federal Law restricts this device to sale  
by or on the order of a physician**

User Configuration Menu password: 'henry' or 4546
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Service Configuration Menu password: 'service' or 9897
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Check for latest Version of EPS320 Installation Manual at <http://www.micropaceep.com> - Downloads page

**Applies to:**  
EPS320 Software V3.19, V3.20 SR3+, V3.21.04, V3.21.05, V3.21.07+  
StimLink™  
Four Channel Stimulus Multiplexer Box  
Touch Screen

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## 1. Pre-ordering checklist

Determine customer requirements by asking customer for preferences and analysing the existing equipment and the laboratory.

### 1.1 Determine customer requirements

Contact the customer and/or inspect site prior to installation and determine the following, recording the results into the corresponding spaces in the installation worksheet.

#### 1- EP Recording Equipment type

- Which system and version do they have, e.g. Bard LabSystem™ Duo™, LS Pro™, GEMS-Prucka CardioLab™ Series etc. What accessories do they have – e.g. do they have one or two ECG outputs for use by the Stimulator? To determine compatibility, refer to Compatible equipment Section

#### 2- Stimulus cabling

- How many stimulation channels do they have in their wiring, i.e., if they want two channel stimulation and have wiring for only one they will need to add a second pair of wires from EPS320 stimulator or the EP Recording Equipment to the patient bed side. Contact the EP Recording Equipment manufacturer for instructions on how to do this.
- If user wants four channel stimulation – order the optional Micropace Four Channel Stimulus Multiplexer Kit, MP3091. You will need to install four stimulation cable pairs from the EP Recording Equipment to the bedside if not already present.
- Consider installing one spare stimulation cable pair to cater for future cable failures.
- Micropace supplies a 08m, 13m and 17m two pair stimulus extension cable – refer to part numbers MP3070-08, MP3070-13, and MP3070-17 in Optional Accessories catalogue.
- What type of connection is required to connect the Stimulator outputs to the EP Recorder amplifier inputs? Usually the EP Recording Equipment manufacturer supplies these cables so order them from them.
- For Connection to EP MedSystems Workmate, order cable MP3384 and request special Installation Instructions from Micropace.

**Warning:** The stimulus cables are part of a Class CF protected intra-cardiac patient circuit. In order to prevent patient micro-electrocution, protect cabling from sources of sudden or gradual damage, from contact with mains voltage and avoid installing stimulus cables alongside mains cables or in grounded conduits. Install Micropace's special ultra-low external capacitance stimulus cable MP3070-XX to minimize ground leakage currents. Installation must be acceptance tested by biomedical engineer for Class CF device.

**Caution:** Consider that stimulus cabling may be used for ECG sensing by the EPS320. Do not route Stimulus cabling near sources of electromagnetic interference, such as video cables, high power cabling and RF energy-carrying cables.

#### 3- ECG inputs

- The Stimulator will need a minimum of one and preferably two ECG external inputs from the EP Recording System to synchronize stimulation. What type of connector is required to access the ECG signal? For example, both the GEMS-Prucka CardioLab™ and the Bard LabSystem™ Duo™/ LS Pro™ equipment have least one ECG output via a BNC connector and may have optional real time output boxes (RTO boxes) which have multiple ECG outputs via 6.5 mm phone sockets. The Micropace installation kit has BNC and Phone Plug cables and suitable adaptors for this purpose.

- ❑ The EPS320 has catheter-tip sensing for basic stimulation synchronizing, but many advanced features of the EPS320 Stimulator function optimally with an external IECG source.

**4- Trigger Outputs**

- ❑ Legacy feature not required by any modern EP Recorder – contact Micropace if required. *(Does the customer have an older EP Recording systems requiring a trigger input signal to trigger analysis screen at end of stim trains? If so, you may need to connect a trigger cable from the EPS320 SyncOutput to the EP Recorder Trigger input. Note what type of connector is required for this Trigger input).*

**5- Define Required EPS320 System Configuration**

- ❑ Determine which of the EPS320 Stimulator configuration and options the customer requires:

Market	EPS320 Stimulator Model	Configuration	Packing Cartons
US	EPS320B-US <sup>1</sup>	Bona Light PC / NEC LCD display, 110-120VAC	2
EU	EPS320B-EU	Bona Light PC / NEC LCD display, 220-240VAC	2

Note 1: Not CE marked

**Table 1 EPS320 Stimulator Configurations**

Market	EPS320 Option	Configuration	Packing Cartons
Any	MP3091	Four Channel Stimulus Multiplexer Kit	1
Any	MP3096	StimLink™ Kit	1
Any	MP3113-GE MP3113-B	Touch Screen Kit (for GE) Touch Screen Kit (for Bard)	1

**Table 2 EPS320 Stimulator Options**

**1.2 Compatible equipment**

The EPS320 Stimulator’s primary function is the generation of constant current predominantly rectangular stimulation pulses with amplitudes of 0.1 to 25mA, duration of 0.5 to 10ms and with a maximum voltage of +/- 27V. Third party switching equipment with the following special characteristics must be used to carry the stimulus pulses to the intracardiac electrodes without significant distortion:

- ❑ Series resistance: < 100 Ohms at up to +/- 25mA
- ❑ Shunt resistance: > 100,000 Ohms at up to +/- 27V
- ❑ Frequency bandwidth: DC to 300 Hz
- ❑ Interference RF energy sources: < 350Vpp at 400 kHz to 600 kHz, or 150W into a 300 Ω load

Higher series resistance reduces maximal attainable pulse current amplitude; lower shunt resistance reduces delivered current in all ranges; reduced frequency bandwidth may alter efficacy of stimulation at any current level and higher RF energy exposure may activate over voltage safety elements, reducing RF energy delivery and overheating within the EPS320 system’s Stimulus Connection Box. Subject to these requirements, the EPS320 Stimulator is intended for use with the following equipment; the user should contact Micropace Pty Ltd for compatibility information prior to use of other equipment: (i) Computerized EP Recording systems manufactured by Bard Electrophysiology (LabSystem™ Duo™ and LS Pro™) and (ii) GE/Prucka (CardioLab™ 4000, 7000) have been tested for use with the EPS320 Stimulator.

### 1.3 Determine Laboratory Layout – routing signal to the patient.

Many installations have control rooms containing EP stimulation and EP Recording equipment separate from patient areas.

Figure 1 shows alternate methods of remote stimulus connection. Note that either the Stimulus Connection Box MP3014 or SM-Box MP3086 must be used in the Stimulus connection circuit to prevent device interaction between the EPS320 and some RF ablation systems.

Schemes A to D show four methods of wiring stimulus from the EPS320 stimulator in the control room to the patient area.

The Stimulus Generator Unit (SGU) may also be located up to 27 m remotely from the EPS320 Computer with the use of Serial Extension cable Part MP3084 (Scheme C). This setup has the advantage of not requiring a long stimulus cable and may thus be preferable in noisy EP Lab environments where catheter-tip ECG's are of poor quality. It has the disadvantage that the SGU is not readily accessible to the operator in case of the need to operate the Manual Backup function or a need to disconnect the patient from the Stimulator.

**Warning: To prevent harm to patient from inability to backup pace during asystole in the case of Stimulator malfunction or loss of power**, when installing the SGU remotely to the Stimulator computer, ensure that the SGU's front panel is readily accessible to attending staff in the Laboratory. Ensure that the nursing / medical staff normally located in the patient area are instructed on the location of the SGU, its function and on how to disconnect the stimulus cable and how to operate the Manual Backup and Emergency Fixed Rate Pacing features of the Stimulator.

Scheme	Application
A Compact	This is applicable for installation with cable routing distance of between 1 to 10 meters, using third party stimulus cables.
B Extended	This schema uses Micropace stimulus extension cable and control extension cable MP3070-XX and MP3090/MP3146 to install across routing distances of up to 15/20 meters. Refer to warnings below regarding routing requirements for the MP3070-XX in order to comply with leakage current requirements of IEC60601-1. MP3070-XX = MP3070-08, MP3070-13 and MP3070-17
C Split system	Recommended split installation method for all remote installation and especially where cable routing length exceeds 15 meters. The stimulus generator is located under the patient bed and the routing distance to the Computer, located in the control room, is spanned by a digital cable of up to 27 meters. The short stimulus cable minimizes stimulus cable leakage currents and noise in sensed ECG.

## Stimulus Connection Options for Micropace EPS320 Family Cardiac Stimulators

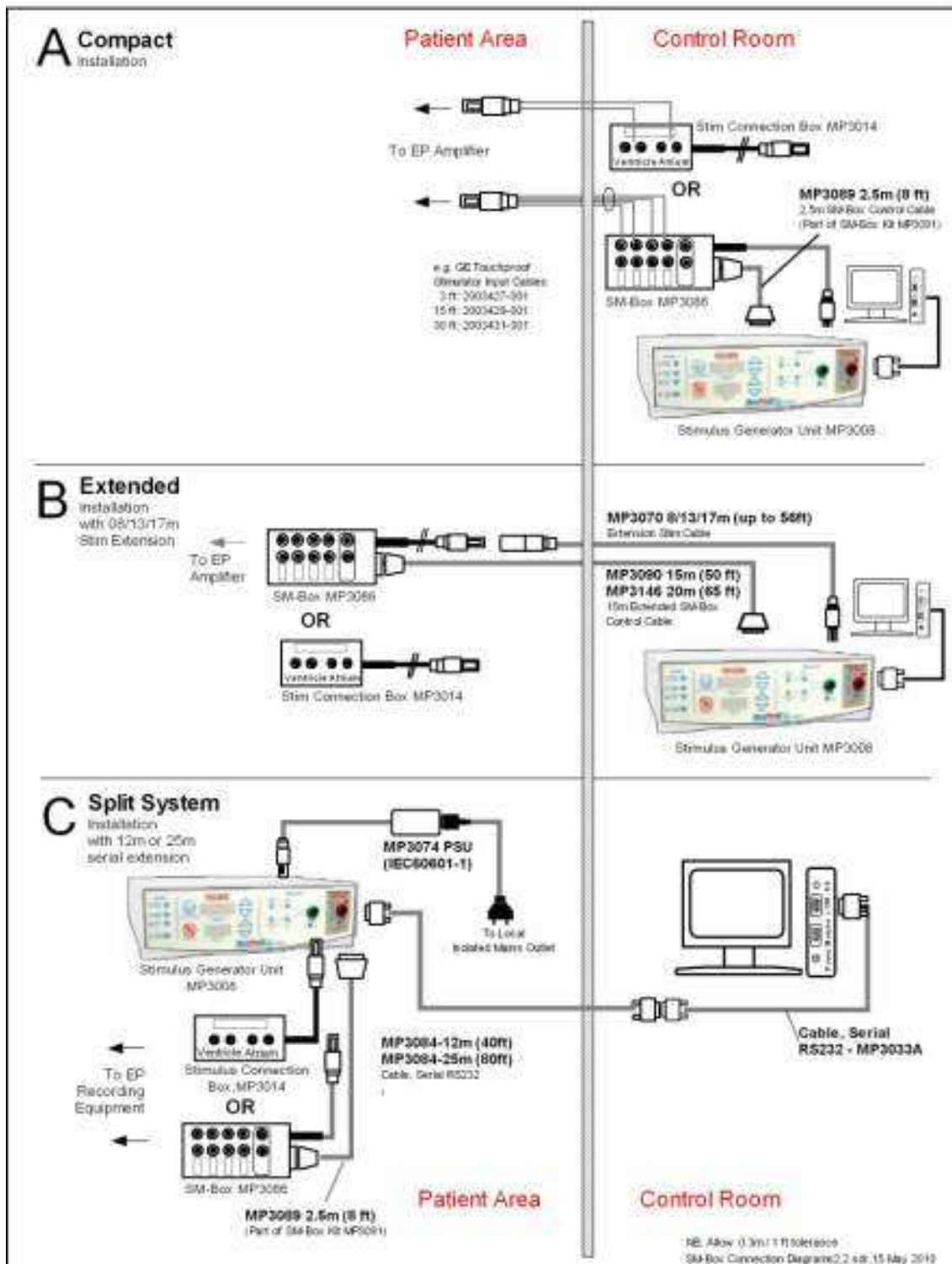


Figure 1 Connection of stimulus to EP Recording Equipment in a remote patient area.

## 2. Pre-delivery checklist

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### 2.1 Tools Required

Tools and materials required are as follows:

- Small screwdriver, flat head.
- Small screwdriver, Phillips
- Knife for cutting cable ties.

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### 2.2 Packing checklist

- Verify that you have received the correct number of packing cartons for your configuration as per Table 1 (2 cartons).
- Ensure that all optional items purchased on Purchase Order match shipping docket and have been received from Micropace.



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## 3. On-Site Installation Procedure

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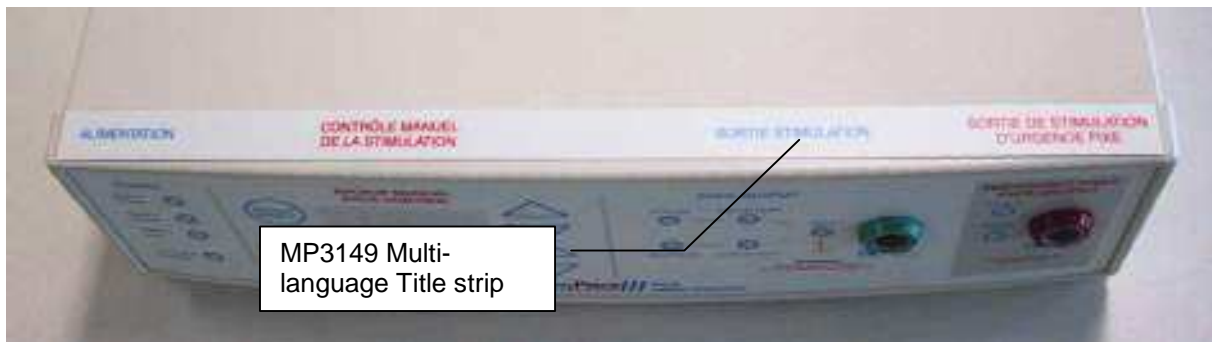
### 3.1 Packing and inspection checklist

- ❑ Check contents of cartons against enclosed Packing List, (see also Packing Lists & Connection Diagrams section below).
- ❑ Ensure that equipment and cabling appears undamaged. Do not use cables or leads if they appear damaged or if connectors appear loose.

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### 3.2 Attach Local Language Labels

The model EPS320B-EU is supplied with multi-language title strips (MP3149) for the front of the SGU. If the country of installation requires, or customer prefers translated product decals, peel off the strip with the language of the country of installation and apply to the top front face of the SGU as shown in photo below.



**Figure 2 Multi-language Title Strip**

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### 3.3 Interconnect Equipment

Interconnect equipment as per Connection Diagram below

- ❑ Figure 16 below or the connection diagram appropriate for your configuration in the User Instruction Manual accompanying your product.
- ❑ You must refer to the Accessories Box, MP3055 Contents and Information for use of Accessories for instructions and warnings for interconnection of equipment.

**Caution:** Connect equipment power leads to isolation transformer before connecting mains power to the transformer, to reduce chances of blowing fuses in the transformer due to large inrush currents. Spare fuses are included in the Installation Accessories.

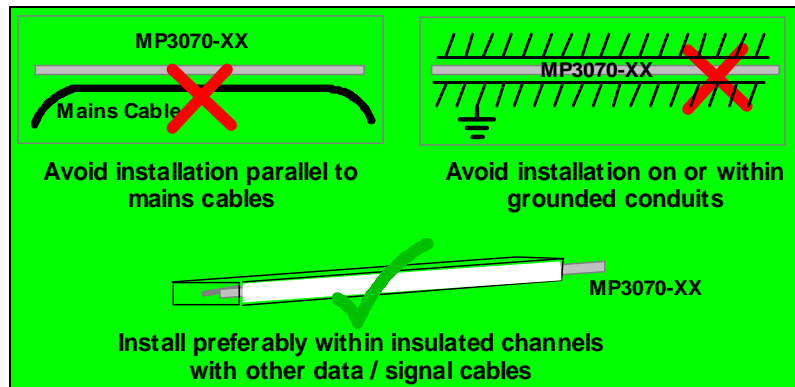
- ❑ RS232 Serial cable MP3033A. Use the MP3033A to interconnect the Bona Light PC to all SGU's. Latest cable Rev A.03 (printed on cable) will not allow older PC's (SN  $\leq$  250) to reset SGU's if needed with, self evident work-around exists - of power cycling SGU.
- ❑ Stimulus connection must include Stimulus Connection Box MP3014 or SM-Box in the circuit. These devices contain RF filters to prevent device interaction between the Stimulator and RF ablation equipment.

**Warning:**

This product is not intended to for use as a life support device. For patients requiring life-supporting pacing, you must use approved temporary pacemaker generators connected directly to intra-cardiac leads.

**Warning:**

This extension cable forms a part of the Class CF patient isolated circuit. In order to prevent electrocution hazards from Patient Leakage Currents, install away from mains-carrying cables and earthed surfaces. Installation must be acceptance tested by biomedical engineer for Class CF device.



- ❑ **Connect External ECG signals to the Stimulator.** External ECG inputs should be connected from the EP Recording System real time amplified ECG outputs to the two External ECG inputs on the rear of the Stimulator via 6.5 mm phone plug - terminated cables provided (MP3034). Although the EPS320 Stimulator can sense ECG from the catheter tip, sensing from external amplified ECG avoids issues of catheter charge accumulation during pacing and more reliable signals for the Stimulator's more advanced features such as SNRT measurement. The software is designed to work most efficiently if you connect ECG-1 Input to IECG from the High RA (HRA) and ECG-2 Input to IECG from the RV Apex (RVA).

**Caution:** If ECG display on the Stimulator is noisy, interconnect Stimulator and EP Recording Equipment with an ECG Signal Cable (MP3034) to connect signal grounds.

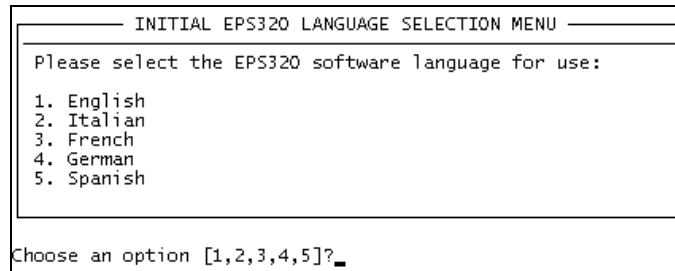
- ❑ **Connect Sync Trigger output signal.** Legacy feature not required by any modern EP Recorder – contact Micropace if required  
*Most modern EP Recording Systems do not require a trigger cable, however, the EPS320 provides a 'Sync-1 Output' trigger output for triggering capture of real-time screen to an analysis screen for older systems. If the user wishes to trigger the display on ectopic/premature beats, then this cable needs to be connected to the EP recording system.*
- ❑ **Auxiliary Connector.** This connector is reserved for use with the Four Channel Stimulus Multiplexer Box
- ❑ **Connect Serial Cable.** Secure this cable to the SGU and the Computer DB9 ports by tightening the connector screws. Note loosened cables are a very common cause of service callouts.
- ❑ **Keyboard cable secured.** Use Cable Tie and MP3061 Cable tie adhesive anchors to secure the keyboard lead /plug from being disconnected while in use.

**Warning:** To prevent harm to patient from inability to start or stop pacing, always secure the keyboard cable to the side of the PC to prevent inadvertent disconnection.

### 3.4 Software Installation

#### 3.4.1 Language selection

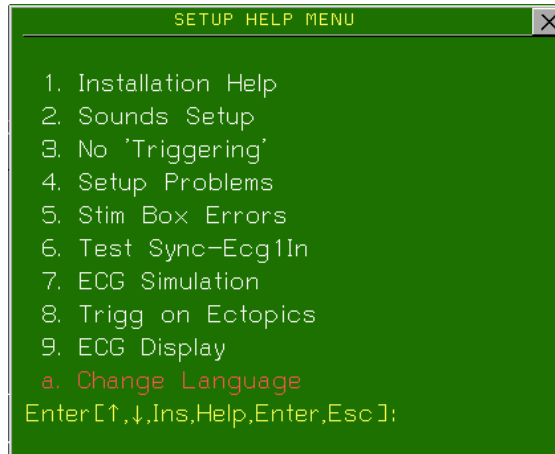
First launch of software at the customer site will present the following “Initial EPS320 Language Selection Menu”



On behalf of the customer, select the preferred language that the customer would like to use. Follow the on screen instructions to complete the process.

Once the language selection process is complete, you will arrive at a screen, which displays a message “Are you a distributor?” (Displayed in the chosen language). If you are a distributor, **press key ‘Y’** and the license agreement will be bypassed. When the end user launches the program, he/she will need to press “N” and read and agree to the License agreement.

User can change their preferred software language display by selecting the “Change Language” option from the ‘Setup Help’ sub-menu of Help Menu.



On selection, the program will exit and launch the same Initial EPS320 Language Selection Menu as shown above. This will be displayed in the current software’s preferred language. Follow the on screen instructions to complete the process. Once completed, the software will launch with the new language display. Customer setup information is preserved throughout the change of entire language process.

### 3.5 Software Re-installation

Software comes pre-installed within the EPS320. If this software needs to be reinstalled, you will need to obtain from Micropace one of the following:

- ❑ For EPS320B (Bona PC) systems, a CF Card with preloaded software (which you can simply insert into its slot inside the PC), or
- ❑ Software USB Key Installer

For the USB Key installer, install the software with the following steps:

- ❑ Insert the software medium and reboot.
- ❑ When you see the “System Initializing” screen, press DEL key 3 times. You will enter the PC’s CMOS Setup.
- ❑ When prompted for password, use **password “mpbonapc”** without quotes.
- ❑ Go to **Advanced BIOS Features** and change **First Boot Device** from USB-FDD to USB-HDD. If option is not available, go to **Hard Disk Boot Priority** and select the USB Key (USB-HDD0) using PGUP/PGDN key to be the first.
- ❑ Press **F10** and Yes to Save to CMOS and EXIT.
- ❑ On reboot, installation program will auto-load and prompt for user selection.
- ❑ Select the type of software to install and follow its instructions to complete the installation.
- ❑ First time execution of the program (Software 3.20 or above) displays a message “Are you a distributor?” in relation to a click-through license agreement. If you are a distributor, **press key ‘Y’** and the license agreement will be bypassed. When the end user launches the program, he/she will need to press “N” and read and agree to the License agreement.
- ❑ First time execution of the program (Software 3.20SR3 or above) will launch the “Initial EPS320 Language Selection Menu”. See Language selection section.

When prompted for a password during installation, use the **password ‘se’** without the quotes and lower case.

After completing the installation, reboot the computer - the EPS320 software will launch automatically. You may now connect the Stimulus Generator Unit (SGU) and turn its power on - the software and SGU will connect and EPS320 Stimulator will be ready for operation.

### 3.6 Warnings and Cautions

**Warnings:** In order to avoid electrocution hazards, PC, Display and SGU Power supply must be connected only to isolated mains via supplied Isolation Transformer.

**Warnings:** In order to prevent arrhythmogenic device interaction between Stimulator and some RF ablation systems, ensure that stimulus output is connected to stimulus input connectors of the EP Recording Equipment always via the Stimulus Connection Box (MP3014 or MP3086).

**Warnings:** If you are contemplating the use of a custom made cable with a connector specific for the EP Recording Equipment (without the Micropace Stimulus Connection Box), you must connect an in-line RF filter between this cable and the EPS320 stimulus output socket. Failure to do this may result in danger to the patient during RF Ablations. Contact Micropace for advice.

**Warning:** The stimulus cables are part of a Class CF protected intra-cardiac patient circuit. In order to prevent patient micro-electrocution, protect cabling from sources of sudden or gradual damage, from contact with mains voltage and do not install stimulus cables alongside mains cables or in grounded conduits.

**Warnings:** In order to reduce risk of patient micro-electrocution, always connect the EP Recording Equipment's stim cable to the Stimulus Connection Box with shrouded versions of 2mm plugs.

**Caution:** Note that cabling on the NEC LCD display should be installed so that they exit from the display's pedestal.

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### 3.7 Turning on the system

If you have no optional accessories or kits to be installed, you may now switch on the system, otherwise install these items according to relevant sections below and return here to start the stimulator:

1. **Switch on Stimulus Generator Unit** (power switch rear right of unit). A green mains power light at left top of front membrane should come on. If not, check that power is connected and is available to the Stimulator Box. The Stimulator Box will enter Standby mode (green mains power light lit only).
2. **Switch on computer** (power switch at front). The stimulator software user screen should come on after approximately 10 seconds. After a further five seconds, message box should appear containing the words:

Versions: \*\*\* All OK \*\*\*

3. The SGU will have lit the green 'PC Pace Control' light and the letters 'PC' will appear in the 'Pace Interval' window, both indicating that the system is in the PC Pace Control mode.

Proceed now to Sections on Configuring Software and then to Section 11. Stimulator Testing and Acceptance.

## 4. EPS320 System Optional Upgrade Kits

The following Optional Accessories and Kits are available from Micropace.

Part Number	Description
MP3091	Four Channel Multiplexer Kit
MP3113-X (where X=GE or B)	Touch screen Only Kit
MP3096	StimLink™ Kit for communication with EP Recorder.

## 5. EPS320 System Optional Accessories

3.21 UIM-ENG -Version 1.1 August 2010.

Part Number	Description
MP3070-XX	Extension Stim Cable – For Stimulus Connection Box – XX = 08m, 13m and 17m
MP3084-12	Extension Serial RS232 Cable, (incl. RF suppression) – 12m
MP3084-25	Extension Serial RS232 Cable, (incl. RF suppression) – 25m
MP3090	SM-Box Extended Control Cable, 15m
MP3146	SM-Box Extended Control Cable, 27m
MP3081	Service Contract per annum, incl. all parts, labour & shipping, software upgrade.

## **6. EPS320 System Spare Parts**

Refer to the latest catalogue for the most up to date listing of Spare Parts currently available.



## 7. Software Configuration

### 7.1 Stimulus Output Options

The EPS320 is a two-channel stimulator, with two independent hardware stimulus generators. The product may however be configured for use as a one, two or four channel stimulator according to user requirements. The stimulus signal is generally connected to a third party EP Recording Equipment Stimulus inputs, where it may be switched under the Recording Equipment's software control to any catheter electrode pair.

The two stimulator channels are mutually isolated, so both channels may be used for unipolar, bipolar stimulation or one channel for unipolar and the other for bipolar stimulation.

**Warning: Stimulus connection must include a Micropace Stimulus Connection Box MP3014 or MP3086.** These devices contain RF filters to prevent device interaction between the Stimulator and RF ablation equipment. The Stimulus Connection Box has shrouded 2mm sockets as required by relevant electrical safety standards – always use corresponding shrouded versions of 2mm plugs to connect the stimulus signal to the patient.

#### 7.1.1 Two Stimulus Channels

This is the standard method of connection. Connect the Chan1-A output to Stim1 input of the EP Recording System and Chan2-V to Stim2 input. For standard pacing protocols involving RA and RV stimulation, the EPS320 software automated features rely on adherence to a convention that Chan1-A to be in the HR Atrium (HRA) and Chan2-V in the RV Apex (RVA) for optimal function.

Stimulator Software factory defaults are set up for two channel stimulation (and two external ECG inputs).

#### 7.1.2 Single Stimulus Channel

Some operators used to or restricted to single channel stimulation use a 'roving' pacing catheter, which they move between cardiac chambers to change stimulation site. The EPS320 may be set up for such single channel stimulation:

- ❑ **Connect the Chan2-V output to the EP Recording System Stimulus Input;** always use this channel because the Emergency Fixed Rate Pacing safety feature outputs only to Chan2-V.
- ❑ Configure Service *Var 11 Redirect Pace to Channel* to '2', Chan2/Ventricle. Stimulator will continue to display four channels on the screen, and each will have its unique programmed current and duration, however, stimulus will always come out of the Chan2-V output. The user can thus still program chamber-specific stimulus current amplitudes and use these by selecting the particular Pace Site on the EPS320 and flipping the pacing catheter into the corresponding chamber.
- ❑ Configure ECG Sensing Options below for one External ECG source.

#### 7.1.3 Four Stimulus Channels

The optional Micropace Stimulus Multiplexer Box with EPS320 Software 3.19 and above will automatically reprogram and switch the two stimulus generators between four output ports, providing virtual four-channel stimulation.

Refer to section on the Four Channel Stimulus Multiplexer Kit Installation below for details of installation.

## 7.2 ECG Sensing Options

Good ECG sensing is critical to the functioning of the EPS320 Stimulator, as it is for all stimulators, and is the commonest cause of customer complaint. Accordingly, the EPS320 has two options for ECG sensing – (i) via external high-level ECG inputs and (ii) via pacing catheter-tip.

### 7.2.1 One External ECG Input

Most installations appear to have just one ECG output from the EP Recording System. This is typically via a BNC connector. Attach a standard BNC to BNC cable of required length (not supplied by Micropace) to the EP Recording System output at one end and use the supplied BNC to 6.5mm Phone adaptors (made up of two connected adaptors) to connect other end to the EPS320 ECG-1 Input (see Figure 3).

When configuring EPS320 Software, ensure of the following two steps:

- ❑ Set Sense Site to EXT-ECG-1 (A) (hotkey Alt-1) and save configuration (with hotkey Alt-S) for all Protocol Setups, if multiple users.
- ❑ Service *Var35 En Sense Site Warning* must be set to 0 or 1, to prevent warning messages of inappropriate sense site for some protocols.

External ECG signals should be set to intra-cardiac signals for optimum sensing performance; they have no ‘T’ wave, which can cause double sensing, and RVA probably changes axis less during tachycardia than surface leads. If using one signal only, we suggest the RVA channel on the EP Recording System.

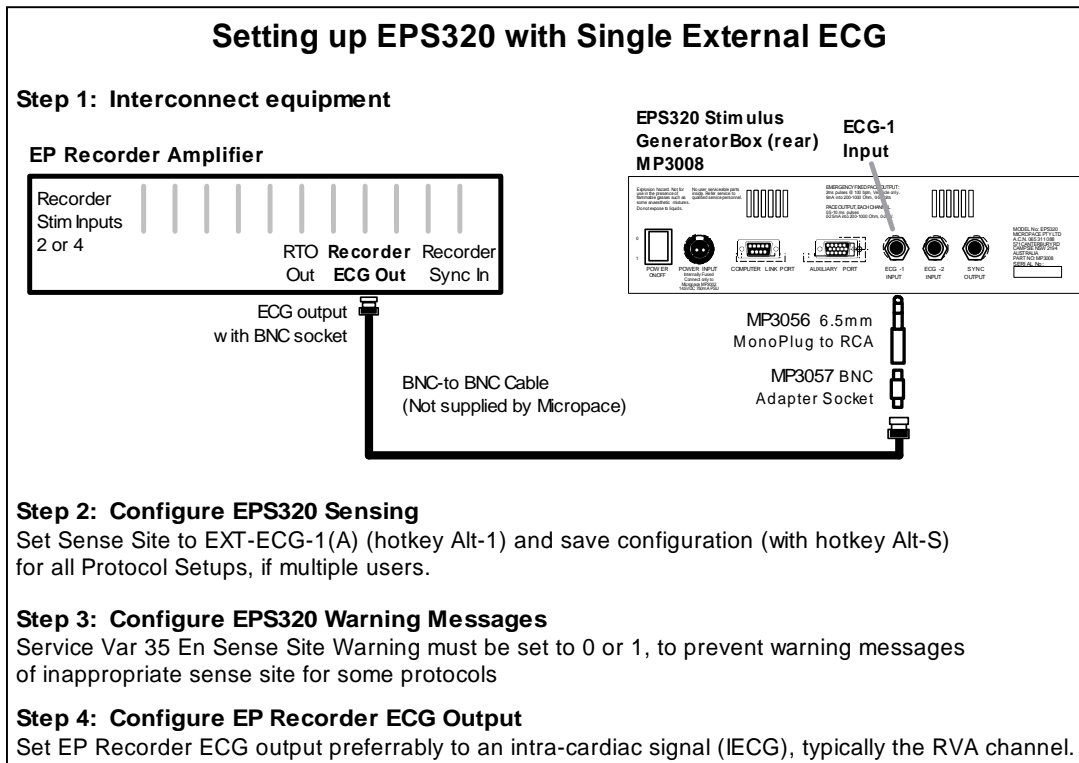


Figure 3 Setting up a single External ECG connection

### 7.2.2 External ECG Inputs

The EPS320 should normally be connected to one external amplified ECG signal via the ECG-1 Input. This may typically be derived from an analogue output on the EP Recording System. The user then can use the EP Recorder to select any source of IECG or surface ECG for triggering, though the IECG is preferred.

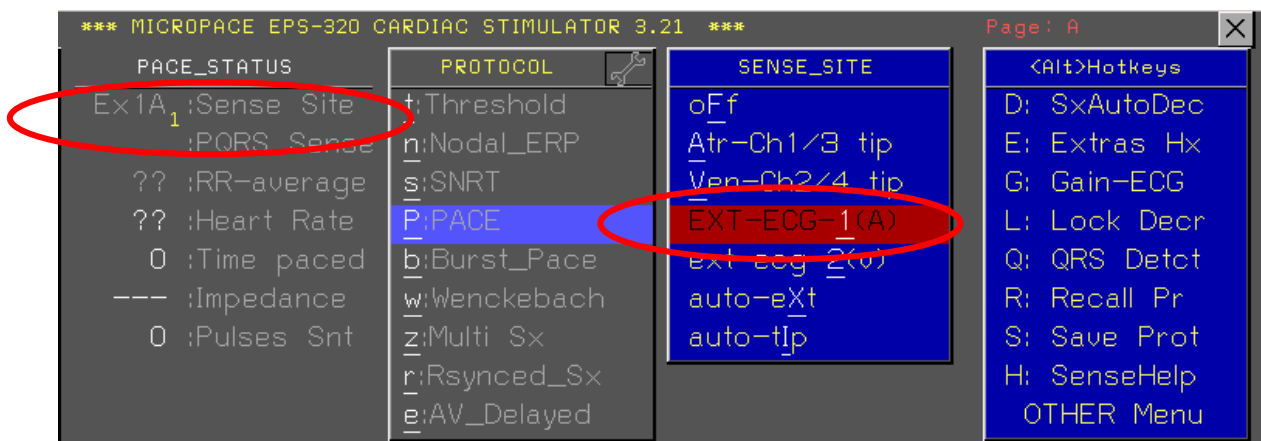
ECG signal source is usually selected to be not from the pacing electrodes, to avoid the large pacing artefacts.. Table 3 summarizes the suggested ECG sensing setup, while Figure 5 shows the schematic. Micropace stimulators have a selectable second external ECG-2 Input, which, if used, may be connected to an alternate ECG signal source.

External ECG signals should be set to intra-cardiac signals for optimum sensing performance; they have no 'T' wave, which can cause double sensing, and RVA probably changes axis less during tachycardia than surface leads.

EP Recording System		EPS320 Stimulator		
ECG Source	RTO Output	ECG Input	Label	Hotkey
HRA	1	ECG-1 Input	EXT-ECG-1	Alt-1

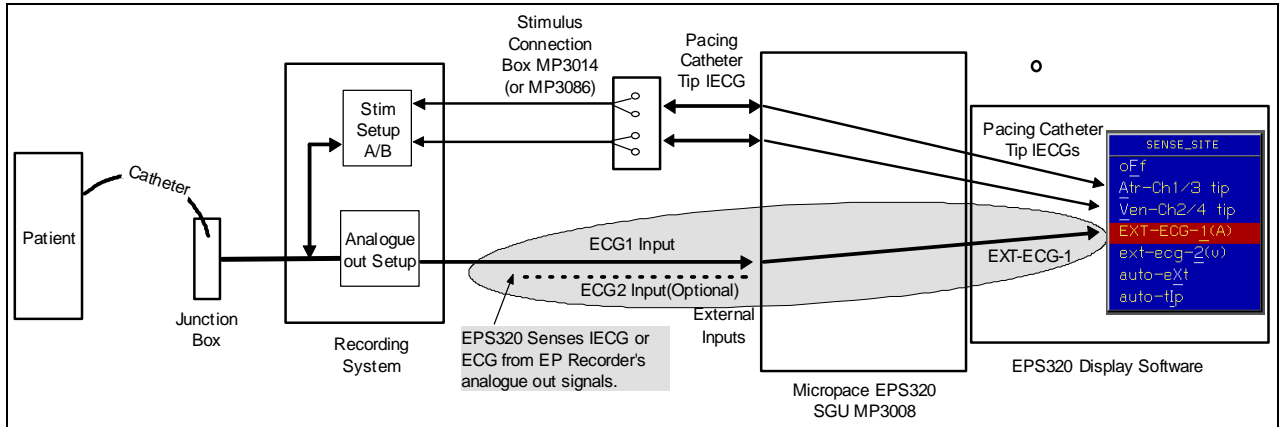
**Table 3 Suggested connections for external ECG sensing.**

To set Sensing to EXT-ECG-1, press Hotkey Alt-1 followed by Alt-S and then select the current Protocol Setup Memory to save setting for this protocol.



**Figure 4 Pace Menu is displayed with ALT key and should be set to EXT-ECG-1 (right); In the Pace-Status display (left), the actual selected sense site indicated as Ext1A<sub>1</sub>, (The subscript 1 indicates the Gain set in Config Menu).**

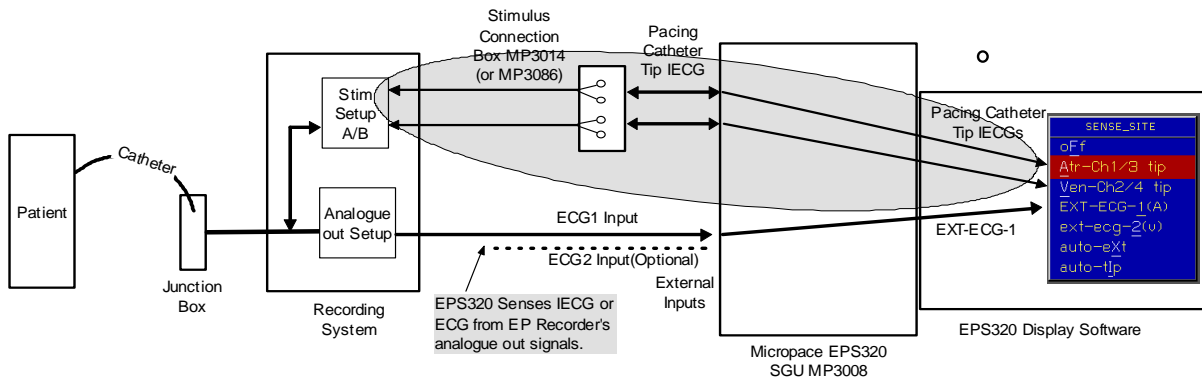
Advanced: If you wish to connect two external ECG inputs, then we recommend that ECG-1 be routinely derived from Atrium and ECG-2 from Ventricle. Then EPS320 sensing setting of AUTO-EXT (hotkey Alt-X) automatically changes ECG inputs according to pacing site – ECG-1 if pacing Atrium (Ch1) or ECG-2 if pacing Ventricle (Ch2).



**Figure 5 External and Catheter-tip ECG sensing schematic – two ECG channels.**

### 7.2.3 Catheter-tip IECG sensing

The EPS320 can also sense from the pacing output channels – amplifying the intra-cardiac signals with appropriate band pass filters. These may be used when no external ECG source is available. It has the disadvantage of being subject to pacing artifacts and pacing electrode charge build up, although the size of these artifacts has been minimized in the EPS320 using special Balanced Charge Pacing. For these reasons, the external ECG is to be preferred. See Figure 6 for the schematic; Table 4 shows the names and hotkeys for these channels.



**Figure 6 ECG sensing setup using Catheter-tip ECG sensing.**

Note that ECG Input setting of AUTO-TIP (hotkey Alt-I) automatically changes IECG inputs according to pacing site – Atr\_ch1-tip if pacing Atrium (Ch1) or Vent\_ch2-tip if pacing Ventricle (Ch2). This may be the preferred setting.

EPS320 Stimulator		
ECG Input	Label	Hotkey
Atrial Channel	Atr_ch1-tip	Alt-A
Ventricle Channel	Vent_ch2-tip	Alt-V

**Table 4 Accessing the catheter-tip ECG sensing.**

### 7.3 Setting Software “QRS Detector” or ECG / IECG electrogram detection

ECG sensing and QRS detection is critical to the functioning of the EPS320 Stimulator, as it is for all stimulators. Please take the time to take the customer through the QRS Detector menu under ‘Alt-Q’ hotkey.

If you use external ECG and customer sets EP Recording System’s Sense channel to a surface lead, then the default settings work well, as their adaptive threshold is required to overcome T waves and prevent double sensing. IECG, however has no T waves and has more variable electrogram complex amplitude, so an absolute threshold may work better – follow instructions in table below.

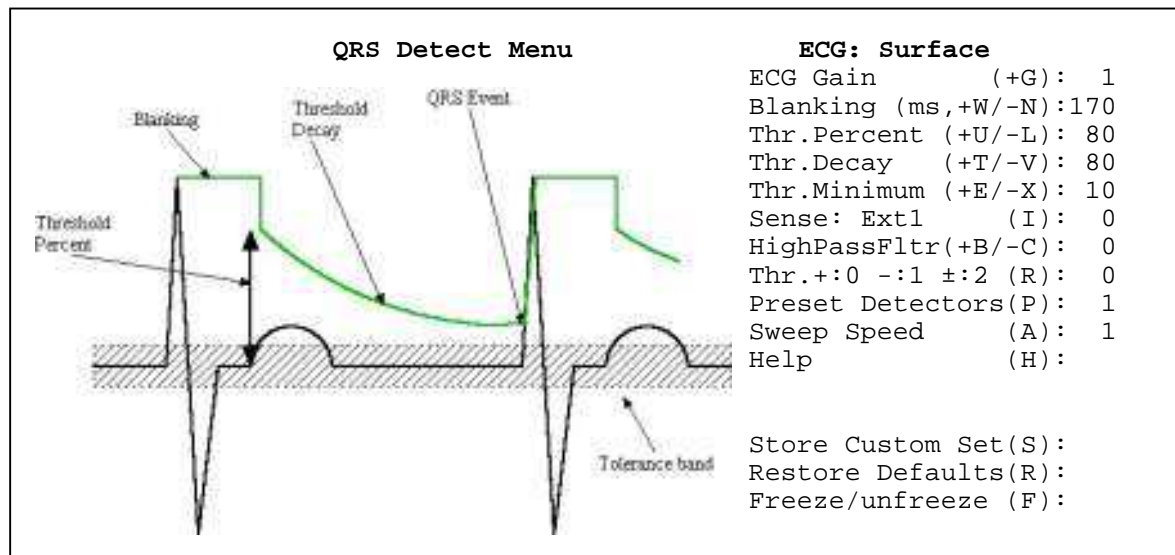


Figure 7 QRS Detect Menu

ECG Source	EP Recorder sense channel set to:	QRS Detect Settings
External	Surface ECG	Normal, Tachycardia or Bradycardia – Adaptive threshold with Percent and Decay required to overcome T wave
External	IECG	Custom, with Less adaptive and more of an absolute threshold may work better – Set Custom to Thr. Percent 30%, Thr. Decay 30, Tolerance 30
Catheter Tip	Does not matter	

### 7.4 Configuring Stimulator defaults

- ❑ The EPS320 is factory preset for two stimulus channel outputs and two external ECG inputs. Warning levels are set to medium and Four Channel Mode to ‘0’ – meaning no StimLink™ or Stimulus Multiplexer Box installed.
- ❑ The two configuration menus, selected with ‘k’ hotkey are protected with the following passwords. The password requirement for the Config menu may be disabled by Config Service *Var-21 En Use of Config Password* in the Service menu (for distributor only). Passwords are case insensitive.

Configuration Menu	Password	Application
Config Menu	'henry' or 4546	User and Distributor
Service Menu	'service' or 9897	Distributor only

- ❑ The stimulator is shipped with Configuration set at factory preset values. Factory preset values may be restored at any time by selecting Config *Var 40 Set Global FACTORY PRESETS*
- ❑ Note that Config Service Vars 2, 12, 17, 22, 28 and 34 are for Micropace R&D purposes and not intended for Distributor to change. They are specifically password protected.

#### **7.4.1 Configure Stimulator Installation:**

Refer to sections on how to configure these:

- ❑ Single Stimulus Channel
- ❑ Single or Two external ECG Channels
- ❑ StimLink™
- ❑ Stimulus Multiplexer Box

#### **7.4.2 Configure Stimulator Preferences:**

It is recommended that you ask the electrophysiologist about their preferred lower safety limits and show them how to change these:

- ❑ Lowest S1 interval in PACE protocol (suggested 230ms). Values adjusted in config menu Hotkey "K".
- ❑ Lowest S1 interval in BURST PACE protocol for overdrive pacing (suggested 180ms).
- ❑ Lowest interval for extra S2-S7 (suggested 120ms).
- ❑ Lowest S1 resulting from automatic decrementation (suggested 280ms).
- ❑ Automation. Determine from user the desired amount of automated decrementation in Nodal\_ERP protocol and Multi\_Sx, the preferred starting currents for threshold in atrium and ventricle, preferred starting S2-S7 in Multi\_Sx and any other variables. Save these default parameters for each protocol to Setup No.1 by pressing "ALT-S" and entering 1". Name this Setup with Doctor's name is appropriate.

#### **7.4.3 Record Configuration**

- ❑ Document all Config variables changed from defaults on the installation worksheet.
- ❑ You can make a backup copy of all files in directory 'c:\stim' onto a USB Flash Stick plugged into the USB Port for you and / or the customer.
- ❑ Service Page contains program maintenance and configuration variables for use by service personnel and program developers. The page is accessible with a special password.

```

+----- EPS320 Ver:3.21      USER - Configuration      Protocol: Pace -----+
  >>PGDN/Enter->Service Page  ---  --3  21 Min.auto Sx for RSync_Sx :      ms
  1 Minimum S1 for PACE       :      ms3  22 Tachy Detect Interval   :      ms
  2 Absolute Min S1, eg BURST:      ms3  23 His-coincident RSynced_Sx:      ms
  3 Minimum Sx (S2-S7)       :      ms3  24 Ectopics Detect Threshold:      ms
  4 Min.auto S1 for ATP       :      ms3  25 Temp Prot.Boosted Current:      -
  5 Min.auto S1 WENCKE/SNRT  :      ms3  26 ECG gain Atrial Chan   :      -
  6 Min.auto S1 for BURST    :      ms3  27 ECG gain Ventric Chan  :      -
  7 Burst -> Overdrive Burst:      -3   28 ECG gain Ext1         :      -
  8 Sound Output Source      :      -3   29 ECG gain Ext2         :      -
  9 F9 %RR Percentage        :      -3   30 Soft QRS Detect Setup  :      -
 10 Sync1out on(Train+1-n)S1:      -3   31 QRS Blanking Time-HWare :      ms
 11 Decr/Incr N'ERP by Table:      -3   32 QRS Sync Timeout      :      ms
 12 W'ke/Brst Autodec'Period:      ms3  33 QRS Sync Dly:0,1-99,>100: -
 13 SNRT Auto Stop          :      3    34 No of Hints ( 13,0=off) :      -
 14 SNRT Duration           :      s3   35 En Square Pace Site   :      -
 15 Repeats Multi_Sx Extra's :      -3  36 Idle Safety Timeout   :      s
 16 En Wencke Log Decrem't'n :      -3  37 Sense Sound           :      ms
 17 En Wencke Beat Decrement:      -3  38 Pace Sound Duration   :      ms
 18 Rate-adaptive Burst S1  :      %3   39 Default Setup No.(1-8) :      -
 19 ATP Intraburst Decrement:      -3  40 Set Global FACTORY PRESET: -
 20 Touch Scrolling of Menu  :      3   41 Initial Input Method  :      -
  
```

1. Minimum S1 for Pace ..... - Minimum allowed S1 value during non-burst, e.g. Pace protocols.
2. Absolute Min S1, eg Burst ..... - Minimum allowed S1 value during Burst, Overdrive Pace, ATP protocols.
3. Minimum Sx (S2-S7) ..... - Minimum allowed S2 to S7 value.
4. Min.auto S1 for ATP ..... - Min. allowed S1 value reached by auto-decrementation in ATP Protocol.
5. Min.auto S1 WENCKE/SNRT- Min. allowed S1 value reached by auto-decrementation in Wenckebach & SNRT Prot.
6. Min.auto S1 for Burst..... - Min. allowed S1 value reached by auto-decrementation in Burst protocol.
7. Burst -> Overdrive Burst..... - Redirect Burst protocol to Overdrive protocol 0= No 1= redirection
8. Sound Output Source ..... - Sound source; 0=none, 1=PC speaker only, 2=External speaker, 3=Both
9. F9 %RR Percentage..... - Sets F9 – S1 = %RR percentage; range 50% to 99%.
10. Sync1out (Train+1-n)S1 ..... - Send Sync pulse on (drive train+1-value) for triggering recorder, (1=last train pulse).
11. Decr/Incr N'ERP by Table... - Decr/Increment in Nodal\_ERP is from Table of values – use INS on parameter
12. W'ke/Brst autodec'Period ... - Interval between auto-decrementation of S1 in Wencke and Burst Pace protocols.
13. SNRT Auto Stop ..... - Pacing stops at end of SNRT timer expiry.
14. SNRT Duration..... - Time to alarm in each SNRT pacing train.
15. Repeats MULTI\_SX Extra's - Repeat VT extra's before decrementing. NB value 2 => 3 repeated trains.
16. En Wencke log Decrem't'n.. - S1 is Auto decremented logarithmically during Wenckebach, i.e. in diminishing steps.
17. En Wencke Beat Decrement - Wenckebach auto-decrementation occurs on every 'TRAIN' no. of stimuli, not time.
18. Rate-adaptive Burst S1..... - Initial S1 in Burst & Overdrive protocol will be thus % of RR interval; 0=disabled.
19. ATP Intraburst Decrement.. - Intra-burst reduction in S1 value, i.e. scanning.
20. Touch Scrolling of Menus ... - Allows sliding of finger on menus..
21. Min.auto Sx for RSync\_Sx.. - Minimum automatically decremented Sx value for RSynced\_SX protocol.
22. Tachy Detect Interval ..... - Sets default tachycardia detect interval for StopOnTachy Pause mode.
23. His-coincident RSynced\_Sx- Sets nominal HV interval for calculating His-coincident S2 (RR-HV).
24. Ectopics Detect Threshold.. - Sets threshold for detecting premature ectopics in as % of RR or in ms.
25. Temp Prot.Boosted Current - Pacing current is boosted by this amount (as mA or %).
26. ECG gain Atrial Chan ..... - Gain for Atrial catheter tip ECG, 1= smallest gain, 4=largest.
27. ECG gain Ventric Chan ..... - Gain for Ventricular catheter tip ECG, 1= smallest gain, 4=largest.
28. ECG gain Ext1..... - Gain for External amplified ECG, 1= smallest gain, 2=largest.
29. ECG gain Ext2..... - Gain for External amplified ECG, 1= smallest gain, 2=largest.
30. Soft QRS Detect Setup ... - Default setup for QRS Detect Menu.
31. QRS Blanking Time-HWare - Minimum Hardware RR detector blanking time – used only if Var 30 is '0'.
32. QRS Sync timeout..... - If no QRS detected by time out, pacing triggered anyway.
33. QRS Sync Dly:0,1-99,>100. - Trigger delay after QRS, in % (if <100) or ( if > =100) RR interval.
34. No of Hints (14,0=off) ..... - Number of Hints on program launch, 0= disable.
35. En Square Pace Site ..... - Enables square buttons for big fingers.
36. Idle safety timeout ..... - Idle keyboard for this time triggers safety standby requiring pressing ESC to cont.
37. Sense sound ..... - Duration of sound made with each QRS sense. (surrogate for loudness).
38. Pace sound Duration ..... - Duration of sound made with each stimulus by PC and SGU (surrogate for loudness).
39. Default Setup No.(1-5)..... - Setup loaded on program launch.
40. Set Global Factory Preset... - Resets all program parameters to Factory presets.
41. Initial Input Method..... - Input device; 1=Both, 2= Touch screen only, 3= Keyboard only.

Note: Press 'h' to obtain further, more detailed help for any variable under the cursor.

**Table 5 Configuration Menu Page**

```

+----- EPS320 Ver:3.21      SERVICE - Configuration      Protocol: Pace -----+
>>PGDN/Enter->Service Page  --- -- 21 En Use of Config Password: 1
1 Output Port- COM(1-4) : 1 22 En Advanced Features : 130
2 Debug_level (0-9) : 0 23 En ECG Simulation : 0
3 QRS Simul' Interval : 7 24 En Plot ECG/RR Times : 2
4 Simulate SNRT/PPI : 0 25 En No SGU mode : 0
5 Simulate Ectopic beats : 300 26 System Upgrade Activation: 0
6 Background Screen Colour: 8 27 En Plot ECG/RR Type : 1
7 Pace (S1) Sound Pitch : 1000 28 Change ecg data file : 0
8 Extras(S2-7)Sound Pitch : 1000 29 StimLink & Four Channels : 0
9 Sense Sound Pitch : 1000 30 En New Prot clears Lock : 1
10 Delay for Capture Detect: 250 31 En Touch Screen : 0
11 Redirect Pace to Channel: 0 32 En Self Calib Detect : 0
12 Enable G-Minus-Increases: 1 33 En Inhibited Mode Warning: 0
13 Alt.Keyboard ↑/↓ -> +/- : 0 34 En TestProgMode- R&D only: 0
14 En Universal Pace Site : 1 35 En Sense Site Warning : 0
15 Sync2out on(Train+1-n)S1: 1 36 Keep Protocols Sx Values : 1
16 Page B Colour : 0 37 En Sx Rounding to 10ms : 0
17 Serial COM3/4 IRQ : 0 38 En Defib Warning : 1
18 En Voltage Display : 0 39 En Manual S1 in Wencke : 0
19 En More Silent Running : 1 40 En Flutter Fib Warning : 1
20 En Keypad Input : 1 41 Input Lockout Duration : 2000 ms
+-----+

```

1. Output Port	- COM port 1-4 to use to communicate with Stimulator.
2. Debug_level 0-9	- For program maintenance/debugging.
3. QRS simul Interval	- RR interval for simulated QRS detect - for demo
4. Simulate SNRT/PPI	- Simulates a delay in post pace interval, 1-9000ms, 0 disables.
5. Simulate ectopic beats	- Simulates ectopic beat every 5 beats with coupling interval equal to this value.
6. Background Screen Color	- Changes background screen color with values from (0-8)
7. Pace (S1)Sound Pitch	- Pitch of sound emits on every S1, value from (50Hz-5000Hz)
8. Extras sound pitch	- Pitch of sound emits on every S2-S7, value from (50Hz-5000Hz)
9. Sense Sound Pitch	- Pitch of sound emitted on every sensed ECG peak. Range 50 -9000Hz. Default 1000 Hz
10 Delay for Capture Detect	- In ms for automatic sensing of capture of ventricle during Multi_Sx protocol
11 Redirect Pace to Channel	- Redirects all channels to just one specified Chan 1-4.
12 Enable G-Minus-Increases	- Makes Grey (numeric pad) '-' key increase (because its on top) & + decrease.
13 Alt.Keyboard - ↑/↓ to +/-	- Change ↑/↓ key meaning from moving active zone on screen to incr / decr variables14
14.En Universal Pace Site	- Enables the keeping of the same pace site for site-uncommitted protocols.
15 Sync2out on(Train+1-n)S1	- Send Sync pulse on (drive train+1-value) for triggering recorder, (1=last train pulse).
16 Page B Colour	- Colour layout for ECG Display Bar for Stimulator B, values 0 to 8.
17 Serial COM3/4 IRQ	- Sets the IRQs for the software to use for serial ports COM3 and COM4.
18 En Voltage Display	- Enable voltage display.
19 En More Silent Running	- Silences QRS sense sound during Keyboard Lockout & disables Sync Timeout sound
20 En Keypad Input	- Enables keypad mapping to support small version keyboard.
21. Enbl use of Config. Passw'	- Password required to enter Configuration menu.
22. Enbl advanced features	- Enables Advanced features, eg. StopOnTachy.
23. Enbl ECG simulation	- Produces simulated ECG trace and QRS sync. For demonstration.
24. Enbl Plot ECG/RR times	- Plotting of ECG trace on screen
25. Enbl no SGU mode	- Enables program operation without Stim Box connected.
26. System Upgrade Activation	- Allows activation of additional software features.
27. Enbl Plot ECG/RR TYPE	- Sets ECG trace type; 0:none, 1:trace only, 2:RR intervals only, 3: both.
28. Change ECG data file	- Allows specification of ECG data input file for emulation of ECG.
29. StimLink & Four Chans	- Sets how 4 Chan implemented – StimLink and Stimulus Multiplexer Box,
30. En New Prot. Clears Lock	- Select new protocol and Auto-Lock is cleared.
31. En Touch Screen	- 1: Touch screen buttons will be displayed and touch function supported
32. En Self Calib Detect	- 1: Software will detect accumulated mis-touches and suggest re-calibration
33. En Inhibited Mode Warning	-Control appearances of "No Interference reversion" message.
34. En TestProgMode	- Enables hotkeys meant for R&D only.
35. En Sense Site Warning	- Sets Warning levels for inappropriate sense site; 0=no warning, 3 = highest
36. Keep Protocols Sx Values	- Remembers existing protocol parameters when changing to other protocols.
37. En Sx rounding to 10ms	- Enable the entry of only the first 2 digits of the Sx intervals
38. En Defib Message	- Control appearances of "Defibrillation Ready?" message
39. En Manual S1 in Wencke	- 0: Manual adjustment of S1 in Wenckebach, 1: auto-decrementation in Wenckebach
40. En Flutter Fib Warning	- Sets level of intrusion of safety limits.
41. Input Lockout Duration	- Configure duration of the Input Lockout (Dual Touch mode only)

**Table 6 Configuration - Service page**



## 8. EPS320 Touch Screen Installation

For hardware installation and troubleshooting guide of the EPS320 Touch Screen Kit, MP3113-GE or MP3113-B, please refer to Touch Screen Booklet part number MP3160.

### 8.1 Compatible Equipment with Touch Screen

The Micropace Touch Screen Kit is compatible with all EPS320B-US or -EU installations containing software versions 3.20+ or 3.21+. Newly shipped EPS320B system will contain the required software Ver 3.21 which works with the Touch Screen.

The Touch Screen Kit is not directly compatible with earlier Micropace systems such as the HP-eVectra based EPS320H, NEC Powermate 2000 based EPS320N or earlier Moniputer-based installations; contact your distributor or Micropace Pty Ltd for a suitable upgrade path.

Compatibility with third party equipment is unaffected.

### 8.2 How Supplied - Touch Screen

R\_PackingList-MP3113-B-TouchScreen\_V1.4.doc

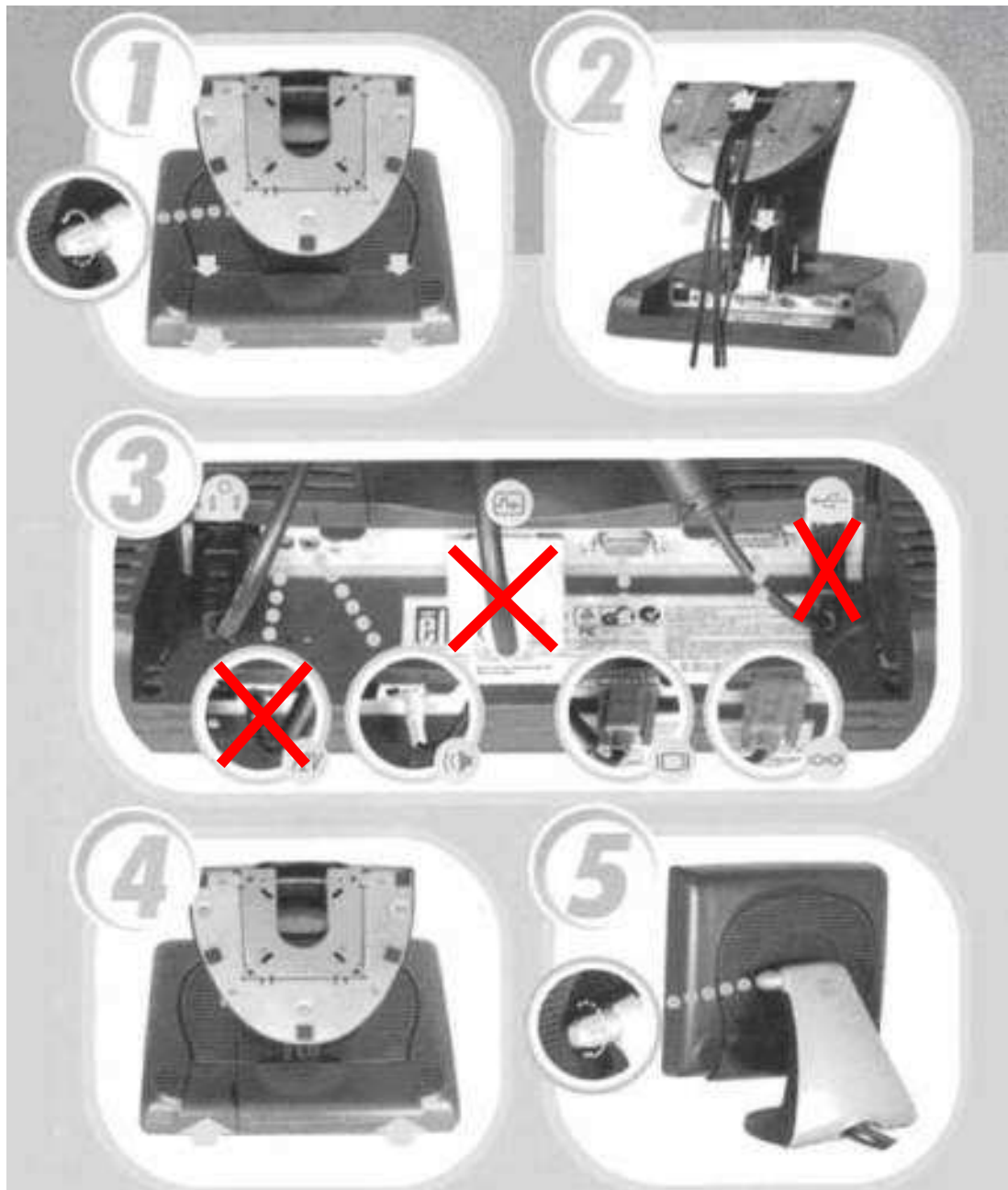
Touch Screen Kit - MP3113-B		
Item	Part No.	Qty
ELO Touch Screen & accessories:	MP3114	1
Touch Video Cable, 2 m	MP3114-3	1
Touch screen Serial Cable, 2 m	MP3114-1	1
Speaker Cable, 2 m	MP3114-2	1
Universal Cloverleaf IEC mains power connector lead IEC320 – C5 to C14	MP3158	1
Touch Screen Instruction Manual	MP3160	1
Touch Screen Stylus and holder	MP3133	1
Touch Screen Quick User Guide	MP3136	1

### 8.3 Quick Installation Guide - Touch Screen

1. Interconnect ELO Touch screen with EPS320 as per Figure 9 below.
2. Ensure all mains power supply is medically isolated.
3. Power up PC and follow the instructions to calibrate the ELO Touch screen. Make sure you calibrate it at the operator's sight level to the touch screen, using a stylus.
4. Launch software, invoke Configuration Menu with hotkey 'k' and password 'henry' or 4546, PGDN to Service menu, password 'service' or 9897, and set Config Service Variable 31 'En Touch Screen' to value '1'.
5. Ensure that Config Variable 41 'Initial Input Method' is set to value '1' to enable both Touch Screen and Keyboard inputs on program launch.
6. Modify Safety parameters in Config Menu as per customer preferences.
7. Modify each Protocol's parameters according to customer preferences and save each.
8. Verify correct installation by rebooting PC and using touch screen to select protocols and start / stop pacing.

### 8.4 Installation

Unpack the kit and interconnect the ELO Touch Screen as shown in photo below. Note that the original manufacturer DVI Video and USB cables have been removed, as unnecessary. Use the supplied, VGA, sound, serial and power cables to connect the touch screen monitor. This monitor must only be powered via the Micropace isolation transformer MP3107 and never directly to the mains power supply.



**Figure 8: ELO Touch Screen Connections – Installation Diagram**

Connect this touch screen to the EPS320B system as shown in Figure 9. Ensure that the ELO Touch Screen RS232 cable connects to COM2 on the Bona Light PC, as COM1 is reserved for connection to the SGU (*take care not to use the MP3033/MP3033A cables for the Touch screen, which physically fit but will not work*). Connect also the keyboard, as you will need it to enter alpha keys if you want to rename Protocol Setups or Stim Channel names. The keyboard may then be stowed away during routine use of the stimulator.

**WARNING:**

Ensure also that all mains power for the system is derived from medically isolated mains; this includes any external mains-powered speakers you might add.

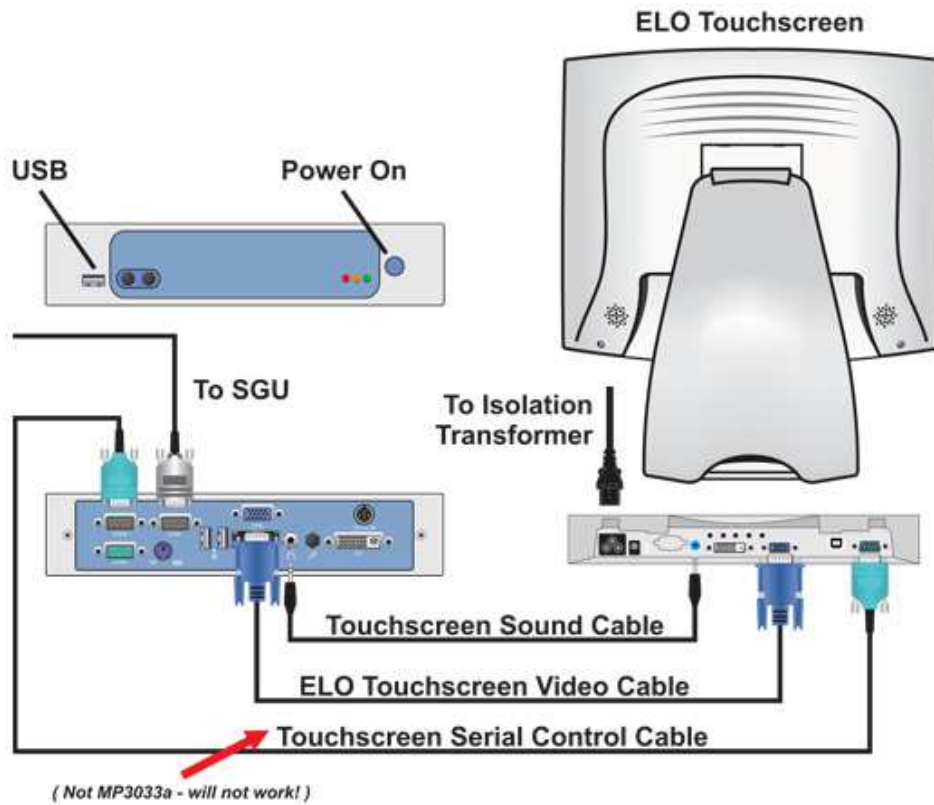


Figure 9: Connection of One Display Touch Screen kit to the EPS320B.

### 8.5 Connections to and configuration of EP Recording equipment

The Touch screen configurations do not alter the connections to third party EP Recording equipment.

## 8.6 Touch Screen Configuration

### 8.6.1 Touch Screen Calibration

On the first launch of stimulator software, the software will prompt to calibrate the touch screen. Select 'Yes' to proceed with the calibration. Follow the instructions carefully.

Make sure that you calibrate the touch screen at the operator's sight level to the touch screen, using a stylus. Once the calibration procedure has been completed, the EPS320 software will respond to each user touch.

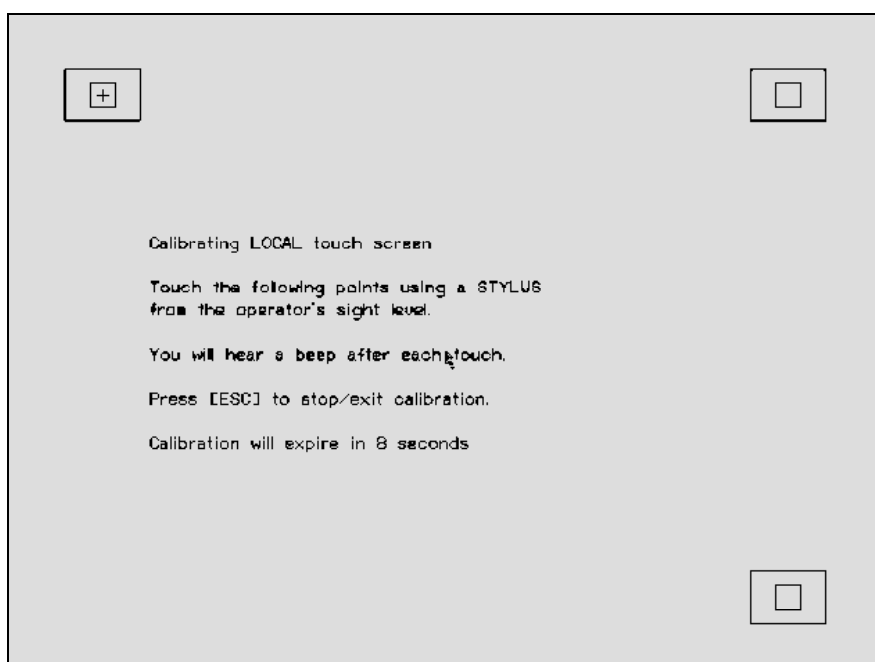


Figure 10 Touch screen calibration

#### Troubleshoot:

If software has not been pre-configured for touch screen the above situation will not occur.

To resolve:

- ❑ Invoke Configuration Menu with hotkey 'k' and password 'henry' or 4546
- ❑ Set Config Variable 41 'Initial Input Method' to value '1' to enable both Touch Screen and Keyboard inputs on program launch.
- ❑ PGDN to Service menu, password 'service' or 9897, and set Config Service Variable 31 'En Touch Screen' to value '1'.
- ❑ On exit of Configuration Menu, the software will prompt to calibrate the touch screen. Select 'Yes' to proceed with the calibration. Follow the instructions carefully.

## 8.7 Verifying installation

When correctly installed, menus and buttons as displayed on the screen will respond to each user touch. Touching the PAGE On/Off button on the bottom center of the screen starts/stops pacing.

## 9. StimLink™ Installation

The StimLink™, MP3096 is an optional cable which replaces the MP3033/MP3033A and also connects an opto-coupled one way data link from the EPS320 PC COM1 port to the EP Recording System COM port.

### 9.1 Warnings and Precautions

**Warning: To avoid stimulation at an undesired pacing site**, when using the StimLink, always verify the final Stim Setting on the EP Recording Equipment before stimulating. The StimLink allows automatic changing of EP Recording Equipment Stim Setup according to Stimulator output channel, however, actual stimulation site may become different to that on the Stimulator if user manually changes the EP Recording Equipment Stim Setup. DO NOT stimulate the patient until confirming that the stimulation site on the EP Recording Equipment is appropriate.

**Caution: To avoid recording incorrect procedure data in the patient's record**, always verify the EP Recording Equipment Log to be an accurate record of the EP study prior to release of the procedure report.

### 9.2 Compatible Equipment with StimLink™

The StimLink™ Kit is compatible with EPS320 Software Version 3.19 or later and EPS320 SGU Firmware 4.68 or later.

The StimLink™ Kit is compatible with Micropace Four Channel Stimulus Multiplexer.

The Bard LabSystem™ Pro™ is suitable for and has been verified to interface with the StimLink™. Refer to the Bard LabSystem™ Pro™ documentation and on-line help for further details.

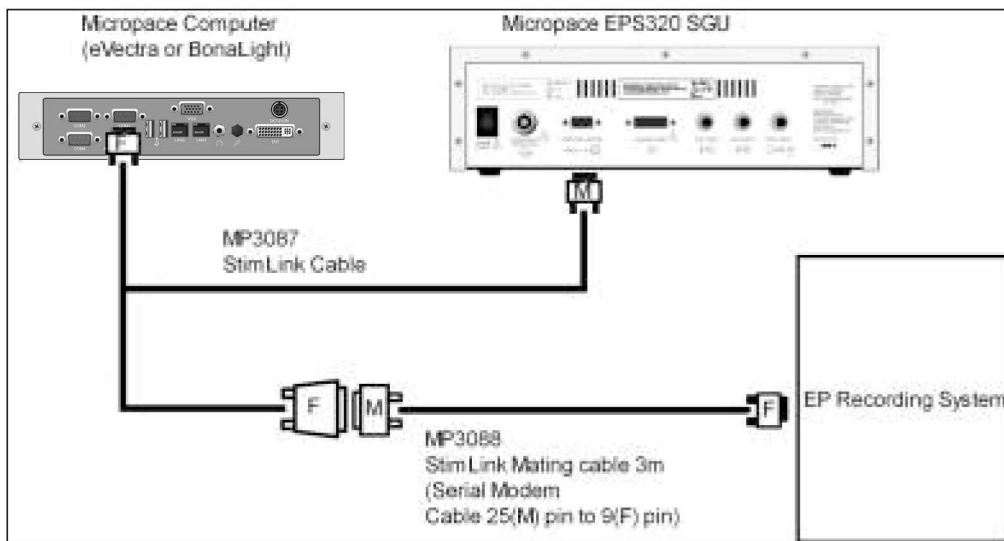
### 9.3 How Supplied - StimLink™

Packing List:

StimLink™ Kit		
Item	Part No.	Qty
StimLink™ Cable	MP3087	1
StimLink™ Mating Cable	MP3088	1
StimLink™ Instruction Booklet	MP3100	1

## 9.4 Connecting the StimLink™ to the EPS320 system

1. Unpack Contents of Kit and verify contents against Packing list. Inspect items for damage – do not use any damaged components.
2. Verify that the EPS320 and EP Recording System are compatible with the StimLink™ according to Compatible Equipment section above.
3. Replace existing RS232 Cable MP3033/MP3033A connected between the EPS320 PC and the SGU with the StimLink™ Cable MP3087 using its two DB9 connectors. Connect the StimLink's Mating cable MP3088 between the StimLink's DB25 connector and the EP Recording System RS232 port (see Figure 11).



**Figure 11 StimLink™ data link with EP Recording System.**

4. Configure the EPS320 to StimLink™ output by setting Config Service *Var-29 Four Channel Mode* to 2, or 3 if the Four Channel SMB is also installed.
5. Configure the EP Recording Equipment to StimLink™ mode (refer to its documentation) and customize its settings for the required stimulation protocols and channels.
6. Verify operation of the PC-SGU communication by commencing stimulating and verifying that stimulus LED's on the SGU (Atrium and Ventricle) light with each stimulus.
7. Verify StimLink™ operation by changing the Protocol on the EPS320 and observing an appropriate change on the EP Recording System.

The EPS320 detects the presence of the StimLink™ DB9 connector connected to the PC COM Port, through a link within the connector; no other connections are tested by this sensor. You will be warned by the software on bootup if Config Service *Var 29 Four Channel Mode* is configured for StimLink™ and no StimLink™ hardware is found, or if StimLink™ hardware is found and Var 29 is not configured to use it.

## 9.5 Configuring the StimLink™

The StimLink™ is configured along with the Four Channel Stimulus Multiplexer (SM) Box via Config Service *Var-29 Four Channel Mode Stimulation*, due to its function in implementing virtual four channel stimulation.

Set the Config Var-29 Variable to value 2 if no SM Box installed (most cases) or value 3 if SM Box installed and intended to be used.

### Var\_29. Four Channel Mode Stimulation

- ❑ This parameter sets the way EPS320 implements pacing into four channels.
- ❑ EPS320 has only two (2) physical Stimulus Generators, so four channels are created by switching 2 into 4 as needed either in the EPS320 or in the EP Recording Equipment Stim Channel selector. The system is therefore limited to stimulating only one or two channels at a time.
- ❑ Values:
  - 0: No Four Channel mode. Ch3 and Ch4 are simply directed to Ch1 and Ch2 outputs respectively. No special Channel programming commands are issued.
  - 1: Multiplexed Mode - SM-Box installed. Suitable for EP Recording Equipment equipped with four (4) stim channel physical inputs (E.g. GEMS-Prucka CardioLab™). The four Stim Channels Ch1-4 are created in the EPS320. Stimulus Multiplexer Box (SM-Box) to appear on its four output ports Chan1-4.
  - 2: EP Recording System Link Mode - StimLink™ installed Suitable for recording equipment equipped with two (2) stim channel physical inputs and StimLink™ software as well as the StimLink™ cable. (E.g. Bard EP LabSystem™ Pro™, Windows 2000). User selection of Ch1-4 in the EPS320 is communicated to the EP Recording Equipment which automatically selects corresponding Stim Set A or B as required. E.g. Ch1 and 2 use Stim Set A and Ch3 and 4 use Stim Set B.
  - 3: Both Multiplexed Mode and EP Recording System Link Mode enabled, for systems equipped with the Stimulus Multiplexer Box (SM-Box) and the StimLink™.
- ❑ Default is 1, Range 0 to 3.
- ❑ Multi-channel limitations - the EPS320 can stimulate:
  - (i) Simultaneously Ch1+Ch2 or Ch3+Ch4,
  - (ii) In A-V Delayed manner, Ch1 (A) and Ch2 (V)
  - (iii) In Three Channel mode Ch1-Ch2-Ch3 (with SM-Box).

## 10. Four Channel Stimulus Multiplexer Box (SM-Box) Installation

This is an optional item supplied as a kit, which includes an instruction manual.

### 10.1 How Supplied

Stimulus Multiplexer Upgrade Kit- MP3091		
Item	Part No.	Qty
Stimulus Multiplexer Box (SM-Box)	MP3086	1
SM-Box Control Cable (2m long 15 pin 'D' Con.)	MP3089	1
Instruction Booklet (this booklet)	MP3092	1
Test LED, Yellow/Red	MP3058	1
<b>Optional items (ordered specifically):</b>		
Extended SM-Box Control Cable (15m)	MP3090	1
Extension Stimulus Connection Cable (8m, 13m, 17m )	MP3070-XX	1

### 10.2 MP3086 Stimulus Multiplexer Box (SM-Box)

This connection box provides stimulus outputs.

A Stimulus Extension Cable (MP3070-08, MP3070-13 or MP3070-17) obtained from Micropace may be used with the Stimulus Connection Box. Refer to the Installation Procedure.

**Emergency Bypass:** In case of real or apparent failure of the Stimulus Multiplexer Box, and need for urgent pacing, use Emergency Bypass Feature on front panel, ensuring that you set the software to pace Ch2-Ventricle or use the Emergency Pace (F12) protocol.



Figure 12 The Stimulus Multiplexer Box

**Warning:** In order to prevent reduced effectiveness of RF ablation and potential induction of arrhythmias, use only supplied SM-Box (Micropace Part MP3086) or Stimulus Connection Box (Micropace Parts MP3014) components to connect Stimulator output to patient circuits. These components contain RF suppression filters to prevent large RF energies from RF Ablation equipment not equipped with RF filters from reaching the Stimulator output circuits. Use of other, including custom made connectors may bypass RF filtering and potentially lead to repeated alarms and shutdowns of the Stimulator and possible induction of unintended life-threatening arrhythmias during delivery of RF ablation energy.

#### 10.2.1 MP3089 SM-Box Control Cable

This cable provides control communication connection between the SGU's Auxiliary port and the SM-Box. It is a straight through DB15 pin cable.

#### 10.2.2 MP3058 Yellow/Red Test LED

This is a helpful test jig consisting of a yellow and a red LED wired in parallel and terminated in a red(+ve) and a black(-ve) 2mm banana plug. It may be useful in testing for the presence of stimulus output at the Stimulus Connection Box or at the patient interface connector. Connect red plug to



positive and black plug to negative pacing output terminals. Pace at 10mA to 20mA for brighter indication. Yellow LED flashes when pacing with correct polarity; red LED flashes when pacing but with incorrect polarity.

This is intended for testing system installation and as an aid to diagnosing the location of faults when a failure to pace problem arises. See Installation Procedure document and Troubleshooting section of User Instruction Manual.

Refer also to Section: 11.2 Procedure for verifying stimulus circuit integrity.

### 10.3 Interconnecting the SM-Box components

## Stimulus Connection Options for Micropace EPS320 Family Cardiac Stimulators

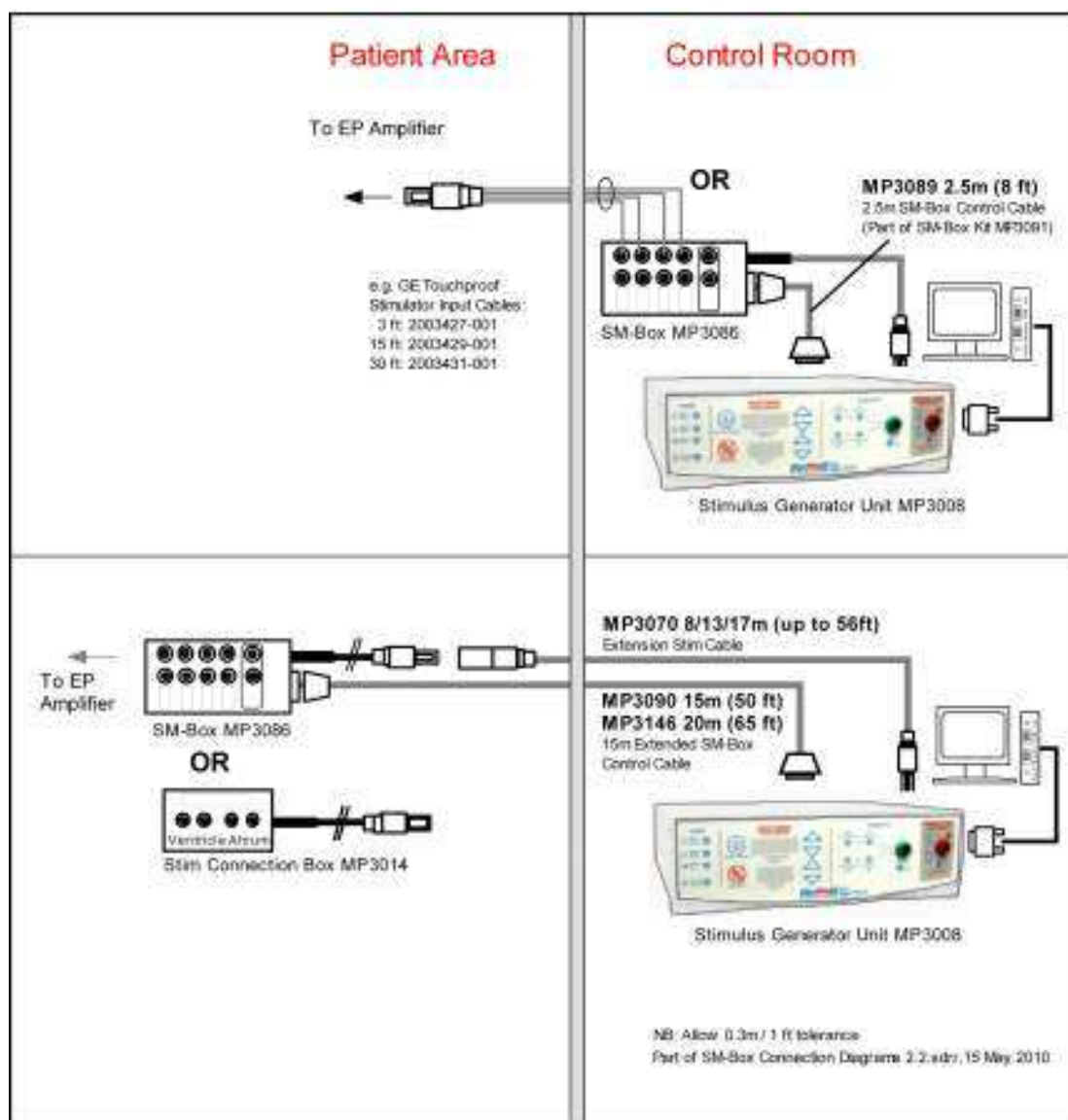


Figure 13 Interconnecting the SMB (for longer routing distances, refer to Sect 1.3 above)

Connect Stimulus Multiplexer Box (SMB) to the Stimulus Generator Unit (SGU) as shown in Figure 13. Insert the green four pin plug into the green stimulus output socket on the front of the SGU and use the SM-Box Control Cable (MP3089) to interconnect the 15 pin socket on the SMB to the 15 pin Auxiliary Port on the rear of the SGU.

If the SMB is required to be located remotely to the SGU, use the two optional extension cables obtained from Micropace by request (MP3090 Extended SM-Box Control Cable and MP3070-XX Extension Stimulus Connection Cable). The SMB requires connection of two shrouded 2mm banana plugs for each channel.

---

#### **10.4 Configuring the EPS320 Software for the SM-Box**

Launch software as per EPS320 User Instruction Manual. Edit the Service Configuration Menu (hotkey 'k' password: 'henry', then PGDN, password: 'service') *Var 29 Four Channel Mode* to value '1', or if StimLink™ is also installed then value '3'. Focus on variable with arrow keys and press 'h' to obtain help text if necessary. If SMB is not connected or software not configured for the SMB as above, then a message will appear informing you of the problem and how to rectify it.

## 11. Stimulator Testing and Acceptance

### 11.1 Testing basic function of the System

1. **Test stimulus output at patient terminals:** Insert Stimulus Test LED into the EP Recording Equipment's bedside catheter junction box - choose two arbitrary outputs. Configure the EP Recording Equipment to stimulate those outputs from the atrial stimulation channel. Commence pacing into the Atrium and ensure that Stimulus Test LED lights with pacing. Yellow light indicates that the stimulus pulse is positive at the red connector and negative at the black one. (Red light indicates the opposite wrong polarity). Next configure EP Recording Equipment to stimulate 2 other outputs for the Ventricular pacing channel and move the Test LED to those outputs; commence pacing the Ventricle and again ensure that Test LED's light. If 'Check Lead' lights on the SGU front panel or Software indicates 'High Impedance' during pacing –this indicate an open connection in the circuit – check connections and EP Recording Systems Stim Channel setting.
2. **Configure ECG output from EP Recording Equipment.** ECG sensing is the commonest cause of complaint, so you are strongly advised to follow instructions here and below. Connect your ECG simulator to the EP Recording System. Configure EP Recording System to output ECG lead of your choice into the ECG output socket into which you have plugged the EPS320 ECG cables. If your ECG simulator does not have intra-cardiac simulated signals, we suggest configuring: Lead V1 -> channel 1 and Lead III -> channel 2. Suggested permanent setup should be HRA -> channel 1, RVA -> channel 2. Refer to separate section on ECG Sensing Options and QRS Detection below.
3. **Configure Stimulator to accept ECG input,** preferably from external signals ECG1\_Ext and ECG2\_Ext according to paced channel, by pressing Alt-x. On the computer screen, an ECG trace should be seen on the Pace Display Bar, white vertical bars will appear above the ECG indicating detected PQRS complexes and a heart shape should flash in the Status Box indicating the same detected QRS complexes. Note: The green LED on the Stimulus Generator Unit labelled 'QRS' does not light with normal Stimulator configuration
4. **Sync Output:** If your EP Recording System has a Stim Detect channel, stimulus trains and their termination will be automatically detected and you can skip the rest of this paragraph. In older installations requiring a trigger input to the EP Recording System, connect sync output of the Stimulator to sync/Trigger input of EP Recording System and configure the Recording System to trigger on that external trigger. Press "N" for nodal ERP study and ensure that the Train parameter (top left hand menu) is set to 8. Commence pacing by pressing Spacebar. Sync output pulse should be issued on the 8<sup>th</sup> drive train stimulus and EP Recording System analysis screen should trigger and sweep at that time. A red line at top of Pacing Display Bar indicates a Trigger output. Sync is also issued on stopping pacing in PACE, SNRT, and BURST protocols and on 8<sup>th</sup> train stimulus in Multi\_Sx. It can also be configured to trigger on ectopic beats in the ECG. Refer to User Instruction Manual. If no trigger is seen ensure that stimulator is configured to issue sync pulse on the 8<sup>th</sup> of eight drive train stimuli (i.e. enter configuration screen by pressing "K", change Sync1out variable (No 10) to a value of 0 if it isn't already (Value of 1 -> on 7<sup>th</sup>, value of 2 -> 6<sup>th</sup> etc). Exit configuration by pressing "Esc").

### 11.2 Procedure for verifying compatibility of EP Recording Equipment

Requirements for compatible EP Recording Systems are listed in Section 1.2 Compatible equipment above.

Where the EPS320 stimulus output is routed through third party equipment, compatibility of the overall stimulation circuit including the third party equipment may be checked by stimulation into the Micropace Test LED (MP3058) at low



and high current values and verifying the EPS320-measured impedance as per the following picture and procedure steps:

Procedure Step	Expected Result	Interpretation of variant results
1. Place Micropace Test LED (MP3058) into Channel A.	N/A	N/A
2. Set Current for Chan A to 0.6mA and start pacing.	Impedance display should be $2800 \pm 150$ Ohms.	If impedance is less than 2650 Ohms, then a pacing circuit has an unacceptable parallel resistance, which will reduce delivered stimulation current to the patient (e.g. impedance of 2300 Ohms suggests presence of a parallel resistance of 2500 Ohms, which will reduce actual delivered stimulation current by nearly 30% compared to indicated value for a 1000 Ohms catheter / patient resistance).
3. Set Current for Chan A to 25mA and start pacing.	Impedance should read $70 \pm 20$ Ohms.	Impedance values higher than 90 Ohms indicate presence of a series resistance in the circuit, which will limit the maximum deliverable stimulation current. (e.g. an impedance of 600 would indicate about 500 Ohm series resistance, and maximum actual deliverable current will be reduced to 16mA).

### **11.3 Biomedical Engineering Acceptance**

Where the EPS320 forms a part of an interconnected system of equipment other than an EP Recording System or where it is installed remotely to the patient using permanently installed stimulus extension cables – MP3070-XX, the installation must be acceptance tested by Biomedical Engineering or equivalent for acceptability of summed mains leakage currents, and patient circuit earth leakage currents measured at the bedside catheter connection box according to IEC60601-1, UL2601-1 or equivalent.

## 12. Troubleshooting the Stimulator Installation

### Micropace Stimulator software does not start on turning on the computer.

- (i) If computer does not respond to the keyboard, check all cable connections and then power down and power up the computer. If the computer still does not respond then the computer may need repair.
- (ii) If the computer displays that an error was detected during launch, see Figure 14. Select Option 2 to execute program recovery. On the next display, see Figure 15, select option 1 to restore the software. Continue this process until all options have been utilised. If issue is not resolved after executing all recovery options, then the computer is faulty and may need to be replaced.

```

ERROR MESSAGE: EXIT-ERROR 01
An error has been detected in the program and the Stimulator cannot be
used.

You must contact your distributor or Micropace (support@micropace.com.au)
to report this error and have Stimulator serviced.

The distributor representative may attempt to recover by choosing the
first option and if unsuccessful the second option in the following
Recovery Menu:
Press any key to continue . . .

----- Recovery Menu -----
 1  Relaunch program
 2  Execute program recovery

"Choose an option "[1,2]?"

```

Figure 14 Error Detected Display

```

----- MICROPACE P/L EPS320 CARDIAC DIAGNOSTIC STIMULATOR -----
RESTORE MENU

Please choose the following options:

 1  Attempt to restore your last known good configuration
 2  Reinstall Program with your last known good configuration
 3  Reinstall Program with factory default configuration

We recommend selecting the options in a consecutively manner.

"Choose an option "[1,2,3]?"

```

Figure 15 Restore Menu Display

- (iii) If the DOS prompt is present, type:

```
'cd c:\stim' <Enter>
```

```
'stim3' <Enter>
```

If this causes the software to launch, then the autoexec.bat file in the computer has probably been altered. Re-installing the software will probably fix the problem. Do this by typing 'c:\stim\factback\reinstal' <Enter> and following its on-screen instructions. If issue is not resolved, then the computer is faulty and may need replacement. **Note: User configuration will revert to default settings.**

#	Problem	Suggested action
1	No power to SGU – External Power Supply connected and SGU front panel Mains Power LED lit orange, despite Power Switch On.	1. Normally Orange Light indicates External power connected but SGU turned Off. Replace power switch cable assembly (MP3200).
2	No ECG on EPS320 screen, patient is connected.	<ol style="list-style-type: none"> <li>1. Select Alt-I, i.e. sense from catheter tip of paced electrode – this should always show an ECG if adequately placed in the heart.</li> <li>2. If using External ECG inputs, verify connection and settings on EP EP Recording Equipment</li> <li>3. Verify that ECG is indeed connected into the ECG inputs, and not the Sync Output on the rear of the SGU.</li> </ol>
3	ECG Sensing not triggering Stimulation correctly.	<ol style="list-style-type: none"> <li>1. Verify that the EPS320 ECG simulation is not enabled (used for Demo) – Config Service <i>Var 23 En ECG Simulation</i> should be 0.</li> <li>2. Sense site possibly from wrong channel / cardiac chamber – verify that sensing is from correct EP Recording System channel and cardiac chamber – Using catheter-tip sensing (hotkey Alt-I) ensures of this; with external ECG check Channel assignments on the EP Recording Equipment.</li> <li>3. Some EP Recording Systems, e.g. older DOS version Prucka CardioLab outputs ECG from a specified displayed channel – changing Recording System’s ‘Page’ may change the outputted ECG channel.</li> </ol>
4	No pacing	<ol style="list-style-type: none"> <li>1. If High impedance showing – see below.</li> <li>2. If normal impedance, check measured impedance on display – if &lt; 100, look for short in the system – also may be set to the same electrode on Stim Setup on EP Recording System; if impedance &gt; 2000, look for faulty equipment in line with the stimulus circuit, eg. RF Ablation switch box. Connect Test LED to the Stimulus Connection Box and verify that EPS320 functions OK.</li> </ol>
5	High impedance observed when pacing	<ol style="list-style-type: none"> <li>1. Check continuity of pacing catheters, replace catheters if open circuit found. NB continuity may be checked by demonstrating presence of stimulus at a particular site with the Test LED’s supplied by Micropace.</li> <li>2. Check correct Stim Setup on the EP Recording System.</li> <li>3. Check continuity of stimulus cable from Stimulus Connection Box to EP Recording System.</li> <li>4. Check continuity of Stimulus Connection Box, if discontinuity found, replace Stimulus Connection Box.</li> <li>5. Open SGU and check continuity of pacing output cable assembly (MP3206). Replace MP3206 if discontinuity found.</li> </ol>
6	Cross-talk problem, Stimuli on contra-lateral channel to the one being paced.	<ol style="list-style-type: none"> <li>1. Check stimulus connection box continuity between channel, e.g continuity between ventricle (+) between atrium (+), if shorted replace stimulus connection box</li> <li>2. For correct stimulus connection box continuity, check continuity between SGU and stimulus connection box,</li> </ol>
7	Emergency Fixed Rate pacing does not work, on connection to patient.	<ol style="list-style-type: none"> <li>1. Plug Stimulus Connection Box into Emergency Fixed Pace Output socket, with a resistor (0 Ohms to 0.5 MOhm ) across Ventricle channel.</li> <li>2. If battery OK light appears only briefly or weakly, then replace 9V Lithium Battery.</li> <li>3. If no lights or sound is produced, check 9V Lithium Battery and replace if discharged; else check continuity of emergency output pacing cable assembly (MP3207), if discontinuity found, replace MP3207.</li> <li>4. If MP3207 continuity is correct and the POST test can measure correct emergency battery voltage, replace mother board PCB.</li> </ol>

## 13. Essential Customer Training

1. **User Instruction Manual.** You must inform the electrophysiologist and technician who will be using the stimulator of the safety features of the stimulator and direct them to the relevant sections in the User Instruction Manual where safety warnings are listed.
2. **Demonstrate Help feature**, including diagrams. Explain Safety Diagram as an aid to safety items below. Help/ 4.Diagrams/ 6.Safety Guide is a useful diagram for this.
3. **Demonstrate Emergency Pacing key.** While Stimulator is in normal PC control mode and in any protocol, press F12 / Red First Aid cross symbol on keyboard to demonstrate Emergency Pace protocol whereby both channels are immediately paced.
4. **Manual Backup Pacing Mode** - The Stimulus Generator Box adopts this Backup Manual mode if user presses the 'BACKUP ENABLE' button or if the Box loses communication with the computer. Demonstrate it by pressing the 'BACKUP ENABLE' button on the Stimulator and then pressing 'PACE ON/OFF' button. Red numerals appear in the 'Current' and 'Pace Interval' windows on the Stimulator Box and pacing commences. Settings may be adjusted with up/down arrow buttons. Pacing is always into both channels. Hit [Enter] on the computer to re-enter PC Control mode. You may demonstrate the automatic adoption of this mode by disconnecting the Serial Communications cable while in the PC Control Mode.
5. **Demonstrate Fixed Rate Emergency Pacing Mode.** Instruct the User that should the Stimulus Generator Unit appear to fail itself, use the Emergency Fixed Pacing mode. SGU failure may be indicated typically by absence of lighting of ATRIUM or VENTRICLE green indicator lights with pacing and absence of stimulus artefact on patient's ECG even in SGU Backup Manual mode. To demonstrate this feature, connect Stimulus Test LED, MP3058 to Stimulator Output on the Ventricle Channel (e.g. on the Stimulus Connection Box) and on the SGU front panel, remove the Stimulus Connection Box's green connector from the green Pace Output socket and insert it into the red Emergency Fixed Pace Output socket. The self-contained emergency circuit will commence pacing at 100 paces per minute, 5mA and 2ms (it detects presence of load resistance on the output commences pacing automatically).

## 14. Installation Follow-up

- You must arrange to be present at the first use of the Stimulator with a patient to fully demonstrate stimulator and ensure trouble free EP study.
- Telephone or return after one week of clinical use of stimulator to check on performance and answer any questions.

## 15. Packing Lists & Connection Diagrams:

**Configuration: EPS320B-EU**
**Serial No. :**


<b>EPS320B-EU STIMULATOR &amp; PC CARTON</b>			
<b>Item</b>	<b>Part No.</b>	<b>Qty</b>	<b>Packed</b>
Isolation Transformer Box:			
Isolation Transformer	MP3107	1	
Accessories Box:	MP3055	1	
Power Supply for SGU only	MP3074	1	
Stimulus Connection Box with RF Filter	MP3014	1	
Isolation Transformer Power Lead, according to Country	MP3059EU	1	
Cable Serial Boost RS232	MP3033A	1	
Isolated Mains Power Lead, IEC 3 to 2 Pin- EU Style	MP3066EU	1	
Cable Signal – 6mm Phono-plug terminated	MP3034	1	
Signal Cable, BNC to Phone plug	MP3109	1	
Isolated Mains Power Lead (IEC3 to 3 Pin)	MP3030	1	
Accessories Booklet	MP3064EU	1	
Installation Kit:	MP3063	1	
Keyboard with key labels	MP3016	1	
Bona Light PC Computer	MP3093	1	
Power Supply for Bona Light PC	MP3335	1	
Stimulus Generator Unit (SGU)	MP3008	1	
Documentation:	-		
User Instruction Manual	MP3395	1	
Installation Procedure Booklet	MP3069	1	
Manufacturer's Test Certificate	-	1	
Summary of Hotkeys	-	1	
Language Support Pack (includes MP3332)	MP3149	1	

R\_Packing List-EPS320B-EU3.1.doc

<b>NEC LCD Screen Carton</b>		
<b>Item</b>	<b>Part No.</b>	<b>Qty</b>
LCD Display (Micropace Part No. MP3076)	LCD52V	1
Video Signal Cable (Part of Micropace No. MP3076)	-	1
NEC LCD Screen Instruction Manual	-	1
Isolated Mains Power Lead, (IEC 3 to 3 pin)	MP3030	1

PackingList-NECMonitor-MP3076-V3.0.doc-27.04.06



Configuration: EPS320B-US

Serial No. :

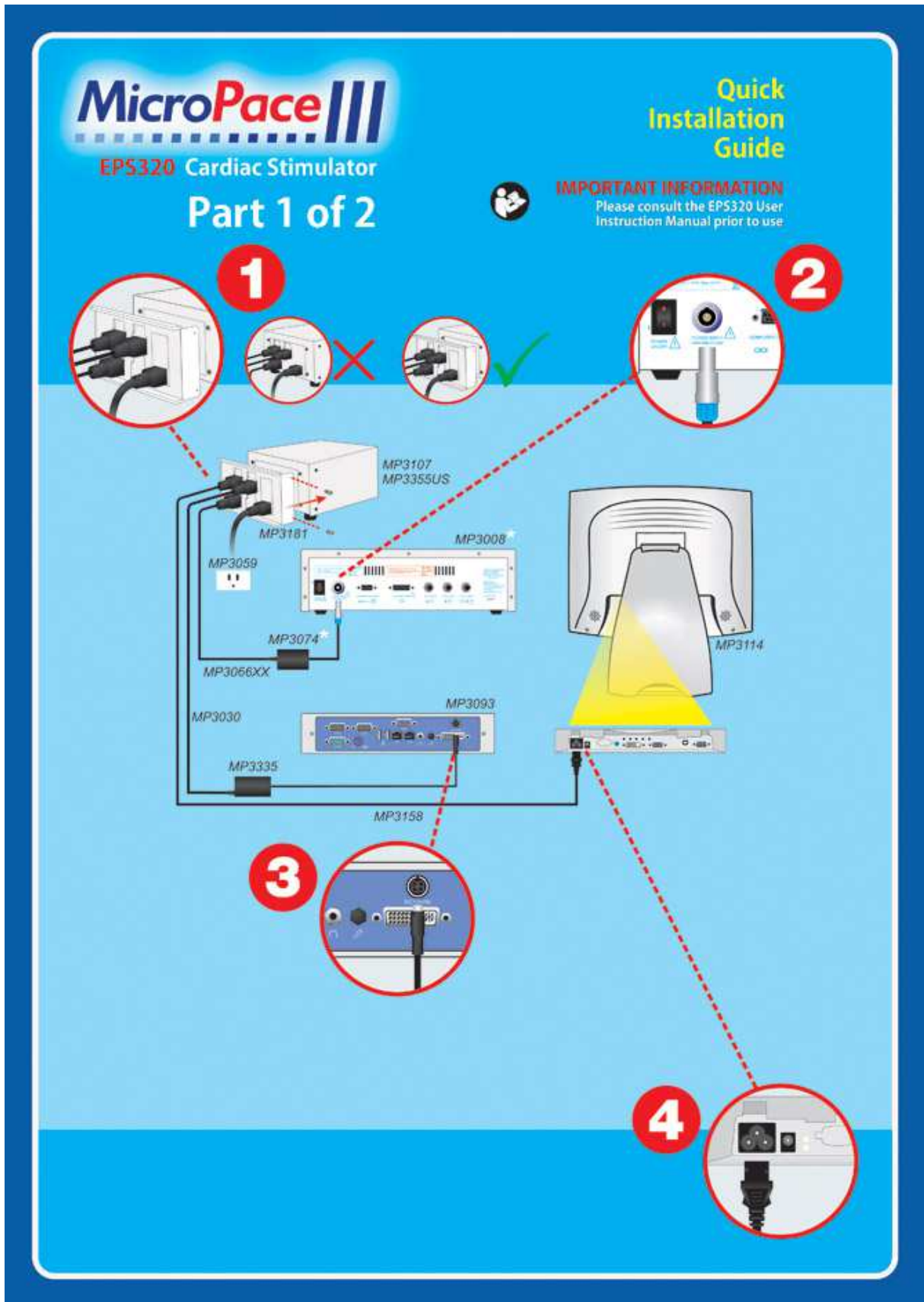
<b>MP3102US STIMULATOR &amp; PC CARTON</b>			
<b>Item</b>	<b>Part No.</b>	<b>Qty</b>	<b>Packed</b>
Isolation Transformer Box:			
Isolation Transformer	MP3107	1	
Accessories Box:	MP3055	1	
Power Supply for SGU	MP3074	1	
Stimulus Connection Box with RF Filter	MP3014	1	
Isolation Transformer Power Lead, according to Country	MP3059US	1	
Cable Serial Boost RS232	MP3033A	1	
Isolated Mains Power Lead, IEC 3 to 2 Pin- US Style	MP3066US	1	
Cable Signal – 6mm Phono-plug terminated	MP3034	1	
Signal Cable, BNC to Phone plug	MP3109	1	
Isolated Mains Power Lead (IEC3 to 3 Pin)	MP3030	1	
Accessories Booklet	MP3064US	1	
Installation Kit:	MP3063	1	
Keyboard with key labels	MP3016	1	
Bona Light PC Computer	MP3093	1	
Power Supply for Bona Light PC	MP3335	1	
Stimulus Generator Unit (SGU)	MP3008	1	
Documentation:	-		
User Instruction Manual	MP3395	1	
Installation Procedure Booklet	MP3069	1	
Manufacturer's Test Certificate	-	1	
Summary of Hotkeys	-	1	

R\_Packing List-MP3102US-V3.09.doc

<b>NEC LCD Series Carton</b>		
<b>Item</b>	<b>Part No.</b>	<b>Qty</b>
LCD Display (Micropace Part No. MP3076)	LCD52V	1
Video Signal Cable (Part of Micropace No. MP3076)	-	1
NEC LCD Screen Instruction Manual	-	1
Isolated Mains Power Lead, (IEC 3 to 3 pin)	MP3030	1

PackingList-NECMonitor-MP3076-V3.0.doc-27.04.06

Figure 16 System Connection Diagram-1







## 16. INSTALLATION WORKSHEET

### 16.1 Customer / system information

Contact	Name	Contact Phone
Hospital Site		
Location within hospital		
Cardiac technician		
Biomedical engineer		
Electrophysiologist No.1		
Electrophysiologist No.2		
Nominated contact person		
Order Number:		Date of Order:
MP Quotation No.		Date of Shipment:
Third party company:		Shipped by:
Installation by:		Date of Installation:
System Serial No.		Date file closed:
Item:		Serial Number:

### 16.2 Pre-order

Customer Requirements	Action/Solution:
1a- EP Recording Equipment make and version & installed options	
1b- EP Recording System ECG output – one, multiple, connector type	
2- Stimulus cabling required, 2 or 4 channels.	
3- ECG cabling required?	
4- Sync Trigger outputs required?	
5- Mains Voltage 110 or 240V?	
6- Remote SGU Laboratory Layout – Stimulus Connection Box or SGU at patient bedside	
7. Remote speakers required?	
8. Four Channel Stimulus Multiplexer required?	
9. StimLink™ required?	

### 16.3 Installation Testing & Acceptance

System Assembly	Method/Completed
Packing List checked complete:	
Stimulus cable connection:	
ECG input method:	

#	On site Testing/ Instruction	Relevant Section	How test	Result Y/N	Comment
1	Power to Computer, displays and Stimulus Generator Box via Isolation Transformer <b>with retaining bracket secured:</b>	3.2	Visual		
2	SGU and Software launch without error messages.				
3	Stimulus output tested at patient end, correct polarity:	11.2.1	LED test cable.		
4	Compatibility of EP Recording Equipment Verified	1.2 and 11.3	Verify		
5	ECG signal on Stimulator verified	11.2.2	Visual		
6	QRS detection by Stimulator Verified:	11.2.3	Visual		
7	EP Recording System Stim (or Trigger) detection from Stimulator verified:	11.2.4	Visual		
8	User Instructed in Use of Manual Backup /Emergency modes:	13.1 to 13.5	Visual + show		
8	Emergency Fixed Rate Pacing functions.	13.5	Verify		
9	Safety test & acceptance, if applicable by hospital:	11.3	Approval		
	<b>Acceptance Criteria:</b> <b>All</b> above fields must have a YES in the Result column for system to be accepted as ready for clinical use.				

### 16.4 Customer follow up

Customer follow up	Date planned:	Responsible person	Date done:	Comment
Demonstration with first patient:				
Further training arrangements:				
Call after first solo use:				

## 16.5 Record of Software Configuration

Record any modified parameters in this matrix:

+----- EPS320 Ver:3.21 USER Configuration ----- USER -----+	
Applies to Stim pages A & B	
1 Minimum S1 for PACE : ms <sup>3</sup>	22 Tachy Detect Interval : ms
2 Absolute Min S1, eg BURST: ms <sup>3</sup>	23 His-coincident RSynced_Sx: ms
3 Minimum Sx (S2-S7) : ms <sup>3</sup>	24 Ectopics Detect Threshold: ms
4 Min.auto S1 for ATP : ms <sup>3</sup>	25 Temp Prot.Boosted Current: -
5 Min.auto S1 WENCKE/SNRT : ms <sup>3</sup>	26 ECG gain Atrial Chan : -
6 Min.auto S1 for BURST : ms <sup>3</sup>	27 ECG gain Ventric Chan : -
7 Burst -> Overdrive Burst: - <sup>3</sup>	28 ECG gain Ext1 : -
8 Sound Output Source : - <sup>3</sup>	29 ECG gain Ext2 : -
9 F9 %RR Percentage : - <sup>3</sup>	30 Soft QRS Detect Setup : -
10 Synclout on(Train+1-n)S1: - <sup>3</sup>	31 QRS Blanking Time-HWare : ms
11 Decr/Incr N'ERP by Table: - <sup>3</sup>	32 QRS Sync Timeout : ms
12 W'ke/Brst Autodec'Period: ms <sup>3</sup>	33 QRS Sync Dly:0,1-99,>100 : -
13 SNRT Auto Stop : <sup>3</sup>	34 No of Hints ( 13,0=off) : -
14 SNRT Duration : s <sup>3</sup>	35 En Square Pace Site :
15 Repeats Multi_Sx Extra's: - <sup>3</sup>	36 Idle Safety Timeout : s
16 En Wencke Log Decrem't'n : - <sup>3</sup>	37 Sense Sound : ms
17 En Wencke Beat Decrement: - <sup>3</sup>	38 Pace Sound Duration : ms
18 Rate-adaptive Burst S1 : % <sup>3</sup>	39 Default Setup No.(1-8) : -
19 ATP Intraburst Decrement: - <sup>3</sup>	40 Set Global FACTORY PRESET: -
20 Touch Scrolling of Menu : <sup>3</sup>	41 Initial Input Method : -

Performed by:

Date:

---

**16.6 Progress/ problems notes**

Progress Notes			
Date	Problem/ Event	Solution	S