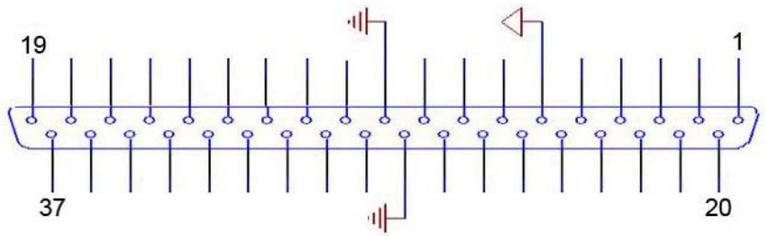


Pinout of DB37 connections on the ten-channel breakout box.

Pin #	Pin Type	Symbol	Description
1	Output	AOUT1	Earth Referenced Analog Output from Channel 1
2	Output	AOUT2	Earth Referenced Analog Output from Channel 2
3	Output	AOUT3	Earth Referenced Analog Output from Channel 3
4	Output	AOUT4	Earth Referenced Analog Output from Channel 4
5	Output	AOUT5	Earth Referenced Analog Output from Channel 5
6	Power	AGND_MST	Analog Ground for Channels AOUT1-AOUT5 (Master LP+)
7	Input	STIM TRIG	External Stimulus Trigger (TTL level). User must be in Stim Mode to trigger stimulation. Triggers on rising edge of pulse.
8	Input	AUXDIN1	Auxiliary Digital input (TTL level) connected to Channel 1 of the Master LP+
9	Input	AUXDIN2	Auxiliary Digital input (TTL level) connected to Channel 6 of the Sub-unit LP+
10	Power	DGND	Digital Ground
11	Input	DIN0	Digital Input (TTL level) connected to Master channel 1
12	Input	DIN1	Digital Input (TTL level) connected to Master channel 1
13	Input	DIN2	Digital Input (TTL level) connected to Master channel 1
14	Input	DIN3	Digital Input (TTL level) connected to Master channel 1
15	Input	DIN4	Digital Input (TTL level) connected to Master channel 1
16	Input	DIN5	Digital Input (TTL level) connected to Master channel 1
17	Input	DIN6	Digital Input (TTL level) connected to Master channel 1
18	Input	DIN7	Digital Input (TTL level) connected to Master channel 1
19	Input	$\overline{\text{STROBEIN1}}$	Active low strobe input connected to Channel 1 and DIN0-DIN7
20	Output	AOUT6	Earth Referenced Analog Output from Channel 6
21	Output	AOUT7	Earth Referenced Analog Output from Channel 7
22	Output	AOUT8	Earth Referenced Analog Output from Channel 8
23	Output	AOUT9	Earth Referenced Analog Output from Channel 9
24	Output	AOUT10	Earth Referenced Analog Output from Channel 10
25	Output	RECON	Signal marking a record all event across all channels
26	Output	$\overline{\text{STIMON}}$	Active low signal, stays low while stimulation is in process on any channel. Signal pulled high when idle.
27	Output	$\overline{\text{STIMSYNC}}$	Active low signal, marks the onset of each pulse in a stimulation train. The signal remains low for a fixed duration of 130us.
28	Power	DGND	Digital Ground
29	Input	DIN8	Digital Input (TTL level) connected to Sub-unit channel 6
30	Input	DIN9	Digital Input (TTL level) connected to Sub-unit channel 6
31	Input	DIN10	Digital Input (TTL level) connected to Sub-unit channel 6
32	Input	DIN11	Digital Input (TTL level) connected to Sub-unit channel 6
33	Input	DIN12	Digital Input (TTL level) connected to Sub-unit channel 6
34	Input	DIN13	Digital Input (TTL level) connected to Sub-unit channel 6
35	Input	DIN14	Digital Input (TTL level) connected to Sub-unit channel 6
36	Input	DIN15	Digital Input (TTL level) connected to Sub-unit channel 6
37	Input	$\overline{\text{STROBEIN2}}$	Active low strobe input connected to Channel 6 and DIN8-DIN15

DB37 connections on the ten-channel breakout box. See text for more details.

Directions for Use for Dual Guideline 4000 LP+™

L011-57-01 (Rev. A2, January 2013)

The dual Guideline 4000 LP+™ system permits users to combine two single LP+ units into one larger system, which can support up to ten recording channels and four analog input channels. This configuration requires the MT-LPP-BOX2 ten-channel breakout box, which transmits important synchronization signals between the two systems to enable precise timing and control of the two individual systems. The ten-channel breakout box also provides easy access to analog and digital input/output connections on the dual LP+ system.

The implementation of the dual LP+ system requires the conversion of one standard LP+ system into a sub-unit LP+ system, which can only be used in the dual configuration. The master LP+ can be used as a stand-alone LP+ or as part of the dual configuration without requiring reconfiguration.

Reference the microTargeting Guideline 4000 LP+™ Directions for Use (L011-57, included with LP+ shipment) for proper use instructions, including important safety precautions and warnings.

Ordering Information

MT-LPP: Guideline 4000 LP+™ neuromodulation targeting system

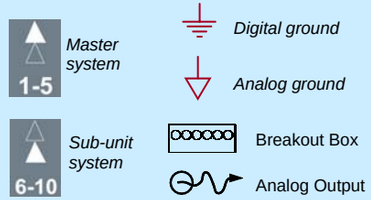
MT-LPP-SUB: Upgrade kit for Guideline 4000 LP+™ to sub-unit for dual LP+ system

MT-LPP-BOX2: Ten-channel breakout box for dual LP+ system

MT-LPP-CART: Cart for use with Guideline 4000 LP+™

MT-LPP-CART-AC: Accessory cart brackets for use with dual LP+ system

Symbol Key



WARNING: The dual LP+ system is not CE marked or FDA cleared as a medical device. Only use the system on human patients if appropriate hospital and regulatory clearances are in place.
WARNING: Only use the dual LP+ system with the recommended FHC cart, or a suitable replacement, with locking wheels and a stable, level surface to safely secure both systems.
WARNING: Only use FHC-recommended equipment, cables, and equipment accessories with the dual LP+ system.
WARNING: Always perform the pre-use checkout procedure (see LP+ Directions for Use) on both systems prior to use in a surgical case.
WARNING: Discontinue use of the Guideline 4000 LP+™ should any erratic function or damage become evident.
WARNING: The Guideline 4000 LP+™ dual system must be operated by a person who has been trained by an FHC authorized representative and has read and understood the Guideline 4000 LP+™ directions for use (DFU).
WARNING: The Guideline 4000 LP+™ dual system can be configured to allow externally initiated stimulation. Always monitor patient response when using this feature to ensure safety.
WARNING: Restrict each Guideline 4000 LP+™ to a single hemisphere. Never record from both hemispheres using a single LP+ while both units are in use.
CAUTION: Keep the BNC protective covers in place on all unused BNC connections on the LP+ and breakout box.

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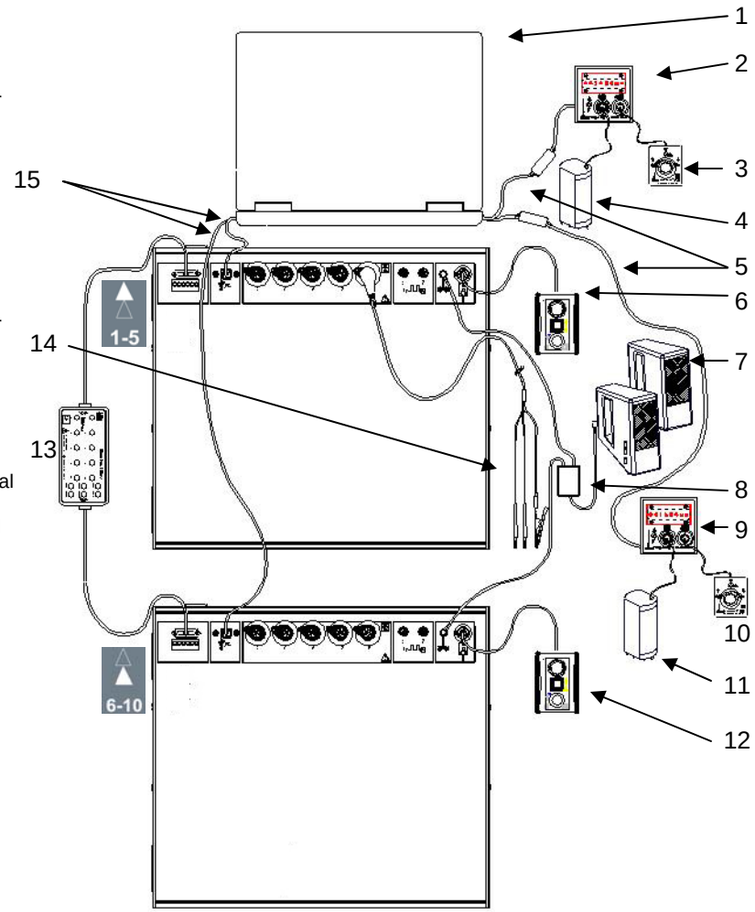
Abbreviated Procedure

Reference the Guideline 4000 LP+ ™ Directions for Use and Guideline 4000 LP+™ help files for more detail on usage of the system.

1. Assemble the dual Guideline 4000 LP+ ™ system as shown.
   a. Be sure to connect the master LP+ system to the master side of the breakout box, and the sub-unit LP+ system to the sub-unit side of the breakout box – see decals on the breakout box and LP+.
   b. The dual system must be used with the breakout box for the systems to be able to communicate with each other.
   c. The sub-unit LP+ may only be used with the master LP+. The master LP+ may be used without the sub-unit LP+ for five-channel operation.
   d. The ten-channel LP+ includes a split audio cable that enables both systems to be used with one pair of speakers. This cable will direct sound from the master unit (channels 1-5) to the left speaker, and will direct sound from the sub-unit (channels 6-10) to the right speaker.
   e. The ten-channel system includes two stimulation remote controls. Stimulation on channels 1-5 is controlled with the remote control attached to the master unit, and stimulation on channels 6-10 is controlled with the remote control attached to the sub-unit.
2. Power up the dual LP+ system.
3. Perform the pre-use checkout procedure for both LP+ systems.
4. Load a user profile and enter patient information.
5. Perform microelectrode recording.
   a. Analog outputs can be configured in the LP+ software to transmit raw (line noise filter only), processed (digital filters and line noise filter), or enhanced audio (see LP+ help files for more detail) output.
   b. Auxiliary digital inputs (AUXDIN1 and AUXDIN2) are linked to channels 1 and 6, respectively. In order to record digital events on AUXDIN1, a recording must be in process on channel 1, and to record on AUXDIN2, a recording must be in process on channel 6.
   c. Digital inputs (DIN0-DIN15) can be used to capture two 8-bit digital words.
      i. By default, a timestamp is sent to the PC any time the digital input state changes on any of the pins, along with the new state of each bit. In this configuration, $\overline{\text{STROBEIN1}}$ and $\overline{\text{STROBEIN2}}$ are non-functional.
      ii. The LP+ can be reconfigured so that digital input states/timestamps are captured only when the strobe inputs are sent a logic low signal. Use $\overline{\text{STROBEIN1}}$ for DIN0-DIN7, and $\overline{\text{STROBEIN2}}$ for DIN8-DIN15. Contact FHC to change this configuration.
      iii. DIN0-DIN7 are linked to channel 1, and DIN8-DIN15 are linked to channel 6. To capture the information on the DIN ports, a recording must be initiated on channel 1 for DIN0-DIN7 and on channel 6 for DIN8-DIN15.
   e. When a "Record All" event is initiated, the RECON pin will transition to a high logic state and stay high for the duration of the recording.
   f. $\overline{\text{STIMON}}$ and $\overline{\text{STIMSYNC}}$ can be used to record stimulation onset/offset timing information. When stimulation is in progress:
      i. $\overline{\text{STIMON}}$ will transition to a logic low at the initiation of stimulation on any channel and remain low for the duration of stimulation. $\overline{\text{STIMON}}$ will remain high otherwise.
      ii. $\overline{\text{STIMSYNC}}$ will transition low to mark the onset of a stimulation pulse, and remain low for a fixed duration of 130us. $\overline{\text{STIMSYNC}}$ remains high when not stimulating.
   a. The dual LP+ system can be configured to allow externally triggered stimulation to occur. For safety reasons, the system is shipped with this functionality disabled. Contact FHC to activate this feature.
      i. The STIM TRIG input can be used to trigger stimulation events with a TTL input pulse. Stimulation is triggered on the rising edge of the input pulse.
      ii. The stimulation dialog box must be open to trigger stimulation.
      iv. In triggered mode (default), stimulation will continue until a second TTL pulse is sent to the STIM TRIG input. Stimulation will terminate on the falling edge of the second pulse. If the Fixed Duration or Train Cycles boxes are checked, stimulation will continue for the duration/number of cycles indicated, regardless of ensuing termination pulses. In this case, stimulation may be stopped by pressing the orange button on the stimulation remote control.
      iii. In gated mode, stimulation will continue as long as the STIM TRIG input is held high. However, if either of the Fixed Duration or Train Cycles boxes are checked, stimulation will continue for the duration/number of cycles indicated, even if the STIM TRIG input is returned to a logic low. In this case, stimulation may be stopped by pressing the orange button on the stimulation remote control.
6. Identify the implantation site.
7. Save patient data.
8. Shut down the dual Guideline 4000 LP+™ system.

System Components

1. Notebook computer
2. microTargeting™ (mT) Controller module
3. mT Controller remote control
4. mT Controller motor or encoder assembly
5. Inline serial–to-USB converters
6. Stimulation remote control (channels 1-5)
7. Speakers
8. Split audio cable for dual LP+
9. microTargeting™ (mT) Controller module
10. mT Controller remote control
11. mT Controller motor or encoder assembly
12. Stimulation remote control (channels 6-10)
13. Ten-channel breakout box for dual LP+ system
14. mT electrode cable for LP+ (sold separately as 66-EL-LP)
15. USB cables



BNC Connection	Description
1-10	Earth Referenced Analog Output from Channel 1-10, ±1.5 V AC-coupled.
AUXDIN1	Auxiliary Digital input (TTL level) connected to Channel 1 of the Master LP+
AUXDIN2	Auxiliary Digital input (TTL level) connected to Channel 6 of the Sub-unit LP+
RECON	Digital output signal (TTL level) marking a "Record All" event (includes all active channels)
$\overline{\text{STIMSYNC}}$	Active low output signal (TTL level), marks the onset of each pulse in a stimulation train. The signal remains low for a fixed duration of 130us.
$\overline{\text{STIMON}}$	Active low output signal (TTL level), stays low while stimulation is in process on any channel. Signal pulled high when idle.
STIM TRIG	External stimulus trigger input (TTL level). User must be in Stim Mode to trigger stimulation. Stimulation triggers on rising edge of pulse and triggers a stimulation event according to current parameters set in software.

BNC connections on the ten-channel breakout box.

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