

# BRIEF COMMUNICATION

## Plug-Holder Unit for Implanting Stimulating or Recording Electrodes<sup>1</sup>

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CLANCY, J. J., D. F. CALDWELL AND J. M. SZOPO. *Plug-holder unit for implanting stimulating and recording electrodes*. PHARMAC. BIOCHEM. BEHAV. 5(3) 359–361, 1976. — The design of a plug-holder unit for electrode implants is described. The plug-holder attaches to the stereotaxic and facilitates the insertion of the electrode contact pins into the plug by retaining the connector plug in a fixed rigid position. In addition, it prevents the accidental breakage of contact lead wires which can normally occur during the contact pin insertion procedure. The unit is inexpensive and simple to construct.

Plug-holder    Electrode implant    Stereotaxic procedures

IMPLANTING electrodes in small animals for stimulating or recording brain electrical activity has become an established research technique in psychobiology. There are several manuals which present detailed descriptions for implanting such electrode systems [2, 3, 4, 5]. A common procedure is to connect the contact lead wires from the implanted electrodes to a plug which is then cemented to the animal's cranium. During test periods an electrical connection is made between the animal and the recording or stimulating device by attaching a wired receptacle to the plug.

Many investigators use the amphenol series 223 Tiny Tim nylon connectors [1] as the plug-receptacle connection between the animal and the apparatus. With the amphenol system, the female relia-tac contact pins are crimped to the electrode contact lead wires prior to surgery. During surgery, after the electrodes are implanted, the amphenol insertion tool (356-200/400-11) is used to insert the female contact pins into the plug, which is then cemented to the skull.

Two disadvantages of this procedure are related to the manual insertion of the female contact pins into the plug. Significant physical pressure is necessary to press the female contact pins into their respective slots and this is extremely difficult when the plug is hand held. Also, the pin moves

rapidly into the slot which can cause the investigator to jerk his hand and break the contact lead wire. Consequently surgical time and the animal can be lost.

These procedural problems can be alleviated by attaching a plug-holder unit to the stereotaxic. The holder unit retains the plug in a rigid, fixed position so that the investigator can use the physical force necessary to drive the contact pin into the plug hole. This eliminates the possibility of breaking a contact lead wire. The holder unit is simple to construct and relatively inexpensive. It can be built for under \$5.00.

### CONSTRUCTION

The holder unit is constructed from three major parts: two 8848-L10 flexaframe connectors and one 46 cm piece of 1.27 cm (1/2 in.) flexaframe rod (Arthur H. Thomas Co., Box 779, Vine Street at Third, Philadelphia, PA. 19105). The flexaframe rod is cut into three pieces: 8 cm, 12 cm, and 15 cm in length. The 12 cm length of flexaframe rod serves as the vertical support rod which attaches the plug-holder unit to the stereotaxic. Using a No. 7 drill, one end of the vertical support rod is center drilled to a depth of 3 cm. The hole is tapped for a 6.35 mm (1/4 in.) 20 NC stud, 7 cm long, which is then inserted into the hole. To

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allow for better contact with the flexaframe connector, the vertical support rod has a flat surface milled along its length. The milled flat should be 0.5 cm wide by 9 cm long from the top of the vertical support rod. (Fig. 1).

A wedge, which is used to hold the vertical support bar in a rigid, fixed position in the stereotaxic, is constructed by cutting a small piece of aluminum to the following dimensions:  $37 \times 25 \times 9$  mm (Fig. 1). A 6.35 mm (1/4 in.) hole is drilled through the center of the aluminum wedge.

The 15 cm length of flexaframe rod serves as the connector rod which links the vertical support rod to the receptacle rod (Fig. 2a). It is also used for longitudinal (A-P) adjustment of the plug-holder unit. The receptacle rod which is constructed from the 8 cm length of flexaframe rod serves two functions: it holds the amphenol plug during pin insertion and is a lateral adjustment for the plug-holder unit (Fig. 3). Initially the rod is flat milled on three sides with the milled faces perpendicular to each other. Each mill should be 1 cm wide by 2.5 cm long and started at the same end of the rod (Fig. 2b). One side remains unmilled.

The last step is the mounting of the amphenol 223-1605 five contact receptacle on the receptacle rod. Two properly spaced holes are drilled through the two opposing milled sides of the rod with a No. 32 drill. The plug is attached to the rod with two No. 4-40  $\times$  19.05 mm (3/4 in.) long nickel plated round head screws, lock washers and hex nuts. The receptacle is mounted on the rod so that the flange edge of the receptacle is flush with the end of the rod and the long edge of the receptacle is flush with the milled edge of the rod. The receptacle is positioned so that the two pin hole row is adjacent to the milled side of the rod (Fig. 2b).

#### ASSEMBLY

First, the vertical support rod, stud end down, is inserted into one of the two holes at the anterior end of the Kopf stereotaxic frame. The hole selected should be the one located on the side opposite to the one from which the investigator operates. The vertical support rod is held in position by placing the aluminum wedge, a lock washer and a 6.35 mm (1/4 in.) 20 NC hex nut on the stud from the underside of the stereotaxic frame (Fig. 1). Tightening the hex nut will secure the vertical support rod to the stereotaxic frame.

One of the flexaframe connectors is used to attach the connector rod to the vertical support rod. The connector rod is positioned so that it is perpendicular to the vertical support rod and parallel to the longitudinal axis of the stereotaxic frame (Fig. 3). With the other flexaframe connector, the receptacle rod is attached to the connector rod. It is positioned perpendicular to the connector rod and parallel to the plane of the stereotaxic frame with the attached amphenol receptacle below and inboard of the connector rod, and facing posteriorly (Fig. 3). This completes the assembly of the plug-holder unit.

#### COMMENTS

The receptacle of the plug-holder unit should be placed so that it receives the plug to be cemented to the animal's cranium, by positioning the receptacle slightly above and

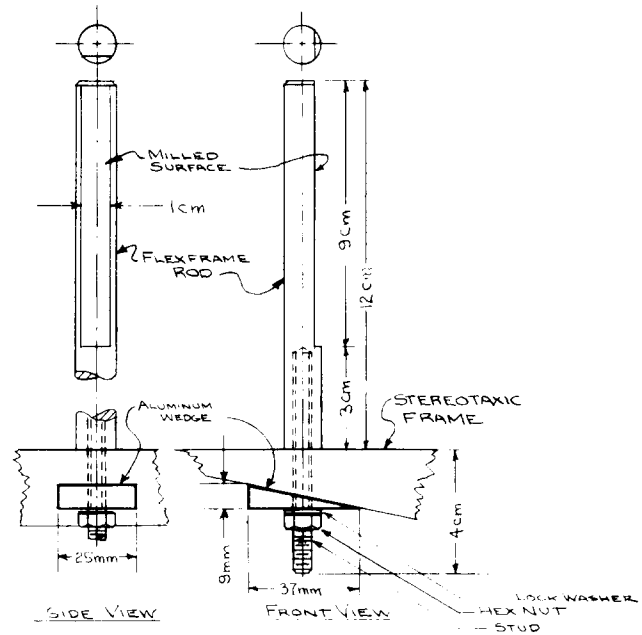


FIG. 1. Schematic diagram. Vertical support rod.

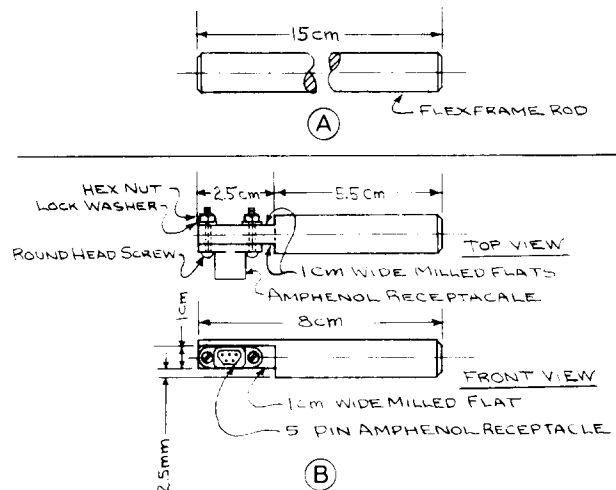


FIG. 2. Schematic diagram. (A) Connector rod, (B) Receptacle rod.

anterior to the animal's skull. This is accomplished by making any of three possible adjustments: vertical – movement of connector rod up and down the vertical support rod; longitudinal – movement of the connector rod back and forth on the vertical support rod; and lateral – movement of receptacle rod in and out of its flexaframe connector (Fig. 3).

Although this plug-holder unit is specially designed for the amphenol 223 Tiny Tim nylon connector system in conjunction with a Kopf stereotaxic, the basic design may be easily modified for use with any connector system or stereotaxic.

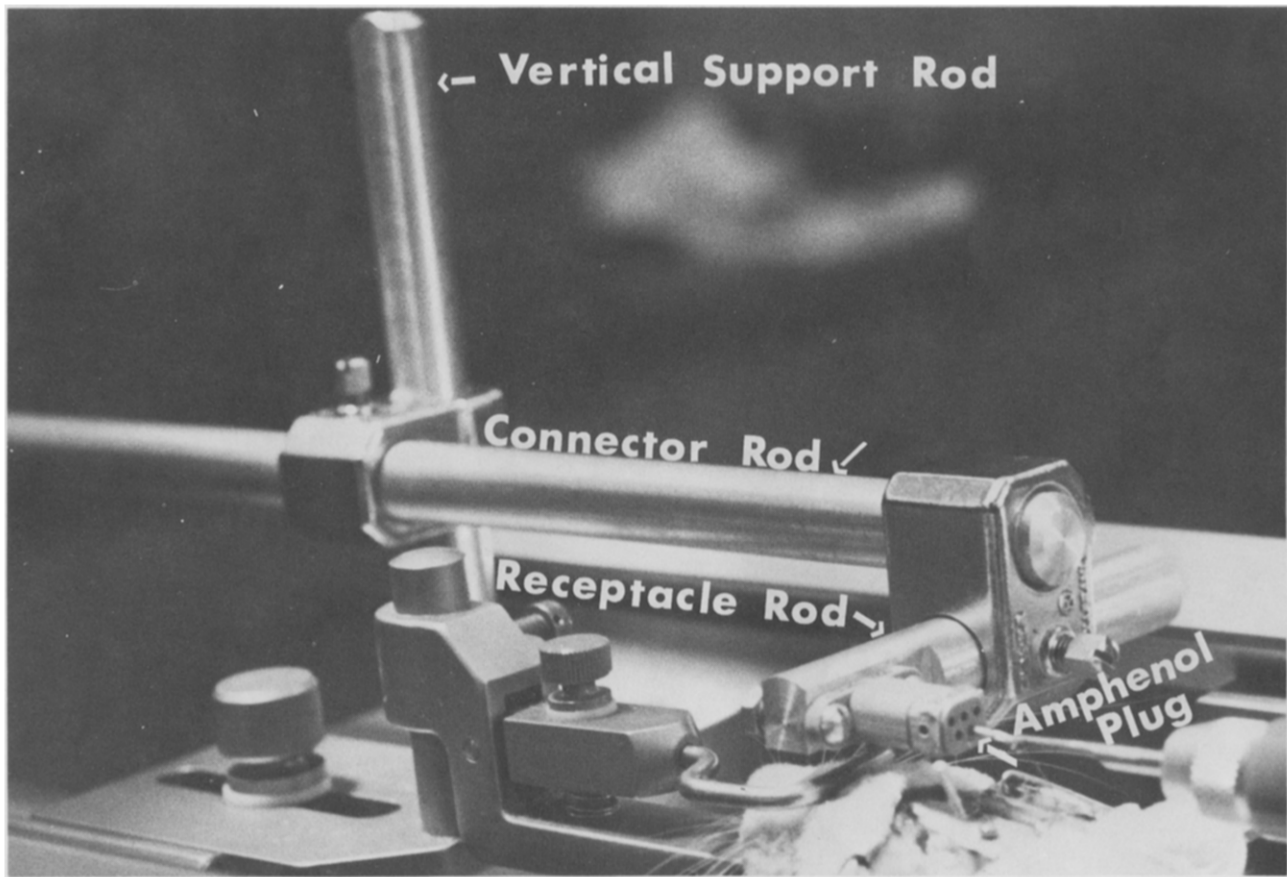


FIG. 3. The plug holder unit in operation for implanting EEG recording electrodes.

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