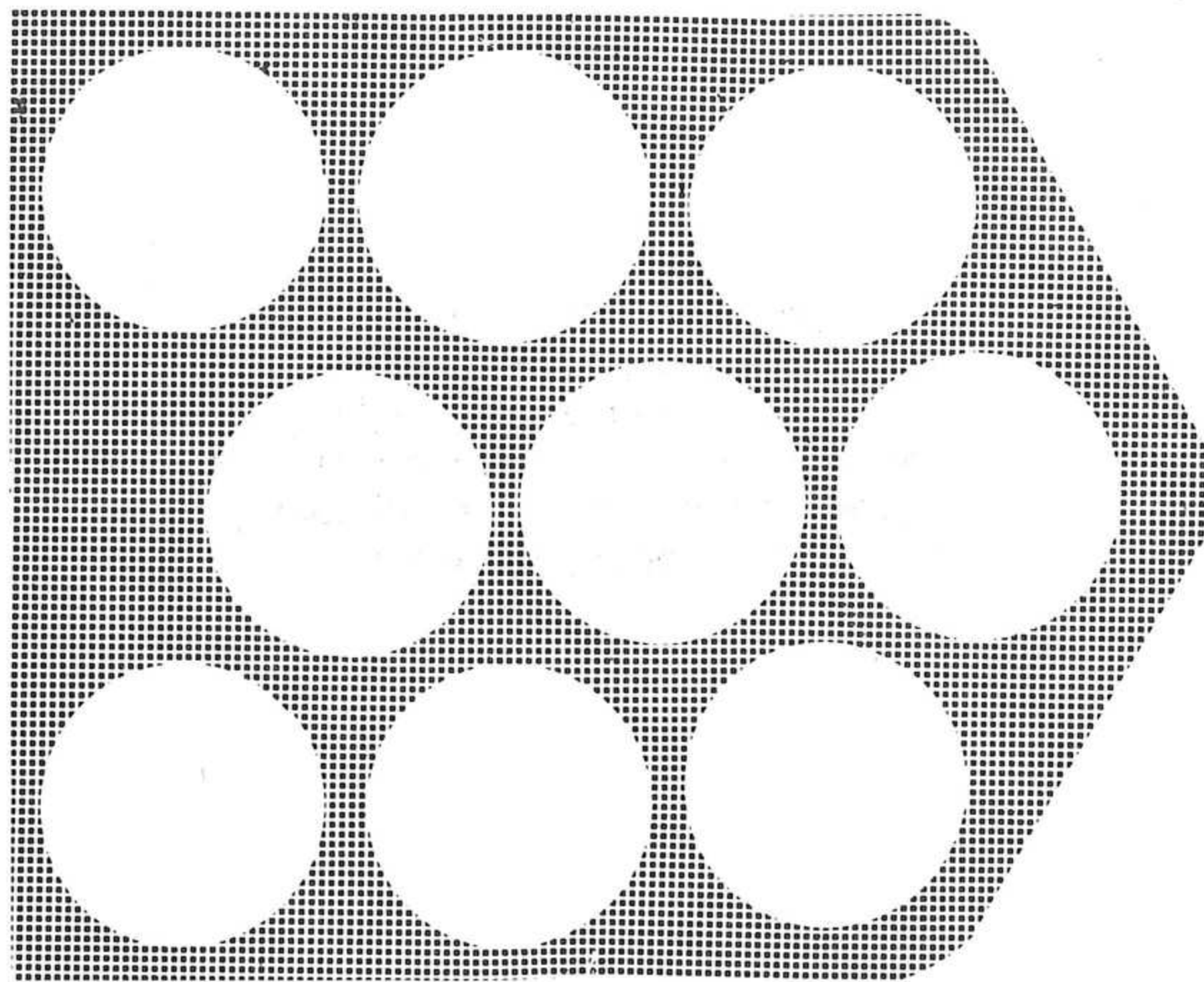

INSTALLATION INSTRUCTIONS

422 BATTERY PACK



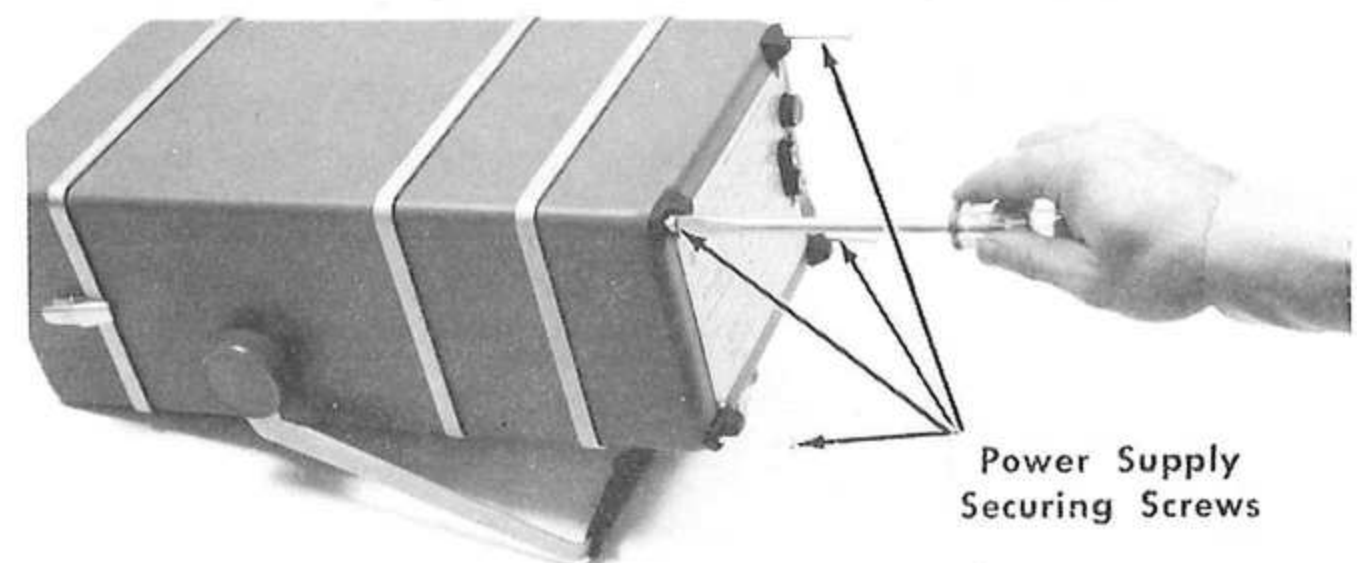
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BATTERY PACK

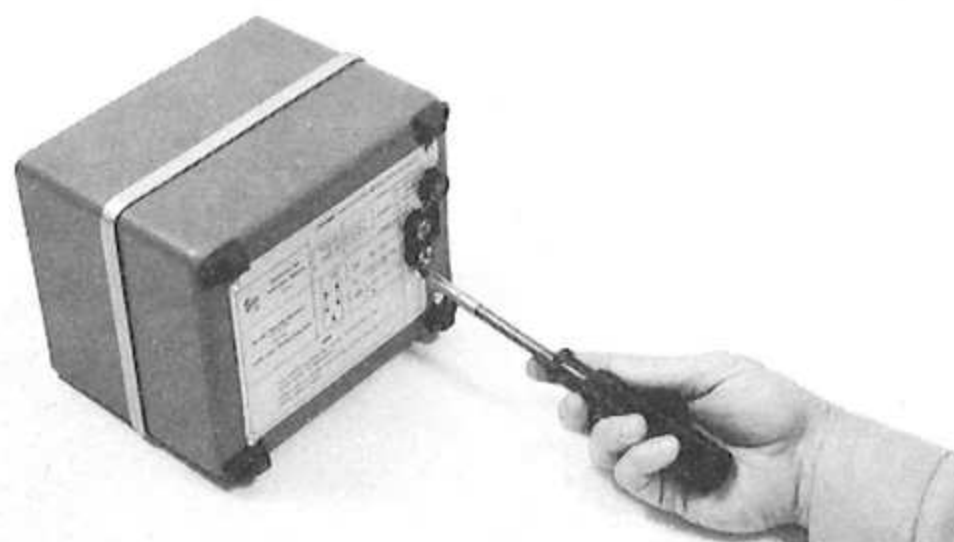
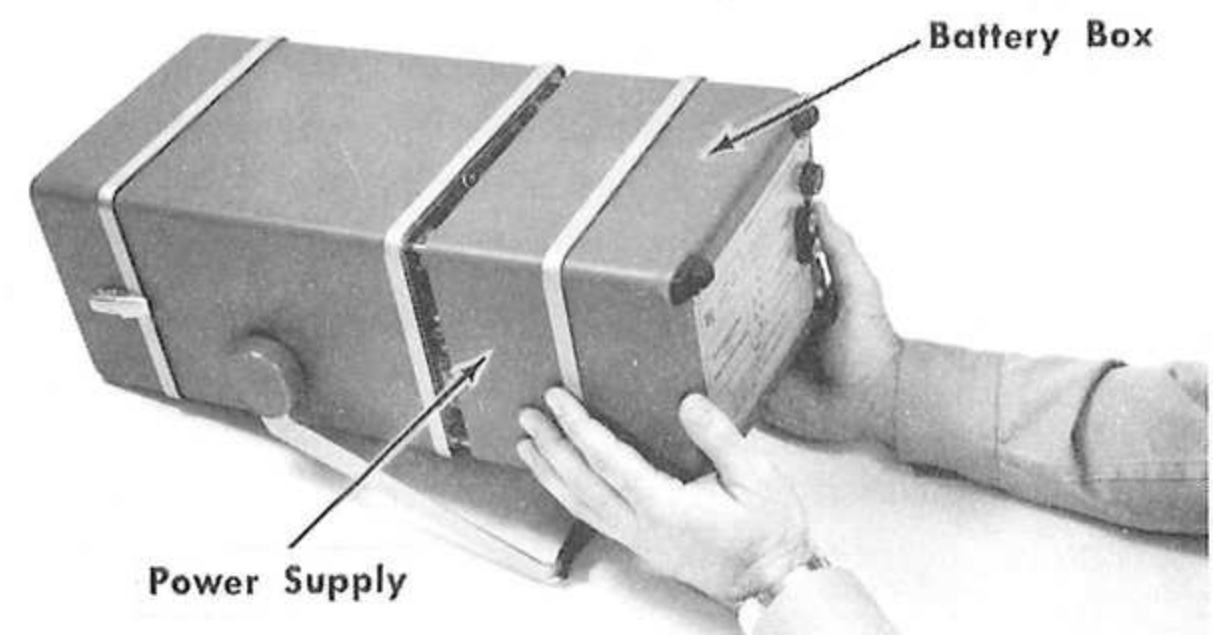
INSTALLATION INSTRUCTIONS 422 BATTERY PACK

1. Removing the Power Supply and Battery Box

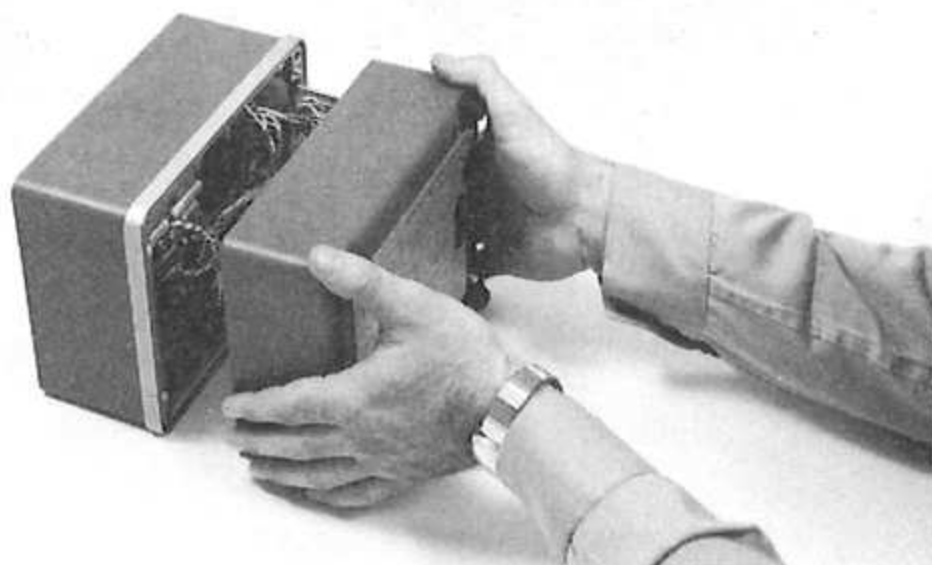
a. Loosen and remove the four power supply securing screws located in the rear feet of the instrument.



b. Separate the power supply and battery box from the indicator unit by sliding them to the rear and off the support rods.

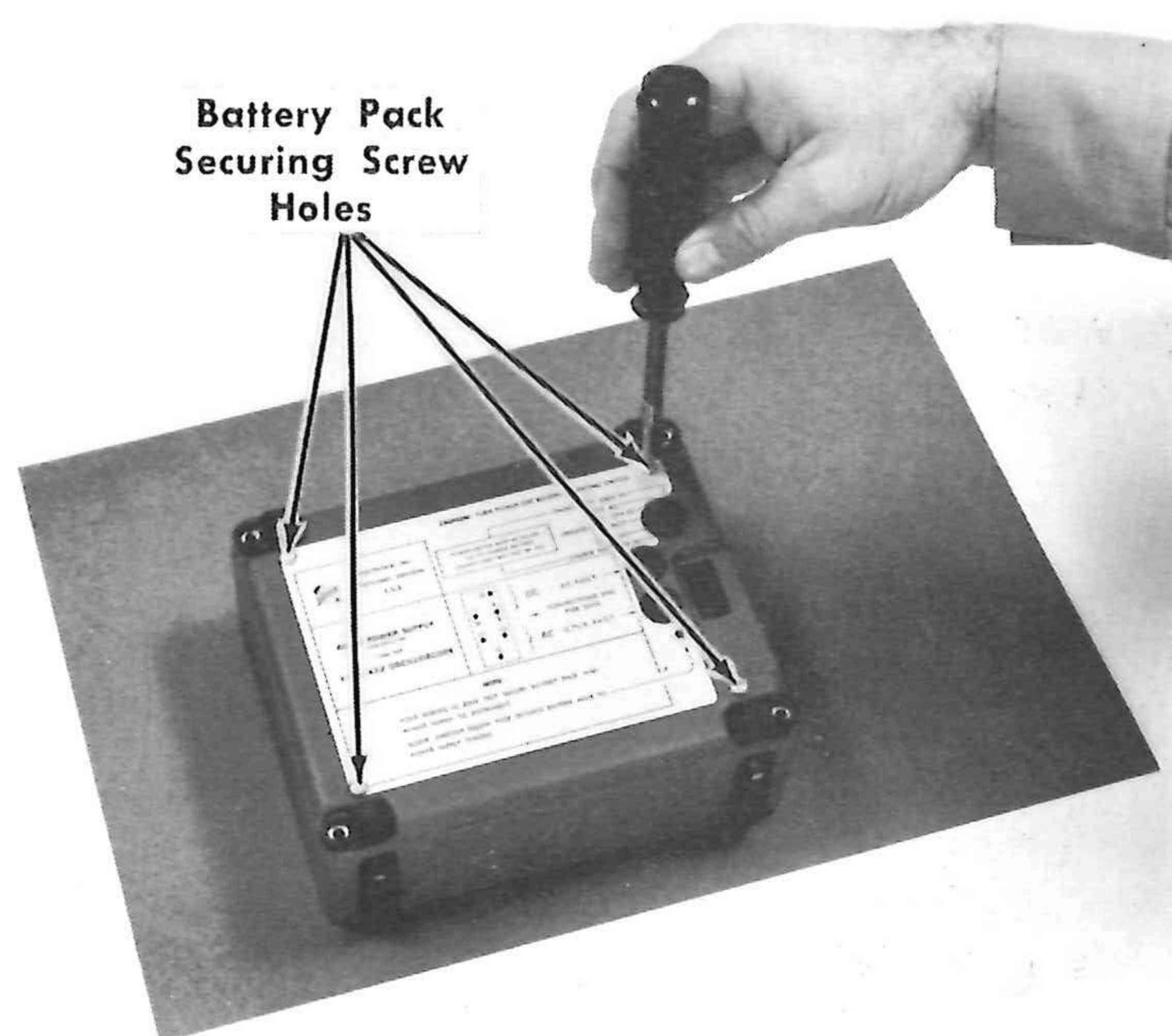


c. Loosen and remove the screw located just below the fuse holders.



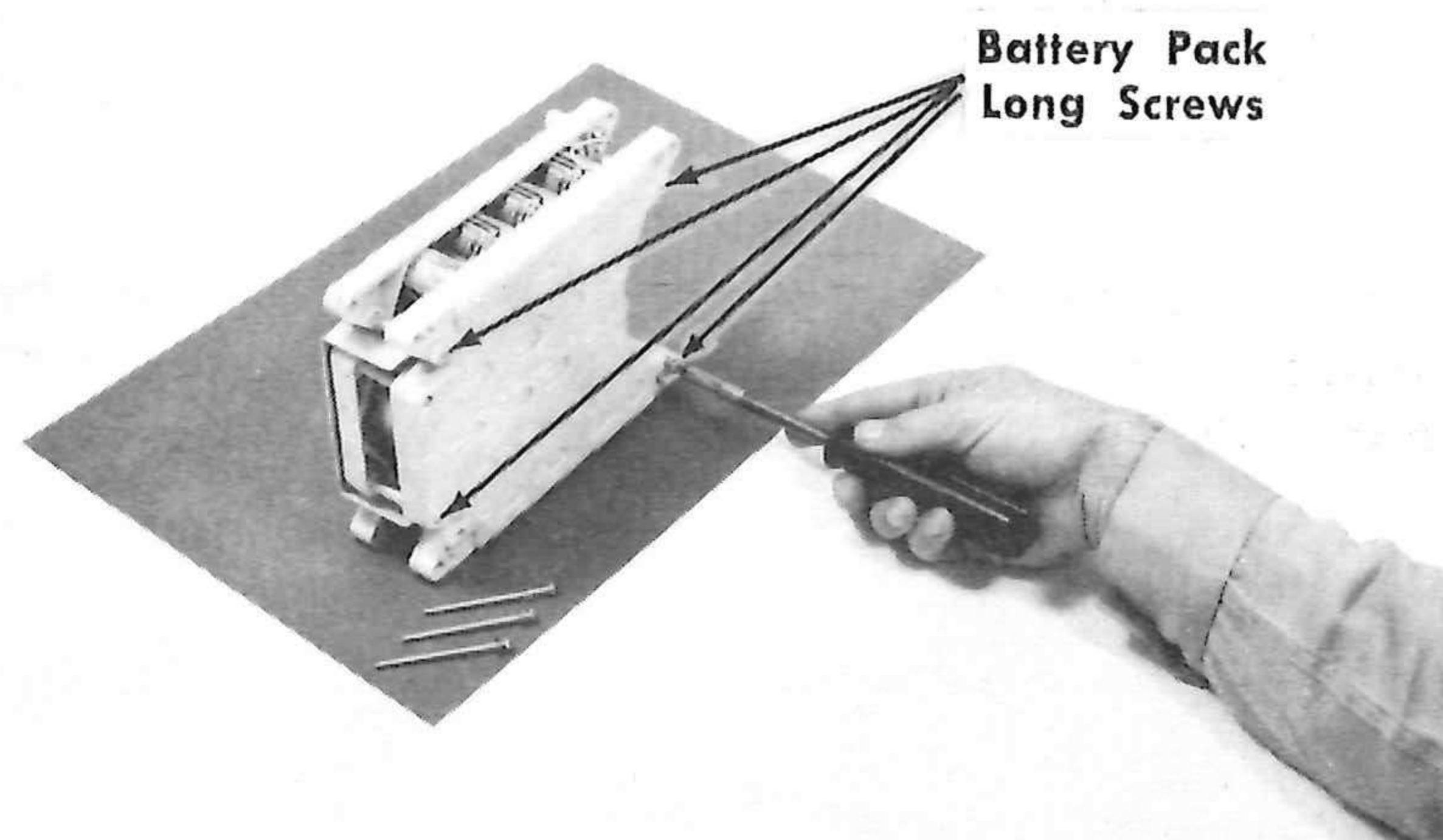
d. Detach the battery box from the power supply.

2. Attaching the Battery Pack

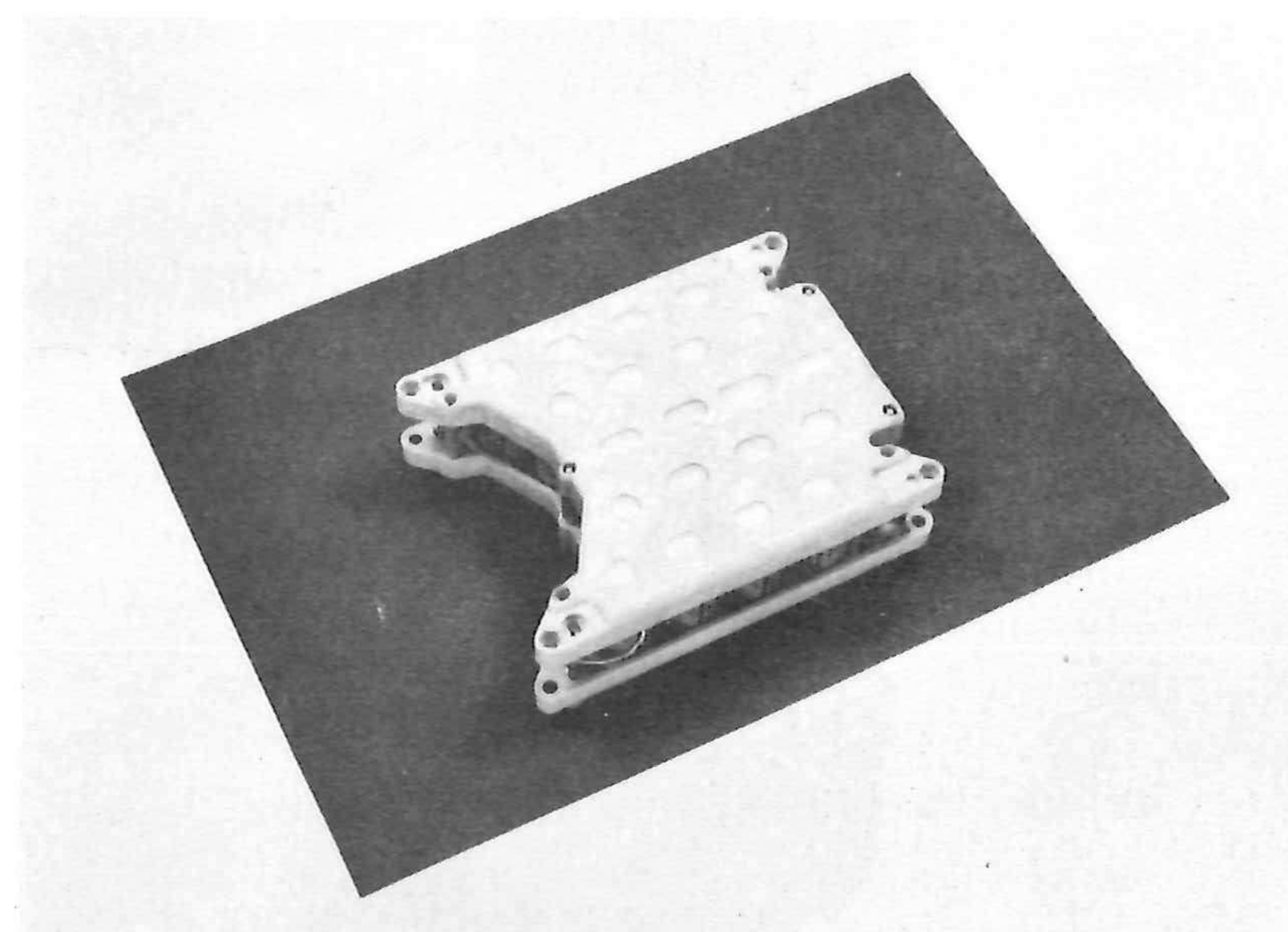


a. Remove and discard the four screws from the Battery Pack securing screw holes.

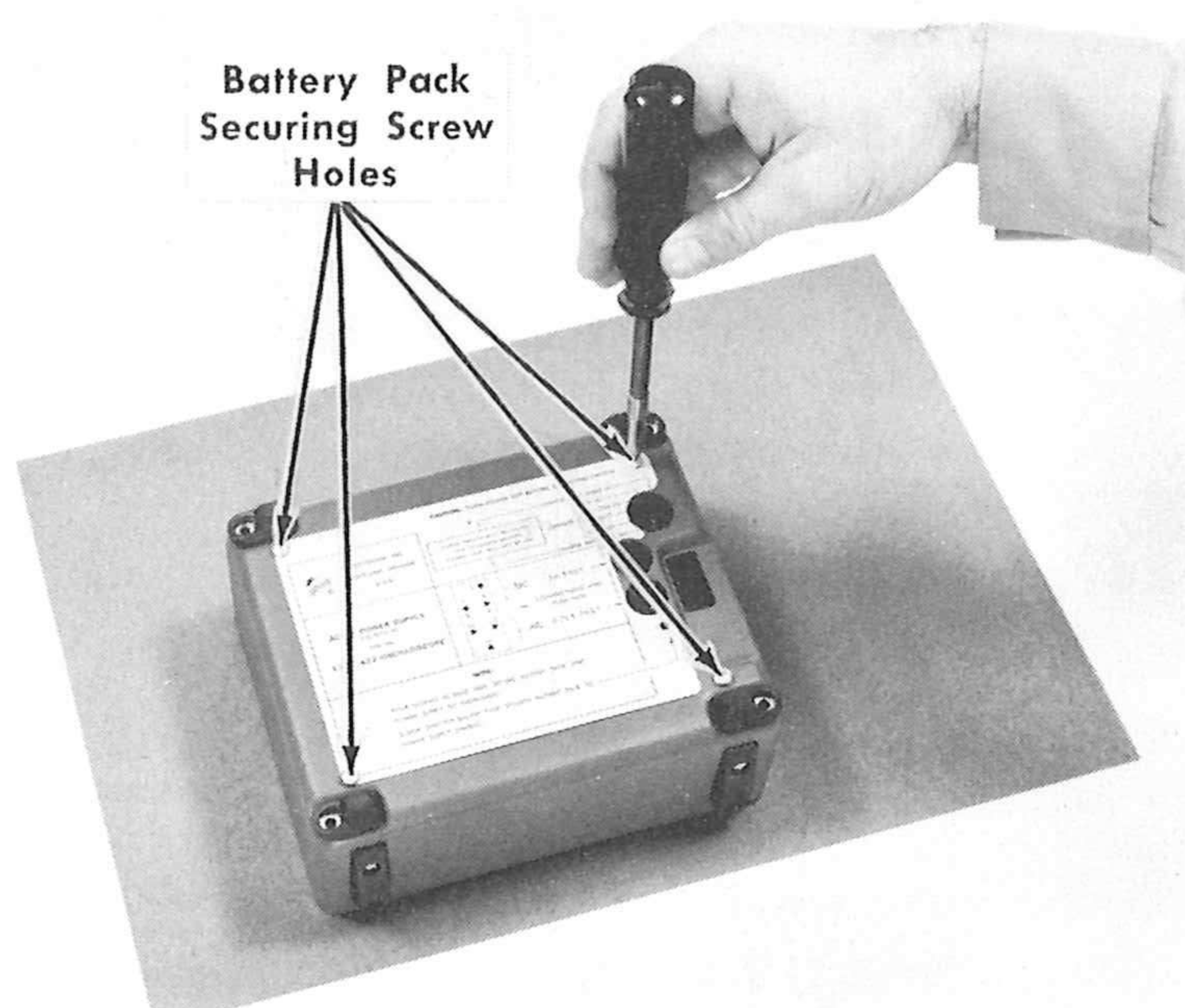
b. Loosen and remove from the Battery Pack the four long screws which go through it near its corners.



c. Set the Battery Pack on a non-conducting flat surface so it is resting on its interconnecting banana jacks and spring bracket.

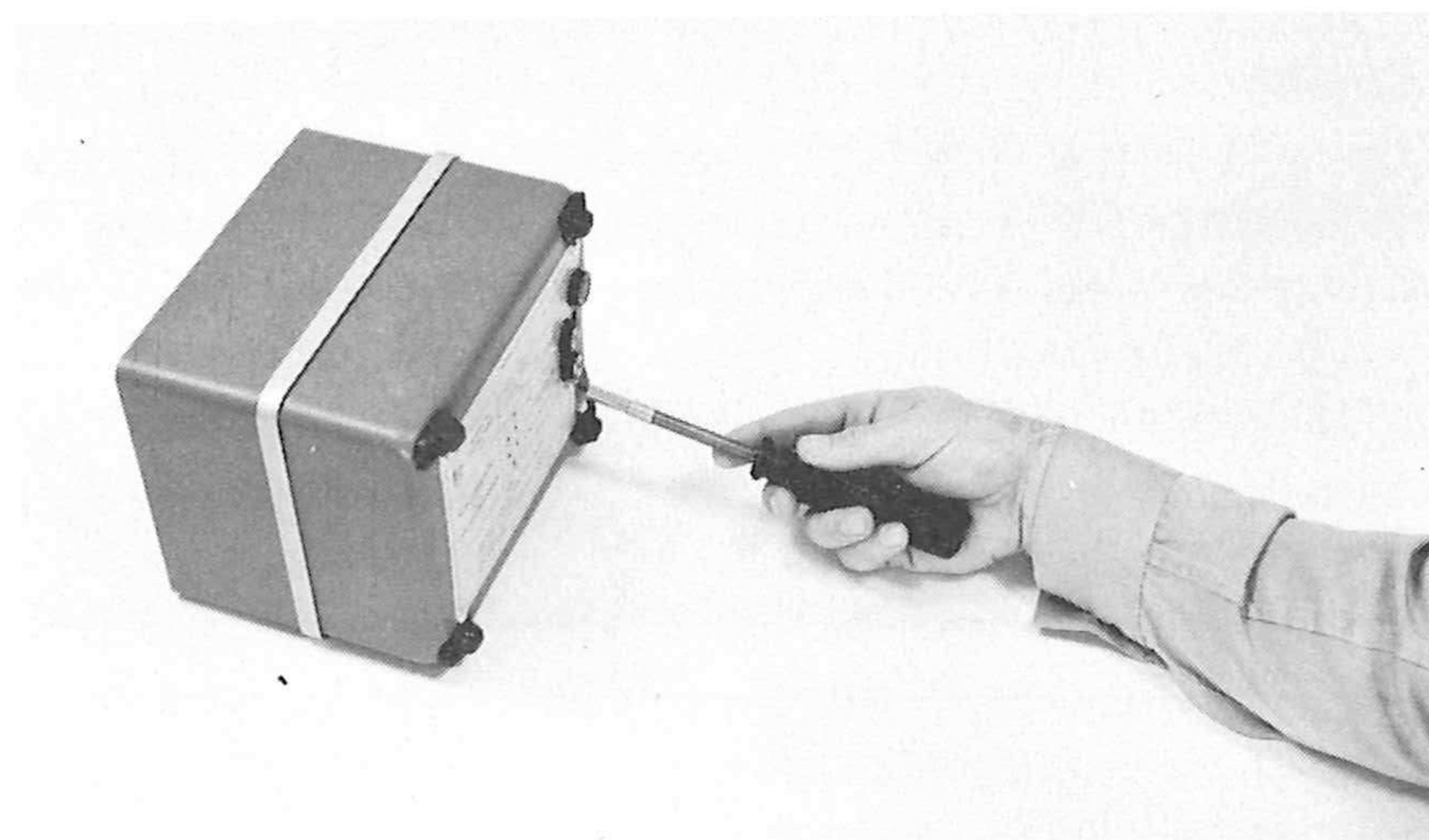
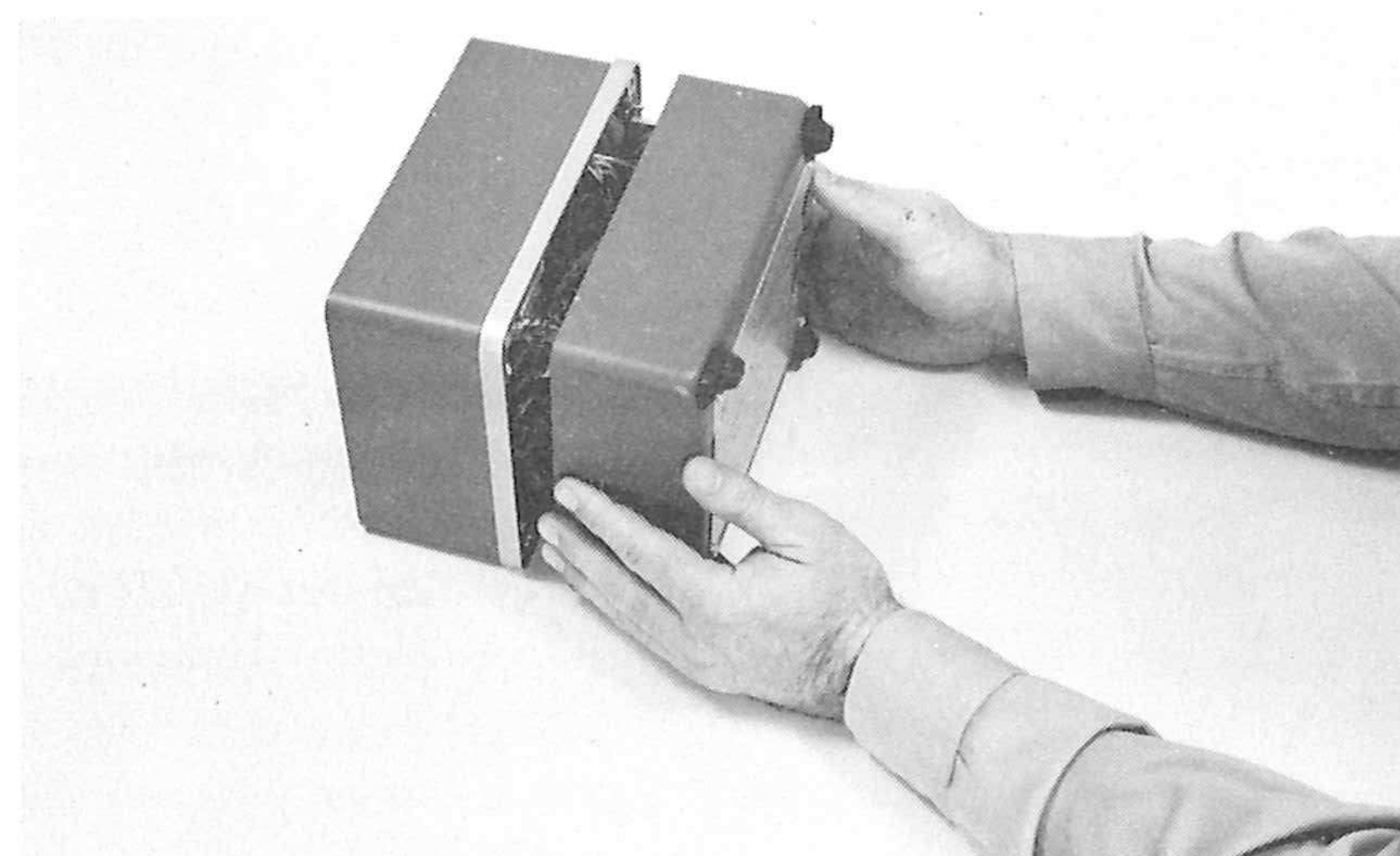


d. Place the battery box over the Battery Pack so that the cutout in the Battery Pack is directly under the knob, fuse and input connector holes in the battery box.



e. Start each of the four long screws, removed from the Battery Pack in step 2b into the four holes indicated, then tighten the four screws securely.

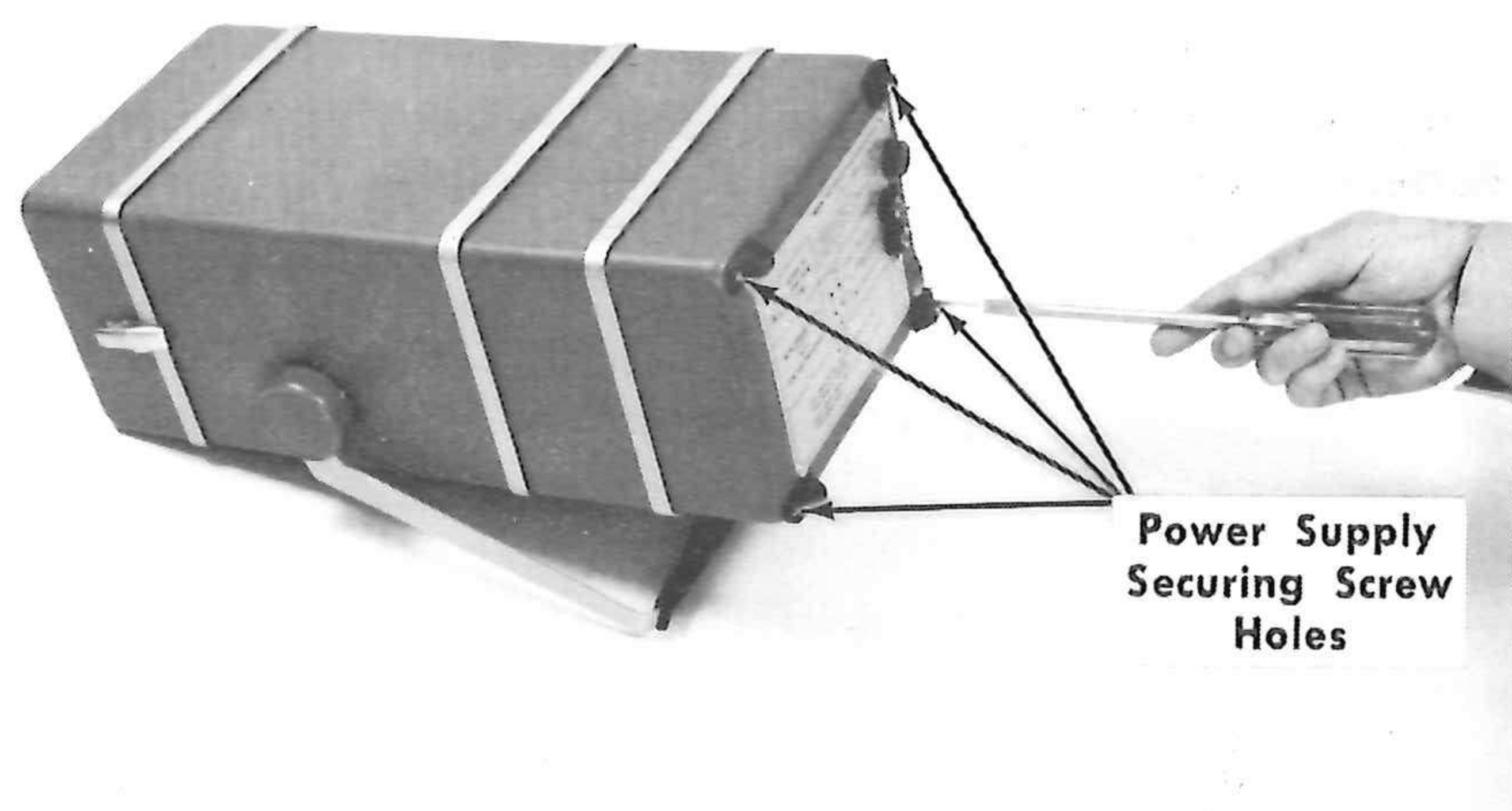
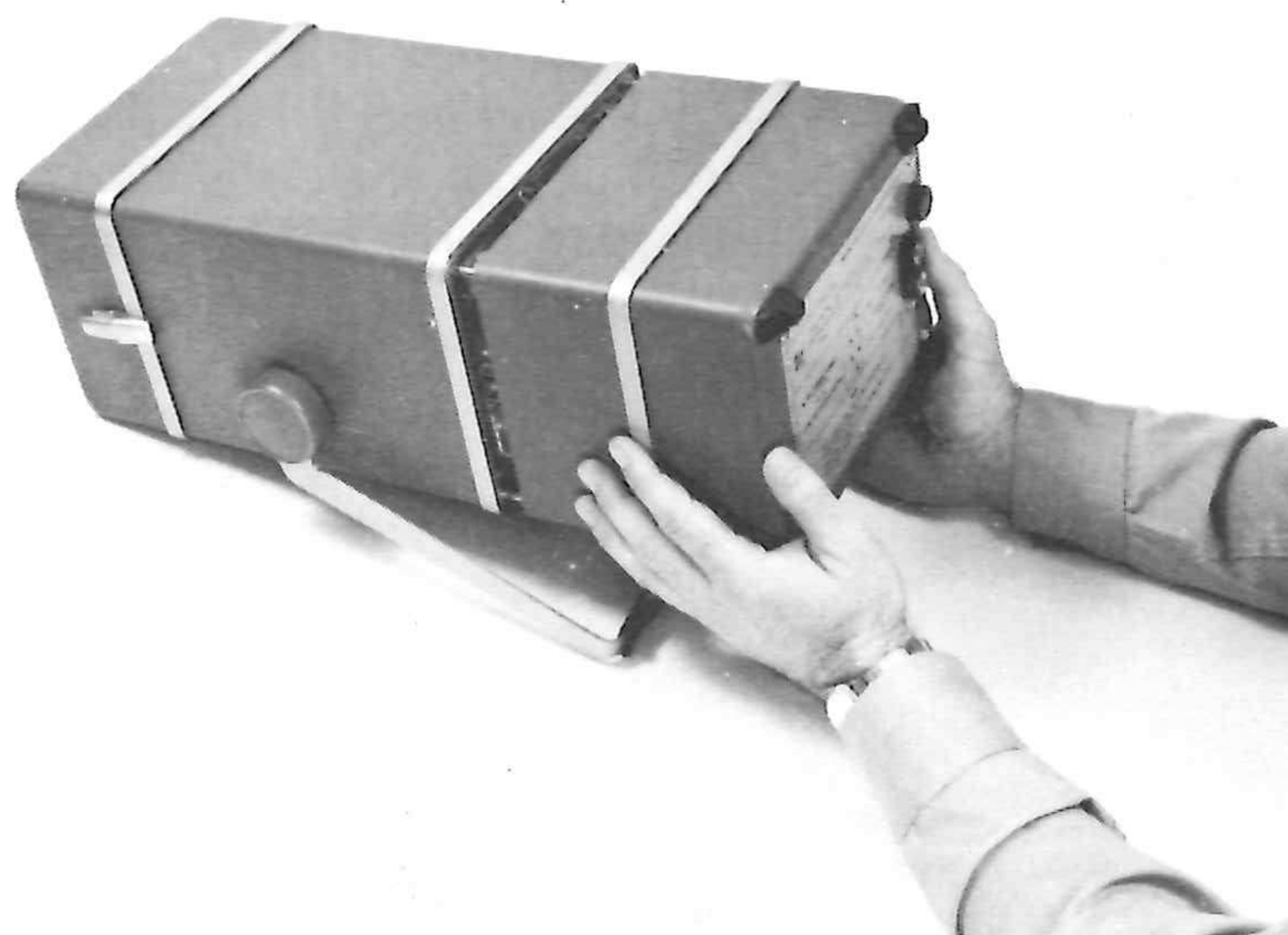
f. Install the battery box/Battery Pack onto the power supply, guiding the interconnecting banana jacks onto the banana plugs of the power supply.



g. Re-install and securely tighten the screw removed in step 1c.

3. Attaching the Power Supply

a. Slide the power supply onto the four support rods protruding from the indicator unit.



b. Start the four screws removed in step 1a into the holes located in the four rear feet of the power supply; then tighten all four screws securely.

This completes the Battery Pack installation procedure. For more information on the Battery Pack refer to the instruction manual for the Type 422 AC-DC Power Supply.

IMPORTANT INFORMATION ABOUT THE USE OF NICKEL-CADMIUM BATTERIES

General

The Nickel-Cadmium battery cells supplied have been selected as a result of exhaustive engineering evaluation. Each battery cell has been rigidly inspected, has received an ampere hour test, and has met or exceeded the minimum ampere hour storage requirement.

The battery cells used in the battery pack should provide a useful operating life extending over several hundred charge and discharge cycles, providing the precautions listed below are observed:

Precautions

The life of hermetically sealed Nickel-Cadmium battery cells may be shortened by any of the following abuses:

1. If recommended charge rate is exceeded.
2. If battery charger is operated incorrectly.
3. If discharged to a point where one or more battery cells are reverse polarized.

The following information concerning Nickel-Cadmium battery cells should prove helpful in avoiding the problems mentioned above.

Battery Charging Information

During charging, sealed Nickel-Cadmium battery cells normally contain an internal pressure because gas evolution and chemical recombination is taking place. Therefore, as charging current is increased, gas evolution and internal pressure also increases; charging at rates in excess of those recommended should be avoided. Battery cell cases and seals will withstand these excess pressures, but the pressure relief vents may be punctured. If this occurs a portion of the electrolyte may be expelled with the gas, resulting in shorter overall battery cell life.

Periodic inspection of the battery box is recommended. The battery box should be closely inspected for signs of electrolyte leakage. If any electrolyte residue is found in the battery box, it should be cleaned away with a 2% solution of Boric Acid in water, after which all wetted area should be thoroughly dried with a soft cloth. For practical purposes, a 2% solution of Boric Acid can be approximated by dissolving $1\frac{1}{4}$ level teaspoons of the powder in one cup of water.

The battery pack used in the Type 422 AC/DC Power Supply should be regarded as a single power storage unit rather than as a set of individual cells, since it is not designed to be readily disassembled for repair or inspection. Any service to the battery pack should be referred to your Tektronix Field Engineer or Representative, especially during the battery warranty period when the guarantee may be altered if the sealed case-retaining screws are removed.

Battery Pack Charging Rates

A battery pack containing 20 specially selected battery cells wired in series is provided for use in the Type 422 AC/

DC Power Supply. The battery cells used in the battery pack are special battery cells, having greater ampere hour storage capacity than standard duty battery cells, and having superior high ambient temperature characteristics.

The Type 422 AC/DC Power Supply contains battery charging circuitry that may be operated from either a 115 V AC or 230 V AC power source. In the CHARGE BATT 115 V AC or CHARGE BATT 230 V AC positions of the POWER MODE switch, the battery pack is charged at approximately 400 milliamperes. In the OPERATE 115 V AC or 230 V AC position, the batteries are trickle-charged at a 30 milliampere constant current rate.

The battery pack should be completely discharged each time before recharging, as noted later in paragraphs on Battery Pack Storage And Shelf Life. The battery pack should then be charged 16 hours at 400 milliamperes to insure it is fully charged. During the charging process thermal cutouts in the 422 AC/DC Power Supply provide protection against overheating the battery pack. In the event the battery pack temperature exceeds the maximum temperature point allowable by the thermal monitor, the charge rate is reduced to 30 milliamperes, the trickle-charge rate. When the battery pack temperature drops sufficiently, the thermal cutout resets and the charger resumes the 400 milliampere charge rate. If the thermal switch reduces the charge rate to 30 milliamperes for any length of time during charging, the battery pack will not receive a full charge in 16 hours. For this reason, do not assume battery pack failure because of one instance of short operating time obtained from a battery pack.

Battery Pack Storage and Shelf Life

The battery pack is shipped in a charged condition, and should be fully recharged at 3-6 month intervals. For best retention of storage capacity, the battery pack should be discharged through a 100 ohm resistor to 0 volts, and then recharged. Two complete charge-discharge cycles are recommended. One charge-discharge cycle in this manner at 3-6 month intervals also aids battery pack life, whether the battery pack is in storage or in periodic use in the oscilloscope. An alternative is a continuous 30 milliampere trickle-charge.

WARNING

Fully or partially charged battery packs are capable of delivering a very large current if accidentally short circuited. Care should be exercised to prevent shorting battery terminals with tools, metal work bench or attached wires. A severe burn can be sustained if rings or other jewelry are allowed to short the battery terminals or attached wires.

Charge retention characteristic of Nickel-Cadmium battery cells vary with temperature. They may be stored at any temperature between -40°F and $+120^{\circ}\text{F}$ without damage, but the higher the ambient temperature, the faster will be the self-discharge rate. Battery packs stored at $+70^{\circ}\text{F}$ will lose approximately 50% of their stored charge in 3 months. For this reason an occasional recharge is recommended for battery packs that are in storage. Battery packs stored at

Battery Pack—422 AC-DC

+120°F on the other hand, will be self discharged of all useful energy in 30 days. Due to the greatly accelerated self discharge rate, it is recommended that battery packs in storage at high ambient temperatures be continuously trickle-charged at a 30 milliamperes rate.

Nickel-Cadmium Battery Pack Performance Data

The Type 422 oscilloscope may be expected to operate approximately 4 hours on a fully charged battery pack. Derating of this time at extremes of temperature should be expected. Some derating with age and/or after dozens of charge-discharge cycles will also be necessary.

Discharging the battery pack under operating conditions to an excessively low terminal voltage is not recommended, since the likelihood of one or more of the battery cells reversing polarity is greatly increased. The battery pack should never be discharged in use below 22 volts. Below this voltage limit, instrument calibration is not reliable. Care should also be taken to turn the oscilloscope off, or to the charge position when the battery pack is known to be in a low state of charge and the instrument not in use.

If the battery pack is found to fall below the lower voltage limit prematurely, contact your Tektronix Field Engineer or Representative for service immediately.