INSTRUCTION MANUAL

R

PROTEXIMETER

MODEL 300

DEC. 1947



THE VICTOREEN INSTRUMENT CO.

5806 HOUGH AVE., CLEVELAND, OHIO

Victoreen

INSTRUCTION MANUAL MODEL 300 PROTEXIMETER

DEC. 1947



PROTEXIMETER INSTRUCTION MANUAL

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PROTEXIMETER INSTRUCTION MANUAL

I - INTRODUCTION

A. Purpose

The Victoreen proteximeter is a compact direct reading instrument designed specifically to measure accumulated scattered radiation for the protection of roentgenologists, technicians, and industrial x-ray personnel. It has also been useful in the protection of personnel operating cyclotrons, Van de Graff generators, and other sources of nuclear energy. It is intended to supplement rather than replace the Minometer pocket chamber by providing a convenient means of monitoring an area. The Proteximeter differs from the 263 and 247 survey meters in that it measures total accumulated radiation in milliroentgens.

B. Special Features

- 1. Full scale reading indicates 200 milliroentgens; midscale 100 milliroentgens which is the accepted value (0.1r) for a daily tolerance dose.
- 2. A special chamber coating makes the instrument independent of x-ray wave length except for wall absorption effects at low energies.
- 3. The hermetically sealed chamber makes the calibration independent of variations in temperature, pressure or relative humidity.
- 4. The three inch meter calibrated in milliroentgens has a scale which is easy to read at a distance.
- 5. Controls have been reduced to a minimum to simplify the operating procedure.
- 6. Extensive laboratory and field tests have proven the Proteximeter to be both rugged and reliable.

II - SPECIFICATIONS

A. Physical Characteristics

Height - 5" exclusive of chamber; 7" overall

Length - 9"

Width - 4"

Weight - 5 pounds

Case - Cast aluminum

Finish - Gray crackle

Indicator - 3" microammeter

Controls - Power switch

Battery voltage adjustment

Charge button

Charging rate (screwdriver) adjustment

Power supply - Five type "D" flashlight cells, easily replaced

B. Performance Characteristics

Sensitivity - 200 milliroentgens, full scale

Accuracy - + 10%

Drift/Leakage - 10 milliroentgens per day, maximum

Wave length - Independent

Wall absorption- 1/16" polyethylene

Battery life - 300 hours continuous reading

Shelf life with normal intermittent reading

Circuit - VX-41A, inverted triode connection

Charging method- Induced transient grid current

Discharging - Gravity switch

III - OPERATING INSTRUCTIONS

- 1. Turn the power switch, lower left, to the "BATT" position.
- 2. Adjust the "BATTERY" knob, lower right, until the meter reading is 100.
 - 3. Turn the power switch, lower left, to the "RUN" position.
- 4. Depress the "CHARGE" button, upper left, two or three times if necessary until the meter reading is zero. (See section V, D)
 - 5. Place the instrument in the desired location for measurement,
 - 6. Turn the power switch to the "OFF" position.
- 7. To obtain the total accumulated radiation, first repeat steps 1, 2, and 3. Next read the meter directly in milliroentgens and then turn the switch off. This reading may be repeated at any time without recharging.
- 8. The switch may be left on "RUN" to be read at a glance, however the battery life will be reduced.

IV - ELECTRONIC DESCRIPTION

A. Chamber

The chamber has a 1/16" polyethylene wall with a graphite conducting surface of less than 200 ohms resistance between the two
points. The circuit electrode is graphite coated polystyrene connected directly to the electrometer grid of the VX-41A vacuum tube.
The total chamber capacitance is 100 uufd.

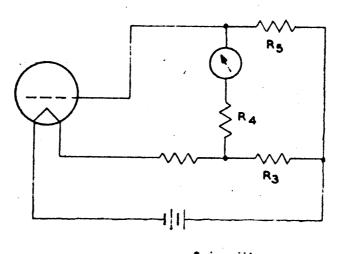
B. Electrometer Circuit

The VX-41A electrometer tetrode is used as an inverted triode with the second (control) grid floating with the chamber anode. The output signal is taken from the first grid, the plate is connected to the first grid to provide an electrostatic shield for the control grid. The plate current is less than 10 microamperes, therefore the

plate has virtually no effect on the output meter reading.

C. Metering Circuit

The normal G1 current, approximately 250 ua., passing through the load resistor R5 provides a voltage drop equal to the filament current of 10 ma. through R3. The meter with its series limiting resistor indicates zero potential difference between the negative side of R5 and the negative side of R3 when the chamber is fully charged. As the chamber is discharged by radiation the negative charge on G2 is reduced causing an increase in current to G1. This increases the voltage drop across the load resistor R5, which is measured by the output voltmeter. Because this voltage charge is a linear function of the total radiation received, the meter is calibrated directly in milliroentgens.

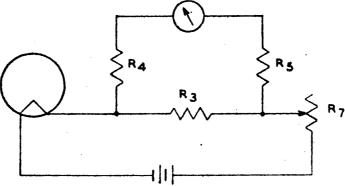


METERING CIRCUIT

D. Battery Check Circuit

The chamber tube filament current is measured by the meter when the switch is in the "BATT" position. The meter is calibrated by the series resistance R_4 plus R_5 , and the shunt resistor R_3 , such that 10 ma. current will read 100 or midscale on the meter. The

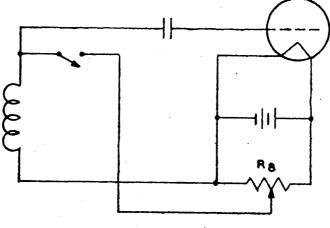
filament current is adjusted by means of the series variable resistor R7.



BATTERY CHECK CIRCUIT

E. Charge Circuit

For the purpose of charging the chamber, consider G_2 as an anode of an ordinary diode rectifier and consider the chamber itself as a capacitor of 100 uufd. An inductance is placed in series with the capacitor and the filament of the rectifier, a voltage is applied across the inductance causing current to flow through it. The current is then suddenly interrupted, causing an induced voltage, $L \frac{di}{dt}$, to be applied to the anode of the rectifier through the capacitor. Current flows momentarily through the rectifier. If this procedure is repeated several times, the capacitance will be charged to the peak induced voltage, $L \frac{di}{dt}$. The peak voltage may be controlled by potentiometer Rg by adjusting the initial voltage applied to the inductance.



CHARGE CIRCUIT

V - FIELD SERVICE NOTES

A. Battery Replacement

- 1. Replace batteries when the meter cannot be set to 100 -- Step 2 in the operating instructions.
 - 2. Remove the four screws and the bottom plate.
- 3. Insert a screwdriver between two batteries and pry one out. The others will slide out easily.
- 4. Observe the polarity marks near the contacts and slide the replacement batteries in place.

B. Performance Test

- 1. Use the performance test if, after a reasonable period of time, the meter shows no indication of radiation.
 - 2. Follow operating instructions 1, 2, and 3.
- 3. Turn the instrument upside down momentarily to discharge the chamber.
 - 4. The meter reading should be greater than 200 milliroentgens.
 - 5. Recharge the chamber as shown in the operating instructions.
- 6. If the meter reading, Step 4 above, is less than 200 milliroentgens, replace the chamber.

C. Drift or Leakage Test

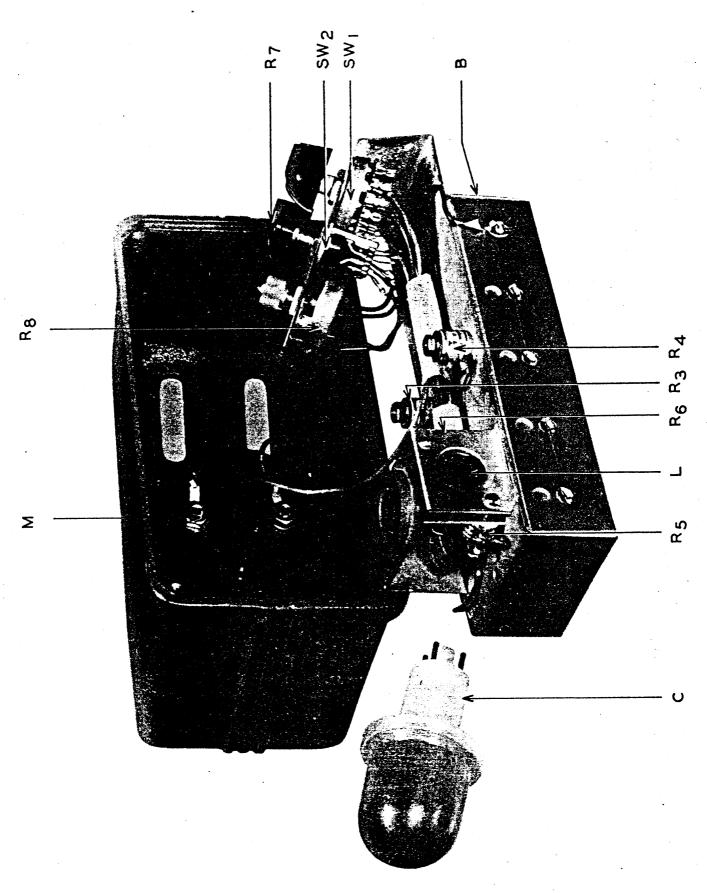
- 1. Follow the operating procedure through Step 4.
- 2. Place the instrument in a location known to be free of radiation except for normal background.
 - 3. Turn the power switch off.
- 4. After 8 hours, read the meter -- Step 7 in the operating instructions.
- 5. If the meter reading is greater than 20 milliroentgens, replace the chamber.

D. Charging Rate Adjustment

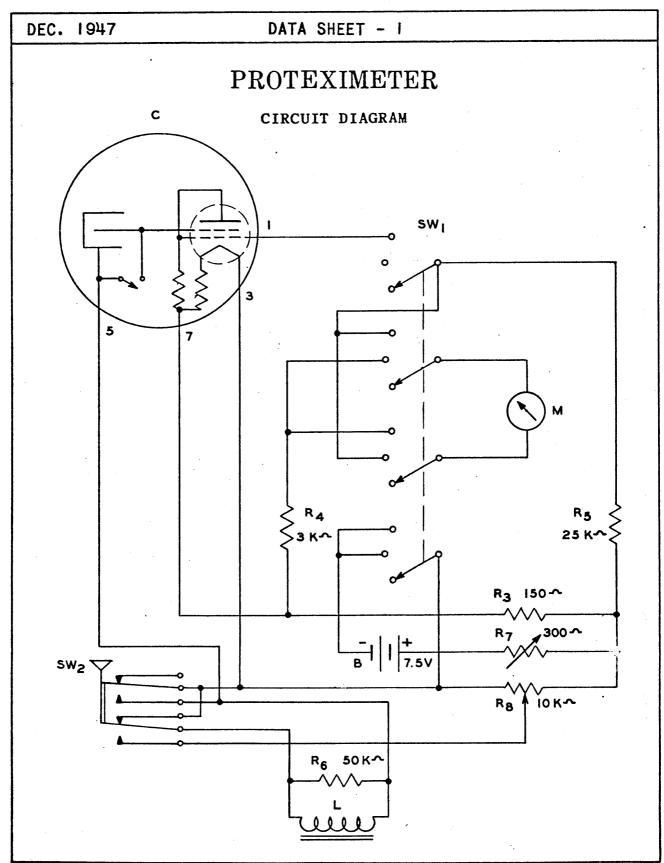
- 1. Adjustment of the charging rate is necessary when the meter does not read zero after the charging button has been pressed several times in Step 3 of the operating instructions.
 - 2. Remove the cap on the "CHG. ADJ." control, upper right.
- 3. Turn the instrument upside down momentarily to discharge the chamber.
- 4. To decrease the charge, turn the screwdriver adjustment clockwise.
- 5. To increase the charge, turn the screwdriver adjustment counter clockwise.
- 6. Recharge the chamber as described in the operating instructions.

E. Chassis Removal

- 1. Remove the chamber.
- 2. Remove all knobs and nuts from the control panel.
- 3. Remove the four feet and bottom plate.
- 4. Remove one screw in the battery channel.
- 5. Slide the chassis out the bottom.



THE VICTOREEN INSTRUMENT CO.



PROTEX IMETER

APPENDIX.

LIST OF REPLACEABLE PARTS

| 263-17 Battery 7½y #2 cells A & B 300-3 Chamber Polyethyline sealed Detector-amplifier 300-18 Inductance Choke (hearing aid) Charger 200-27 Meter 0-100 ma. 2000 Indicator 185-167 Resistor 5,000 ohm Bobbin ¼W Meter Bias 185-168 Resistor 25,000 ohm Bobbin ¼W Meter calibration 185-169 Resistor 25,000 ohm Bobbin ¼W Meter calibration 185-169 Resistor 25,000 ohm Bobbin ¼W Meter calibration 300-41 Pot 50,000 ohm Lt% ¾W Coll shunt 300-42 Pot 10,000 ohm linear taper Battery adjustment 300-14 Switch Rotary, 4 circuit 3 position (Off-on Battery Alunt 120-30 Knob Bar pointer Off-Battery Run 120-30 Knob Bar pointer Off-Battery changel 300-47 Socket Octal (8 prong) Charging adjustment 300-50 Coup and knull Plasting olip Charging adjustment <td< th=""><th>Ref.</th><th>Part No.</th><th>Component</th><th>Description</th><th>Function</th><th>Spare Parts Kit *</th><th>Manufacturer</th></td<> | Ref. | Part No. | Component | Description | Function | Spare Parts Kit * | Manufacturer |
|--|---|----------|-------------|------------------------------|----------------------|-------------------------|-----------------|
| 300-3 Chamber Polyethyline sealed Detector-amplifier 300-18 Inductance Choke (hearing aid) Charger 200-27 Meter 0-100 mm. 2000 Indicator 185-167 Resistor 150 ohm Bobbin ¼m Meter Bias 185-168 Resistor 25,000 ohm Bobbin ¼m Meter calibration 185-169 Resistor 25,000 ohm Bobbin ¼m Meter calibration 185-169 Resistor 25,000 ohm Bobbin ¼m Meter calibration 185-169 Resistor 25,000 ohm Hobbin ¼m Output load 300-56 Resistor 50,000 ohm Hobbin ¼m Coll shunt 300-41 Pot 10,000 ohm linear taper Charging adj. 300-42 Switch Rotary, 4 circuit 3 position (Off-on Batery Alusther 120-30 Knob Bar pointer Off-Battery Run 120-30 Knob Bar pointer Off-Battery changel 300-47 Socket Octal (8 prong) Chargery contect 300-57 Compact Plastic 300-57 Menual <th>æ</th> <th>263-17</th> <th>Battery</th> <th>7½v #2 cells</th> <th>A&B</th> <th>250</th> <th>Ray-O-Vac</th> | æ | 263-17 | Battery | 7½v #2 cells | A&B | 250 | Ray-O-Vac |
| 300-18 Inductance Choke (hearing aid) Charger 200-27 Meter 0-100 ma. 2000 Indicator 185-167 Resistor 150 ohm Bobbin Amage Meter Bias 185-168 Resistor 25,000 ohm Bobbin Amage Meter calibration 185-169 Resistor 25,000 ohm Bobbin Amage Meter calibration 185-169 Resistor 25,000 ohm Hobbin Amage Meter calibration 185-169 Resistor 25,000 ohm Hobbin Amage Meter calibration 185-169 Resistor 25,000 ohm Hobbin Amage Meter calibration 300-56 Pot 10,000 ohm Hobbin Amage Meter Calibratic adjustment 300-13 Switch D.P.D.T. Push Button Charging adjustment 120-30 Knob Bar pointer Battery adjustment 120-30 Knob Bar pointer Off-Battery Amager 300-47 Socket · Octal (8 prong) Charging adjustment 300-47 Socket · Octal (8 prong) Charging adjustment 300-65 Cover Plassic 300-67 Manual Instruction Materproof | ບ | 300-3 | Chamber | | Detector-amplifier | ю | Victoreen |
| 185-167 Mater 150 ohm Bobbin 24 Meter Bias 185-168 Resistor 3,000 ohm Bobbin 34 Meter Calibration 185-169 Resistor 25,000 ohm Bobbin 34 Output load 185-169 Resistor 25,000 ohm Bobbin 34 Output load 185-169 Resistor 25,000 ohm Bobbin 34 Output load 185-56 Resistor 50,000 ohm Bobbin 34 Output load 185-56 Resistor 300 ohm linear taper Battery adj. 300-41 Rotary, 4 circuit 3 position (Off-on Battery Run 300-14 Switch Bar pointer Battery channel 120-30 Knob Bar pointer Off-Battery Run 120-30 Knob Bar pointer Off-Battery channel 300-47 Socket Octal (8 prong) Chamber 300-65 Cover Plastic Plastic 300-65 Cover Plastic 300-67 Manual Instruction Reserve Contact 300-67 Manual Instruction Reserve Contact 300-67 Screwdriver 1/8" blade | 1 | 300-18 | Inductance | Choke (hearing aid) | Charger | 8 | Standard Trans. |
| 185-167 Resistor 150 ohm Bobbin 量析 Meter Califration 185-168 Resistor 3,000 ohm Bobbin 量析 Mater califration 185-169 Resistor 25,000 ohm Bobbin 操作 Coil shunt load 185-169 Resistor 50,000 ohm ± 5% 量析 Coil shunt load 300-56 Pot 300 ohm linear taper Charging adj. 300-13 Switch Rotary, 4 circuit 3 position (Off-on Battery adj. 300-14 Switch D.P.D.T. Push Button Charging adj. 300-14 Feet Felt ½ Battery Run 120-30 Knob Bar pointer Off-Battery edjustment 120-30 Knob Bar pointer Off-Battery of Justment 300-24 Insulator Mica board Chanber 300-57 Cop Knurled Changing clip Changing adjustment 300-57 Cortact Spring clip Changer Mattery contact 300-65 Cover Plastic Mattery contact Materproof 300-67 Manual Instruction Matter | ĸ | 200-27 | Meter | 0-100 ma. 2000 | Indicator | - | : |
| 185-168 Resistor 3,000 ohm Bobbin 1/4 Meter calibration 185-169 Resistor 25,000 ohm Bobbin 1/4 Output load 185-56 Resistor 50,000 ohm ± 5% 1/4 Output load 300-58 Pot 300 ohm linear taper Battery adj. 300-14 Pot 10,000 ohm linear taper Charging adj. 300-14 Switch Rotary, 4 circuit 3 position (Off-on Battery Run) 200-14 Switch D.P.D.T. Push Button Charging 120-30 Knob Bar pointer Battery adjustment 120-30 Knob Bar pointer Off-Battery Run 300-24 Insulator Mica board Chamber 300-47 Socket Octal (8 prong) Chamber 300-57 Contact Spring clip Battery contact 300-67 Manual Instruction Screwdriver 1/8" blade 300-67 Manual Instruction Screwdriver 1/8" blade 300-67 Waterproof Screwdriver 1/8" blade 300-67 Waterproof Screwdriver 1/8" blade 300-67 Waterproof Screwdriver 1/8" blade 300-67 Screwdriver 1/8" blade Screwdriver 1/8" blade 300-67 Screwdriver 1/8" blade Screwdriver 1/8" bl | R3 | 185-167 | Resistor | 150 ohm Bobbin 🛂 | Meter Bias | 5 | Shallcross |
| 185-169 Resistor 25,000 ohm Bobbin 1/4 Output load 186-56 Resistor 50,000 ohm + 5% 1/4 Coil shunt 300-56 Pot 300 ohm linear taper Battery adj. 300-41 Pot 10,000 ohm linear taper Charging adj. 300-13 Switch Rotary, 4 circuit 3 position (Off-on Battery Run) 300-14 Switch D.P.D.T. Push Button Charging adj. 120-30 Knob Bar pointer Off-Battery Run 120-30 Knob Bar pointer Off-Battery Run 300-24 Insulator Wica board Chamber 300-47 Socket : Octal (8 prong) Chamber 300-67 Manual Instruction Spring clip Battery contact 300-67 Manual Instruction Screwdriver 1/8" blade 180-50 Screwdriver 1/8" blade Screwdriver 1/8" blade 180-50 Socket Socket Spring clip Screwdriver 1/8" blade Screwdriver | R4 | 185-168 | Resistor | 3,000 ohm Bobbin ¼W | Meter calibration | 5 | Shallcross |
| 185-56 Resistor 50,000 ohm ±5% ½W Coil shunt | R5 | 185-169 | Resistor | 25,000 ohm Bobbin 計W | Output load | ယ | Shallcross |
| 300-56 Pot 300 ohm linear taper Battery adj. 300-41 Pot 10,000 ohm linear taper Charging adj. 300-13 Switch Rotary, 4 circuit 3 position (Off-on Battery Run) 300-14 Switch D.P.D.T. Push Button Charging 70-46 Feet Felt ½" Battery Run 120-30 Knob Bar pointer Off-Battery Run 300-24 Insulator Mica board Charber 300-47 Socket Octal (8 prong) Charging adjustment 300-57 Contact Spring clip Battery contect 300-56 Cover Plastic 300-65 Waturled Battery contect 300-66 Wanual Instruction 300-67 Wanual Instruction | R6 | 185-56 | Resistor | 50,000 ohm + 5% W | Coil shunt | വ | Allen-Bradley |
| 300-41 Pot 10,000 ohm linear taper Charging adj. 300-13 Switch Rotary, 4 circuit 3 position (Off-on Battery Run) 300-14 Switch D.P.D.T. Push Button Charging 70-46 Feet Felt ½n Rest Pointer Battery adjustment 120-30 Knob Bar pointer Off-Battery Run 300-24 Insulator Mica board Battery channel 300-47 Socket Octal (8 prong) Chamber 300-53 Cap Kmurled Charging adjustment 300-54 Plastic Waterproof Amanal 300-65 Cover Plastic Waterproof Amanal 300-67 Manual Instruction Waterproof Amanal | R7 | 300-58 | Pot | 300 ohm linear taper | Battery adi. | ည | Internat'1 Res. |
| 300-13 Switch Rotary, 4 circuit 3 position (Off-on Battery Run) 300-14 Switch D.P.D.T. Push Button Charging 70-46 Feet Felt ½" Battery Run 120-30 Knob Bar pointer Off-Battery adjustment 300-24 Insulator Mica board Battery channel 300-57 Cap Kmurled Charging adjustment 300-57 Contact Spring clip Battery contact 300-65 Cover Plastic Waterproof 300-67 Manual Instruction Waterproof | R8 | 300-41 | Pot | 10,000 ohm linear taper | Charging adj. | က | Mallory |
| 300-14 Switch D.P.D.T. Push Button Charging 70-46 Feet Felt ½" Bat pointer 120-30 Knob Bar pointer Off-Battery adjustment 300-24 Insulator Mica board Battery channel 300-57 Cap Knurled Charging adjustment 300-57 Contact Spring clip Battery contact 300-65 Cover Plastic Waterproof 300-67 Manual Instruction Waterproof | LMS | 300-13 | Switch | Rotary, 4 circuit 3 position | (Off-on Battery Run) | - | Mallory |
| Feet Felt #" Knob Bar pointer Off-Battery adjustment Knob Bar pointer Off-Battery Run Insulator Mica board Battery channel Socket · Octal (8 prong) Chamber Cap Knurled Contact Spring clip Battery contact Cover Plastic Waterproof Manual Instruction Screwdriver 1/8" blade | SW2 | 300-14 | Switch | D.P.D.T. Push Button | Charging | н | Mallory |
| Knob Bar pointer Off-Battery adjustment Knob Bar pointer Off-Battery Run Insulator Mica board Battery channel Socket Octal (8 prong) Chamber Cap Knurled Contact Cover Spring clip Battery contact Cover Plastic Waterproof Waterproof Waterproof Waterproof | *************************************** | 70-46 | Feet | Felt ½" | | 10 | T-R Brawley |
| KnobBar pointerOff-Battery RunInsulatorMica boardBattery channelSocketOctal (8 prong)ChamberCapKnurledCharging adjustmentContactSpring clipBattery contactManualInstructionWaterproofScrewdriver1/8" blade | *************************************** | 120-30 | Knob | Bar pointer | Battery adjustment | - | Gen. Cement |
| Insulator Mica board Battery channel Socket · Octal (8 prong) Chamber Cap Knurled Charging adjustment Cover Spring clip Battery contact Manual Instruction Screwdriver 1/8" blade | | 120-30 | Knob | Bar pointer | Off-Battery Run | H | Gen. Cement |
| Socket · Octal (8 prong) Chamber Cap Knurled Charging adjustment Contact Spring clip Battery contact Manual Instruction Screwdriver 1/8" blade | | 300-24 | Insulator | Mica board | Battery channel | 15 | Victoreen |
| Cap Charging adjustment Contact Spring clip Battery contact Cover Plastic Manual Instruction Screwdriver 1/8" blade | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 300-47 | Socket . | Octal (8 prong) | Chamber | -1 | Amphenol |
| Contact Cover Plastic Manual Instruction Screwdriver 1/8" blade | | 300-53 | Свр | Knurled | Charging adjustment | . | Victoreen |
| Cover Plastic Manual Instruction Screwdriver 1/8" blade | | 300-57 | Contact | Spring clip | Battery contact | 25 | Victoreen |
| Manual Instruction Screwdriver 1/8" blade | | 300-65 | Cover | Plastic | Waterproof | 40 | Giller Prods. |
| river | *************************************** | 300-67 | Manua1 | Instruction | | | Victoreen |
| W | | | Screwdriver | 1/8" blade | | 7 | |
| | | | · Wrench | | | | |

^{*} NOTE: The spare parts wit is designed to service 10 instruments under field operating conditions in accordance with United States Atomic Energy Commission specifications, and contains parts as listed above.

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