

INSTRUCTION MANUAL

for the

BIRNS Emergency Lighting Fixture

Model 4701

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1. SCOPE

- a. This Manual provides basic information and requirements for installation and maintenance of the BIRNS Emergency Lighting Fixtures Model 4701, and its sub-models numbers 4701-10, 4701-02, 4701-31, and 4701-32. Except where noted, the information in this Manual applies equally to all models.

2. APPLICABLE DOCUMENTS

- a. BIRNS, Inc.
 - i. Drawings
 - (1) 4701-101: "Assembly Drawing"
 - (2) 4701-300: "Installation Drawing"
 - (3) 4701-501: "Electrical Schematic"
 - (4) 4701-701: "Wiring Diagram"
 - ii. Documents
 - (1) MAN-4701-202, "Packaging, Shipping, Storage and Handling Procedures for the Emergency Lighting Fixture Model 4701"
- b. Industry Standards
 - i. UL924, "Emergency Lighting & Power Equipment"
 - ii. NFPA 70, "National Electric Code"

3. QUALITY CONTROL

- a. The Customer's Quality Assurance Department shall maintain surveillance over this Manual to the degree necessary to assure compliance with its requirements.

4. SAFETY PRECAUTIONS

- a. READ AND UNDERSTAND THE ENTIRE MANUAL PRIOR TO INSTALLATION OF THE UNIT.
- b. DANGER OF SHOCK HAZARD! Do not use outdoors or subject unit to any kind of moisture.
- c. DANGER OF FIRE/EXPLOSION! Do not use in areas where explosive or flammable vapors may be present.
- d. Do not mount near sources of heat.
- e. Use of this unit other than as intended may void the warranty.
- f. Mount and use this unit in strict accordance with National Electrical Code, Uniform Building Code, Life Safety Code, and/or any other local code requirements. Use only approved wiring methods.
- g. DANGER OF SHOCK HAZARD! Do not allow servicing or installation of this unit by other than properly trained and qualified personnel.
- h. Do not use parts of components not recommended by the manufacturer; this may cause an unsafe condition and may void the warranty.
- i. Do not connect the batteries prior to installation.
- j. Do not connect the batteries prior to connection to main power.
- k. Ensure that AC power supply is not energized ("OFF") prior to installation.
- l. Remove the 20A fuse whenever connecting or disconnecting the batteries.

5. DESCRIPTION

- a. The BIRNS Emergency Lighting Fixture Model 4701 (Rev. A) is subclassified as follows:
 - i. 4701-10 is suitable for Nuclear Safety Related use, and meets all of the applicable requirements of KEPCO Specification 9-173-E721 including Section 4.06.C, "Special Requirements". Model 4701-10 is wired in accordance with BIRNS drawing 4701-1-701.
 - ii. 4701-02 is suitable for Nuclear Safety Related use, and has this specific feature:
 - (1) Batteries used are restricted to PowerSonics' model PS-6360
 - iii. 4701-31 is suitable for Nuclear Safety Related use, and has this specific feature:
 - (1) LED indicator lights are used (in place of incandescent indicators)
 - iv. 4701-32 is suitable for Nuclear Safety Related use, and has these specific features:
 - (1) Batteries used are restricted to PowerSonics' model PS-6360
 - (2) LED indicator lights are used (in place of incandescent indicators)
 - v. Model 4701 (Rev. N/C) is *not* suitable for Nuclear Safety Related use, as its inner wire insulation is PVC.
 - (1) Model 4701 (Rev. N/C) input voltages are 120, 220, and 240 VAC (i.e. no 277 VAC).
- b. Except where noted, all instructions, information, and documentation apply equally to all Model 4701 sub-models, and they are collectively referred to as "Model 4701".
- c. The BIRNS Emergency Lighting Fixture Model 4701 is a seismically-qualified nuclear grade incandescent wall-mounted emergency light. It has integral sealed rechargeable batteries and solid-state charging circuitry that provides a minimum of eight hours emergency illumination. Model 4701 is designed in accordance with UL 924, "Emergency Lighting Equipment", and NFPA 70, "National Electric Code".
- d. The BIRNS Emergency Lighting Fixture Model 4701 is designed to provide features lacking in other fixtures of this type. To that end the BIRNS Emergency Lighting Fixture Model 4701 is constructed entirely of stainless steel and incorporates many internal and external improvements, listed below, in the section entitled "Functional Description".

6. PURPOSE

- a. The purpose of the BIRNS Emergency Lighting Fixture Model 4701 is to provide illumination in case of power failure. It uses standard mains current to maintain its batteries in a state of constant readiness, and automatically energizes its lights if the mains current drops below 88% of its standard RMS value. When the mains current resumes, the BIRNS Emergency Lighting Fixture Model 4701 de-energizes its lights and recharges its internal batteries.

7. FUNCTIONAL DESCRIPTION

*** EXTERNAL PRODUCT FEATURES ***

- a. HIGH OUTPUT EASY-TO-READ STATUS INDICATORS WITH LONG LIFETIMES. This model features specially-designed easy-to-read Status Indicator Lights, with long lifetimes. These are installed in the following color code:
 - i. GREEN: AC power "ON"; normal operation
 - ii. AMBER: High-current battery recharging
 - iii. RED : Emergency mode
- b. TEST SWITCH ALLOWS FOR ROUTINE SCHEDULED TESTING TO ENSURE NORMAL OPERATION. A single test switch provides a simple and fast test, that combined with regular trouble-shooting, is the most effective method for ensuring proper operation of the unit during a power failure. The test switch circuit provides testing of proper operation of: the batteries; floodlights; pilot lights; fuses, relay/switch module; charger module; and overall wiring integrity.
- c. FULL-SCALE 0-15 VDC BATTERY STATUS INDICATOR PROVIDES ACCURATE BATTERY STATUS FOR PERIODIC INSPECTION OR ROUTINE MAINTENANCE. This provides a visual inspection point to ensure proper operation and charge of the batteries, so that their operation is assured during any power failure.
- d. RUGGED ELECTROPOLISHED TYPE 304 STAINLESS STEEL HOUSING AND COVER. This material is excellent for prevention of corrosion effects, and does not require any form of coating or protection.
- e. SEVEN ELECTRICAL ENTRY KNOCK-OUTS FOR EASY INSTALLATION. There are two knock-outs in each of the two sides of the unit; two in the bottom of the unit; and one in the back of the unit. These provide for optimum installation.
- f. MIRROR-FINISH HOUSING AND COVER PROVIDE FOR EASY CLEANING IN THE NUCLEAR ENVIRONMENT.

- g. PERMANENTLY-MOUNTED LOW-PROFILE STAINLESS STEEL THREADED INSERTS PROVIDE EXCELLENT INTERNAL COMPONENT MOUNTING. There is no need for small nuts and other parts; neither is there a danger that screws might strip the threads in thin sheet metal.
- h. FLOOD LIGHTS PAN 360 DEGREES AND TILT 120 DEGREES FOR OPTIMUM ILLUMINATION.
- i. GLARE-FREE EXTERNAL LABELS PROVIDE OPTIMUM READABILITY.

*** INTERNAL PRODUCTS FEATURES ***

- j. INTEGRATED TRANSFORMER ASSEMBLY/CABLE HARNESS PROVIDES EASY ACCESS TO FIELD-REPLACEABLE COMPONENTS. It is specially designed not to block mounting holes.
- k. EASILY FIELD-REPLACEABLE COMPONENTS ARE:
 - i. BATTERIES (Replace in pairs). The batteries may be easily replaced, simply by disconnecting the battery jumper wires, and removing two screws.
 - ii. RELAY. The relay/switch module is mounted in a plug-in socket, secured with an expendable non-metallic strap, and is quickly replaced with minimum tools.
 - iii. CHARGER MODULE/PCB ASSEMBLY. This unit plugs into a spring-loaded card edger connector (which is keyed to fit only one way). A stainless support bracket doubles as a heat sink. Field replacement of the Charger Module requires removal of only 4 screws.
 - iv. STATUS INDICATOR LIGHTS. These may be replaced, if necessary, simply by removing their wires (which have push-on/pull-off terminals) and replacing the indicator lights. This is a fast, tool-free procedure.
 - v. FUSES. Fuses are held in standard fuse holders; they may be quickly replaced without tools.
 - vi. FLOODLIGHT LAMPS. Floodlight lamps may be quickly replaced, using a single screwdriver.
 - vii. INSULATED CONTACTS FOR SAFETY. All wire connections are fully insulated, either with heat-shrink insulation tubing or fully-insulated wire terminations.
 - viii. PRINTED CIRCUIT BOARD HAS GREEN SAFETY CONFORMAL COATING FOR MINIMIZING CORROSIVE EFFECTS OF HUMIDITY.

8. SCHEDULED MAINTENANCE

NOTE

Regular performance testing, combined with effective troubleshooting in case of problems, is the most important type of scheduled maintenance. This simple test encompasses the entire unit, and will indicate any existing problems with the circuitry, lamps, indicators, and batteries.

- a. MONTHLY TESTING. Once monthly test the Emergency Light as follows:
 - i. Press the test switch (21D-015) and hold for 5 seconds. While the test switch is depressed, the following results are required.
 - (1) the floodlights should activate;
 - (2) the red "Emergency Mode" indicator should activate;
 - (3) the green "Normal Power" indicator should deactivate.If they do not, consult the "Troubleshooting" Chapter.
 - ii. After 5 seconds have elapsed, release the test switch. When the test switch is released, the following results are required:
 - (1) the floodlights should deactivate;
 - (2) the red "Emergency Mode" indicator should deactivate;
 - (3) the green "Normal Power" indicator should reactivate. If they do not, consult "Troubleshooting" Chapter.

NOTE

The amber "high charge" indicator may activate momentarily or for a short while. This is normal and may be expected. However, if the amber "high charge" indicator remains on for more than one hour, consult "troubleshooting chapter."

- b. ANNUAL TESTING. Once every 12 months, open the unit cover and inspect the unit's interior for the following:
- i. Inspect for contact corrosion at the batteries. If any battery contact corrosion is evident:
- (1) Shut off the power to the unit and remove the 20A fuse (18E-004).
 - (2) Disconnect the batteries.
 - (3) Clean the battery contacts of all corrosion with a wire brush, abrasive paper, or similar.
 - (4) Apply a thin film of pure food-grade silicone grease to the battery contacts.
 - (5) Inspect the wire terminals; if they are heavily corroded replace them.
 - (6) Reconnect the batteries.
 - (7) Reinstall the 20A fuse (18E-004) and energize the unit.
- ii. Do a 30-second Performance Test. (For more information, see Chapter 7, "Corrective Maintenance".)

NOTE

When reconnecting the batteries and re-installing the fuse, the lights may only activate for 3-10 seconds. This is normal. The unit will reset itself when power is restored.

- iii. Inspect for contact corrosion at the Charger Module Assembly PCB (20B-005). If any obvious corrosion at the Charger Module Assembly PCB is present:
- (1) Shut off the power to the unit and remove the 20A fuse (18E-004).
 - (2) Disconnect the Battery Jumper Wire (17A-005).
 - (3) Remove the screws holding the PCB bracket to the box.
 - (4) Grasp the PCB and pull straight out from the unit.
 - (5) Gently clean the PCB of all corrosion, particularly from the contacts on the edge that mates into the card edge connector.
 - (6) Apply a very thin film of pure food-grade silicone grease to the PCB contacts.

- (7) Reinsert the PCB into the connector, and reattach the bracket screws.
 - (8) Reconnect the Battery Jumper Wire (17A-005).
 - (9) Reinstall the 20A fuse and energize the unit.
 - (10) Do a 30-second Performance Test. (For more information, see Chapter 7, "Corrective Maintenance".)
- iv. Inspect for obvious damage to the Relay/Switch (21D-016). If there is any obvious damage to the Relay/Switch Module:
- (1) Shut off the power to the unit and remove the 20A fuse (18E-004).
 - (2) Remove the nonconductive strap securing the Relay/Switch Module.
 - (3) Remove the Relay/Switch Module by pulling it straight out of its socket.
 - (4) Replace the old Relay/Switch Module with a new one.
 - (5) Attach a new securing strap.
 - (6) Reinstall the 20A fuse and energize the unit.
 - (7) Do a 30-second Performance Test. (For more information, see Chapter 7, "Corrective Maintenance"
- v. Inspect for loose wires or contacts. If any are present:
- (1) Shut off the power to the unit and remove the 20A fuse (18E-004).
 - (2) Disconnect the Battery Jumper Wire (17A-005).
 - (3) Repair or replace the loose wires or contacts.
 - (4) Reconnect the Battery Jumper Wire.
 - (5) Reinstall the 20A fuse and energize the unit.
 - (6) Do a 30-second Performance Test. (For more information, see Chapter 7, "Corrective Maintenance".)

9. BATTERIES

The batteries are of sealed construction, and require no special maintenance other than periodic inspection to ensure that they retain their charge. (This inspection should be carried out at the same time as the monthly performance test described above.)

- a. Once monthly, read the Battery Volt Meter (18J-009). The meter should read between 10-14 VDC. (If it does not, see the section on “Troubleshooting”.)
- b. Replace the batteries after five (5) years of continuous use. (For more information, see the section on “Corrective Maintenance”.)

The batteries used in the BIRNS Emergency Lighting Fixture have a low self-discharge rate which permits battery storage for long periods. However, the maximum battery storage period without recharging (“shelf life”) is highly temperature-dependent; lower ambient storage temperatures enhance shelf life characteristics.

At an ambient storage temperature of 20°C (68°F) in a Level 'B' warehouse, the batteries will retain the following approximate capacity:

- | | |
|-----------------|-------------------------|
| after 1 month: | 97% of nominal capacity |
| after 3 months: | 91% of nominal capacity |
| after 6 months: | 83% of nominal capacity |

The percentage of retained nominal capacity is expressed as the battery’s “Capacity Retention Ratio”. We recommend that a battery be charged before use if its Capacity Retention Ratio drops below 80%, and therefore recommend that the battery be charged after the following storage periods:

- | | |
|------------------|------------|
| at 5°C (41°F): | 18 months |
| at 20°C (68°F): | 6 months |
| at 30°C (86°F): | 3 months |
| at 40°C (104°F): | 1.5 months |

10. TROUBLESHOOTING

The following is a list of possible problems with their causes and required corrective actions.

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
AC supply breaker trips or supply fuse blows.	<ol style="list-style-type: none"> 1. Short circuit in AC supply line 2. Overload on circuit 3. Incorrect power connectors (e.g. 277VAC input connected to 120VAC terminal). 4. Short circuit in unit wiring. 	<ol style="list-style-type: none"> 1. Remove short 2. Correct for proper load 3. Check input power connections and correct. 4. De-energize power and inspect unit wiring unit for loose or dislodged connections and correct wiring.
Floodlights do not activate during routine test	<ol style="list-style-type: none"> 1. Blown 20 amp fuse 2. Lamps burned out 3. Lamps disconnected 4. Batteries disconnected 5. Batteries dead 6. Faulty Relay/Switch 7. Faulty Test Switch 	<ol style="list-style-type: none"> 1. Replace fuse 2. Replace Lamp 3. Reconnect lamps 4. Reconnect batteries 5. Check battery voltage at voltmeter on panel, replace batteries if <10V 6. Replace Relay/Switch 7. Replace Test Switch
One floodlight does not activate during routine test	<ol style="list-style-type: none"> 1. Lamp disconnected 2. Lamp burned out 	<ol style="list-style-type: none"> 1. Reconnect lamp 2. Replace lamp
Red indicator light does not activate during routine test	<ol style="list-style-type: none"> 1. Indicator disconnected 2. Indicator burned out 	<ol style="list-style-type: none"> 1. Reconnect indicator leads 2. Replace indicator
Green indicator light does not deactivate during routine test	<ol style="list-style-type: none"> 1. Faulty Relay/Switch 2. Faulty Charger Module 3. Faulty Test Switch 	<ol style="list-style-type: none"> 1. Replace Relay/Switch 2. Replace Charger Module 3. Replace Test Switch

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Floodlights do not deactivate after routine test	<ol style="list-style-type: none"> 1. 5A fuse blown 2. Faulty Relay/Switch Module 3. Faulty Test Switch 	<ol style="list-style-type: none"> 1. Replace 5A fuse 2. Replace Relay/Switch Module 3. Replace Test Switch
Red indicator does not deactivate after routine test	<ol style="list-style-type: none"> 1. Faulty Relay/Switch 2. Faulty Charger Module 	<ol style="list-style-type: none"> 1. Replace Relay/Switch Module 2. Replace Charger Module
Floodlights activate without apparent cause	<ol style="list-style-type: none"> 1. Open AC supply circuit 2. Blown 5A fuse 3. Faulty Relay/Switch 4. Faulty Charger Module 	<ol style="list-style-type: none"> 1. Correct open AC circuit 2. Replace 5A fuse 3. Replace Relay/Switch Module 4. Replace Charger Module
Unit provides less than 8 hours of light during power failure	<ol style="list-style-type: none"> 1. Excessive load on batteries 2. Faulty Relay/Switch Module 3. Faulty batteries 4. Faulty Charger Module 	<ol style="list-style-type: none"> 1. Correct load 2. Replace Relay/Switch Module 3. Replace batteries 4. Replace charger Module
Green indicator light does not reactivate after routine test	<ol style="list-style-type: none"> 1. Faulty Relay/Switch Module 2. Faulty indicator light 3. Faulty Charger Module 	<ol style="list-style-type: none"> 1. Replace Relay/Switch Module 2. Replace indicator light 3. Replace Charger Module
Amber indicator light remains on for more than one hour after routine test	<ol style="list-style-type: none"> 1. Faulty batteries 2. Faulty Charger Module 	<ol style="list-style-type: none"> 1. Replace batteries 2. Replace charger module
Amber indicator light activates without apparent reason	<ol style="list-style-type: none"> 1. Normal if for less than 1 hour duration 2. Faulty batteries (if for more than 1 hour duration) 	<ol style="list-style-type: none"> 1. No action required 2. Check battery volt meter for low voltage (<10V); Replace batteries

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Green indicator light does not activate during normal operation	<ol style="list-style-type: none">1. Faulty indicator light2. Faulty Relay/Switch Module	<ol style="list-style-type: none">1. Replace indicator light2. Replace Relay/Switch Module
Battery voltage status indicator meter reads below 10 VDC	<ol style="list-style-type: none">1. Low battery voltage2. Faulty Voltmeter	<ol style="list-style-type: none">1. Check batteries voltage with volt/ohm meter; replace batteries if <10V2. Replace voltmeter

11. CORRECTIVE MAINTENANCE

a. HOW TO REMOVE AND REPLACE THE COVER.

TO REMOVE THE COVER:

- i. The cover (14A-005) is retained with four No. 8 sheet metal screws (23B-095), one on each of the four sides of the cover.
- ii. Remove the four screws (23B-095), with a screwdriver, by turning them counter-clockwise. Set them aside.
- iii. Remove the cover by pulling it straight off of the Fixture.

TO REPLACE THE COVER

- iv. To replace the cover, gently put it onto the open front of the box (08C-001) until it is seated.
- v. Install the four No. 8 sheet metal screws, one on each of the four sides of the cover, with a screw-driver by turning clockwise until seated. DO NOT OVER TIGHTEN.

b. REPLACING THE FLOODLIGHT LAMPS.

CAUTION***WEAR EYE PROTECTION. REPLACE ONLY ONE (1) LAMP AT A TIME.***

- i. De-energize AC supply and remove cover.
- ii. Remove 20 A (DC) fuse.
- iii. Separate floodlight housing by removing Philips screw and lifting off the retainer.
- iv. Disconnect wire leads from screw terminals on old lamp and reconnect to new lamp (NOTE: no wire orientation is required.)
- v. Note positioning of wire retaining clip on old lamp before removing it.
- vi. Remove wire retaining clip and lamp.
- vii. Install new lamp and re-install clip.
- viii. Reassemble floodlight housing.
- ix. Reinstall 20 A fuse.

NOTE*The floodlights will go out in 3-10 seconds. The unit will reset itself when power is restored.*

- x. Reinstall cover and energize the circuit.

c. REPLACING THE FUSES.

- i. De-energize AC supply and remove cover.
- ii. Remove the affected fuse, by opening the fuse holder (18B-005). Open the fuse holder by rotating the fuse holder cover counter-clockwise.
 - (1) 5A fuse: 18E-003
 - (2) 20A fuse: 18E-004
- iii. Insert a new replacement fuse into the appropriate fuse holder.

CAUTION

THE 5A FUSE MUST ONLY BE INSERTED INTO THE TOP FUSE HOLDER. THE 20A FUSE MUST ONLY BE INSERTED INTO THE BOTTOM FUSE HOLDER.

- iv. Close the fuse holder by putting on its cover and turning clockwise.
- v. Reinstall the Fixture cover and energize the circuit.

d. REPLACING THE BATTERIES.

NOTE

The battery manufacturer recommends that both batteries be replaced at the same time.

- i. De-energize the AC supply circuit and remove cover (14A-005).
- ii. Remove 20 A fuse (18E-004).
- iii. Unplug the Battery Jumper Wire (17A-005) from the batteries. Unplug the positive and negative leads from the batteries.
- iv. Remove the three battery brackets (09A-012 and 09A-013). Remove the old batteries.
- v. Clean any foreign matter from battery area.
- vi. Install the new batteries with the labels facing out. Re-install the three battery brackets.
- vii. Connect the brown wire to the negative terminal on the left battery, and the red wire to the positive terminal on the right battery.
- viii. Install the Battery Jumper Wire (17A-005).
 - (1) Push one end of the Battery Jumper Wire onto the RED (POSITIVE) terminal on the left battery.
 - (2) Push the other end of the Battery Jumper Wire onto the BLUE (NEGATIVE) terminal on the right battery
- ix. Re-install the 20A fuse.

NOTE

The floodlights will go out in 3-10 seconds. This is normal. The unit will reset itself for standby operation when the ac supply is restored.

- x. Replace the cover.
- xi. Energize the circuit.

- e. REPLACING THE CHARGER MODULE PCB ASSEMBLY.
 - i. De-energize the AC supply circuit and remove the Fixture cover.
 - ii. Remove the 20A fuse.
 - iii. Remove the Battery Jumper Wire.
 - iv. Remove the four Pan Slot 6-32 x 0.25 screws (23B-004) from the top of the Fixture (between the floodlight lamp Head Assemblies), by rotating them counter clock wise with a screwdriver.
 - v. Remove the Charger Module Assembly (20B-005) by pulling it straight out from the card edge connector (18D-023).
 - vi. Insert a new charger Module Assembly by gently pushing it straight into the card edge connector.

NOTE

The charger module PCB and the card edge connector are keyed so that the module will only fit into the connector with a right-angle stainless steel bracket.

- vii. Replace the four Pan Slot screws.
- viii. Replace the Battery Jumper Wire.
- ix. Replace the 20A fuse.
- x. Replace the Fixture Cover.
- xi. Energize the AC power.

- f. REPLACING THE RELAY/SWITCH MODULE.
 - i. De-energize the AC supply and open the Fixture cover.
 - ii. Remove the 20A fuse.
 - iii. Remove the Battery Jumper Wire.
 - iv. Remove the nylon strap retaining the Relay/Switch Module in place.
 - v. Remove the Relay/Switch Module (21D-016) by firmly pulling it straight out from its socket (18R-001).
 - vi. Install the new Relay/Switch Module by inserting it into the socket until seated.
 - vii. Install a new non-metallic Module retaining strap. NOTE: a sturdy nylon cable tie is appropriate for this purpose.
 - viii. Replace the Battery Jumper Wire.
 - ix. Replace the 20A fuse.
 - x. Replace the Fixture cover and activate the AC power supply.

- g. REPLACING THE PILOT LIGHTS (also called Status Indicator Lights).
 - i. De-energize the AC supply and open the Fixture cover.
 - ii. Remove the 20A fuse (28E-004).
 - iii. Remove the Battery Jumper Wire.
 - iv. Disconnect the affected Pilot Light by pulling the wire terminals straight off of the Pilot Light terminals.
 - (1) Red Pilot Light: 18L-001 (incandescent); 18L-004 (LED)
 - (2) Green Pilot Light: 18L-002 (incandescent); 18L-005 (LED)
 - (3) Amber Pilot Light: 18L-003 (incandescent); 18L-006 (LED)
 - v. Remove the Pilot Light from the Fixture box by pressing on the Pilot Light's two plastic retaining tabs on the inside of the box while pushing it straight out of its hole.
 - vi. Insert a new Pilot Light by pushing it straight into its hole.
 - vii. Connect the wires to the new Pilot Light by pushing the wire terminals directly onto the Pilot Light spade terminals until fully seated.
 - viii. Connect the Battery Jumper Wire.
 - ix. Replace the 20A fuse.
 - x. Replace the Fixture cover and activate the AC Power supply.

- h. REPLACING THE VOLT METER.
 - i. De-energize the AC supply and open the Fixture cover.
 - ii. Remove the 20A fuse.
 - iii. Remove the Battery Jumper Wire.
 - iv. Disconnect the Voltmeter (18J-009) by removing the nuts holding the wires onto its two terminal posts.
 - v. Remove the wires from the Voltmeter.
 - vi. Remove the non-conductive retention strap from the Voltmeter.
 - vii. Remove the Voltmeter from the Fixture box by removing its two retaining screws. Push the Voltmeter straight out of its hole.
 - viii. Insert a new Voltmeter by pushing it straight into its hole. Ensure that it is reading right-side up.
 - ix. Connect the wires to the new Voltmeter and tighten the terminal nuts.
 - x. Install the new Voltmeter into its hole. Install the two retaining screws.
 - xi. Install a new non-conductive retention strap onto the Voltmeter.
 - xii. Connect the Battery Jumper Wire.
 - xiii. Replace the 20A fuse.
 - xiv. Replace the Fixture Cover.
 - xv. Energize the AC power supply.

12. TECHNICAL SPECIFICATIONS

a. MATERIALS

i. BATTERIES

- (1) Electrode plates: Lead-calcium alloy, antimony-free
- (2) Plate separators: woven glass fiber cloth
- (3) Electrolyte : immobilized (gelled) dilute inorganic sulphuric acid
- (4) Container : ABS (acrylonitrile butadiene styrene copolymer)
- (5) Terminals : tin-plated brass
- (6) Relief Valve seal: neoprene rubber
- (7) Container seal : polyurethane

NOTE

During discharging, the negative plate is lead and the positive plate is lead dioxide, both becoming lead sulfate. The alloying of both plates with small amounts of calcium gives strength to the plate and helps inhibit corrosion.

NOTE

If excessive gas pressure builds up within the battery, the relief valve will open and release the pressure. The hydrogen and oxygen gasses vented are clean and non-corrosive. The one-way valve not only ensures that no air gets into the battery where the oxygen would react with the plates causing internal discharge, but also represents a safety device. The vent release pressure is 2-6 psi.

ii. EMERGENCY LIGHTING FIXTURE

- (1) Box 300-series stainless steel
- (2) Cover 300-series stainless steel
- (3) Bracket, single 300-series stainless steel
- (4) Bracket, dual 300-series stainless steel
- (5) Bracket, fuse 300-series stainless steel
- (6) All screws, washers, and lockwashers : 300-series stainless steel
- (7) All labels adhesive Mylar tape

- (8) Lamp head chrome-plated brass
- (9) PCB assembly fiberglass, clad with tin-plated copper; stainless bracket
- (10) Wire insulation
 - (a) Model 4701, Rev. N/C PVC Insulation, tinned stranded copper conductor
 - (b) Model 4701-1 (Safety Related) Hypalon (CSPE) Insulation, Stranded Copper conductor
 - (c) Model 4701, Rev. A Cross-linked polyethylene (XLPE) Insulation, Stranded Copper conductor
- (11) Battery wire sockets Nylon or vinyl insulation
- (12) Wire ties, nonconductive Polypropylene

b. PHYSICAL

- i. Height: 53 cm (21 inches)
- ii. Width: 41 cm (16 inches)
- iii. Depth: 10 cm (4 inches)
- iv. Weight: 21.4 kg (47 pounds)
- v. Mounting: Wall Mounting Type

c. ELECTRICAL

- i. AC Supply Voltage:
 - (1) Model 4701 Rev. "N/C": 120, 220 or 240 VAC
 - (2) Model 4701 Rev. "A": 120, 220, 240 or 277 VAC)
- ii. Supply frequency: 50 or 60 Hz

- iii. Maximum Emergency Loads:
 - (1) For 1.5 hours: 170 W
 - (2) For 8 hours: 45 W

- d. LAMP INFORMATION
 - i. Number of lamps: 2
 - ii. Rated Voltage of lamps: 12.8 volts
 - iii. Rated wattage of each lamp 18 W
 - iv. Type of lamp: Sealed Beam, PAR 36
 - v. Rated lamp lifetime: 300 hours
 - vi. Light output per lamp: 1500 CBCP/lamp
 - vii. Beam spread to 10% max CP:
 - (1) Horizontal: 50 degrees
 - (2) Vertical: 25 degrees

- e. BATTERY INFORMATION
 - i. Type of Battery: Sealed flat-plate gelled electrolyte lead-acid
 - ii. Number of cells: 6 total (3 cells per battery)
 - iii. Nominal Voltage: 12 VDC (6 VDC/battery)
 - iv. Discharge operation time: 8 hours (min) to 87.5% battery voltage, at rated wattage of lamp.
 - v. Maximum storage period: 30 days without charging and temperature limitations
 - vi. Total Battery Capacity: 33 amp-hours
 - vii. Nominal Battery Weight: 6.4 +/- .12 kg (14 +/- .25 lbs)

13. INSTALLATION INSTRUCTIONS

a. UNPACKING

CAUTION

THE PACKED UNIT WEIGHS 47 POUNDS (21.4 kg). DO NOT DROP IT. TAKE ALL NECESSARY SAFETY PRECAUTIONS WHEN LIFTING HEAVY WEIGHTS.

NOTE

We recommend that the unpacking be performed in the same area as the final installation, to protect the unit during transportation to the installation site.

- i. Set the packaged unit on flat horizontal surface. Lay the carton flat.
- ii. Cut open both sealed ends. (These are the two smallest sides of the carton.)
- iii. Look into the carton. Ensure that the thin polystyrene packing piece is on the bottom. (If it is on the top, turn the unit over.)
- iv. Hold the cardboard carton with one hand. Using the other hand, push the interior polystyrene. Packing fully out of the carton until it rests free on the horizontal surface.
- v. Remove the top polystyrene piece by lifting it straight up.
- vi. Holding the unit by the two lamp head assemblies, tilt the unit up until it is resting upright on the thin flat polystyrene pad.
- vii. Cut the polyethylene bag from around the unit, taking care not to scratch the mirror finish. Discard the desiccant and all other packing materials.
- viii. Ensure that units for installation inside containment are indeed the proper Nuclear Safety Related-rated units.

b. PRE-INSTALLATION

- i. Holding the unit by the two lamp head assemblies, tilt it back until it is resting flat on the thin flat polystyrene pad.
- ii. Remove the four #8 sheet metal screws securing the cover and set aside. Lift off the cover.
- iii. Locate the Battery Jumper Wire. [This is a red wire, 8 inches (20 cm) long, with two blue fully insulated slip-on female connectors.] RETAIN FOR FINAL INSTALLATION.

c. INSTALLATION.

CAUTION***ENSURE AC POWER IS "OFF" (DE-ENERGIZED) PRIOR TO INSTALLATION!!***

- i. Open the appropriate knock-out to allow for wire entry into the unit.
- ii. Affix the unit to the wall.

NOTE***Three 0.375-inch (9.5mm) mounting holes are provided— one in each of the two upper corners and one in between the batteries, near the bottom of the unit.***

- iii. Install the appropriate conduit.
- iv. Draw the AC power wires into the unit.
- v. Terminate the ground wire with a crimp-on type uninsulated ring terminal.
- vi. Attach the terminated Ground Wire to the right Single Battery Bracket retaining screw. This screw is marked with a green dot on the bracket.
- vii. Remove the 5A fuse and retain for later use.

- viii. Connect the Hot (Live) and Neutral (Common) wires to the appropriate positions on the Terminal Block (18K-001). Reading from left to right:
- (1) NEUTRAL (COMMON) – No. 1 position (first from the left)
 - (2) 120 VAC (LIVE) – No. 3 position (third from the left)
 - (3) 220 VAC (LIVE) – No. 4 position (fourth from the left)
 - (4) 240 VAC (LIVE) – No. 5 position (fifth from the left)
 - (5) 277 VAC (LIVE) – No. 6 position (sixth from the left)

NOTE

The No. 2 position in the Terminal Block (second from the left) is unused.

- ix. Check that the wires are securely fastened into the terminal block.
- x. Re-install the 5A fuse.
- xi. Remove the 20A fuse and retain for later use.
- xii. Install the Battery Jumper Wire.
 - (1) Push one end of the Battery Jumper Wire onto the RED (POSITIVE) terminal on the left battery.
 - (2) Push the other end of the Battery Jump Wire onto the BLUE (NEGATIVE) terminal on the right battery.
- xiii. Aim the floodlight lamp Head Assemblies.
 - (1) Loosen the 3/8" nut at the base of the Lamp Head Assembly (inside the unit).
 - (2) Swivel the Lamp Head Assembly to desired position.
 - (3) Tighten the 3/8" nut to secure the Lamp Head Assembly in position.
 - (4) Loosen the 5/16" horizontal nut at the Lamp Head Assembly joint.
 - (5) Tilt the lamp Head to desired position.
 - (6) Tighten the 5/16" nut to secure the Lamp Head in position.
- xiv. Install the 20A fuse.

NOTE

The floodlights and the red “emergency mode” indicator may activate momentarily; if this happens, within 3-5 seconds they will switch off and green “normal power” indicator will activate. This process is normal.

- xv. Replace the unit Cover (14A-005) with the four #8 sheet metal screws (23B-095).
- xvi. Energize the AC supply circuit.

NOTE

The amber “high charge” indicator may activate until the batteries reach their full-charged capacity.

d. POST-INSTALLATION

- i. Do a standard Performance Test, as per the directions in Chapter 5, “Scheduled Maintenance”, in the section entitled “Performance Testing”.

NOTE

The Emergency Lighting Fixture incorporates a trim potentiometer, that controls the charging rate (and, thereby, the charging current), as a component on the Charger Module Assembly (20B-005). This control is pre-set in the factory. It can be adjusted to reduce the charging current; reduction of the charging current does, however, increase the recharge time.

To adjust the charging rate, use a straight-blade screwdriver with a blade width of less than or equal to 0.125" to turn the white potentiometer (marked "TRIM"). Turn the trim-pot CLOCKWISE to DECREASE the output voltage, which decreases the charging current (and increases the charge time). (Turn the trim-pot COUNTER-clockwise to INCREASE the charging current.)

Appendix A

Drawings

for the

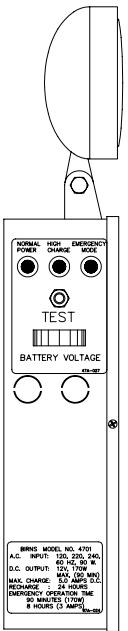
BIRNS Emergency Lighting Fixture

Model 4701

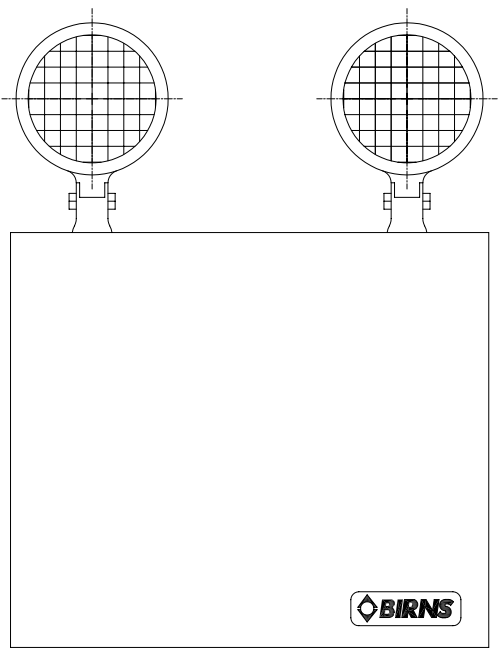
Drawing No.	Drawing Title	Rev.
4701-01-12	Layout, Emergency Lighting Fixture BIRNS Model 4701	N/C
4701-01-11	Features & Specifications, BIRNS Emergency Light, Model 4701	N/C
4701-01-10	BIRNS Emergency Light, Model 4701	N/C
4701-01-30	Installation Dimensions, Lighting Fixture BIRNS Model 4701	N/C
4701-01-40	Overall Dimensions, Emergency Lighting Fixture, BIRNS Model 4701	N/C

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REVISIONS				
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Ø-		INITIAL DRAWING RELEASE	941111	E.BIRNS



BIRNS MODEL NO. 4701
 A.C. INPUT 120, 270, 240, 180, 120, 90
 D.C. OUTPUT 12V, 7.5V, 6V
 MAX. CHARGE 1.5 AMP D.C.
 RECHARGE 24 HOURS
 DISCHARGE OPERATION TIME
 90 MINUTES (175W)
 8 HOURS (10 AMP)



MATERIAL	
TREATMENT	
FINISH	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 ALL DIMENSIONS TO APPLY AFTER PLATING
 .000 ----- ±.005
 .00 ----- ±.010
 .0 ----- ±.015
 FRACTIONS ± 1/32
 ANGULAR ± 1/2°
 ROUGHNESS 63/
 METRIC ± .5
 DRILLED HOLES UP TO 1/2" + .005 - .001
 BREAK SHARP EDGES .005-.015
 FILLET RADII TO BE .015

CONTRACT NUMBER	
DRAWN J.KO	DATE 941109
CHECK D.MILLER	DATE 941111
ENGR J.KO	DATE 941110
QA J.MAGLAQUE	DATE 941111
APPROVED E.BIRNS	DATE 941111

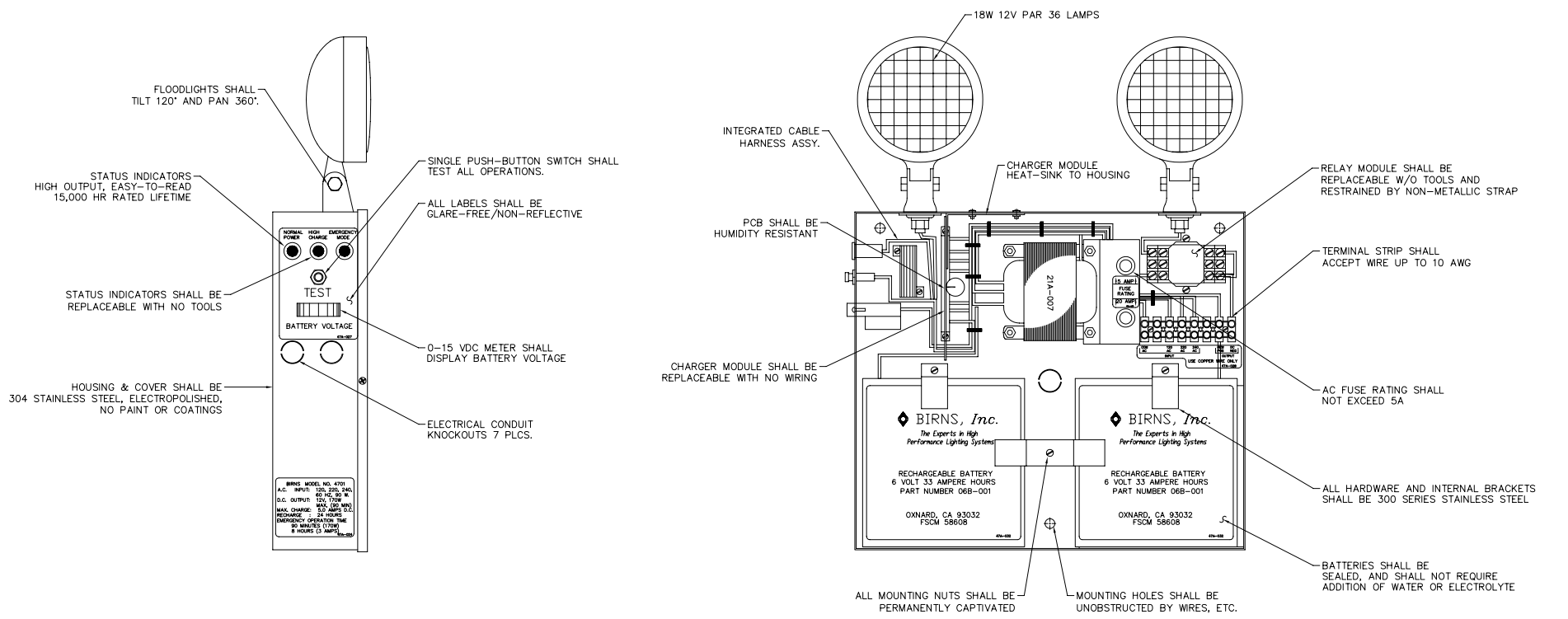
BIRNS, Inc. Tel: 805-487-5393 Main Plant: 1720 FISKE PLACE, OXNARD CA, 93033		
TITLE		
LAYOUT, EMERGENCY LIGHTING FIXTURE BIRNS MODEL 4701		
SIZE D	CAGE CODE 58608	DWG NO. 4701-01-12
SCALE 1/2	UNIT WT.	46 LB. SHEET

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0-		INITIAL DRAWING RELEASE	941111	E.BIRNS

- NOTES:**
- ALL WIRE CONNECTIONS SHALL BE FULLY INSULATED; WIRE NUTS NOT ACCEPTABLE.
 - NO SHARP EDGES IN ANY EXPOSED AREA.
 - FIXTURE SHALL BE DESIGNED AND TESTED IAW UL 924.
 - FIXTURE SHALL BE SEISMICALLY QUALIFIED IAW KEPKO SPEC. 9-173-E721.
 - FIXTURE SHALL PROVIDE MIN 8 HRS EMERGENCY ILLUMINATION.



BIRNS MODEL NO. 4701
 A.C. INPUT 120, 270, 360
 D.C. OUTPUT 12V 1.75W
 MAX. CHARGE 15V AMP 0.32
 RECHARGE 24 HOURS
 EMERGENCY OPERATION TIME
 80 MINUTES (170W)
 8 HOURS (15 AMP)

MATERIAL	TREATMENT	FINISH

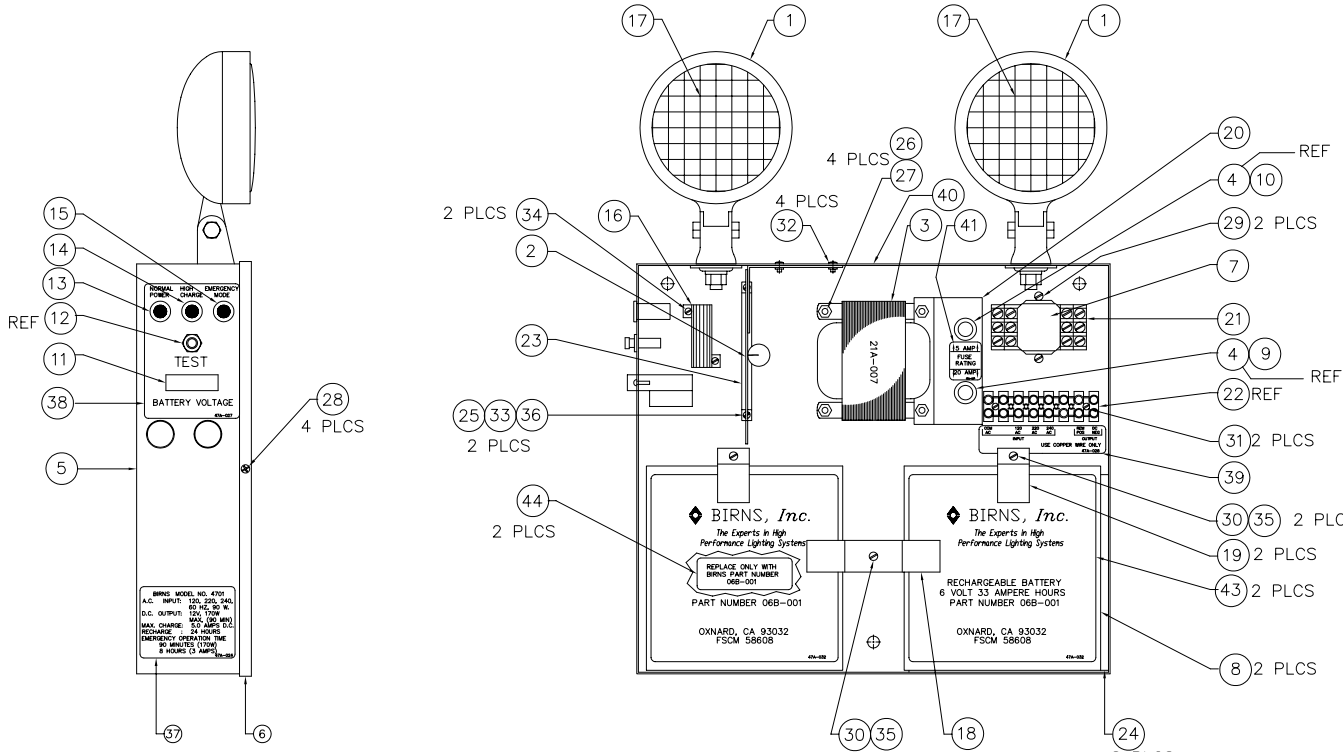
UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 ALL DIMENSIONS TO
 APPLY AFTER PLATING
 .000 ----- ±.005
 .00 ----- ±.010
 .0 ----- ±.015
 FRACTIONS ± 1/32
 ANGULAR ± 1/2°
 ROUGHNESS 63/
 METRIC ± .5
 DRILLED HOLES UP
 TO 1/2" + .005 - .001
 BREAK SHARP EDGES .005-.015
 FILLET RADII TO BE .015

CONTRACT NUMBER		BIRNS, Inc. Tel: 805-487-5393 Main Plant: 1720 FISKE PLACE, OXNARD CA, 93033	
TITLE		FEATURES & SPECIFICATIONS, BIRNS EMERGENCY LIGHT, MODEL 4701	
DRAWN J.KO	DATE 941109	SIZE	CAGE CODE DWG NO.
CHECK D.MILLER	DATE 941111	D	58608 4701-01-11
ENGR. J.KO	DATE 941110	SCALE	1/2 UNIT WT. 46 LB. SHEET
QA J.MAGLAQUE	DATE 941111		
APPROVED E.BIRNS	DATE 941111		

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NOTES:
 1. ITEM 45 NOT SHOWN FOR CLARITY, CONNECTED W/ ITEMS 3, 4, 12, 16, 22, 23..
 2. ITEM 42 IS ON ITEM 6, COVER (INSIDE).

ZONE		LTR		REVISIONS	DATE	APPROVED
				DESCRIPTION		
				INITIAL DRAWING RELEASE		



REQ	ITEM	PART NO.	DESCRIPTION	MATERIAL	SPEC.
1	45	17A-007	WIRING ASSY.	XLPE	COMM
2	44	47A-035	LABEL, BATTERY REPLACE	MYLAR	COMM
2	43	47A-032	LABEL, BATTERY	MYLAR	COMM
1	42	47A-033	LABEL, INSTALL	MYLAR	COMM
1	41	47A-034	LABEL, FUSE	MYLAR	COMM
1	40	47A-030	LABEL, FLOODLIGHT ADJUST	MYLAR	COMM
1	39	47A-028	LABEL, TERMINAL BLOCK	MYLAR	COMM
1	38	47A-027	LABEL, PILOTS, TEST, VOLT	MYLAR	COMM
1	37	47A-024	LABEL, SPECIFICATION	MYLAR	COMM
2	36	23E-021	#4 LOCKWASHER	S.S.	18-8
3	35	23E-019	#8 LOCKWASHER	S.S.	18-8
2	34	23B-080	4-40 X 1/4 LG. PAN SLOT	S.S.	18-8
2	33	23B-096	4-40 X 3/4 LG. PAN SLOT	S.S.	18-8
4	32	23B-004	6-32 X 1/4 LG. PAN SLOT	S.S.	18-8
2	31	23B-074	6-32 X 3/4 LG. PAN SLOT	S.S.	18-8
3	30	23B-005	8-32 X 3/8 LG. PAN SLOT	S.S.	18-8
2	29	23B-094	8-32 X 7/8 LG. PAN SLOT	S.S.	18-8
4	28	23B-095	8-32 X 3/8 PAN PHILIP	S.S.	18-8
4	27	23B-013	10-32 X 1/2 LG. PAN SLOT	S.S.	18-8
4	26	23F-021	10-32 KEPS NUT	S.S.	18-8
2	25	26C-006	STANDOFF	S.S.	18-8
8	24	30A-003	FOAM STRIP	NEOPRENE	CLOSED CELL
1	23	18D-023	CONNECTOR	NYLON	COMM
1	22	18K-001	TERMINAL BLOCK	NYLON	COMM
1	21	18R-001	SOCKET	NYLON	COMM
1	20	09A-014	BRACKET, FUSE HOLDER	S.S.	304
2	19	09A-013	BRACKET, SINGLE	S.S.	304
1	18	09A-012	BRACKET, DUAL	S.S.	304
2	17	32D-068	LAMP, 18W PAR 36	GLASS	BOROSILICATE
1	16	21F-010	RESISTOR, 1 OHM, 50W	ALUM	COMM
1	15	18L-001	PILOT LIGHT, RED	NYLON	COMM
1	14	18L-003	PILOT LIGHT, AMBER	NYLON	COMM
1	13	18L-002	PILOT LIGHT, GREEN	NYLON	COMM
1	12	21D-015	TEST SWITCH	EPOXY	COMM
1	11	18J-009	VOLT METER	ARYLIC	COMM
1	10	18E-001	FUSE, AC, 5A	GLASS	BOROSILICATE
1	9	18E-004	FUSE, DC, 20A	GLASS	BOROSILICATE
2	8	06B-001	BATTERY, 6 VOLT	GEL CELL	COMM
1	7	21D-016	RELAY/SWITCH MODULE	ARYLIC	COMM
1	6	14A-005	COVER	S.S.	304
1	5	08C-001	BOX	S.S.	304
2	4	18B-005	FUSE HOLDER ASSY., 250V	ABS	COMM
1	3	21A-007	TRANSFORMER ASSY.	COPPER	COMM
1	2	20B-005	CHARGER MODULE ASSY.	FIBERGLASS	COMM
2	1	36A-001	LAMP HEAD ASSY.	S.S.	18-8

NOTE: ITEM 6 (COVER) IS REMOVED IN THIS VIEW

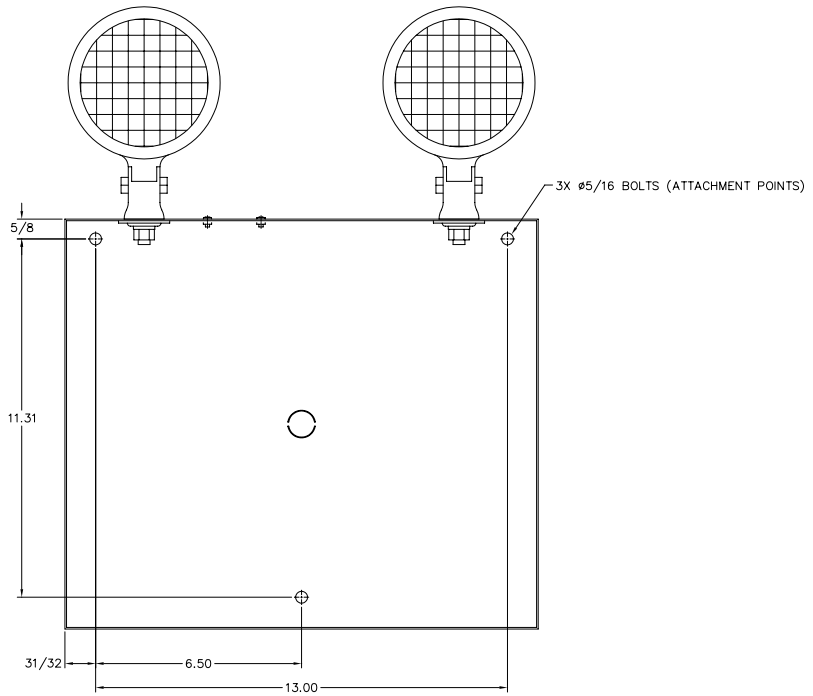
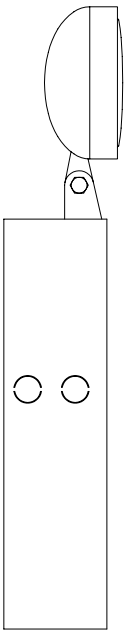
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.00 ----- ±.010	
.0 ----- ±.015	
FRACTIONS ± 1/32	
ANGULAR ± 1/2°	
ROUGHNESS 63	
METRIC ± .5	
DRILLED HOLES UP TO 1/2" + .005 - .001	
BREAK SHARP EDGES .005-.015	
FILLET RADI TO BE .015	
NEXT ASSY	USED ON
APPLICATION	

DRAWN		DATE	TITLE	
J.KO	941109	BIRNS, Inc. Tel: 805-487-5393 Main Plant: 1720 FISKE PLACE, OXNARD CA, 93033		
W.WANG		BIRNS EMERGENCY LIGHT, MODEL 4701		
J.KO	941110	SIZE	CAGE CODE	DWG NO.
J.MAGLAQUE		D	58608	4701-01-10
E.BIRNS		SCALE	1/2	UNIT WT. 46 LB. SHEET

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REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
Ø-		INITIAL DRAWING RELEASE	941111	E.BIRNS

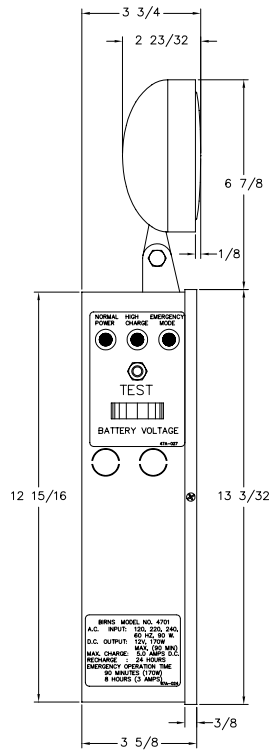


(NOTE: FRONT COVER & INSIDE COMPONENTS REMOVED)

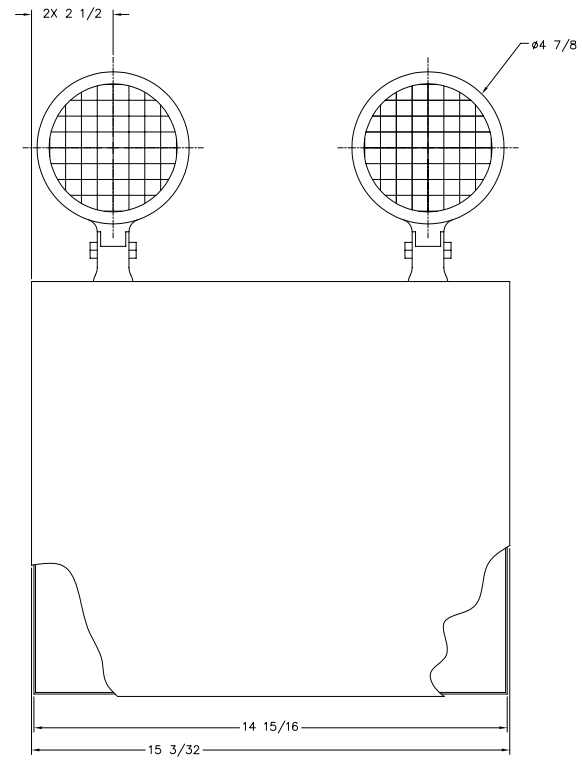
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	NEXT ASSY USED ON APPLICATION	SCALE 1/2 UNIT WT. 46 LB. SHEET		SIZE CAGE CODE DWG NO. D 58608 4701-01-30		

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REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	Ø-	INITIAL DRAWING RELEASE	941111	E.BIRNS



BIRNS MODEL NO. 4701
 A.C. INPUT 120, 270, 360, 480 VAC
 11, 17, 23, 30 Hz
 D.C. OUTPUT 12V, 1.7Ah @ 20°C
 MAX. CHARGE 1.5 AMP @ 20°C
 RECHARGE TIME 24 HOURS
 DISCHARGE OPERATION TIME
 90 MINUTES (170%)
 8 HOURS (50%)



MATERIAL	
TREATMENT	
FINISH	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 ALL DIMENSIONS TO APPLY AFTER PLATING
 .000 ----- ±.005
 .00 ----- ±.010
 .0 ----- ±.015
 FRACTIONS ± 1/32
 ANGULAR ± 1/2°
 ROUGHNESS 63/
 METRIC ± .5
 DRILLED HOLES UP TO 1/2" + .005 - .001
 BREAK SHARP EDGES .005-.015
 FILLET RADII TO BE .015

CONTRACT NUMBER	
DRAWN J.KO	DATE 941109
CHECK D.MILLER	DATE 941111
ENGR J.KO	DATE 941110
QA J.MAGLAQUE	DATE 941111
APPROVED E.BIRNS	DATE 941111

BIRNS, Inc. Tel: 805-487-5393 Main Plant: 1720 FISKE PLACE, OXNARD CA, 93033	
TITLE OVERALL DIMENSIONS, EMERGENCY LIGHTING FIXTURE BIRNS MODEL 4701	
SIZE D	CAGE CODE 58608
DWG NO. 4701-01-40	
SCALE 1/2	UNIT WT. 46 LB. SHEET

Appendix B

Data

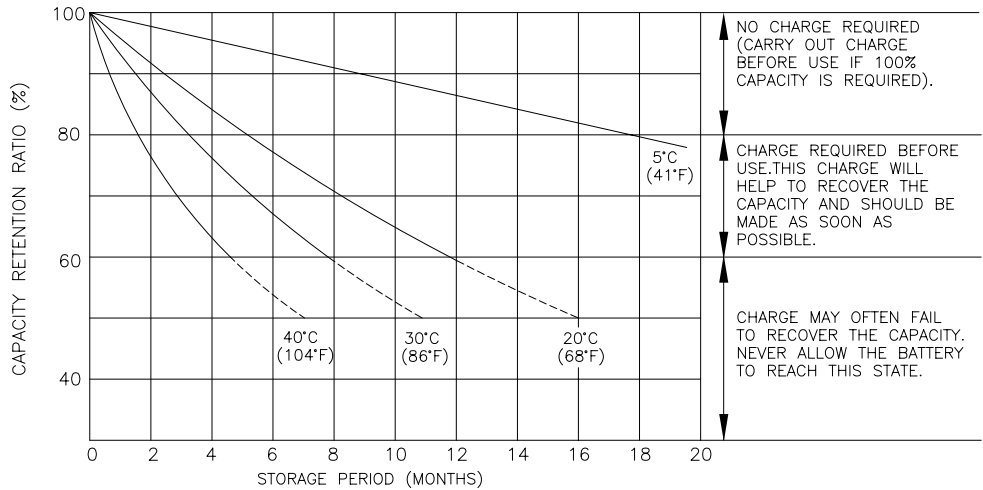
for the

BIRNS Emergency Lighting Fixture

Model 4701

Doc. No.	Document Title	Rev.
06B-001B	6V Battery, Shelf Life & Storage	0

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
0	INITIAL DWG RELEASE	941202	E.BIRNS



DRAFTING REFERENCE:
06B-001B.DWG

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MATERIAL	NONE
TREATMENT	NONE
FINISH	NONE
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES

ALL DIMENSIONS TO APPLY AFTER PLATING

.000 _____ ±.005
.00 _____ ±.010
.0 _____ ±.015

FRACTIONS ± 1/32
ANGULAR ± 1/2°
ROUGHNESS 63
METRIC ± .5
DRILLED HOLES UP TO 1/2 + .005 - .001

THREADS MUST BE FREE OF SHARP EDGES AND BURRS
RADIUS ALL SHARP EDGES .005 - .015
RADIUS BLEND ALL CHAMFERS
FILLET RADII TO BE .015

CONTRACT NUMBER	
DRAWN	DATE
D.MILLER	930325
CHECK	DATE
J.KO	941201
ENGR	DATE
P.CALLAN	930325
APPROVED	DATE
E.BIRNS	941202

BIRNS INC. MAIN PLANT: 1720 FISKE PLACE
OXNARD, CA. 93033
TELEPHONE: (805) 487-5393

TITLE
6V BATTERY, SHELF
LIFE & STORAGE

SIZE	CAGE CODE	DWG NO.
B	589608	06B-001B
SCALE: NONE	UNIT WT.:	SHEET OF