# Silent Sentinel
Solar Powered Advanced Warning
# Arrow Panels

# Operation and Maintenance Manual


**Part Number 550-025-100**

SOLARTECH®

*As Reliable as the Sun*

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550-025-100

Third edition: 14 October 2002

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# INSTALLATION & OPERATION

Advance warning arrow panels are intended to supplement other traffic control devices in diverting or channelizing traffic around and through highway work zones. Detailed description of how they are to be placed and utilized in the work zone is presented in the Federal Highway Administration Manual on Uniform Traffic Control Devices and also in many individual state D.O.T. specifications. These publications include detailed instructions on where to place the arrow panel, particularly in situations where visibility may be limited due to a curved approach to the work zone or where the work zone is near an on ramp or other traffic merging point. If one of these manuals or specifications is not available, you should consult with local traffic safety officials before placing the arrow panels in the work zone. Proper installation is essential to the effectiveness of any traffic safety device.

A safety check of the arrow board should be made before transporting the unit over the road. The Safe Operating Procedures form included in the back of this manual should be used as a safety check sheet by the operator of the arrow board to make sure that nothing has been overlooked.

Before transporting the unit to the work zone, make certain that the battery bank is fully charged. This can be done by checking the **BATTERY LEVEL** indicator on the control module. Switch the unit on and observe the **BATTERY LEVEL** indicator. It should indicate **NORMAL** or **FULL** depending on location and available sunlight. If the battery bank is not fully charged a few hours of bright sunlight should be adequate to prepare the unit for field operation. If adequate sunlight is not available the battery bank can be recharged using any automatic-type battery charger of adequate capacity; a 12 Volt, 40 to 60 Amp charger will recharge the batteries in a few hours. Check the service & repair section of the manual for additional information on battery bank charging.

On trailer mounted units, make sure that the trailer coupler, safety chains, clevis pins, bolts, and latches are all properly installed and secured. Connect trailer wiring harness to tow vehicle and check for proper operation of stop, turn, and tail lights. Make sure that the tongue jack has been placed and locked in the up position before moving the unit. Make sure all four jack stands are pinned and locked in the up position. Check for proper inflation of tires. The correct tire pressure is 26 psi (175 kPa). Close and secure the cover on the battery compartment with a padlock.

On truck mounted units, make sure that the frame is securely fastened to the bed or deck of the truck. Make sure that the arrow panel is in the down position for high speed travel.

Upon arriving at the work site, check the area for overhead obstructions that might interfere with the safe and effective operation of the **SILENT SENTINEL**. Be aware of overhead items such as wires, tree branches, or any other overhead or nearby tall object that might shade the solar array and interfere with proper operation of the solar electric charging system.

Once the appropriate location has been selected, the unit can be positioned and set up for operation. Block the trailer wheels before disconnecting coupler from the tow vehicle. It is best to position the trailer before raising the sign panel, since the tongue weight is substantially greater with the sign panel vertical. The jack stands must be extended to provide a more stable platform for the unit.

Lower the tongue, using the tongue jack, to its lowest position. Then lower the rear jack stands and install and secure the locking pins. Now raise the tongue, while periodically sighting through the sight tubes located on the left side frame uprights. Stand approximately four feet from the front sight tube, line up the rear sight tube until it is centered inside the front sight tube. Adjust position of unit until the line of sight is directly into oncoming traffic. Then lower the front jack stands and install and secure the locking pins. At this point the trailer tongue or the optional removable combination coupler, if so equipped, can be removed for additional security.

The sign panel can now be raised to the operation position. Pull and turn the latch pins located just below the pivot point for the arrow panel support frame to lock them in the retracted position. Raise the arrow panel to the full upright position using the winch located on the right hand side of the trailer. Turn and release the locking pins to secure the arrow panel in the upright position.

Open the cover to the battery compartment. Select the desired **SIGNAL PATTERN** on the control module and check the **BATTERY LEVEL** indicator. If adequate sunlight is available, the **VOLTAGE OK** and the **CHARGING** indicators will also be on.

***Check immediately to make sure the unit is displaying the correct pattern!***

The **AUTO TRACK LAMP INTENSITY** indicator should also be on. If **HIGH** or **LOW LAMP INTENSITY** is selected manually, the **LAMP INTENSITY** will automatically return to **AUTO TRACK** during the first night cycle.

Install a padlock on the battery compartment cover to prevent tampering with the controls and batteries.

Periodically check the solar array for dust and dirt buildup and check the fluid level in the batteries. Every 30 days should be adequate except in extreme conditions of dirt or low ambient temperature or low sunlight. Clear snow buildup from the solar array as soon as possible!

Check the **BATTERY LEVEL** indicator every few days to make sure that the unit is receiving an adequate amount of solar energy to maintain the battery bank at an acceptable charge level. In the event that the **BATTERY LEVEL** display indicates **RECHARGE**, the battery bank should be charged by a line-powered auxiliary battery charger as soon as possible. If the battery bank is allowed to discharge to a very low level in extremely cold weather the electrolyte may freeze and cause permanent damage to the batteries.

The battery bank may require a few recharge cycles before it reaches its full energy storage capacity. New lead acid type batteries usually do not reach their full energy storage capacity until they have gone through several (10 to 15) charge/discharge cycles. Consult the **BATTERY CHARGING** section of the **SERVICE, REPAIR & TROUBLESHOOTING** manual for the **SILENT SENTINEL** for additional information on battery bank charging and maintenance.

The solar array and lamp lenses should be cleaned as required for safe and effective operation.

To prepare unit for transport, simply reverse the setup procedure. Pull and turn the latch pins to lock them in the retracted position. Slowly turn the winch handle in a counter - clockwise direction to lower the arrow panel. The automatic brake will safely control the decent. Make sure that jack stands, sign panel and all pins are securely locked in the proper position before transporting. Raise and lock the tongue jack in a horizontal

position. Carefully check the hitch and coupler integrity, the safety chain installation, tire inflation, and the trailer stop, turn, and tail light functions before transporting unit.

# MAINTENANCE

Except for a few simple routine procedures the **SILENT SENTINEL** is practically maintenance free. The three most important aspects of insured trouble-free operation are:

1. Cleaning the upper surface of the solar array (mild soap and water or window cleaner is all that is required).

2. Cleaning the lamp lenses and photocell lens (located on the lower surface of the arrow panel frame, near the control cable connector).

3. Maintaining the proper electrolyte level in the batteries.

The lamp lenses and the solar array should be checked and cleaned as required. Normal rainfall will usually keep the solar array clean except in very dry, dusty conditions or following a snowfall.

The batteries should be checked every one to three months, adding distilled water only as required. It is not unusual for the batteries to provide up to one year of continuous service without requiring added water. It is, however, very important to never allow the electrolyte level in the batteries to drop below the plates. Exposure of the plates will cause irreversible damage to the batteries.

***CAUTION:*** *Batteries produce hydrogen gas while being charged. Hydrogen gas is extremely flammable and sparks, open flame, or lit cigarettes should be avoided. Also, batteries can produce intense heat or explosion if the terminals are shorted. Skin and eye protection should be used when working around batteries to prevent contact with battery electrolyte.*

In addition to these basic maintenance steps, the following procedures should also be performed to insure that the **SILENT SENTINEL** will continue to provide trouble-free service for years to come.

Periodically check tires for proper inflation. The recommended tire inflation pressure for the **SILENT SENTINEL** is 26 PSI (175 kPa). Check tires for tread wear and sidewall cracking. Tires that exhibit tread depth of less than 3/32 inch or excessive side wall cracking should be replaced to insure safe operation while towing. Replace worn out tires with tires of the same size and rating as the original factory equipped tires.

Periodically lubricate all pivot points and locking pins to provide smooth reliable performance and to prevent excessive rust formation in critical areas. Use a setting type spray lubricant that will provide good penetration and resist washing out.

Inspect the lanyards that secure the locking pins to the frame. Replace any missing lanyards or any lanyards that show signs of excessive wear.

Periodically lubricate the swivel jack on the tongue with a setting-type spray lubricant. Apply lubricant to the swivel mounting bracket

as well as the crankshaft to help minimize the effects of corrosion and to insure smooth, troublefree operation.

Remove, clean, and repack the wheel bearings and spindles at least once each year with a good grade of wheel bearing grease. Make sure that the bearings are installed properly, the spindle nuts are properly torqued, the cotter keys are installed, the bearing dust caps are installed, and the wheel lugs are properly tightened.

Lubricate the winch pivot points with motor oil or silicone lubricant as needed. Do not lubricate the brake disks and pads located on the crank shaft. Check the cable and clamps periodically for wear or fraying. Service or replace as required.

Any special maintenance concerns should be addressed directly to the factory. We are always there to help you make sure that the quality that was designed and built into your **SILENT SENTINEL** remains there!

***NOTE:*** ***SOLAR TECHNOLOGY*** *has taken every precaution to ensure that the* **SILENT SENTINEL** *is a safe and effective piece of traffic safety equipment.* ***SOLAR TECHNOLOGY****, however, cannot be held responsible for any injuries, accidents, or other mishaps resulting from the use, misuse, or abuse of the* **SILENT SENTINEL** *or any other* ***SOLAR TECH*** *product. It is the user's sole responsibility to ensure that the manner in which the* **SILENT SENTINEL** *is used is consistent with safe practices and that the user understand that he/she is the only liable party.*

# MAINTENANCE CHART

| | |
|---|---|
| **PERIODICALLY AS REQUIRED:** | **Clean solar panels** |
| | **Clean photocell lens** |
| | **Clean lamp lenses and shrouds** |
| | **Check tire pressure** |
| **EVERY ONE TO THREE MONTHS:** | **Check and replenish battery water** |
| **ONCE EACH YEAR:** | **Clean and repack wheel bearings** |
| | **Check and lubricate winch or lift jack** |
| | **Check and lubricate pivot points** |
| | **Check and service coupler** |
| | **Check and lubricate tongue jack** |
| | **Check fasteners and locking pins** |
| | **Check wires, cables, clamps & supports** |

**NOTE:** The document shown on the following page is a copy of the Silent Sentinel Arrow Board User's Guide located inside the battery compartment on your **SILENT SENTINEL**. If this card should become lost or damaged it should be replaced immediately to insure safe and responsible operation of the unit. Replacement cards can be obtained from the factory free of charge at anytime during the lifetime of the equipment.

# Silent Sentinel Arrow Board User's Guide

**SOLAR TECHNOLOGY, INC.**
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## *Prior to Transporting:*

- Switch control module off.
- Close battery compartment cover.
- Secure battery compartment with padlock.
- Insure arrow panel lowered on rear support.
- Secure all jack stands in retracted position.
- Secure all locking pins in appropriate positions.
- Connect and lock coupler onto tow vehicle.
- Retract and lock tongue jack in horizontal position.
- Install safety chains, crisscrossed under tongue.
- Connect stop and tail lights and check function.
- Periodically check tire pressure and coupler integrity.

## *Safety Checks Prior To Operation:*

- Insure all jackstands lowered prior to raising arrow panel.
- Check for overhead wires & obstructions and insure locking pins retracted prior to raising arrow panel.
- Do not stand under arrow panel while raising/lowering.
- Keep hands clear of lifting mechanism at all times.
- No smoking or open flames near battery compartment.
- Insure battery compartment lid is secured open prior to accessing the compartment.
- Check battery fluid level periodically - add distilled water as needed (fill to bottom of indicating ring).
- Avoid contact with battery fluid at all times - should contact occur flush with water and seek medical attention.
- Insure arrow panel is displaying correct pattern and is visible to drivers approaching the work zone.
- Always lock battery compartment to prevent tampering with control panel.

## *Operation:*

Jack stands should be used if unit is not attached to tow vehicle. Chock wheels before detaching. Fully extend jack stands.

Check for proper positioning of sign panel by sighting through sight tubes toward location of approaching traffic.

Check for overhead obstructions before erecting sign panel & solar array. Retract locking pins, erect sign panel with winch, release locking pins. Winch handle can be removed for additional security.

Select desired pattern. Set lamp brightness to auto for normal day-night operation.

Check battery status for normal or full charge indication.

***CHECK PANEL FOR CORRECT DISPLAY OF DESIRED PATTERN!***

(Note: In accordance with MUTCD center lamp of flashing arrow head does not light!)

Trailer coupler & winch handle can be stored in locked battery compartment for complete security.

## *Maintenance:*

Check battery fluid level once each month. Add distilled water if level is below indicating ring.

Lubricate pivot points and tongue jack screw shaft (lube hole on outer tube near handle) every 3 months. Use good grade of chain lube.

Check tire pressure when regular maintenance is being done. Correct pressure is 26psi (200kPa).

Clean lamp lenses and solar panels periodically as required.

## *Lamp Replacement:*

**(P/N 940-025-146)**

Loosen screws around lamp shrouds one full turn. Turn shroud slightly counterclockwise and remove. Remove wire terminals from lamps. Be sure to grasp terminals to prevent damage to wires or lamps. Reconnect terminals to new lamp and replace lamp & shroud. Make sure that the lamp is positioned correctly. Do not over-tighten shroud mounting screws.

## *Controller Replacement:*

**(P/N AB-25-935)**

Remove four black nylon snap rivets mounting controller to battery box mounting plate and disconnect all locking electrical connections. Install new controller by reversing this procedure.

**NOTE:** Use a copy of the Certificate of Quality Assurance shown on the next page as a checklist anytime service or repair is performed on your **SILENT SENTINEL** arrow board. This is the same certificate used at the factory to insure safe and reliable operation of your **SILENT SENTINEL**.

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# SILENT SENTINEL ADVANCE WARNING ARROW PANEL

## Certificate of Quality Assurance

**(P/N - 555-100-025)**

**Serial Number: AB-_____-D- _____ SO# _____ WO# _____ Unit# _____**

**DOCUMENTATION:**

| | | |
|---|---|---|
| _____ | Paint Checktag Attached: | WO#_____ Unit#_____ |
| _____ | AB-25-005 Production Checklist Attached: | WO#_____ Unit#_____ |
| _____ | AB-25-935 Checktag Attached: | WO#_____ Unit#_____ |
| _____ | Arrow Panel Assembly Checktag Attached: | WO#_____ Unit#_____ |
| _____ | Solar Array Checktag Attached: | WO#_____ Unit#_____ |

**CHECKED:**

_____ Coupler Installed with Grade 5 Bolts & Stover Lock Nuts - Verified with MOT.
_____ Safety Chains - Stover Lock Nut - Correct Length - Rotate Freely.
_____ Arrow Panel Mounting Hardware Tightened.
_____ Solar Array Mounting Hardware Verified Tightened.
_____ Arrow Panel Connector Watertight Seal Installed - Connector Tightened.
_____ Arrow Panel and Solar Array Cable Position & Clearance Satisfactory.
_____ Arrow Panel Label (State D.O.T. label if required) Installed.
_____ All Decals Installed Correctly and Neatly.
_____ Solar Panel Serial Numbers Recorded on MOT.
_____ Serial Number Tag Installed and Cross Checked w/MOT & Shipper.
_____ Operation & Maintenance Manual Placed in Storage Compartment.
_____ Paint Coverage & Finish - Checked Satisfactory.

**TESTED:**

_____ Arrow Panel Lifting Mechanism (Lube as required).
_____ Battery Box Opens/Shuts (support spring sat) & Latches Satisfactory.
_____ Battery Bank Charged - Voltage>12.6 VDC and Solar Panels Clean.
_____ Final Op Check - All Patterns - Rear Panel Indicators - Auto Dimmer All Sat.
_____ Current Draw (DC amps): Controller on with all lamps OFF: _____.
_____ Current Draw (DC amps): Double Arrow - LowIntensity:_____ Full Intensity:_____.
_____ Solar Charger LED's Indicate Proper Operation when Test Light Applied to SA.
_____ Current Output (DC amps): SA Tested with Test Light (Controller OFF): _____.

**READY TO SHIP:**

_____ Control Panel Controls Set For Shipping (Signal Power - Off).
_____ Trailer Lighting Cable - Secured for Shipping.

**DATE: _____ SIGNATURE: _____**

# SERVICE & REPAIR

The **SILENT SENTINEL** is a highly reliable, low maintenance, state of the art piece of equipment. However, even the best of things require service and repair from time to time. When this time comes you will find the **SILENT SENTINEL** very user friendly. The service and troubleshooting procedures included in this manual will step you through most common problems and get your unit back on line. If you are unable to solve a problem on your own, our highly trained and knowledgeable factory personnel are always there to help.

## LAMP REPLACEMENT

In the event that a lamp should fail, use the following procedure to insure correct lamp installation.

To remove defective lamp, raise the arrow panel approximately one and a half to two feet above the travel position. Loosen the three phillips head screws securing the plastic hood over the defective lamp one full turn. Place hand on lamp lens and turn the shroud a few degrees counterclockwise to unlock and remove. Allow the hood to slide over the hand that is holding the lamp in place down onto your arm.

Remove the lamp from the shroud and carefully remove the push-on terminals and wires from the back of the lamp.

Now install the wire connectors onto the terminals on the new lamp.

Place the lamp back into the shroud. Make certain that the tab on the edge of the lamp is inserted into the keyway of the shroud. This is very important! Correct lamp lens position will insure that the beam pattern is properly oriented.

While holding the lamp in position with the hand and arm with the hood, slide the hood up and over your hand and install the hood onto the screws in the panel. Place the hood over the screws so the holes line up with the screws and drops into place. Turn the hood a few degrees clockwise until it locks in place and tighten the three phillips screws that hold it in place. Do not over tighten the screws.

After lamp replacement is complete, check the arrow board for proper function of arrow patterns.

## CONTROL MODULE

All control functions necessary to the operation of the **SILENT SENTINEL** are integrated into one easy to service control module located in the battery compartment.

To remove the control module, simply remove the four black nylon snap rivets securing the control module to the mounting plate in the battery box and carefully lift the module straight up and out of the battery box compartment. Do not open the control module enclosure or attempt to repair the control module in any manner.

**NOTE:** *There are no field serviceable parts in the control module. The control module circuit board contains sophisticated electronic circuitry and some surface mount devices which require special equipment and techniques for repair and replacement. Any attempt*

*to service the circuit board which results in damage will void the warranty. Field repairs to the control module circuit board should not be attempted. The control module can be repaired very quickly and economically at the factory.*

If control module is to be replaced, the next step is to disconnect the cables from the module. All of the connectors are self locking so they will not come loose during normal operation.

To remove the power cables (**P1** and **P3**), using the thumb and forefinger, squeeze the locking levers on either end of the connector housing and slide the cable and connector out of the socket on the circuit board.

To remove the control cable (**P2**), loosen the locking thumbscrews on either side of the connector and slide the plug out of the PCB connector.

To reinstall the control module back into its housing simply reverse the above procedure following the cable schedule listed below.

| CABLE | CONNECTOR |
|---|---|
| Battery Power (4 Wire Bundled) | P1 |
| Arrow Panel Control (Gray Jacketed) | P2 |
| Solar Array Power (2 Wire Jacketed) | P3 |

**NOTE:** It will take approximately 20 seconds for the control module to re-initialize after it is first powered. Set the pattern select switch to **RIGHT FLASHING ARROW** or **LEFT FLASHING ARROW** before inserting battery power cable into connector **P1**. If the control module will not function after it is installed, disconnect **P1** and reconnect it to re-initialize the control module.

Make sure that all of the connectors are properly seated and their locking mechanisms are engaged. Install and tighten the locking thumbscrews on connector **P2**. Use only finger pressure to tighten the screws. Do not over tighten.

Check all control functions after control module has been installed.

Check for the proper functioning of the **SOLAR CHARGER** indicators with unit exposed to sunlight. The **VOLTAGE OK** and the **CHARGING** indicators should be on even on cloudy and overcast days, particularly during the middle of the day when the sun is high in the sky.

Make certain that **BATTERY LEVEL** indicators are functioning properly. The **BATTERY LEVEL** indicator lamps display the approximate charge level of the battery bank by displaying the range of voltage as indicated below.

| INDICATOR | VOLTAGE RANGE |
|---|---|
| **FULL** (flashing) | Over 15 |
| **FULL** | Over 13 |
| **NORMAL** | Between 12 & 13 |
| **RECHARGE** | Between 11 & 12 |
| **RECHARGE** (flashing) | Below 11 |
| **LOW BATTERY** | Below 10.7 (shutdown) |

Check all arrow panel patterns for correct display.

## POWER & CONTROL CABLES

The power and control cables all have either connectors or terminals on both ends to accommodate easy repair or replacement in the event they become damaged or destroyed.

The solar array power cable can be removed and replaced by disconnecting both leads at the terminals in the junction box located on the underside of the solar panel. The cable ties must be removed first by cutting them with a diagonal cutter; be careful to avoid damaging the cable jacket. It may be necessary to remove the nuts and lockwashers that hold the solar array in place and lift up the solar array to gain access to the electrical terminals in the junction boxes located on the underside of the solar panels.

Remove the cover to the solar panel's junction box - loosen the terminal screws and remove the snap spade terminals from the screws. Loosen the strain relief and carefully pull the wires though the strain relief. Remove the control module and pull the cable through from the inside of the compartment until it is free from the strain relief. Disconnect the cable from the control module. The cable can now be repaired or replaced. Be sure to observe correct polarity when reconnecting the wires in the conduit body or to the solar panel terminals: White or red to positive (+) and black to negative (-).

The arrow panel control cable can also be easily serviced or replaced by following the above steps first to remove the solar array power cable, then continuing on to remove the control cable. Disconnect the control cable from the arrow panel frame by turning the locking ring counterclockwise and removing the connector and cable from the receptacle. Now disconnect the control cable from the control module and remove the four rivets securing the cable access port cover on the outside of the battery compartment. The control cable can be removed from the unit. Note that the cable access port cover is an integral part of the control cable assembly and is supplied with the replacement control cable.

Reverse the above procedure to install repaired or replacement cables. Install the arrow panel control cable first followed by the solar array power cable (the rivets may be replaced with #10 x 1/2" machine screws and nylon lock nuts if 3/16" pop rivets are unavailable). Make sure that there is enough cable at the pivot point of the arrow panel support frame and at the pivot point of the solar array mounting frame to accommodate the movement of the lifting mechanism during normal operation. Be sure to use UV stable (black) cable ties to secure the cables to the cable tie anchors and to the trailer frame.

The battery power wire harness can be removed by disconnecting the four wire leads from the batteries and pulling them through the dividing bulkhead into the control module housing. Broken or damaged wires in the battery power harness can be replaced by using 12 AWG stranded and tinned wire with PVC insulation. Always make sure that the battery connections are tight and kept dry to minimize corrosion around the terminals.

Broken or damaged pins in the arrow panel wire harness connector, located in the frame of the arrow panel, can be replaced by standard D-subminiature connector terminals available at your

local Radio Shack store. Remove the four screws holding the connector to the frame and withdraw the connector from the frame. There should be enough wire inside the panel to allow the connector to come out about 8 inches. Now, simply locate the defective pin and its associated wire, pull the wire and pin out of the back of the connector housing, crimp on a new terminal, and insert it into the back of the connector housing. Push it in until it clicks and locks into place.

More extensive damage to the arrow panel wire harness may necessitate dismounting the panel from the trailer or frame and removing the back panel to gain access to the inside of the panel. While removing the rear panel from the arrow panel carefully disconnect the leads going to the rear panel indicators so the rear panel can be completely separated from the panel assembly. You will now have complete access to the arrow panel wire harness. You can repair or replace broken or damaged wires in the harness or install a complete new wire harness assembly available from the factory.

You will notice that everything used in the construction and assembly of the **SILENT SENTINEL** is modular in nature and very easy to repair or replace.

Rear panel indicators can be removed and replaced by disconnecting their leads from the arrow panel wire harness assembly, removing the nut from the inside of the rear panel and sliding the indicator assembly out of the mounting hole. Install the replacement indicator by reversing the procedure.

The trailer lighting wire harness can be repaired or replaced as necessary. If a new or different type of connector is installed, be sure to follow the color code as listed below:

| | |
|---|---|
| BROWN | Taillights |
| YELLOW | Left Stop & Turn |
| GREEN | Right Stop & Turn |
| WHITE | Ground |

## BATTERY BANK

Providing proper care and maintenance for the batteries in the **SILENT SENTINEL** will optimize the level of performance and maximize their life expectancy. It is very important to maintain the level of electrolyte in the batteries above the plates. If the electrolyte level is allowed to drop below the plates, that portion of the plates that have been exposed is permanently damaged and will not recover after the electrolyte level is returned to normal.

Use only clean distilled water and fill each cell to the indicating ring. A commercially available battery filling container will simply and safely fill each cell to the appropriate level automatically.

The other primary factor in determining service life for a bank of batteries is the degree of plate sulfation. The pulse width modulated charge control circuit used in the **SILENT SENTINEL** control module helps to minimize plate sulfation. However the best situation to minimize the accumulation of sulfides is to periodically agitate the batteries. Normally the movement that the batteries will experience when the unit is moved from one work zone to the next is sufficient to mix sediment in the bottom of the battery cases back into the electrolyte. It is best for the batteries if the unit is moved enough to mix the electrolyte every few months.

## BATTERY TESTING

The **BATTERY LEVEL** indicators on the control module front panel are all that is required to monitor battery charge level under normal operating conditions. If a battery problem is suspected, there are some easy to perform tests that can help to isolate the problem.

The first step in isolating a battery bank problem is to measure the battery voltage under varying conditions using a Digital Multimeter. We need to verify the performance of the **BATTERY LEVEL** indicators as well as get a more precise measurement of battery voltage. If the battery bank is fully charged and the solar charger is active, the battery voltage should measure somewhere between 13.0 and 14.5 Volts. Remember, the voltage reading will be temperature dependent because of the temperature compensation feature of the charge control circuit.

Voltage readings should be as follows:

| Temperature | Battery Voltage |
|---|---|
| 50 $^0$F | 14.4 Volts |
| 70 $^0$F | 14.0 Volts |
| 80 $^0$F | 13.7 Volts |
| 100 $^0$F | 13.3 Volts |

If voltage readings are different from those listed above, batteries should first be charged using an external automatic battery charger and the voltage measurements taken again. If the voltage readings still fail to meet the above specifications, further testing of the batteries or the solar charging system may be required.

The condition of the batteries can be checked using a battery tester or hydrometer to determine the specific gravity of the electrolyte in each cell. A healthy, fully charged battery will produce an electrolyte specific gravity reading of 1.225 or greater. If one cell of one battery yields a reading significantly less than 1.225 that battery has a bad cell and will adversely effect the performance of the entire battery bank.

Replace the defective battery with an identical make and model battery and rerun the battery bank tests.

If the hydrometer test indicates that all battery cells are healthy, but you still suspect a battery bank problem, then the next step is to individually load check each battery. This will require that the jumper wires that connect all the batteries in parallel be removed. Loosen all the battery terminals and carefully remove all the jumper wires to isolate all the batteries. Now using a battery tester apply a heavy load to each battery and check the load current and battery voltage. If the vent caps are removed, a high resistance cell can be located by observing bubbling of the electrolyte caused by overheating of that cell.

A battery with a high resistance cell connection will pass all other tests and appear to be healthy when it indeed is not.

Again replace the defective battery and rerun the battery bank tests.

If after conducting all the battery tests the batteries appear to be all right, but the unit still fails to provide continuous service in conditions of adequate sunlight, the power output of the solar array should be checked.

## BATTERY CHARGING

The battery bank used on the **SILENT SENTINEL** has a very high energy storage capacity and under normal operating conditions, should never require recharging. However, if the unit was operating in severely cold conditions or used in a location where adequate sunlight was not available; if the **LAMP INTENSITY** control was locked in the **HIGH** position for an extended period; or if the unit has been operating under bright night lighting, such as a street light, preventing the lamp brightness control from dimming the lamps at night, the battery bank will eventually run down and require an extended period in adequate sunlight, preferably with the pattern select switch in the **OFF** position or charging from an external source. This will insure that the unit will provide the best possible performance when it is put back into service.

Although the **SILENT SENTINEL** is available with an optional built in automatic battery charger, it is generally recommended that in the event that the battery bank does require recharging that an external battery charger be used. For the few, if any, times that the battery bank needs to be recharged the built in charger seems like an unnecessary expense. In addition, because of the unique design of the charge control circuit in the control module, any commercial automatic battery charger can be used to recharge the battery bank without the need to disconnect any wires or cables.

Simply connect the positive (RED) lead from the charger to the positive (**POS**) terminal of one of the batteries in the battery bank with the RED jumper attached. Then connect the negative (BLACK) lead from the charger to the negative (**NEG**) terminal of one of the batteries in the battery bank with the BLACK jumper attached.

**NOTE:** ***Do not connect the charger leads to the battery terminals with the jumpers that connect the negative (NEG) terminal of one battery to the positive (POS) terminal of another battery in the battery bank!***

Plug in the charger, switch it on and let it run to completion. As always, observe correct voltage polarity!

The battery bank used in the **SILENT SENTINEL** arrow boards, depending on the battery configuration, provides anywhere from 520 to 780 Amp Hours of energy storage. What this means is that it takes a significant amount of energy to recharge the battery bank once it becomes completely discharged. Using the following guidelines will help insure that the battery bank is receiving a full charge during a recharge cycle.

| BATTERY CHARGER OUTPUT CAPACITY | HOURS REQ'D FOR FULL CHARGE |
|---|---|
| 20 Amps | 36 to 40 hrs |
| 40 Amps | 14 to 16 hrs |
| 60 Amps | 8 to 10 hrs |

It is also important to keep in mind that when using a line-powered auxiliary battery charger, the **BATTERY LEVEL** indicators on the unit's control panel will not correctly indicate the state of charge of the battery bank. The **BATTERY LEVEL** monitoring and indicator circuits built into the control module are designed to monitor the state of charge of the battery bank during charging by the solar electric panels. The solar electric charging system provides a slower recharge cycle than a line powered charger and will raise the battery voltage more slowly and to a lower voltage level.

The solar electric charging system will recharge the battery bank to a voltage of from 13.3 to 14.5 Volts depending on the ambient temperature. The **BATTERY LEVEL** display will indicate a **FULL** charge whenever the battery voltage is above 13 Volts. Based on the output current range of the solar charger, a battery voltage in excess of 13.0 Volts indicates a very high to full state of charge.

When using a line-powered auxiliary battery charger, however, the high output current will push the battery voltage over 13 Volts within minutes after the start of the charge cycle. This does not indicate that the battery bank is fully charged. The higher voltage indication simply means that the battery bank is receiving a charge at a much faster rate than the solar electric charger can provide. This will result in a much higher battery voltage, typically 15 Volts or more, during the charge cycle, particularly near the end of the recharge cycle when the battery bank is reaching a full state of charge.

When using an auxiliary battery charger, always use the state of charge indicators on the charger. If no indicators are available, use the information on the charger cycle time chart to determine the approximate time required for a complete charge cycle.

Automatic type battery chargers, the type we install as optional auxiliary chargers, are ideally suited for this type of application. They constantly monitor the state of charge as well as the rate of charge and will automatically shut off when the charge cycle is complete. The automatic type chargers will provide precisely the right amount of charge regardless of the size of the battery bank or its state of charge. Simply connect the charger, plug it in, and let it run to completion.

In an emergency, jumper cables can be used to connect the battery bank to the battery of a vehicle, with the engine running, to recharge the battery bank. A charge time of one to two hours will provide more than enough energy to put the unit back into service. Incidentally, the unit can be switched on within minutes of being connected to the vehicle battery, providing service while it is being recharged.

Another example of the safety, efficiency, and convenience designed and built into every **SILENT SENTINEL**.

When the batteries finally reach the point in their life cycle that they are unable to effectively hold a charge, they will have to be replaced. The battery compartment is designed to accommodate case sizes GC-2 and 8D batteries. The batteries should be the deep cycle variety with a minimum Amp Hour capacity of 260 Amp-Hours each. Replace the batteries with an equivalent rating battery to insure that the runtime performance originally designed into the unit will not be compromised.

## SOLAR ARRAY

The array of solar (photovoltaic) panels mounted on top of the unit are the principle source of energy for operation and maintenance of the battery bank. Normally, the only attention that they demand is an occasional cleaning with mild soap and water.

Whenever the solar array is being checked or serviced, make certain that the wire terminal screws are tight and that there is no evidence of corrosion.

In the event that one of the solar panels should become damaged, very often they can be easily repaired. The unbreakable type of solar panels generally will tolerate a great deal of impact and bending without sustaining any damage.

If the upper surface of one of the solar panels is severely scratched or punctured, the void should be filled in with a clear silicone sealant. The panel will continue to function as long as the solar cells are protected from excess moisture penetration.

If the aluminum frame in which the panels are mounted is twisted or bent, it can be repaired or replaced without necessitating the replacement of the entire panel.

Disconnect the wires from the solar panel electrical terminals and remove the damaged panel from the solar array mounting bars. Depending on which panel is being removed, it may be easier to remove the entire solar array from the mounting frame first. Performing solar panel repairs indoors or out of the path of direct sunlight will prevent sparking from occurring when wires are connected or disconnected.

The damaged frame can be removed from the panel by removing the screws from the corners of the frame. Replace the damaged frame members and reassemble the frame. The repaired solar panel can now be reinstalled on the mounting bars.

Make sure the wires are connected to the appropriate terminals and securely tightened. Observe correct terminal polarity. The black wire from the solar array power cable should be connected to the negative (-) terminal and the white wire to the positive (+) terminal.

## SOLAR ARRAY POWER OUTPUT

If you suspect there is a problem with the solar array but there is no obvious physical or electrical cause, the power output from the solar array can be easily measured to determine if the array is performing up to acceptable standards.

You will need the following items to perform the power output tests. A multimeter with DC current capability of 10 Amps, three test leads with small alligator clips on each end, and a small piece (one foot square) of cardboard or other insulating material.

The unit must be in full sunlight during the middle of the day to successfully perform this test.

Remove the four black nylon snap rivets securing the control module in the battery compartment. Carefully lift the control module out of the compartment and lay it on the piece of cardboard insuring that the control module does not come in contact with any battery terminals.

Set the multimeter to measure DC current, 10 Amps or greater.

Refer to the control module circuit board diagram in the back of this manual.

Remove the cable which is plugged into connector P3 on the control module circuit board. Using a jumper lead, connect PIN 2 of the solar array power cable connector to PIN 2 of connector P3 on the circuit board. Using another jumper lead, connect the positive lead from the multimeter to PIN 1 of the solar array

power cable connector. Using the third jumper lead, connect the negative lead from the multimeter to PIN 1 of connector P3 on the control module circuit board.

The **SOLAR CHARGER ACTIVE** indicator should come on at this point. If the indicator does not come on, check the multimeter settings and the test lead connections.

The multimeter will indicate the amount of current that the solar array is generating. The actual solar array output current will vary depending on the amount of sunlight striking the panel and on the charge condition of the battery bank. Higher levels of sunlight will, of course, produce higher output current and a discharged battery bank will draw more current from the solar array than a fully charged battery bank.

The current generated by a fully functional solar array in good sunlight should be as follows:

50 Watt array - 1 to 2 Amps
75 Watt array - 2 to 3 Amps
100 Watt array - 3 to 5 Amps

**NOTE:** *Solar array upper surface must be clean for the test results to be valid. If an oily film has built up on the surface, it should be cleaned with a commercial window cleaning solution.*

If the battery bank is fully charged, indicated by a **FULL** display on the **BATTERY LEVEL** indicators, the current output from the solar array may switch on and off. This is due to the charge controller circuit in the control module sensing the state of charge of the battery bank and switching the charging current on and off as required to maintain the battery bank at a full charge level.

If the current readings obtained during the solar array test are significantly lower than those indicated in the table, one or more of the solar panels may be defective. If this is the case it will be necessary to test the solar panels individually.

Disconnect the solar array power cable from the solar array and remove the solar array from the solar array mounting frame. Disconnect all of the jumper wires connecting the solar panel electrical terminals together. Now measure the current output from each solar panel by connecting the leads from the multimeter to the solar panel output terminals. The output current from the solar panels should range from 1 Amp on a cloudy day to 3 Amps on bright, sunny summer day. On an average sunny day the output current should be about 2 to 3 Amps depending on the individual solar panel rating.

If the current output from any of the solar panels is less than that anticipated, the solar panel is not performing up to required levels and should be replaced.

When the solar array jumper wires and power cable are being reconnected, be sure to observe correct polarity. Also make sure that none of the wires or cables are in a position where they might be pinched or abraded.

If any of the wire terminals need to be replaced, be certain to use good quality tin-plated copper terminals. If any of the terminal screws or lockwashers must be replaced use stainless steel hardware.

After all testing has been completed, reconnect the solar array power cable to connector P3 on the control module circuit board and return the control module to its position in the battery compartment.

## POWER CONSUMPTION

A very effective way of determining if the **SILENT SENTINEL** is operating properly and at peak efficiency is to measure the current consumption under typical known operating conditions. Performing this test will require the same equipment used for the solar array power output test. This test must be performed indoors, out of direct sunlight, or with the solar array output cable disconnected from the control module.

Disconnect the wire on the positive (+) terminal on the battery closest to the control module compartment that goes into the control module compartment. Configure the multimeter for measuring DC current up to 10 Amps. Connect the positive lead of the multimeter to the positive terminal of the battery and the negative lead of the multimeter to ring terminal on the wire that was just removed from the battery.

With the pattern select switch in the **OFF** position and the **SOLAR CHARGER** indicators off the multimeter should read 10 milliamps or .010 Amps.

Now set the pattern select switch to one of the patterns indicated below and compare the multimeter readings to the table below. The meter readings will alternate between the value shown in the chart and .050 Amps as the lamps flash on and off. A digital multimeter with a hold feature will simplify measuring the current drain. Current values are in Amps at a battery voltage of 12.5 Volts.

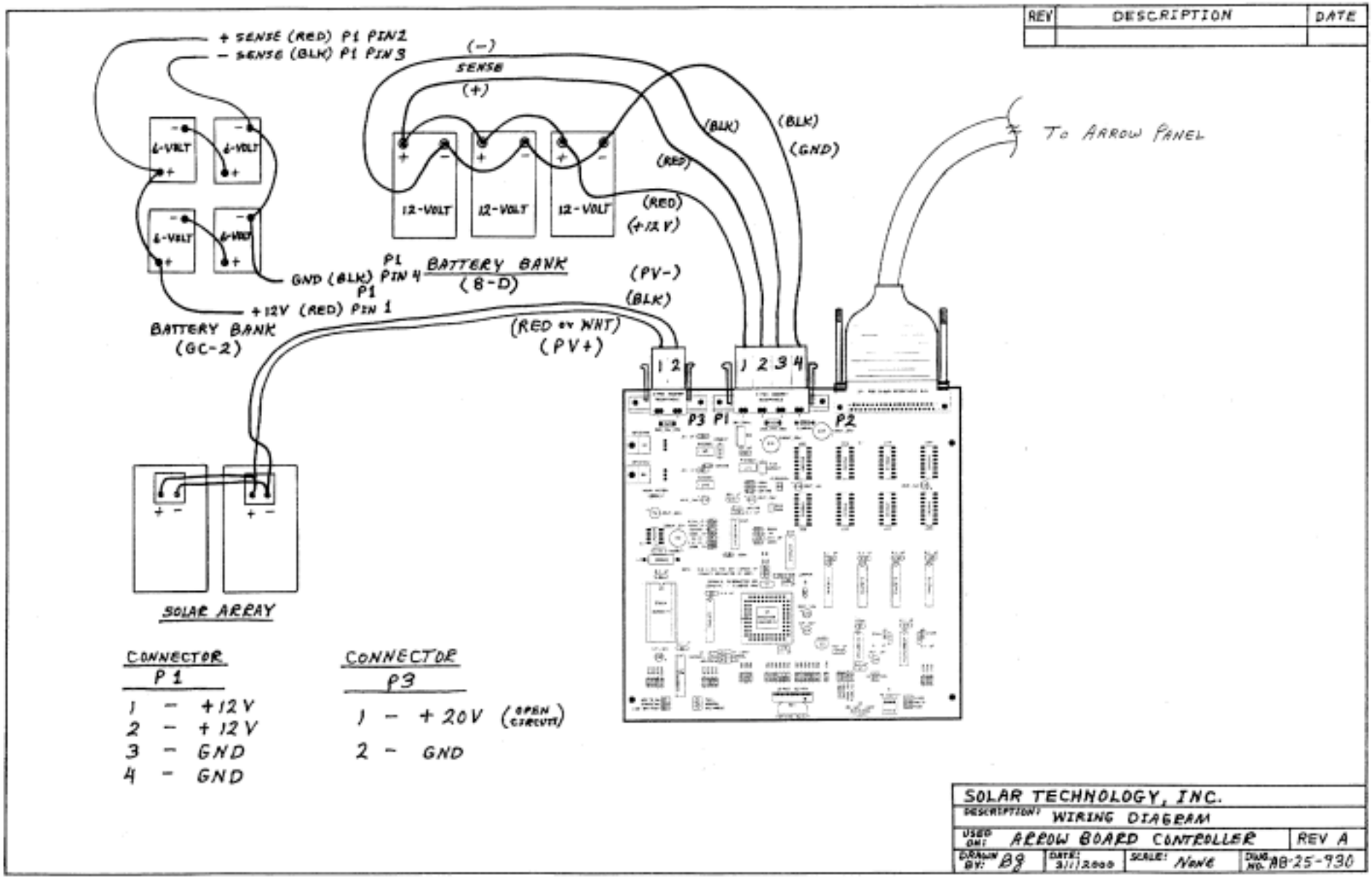
| SIGNAL PATTERN | LAMP BRIGHTNESS | |
|---|---|---|
| | LOW | HIGH |
| Single Arrow | 0.50 | 1.25 |
| Double Arrow | 0.60 | 1.60 |
| Caution Bar | 0.35 | 0.90 |
| 4-Corner Caution | 0.20 | 0.50 |

Current readings even slightly different from those listed in the table above can be an indication of a problem with the unit. If the readings obtained vary more than 10% from those listed in the table check to make sure that factory specified lamps have been installed in the panel and that the lamp patterns are being displayed correctly. If no obvious cause for the problem is apparent consult with factory service personnel for further assistance.

# TROUBLESHOOTING

The **SILENT SENTINEL** is designed to provide the highest level of reliability possible. However, even the best of equipment will require service and repair from time to time. It is when the **SILENT SENTINEL** requires service and repair that the benefits of the quality of design that goes into each and every unit becomes apparent. The **SILENT SENTINEL** is designed to be quickly and easily diagnosed and repaired. Following the few simple steps outlined below should enable you to zero in on the problem and fix it with a minimum of time and effort. After the source of the problem is located, refer to the appropriate part of the **SERVICE & REPAIR** section of the manual for the recommended procedure to solve the problem and get the unit back into the field.

| SYMPTOM | CHECK |
|---|---|
| Unit will not operate and **BATTERY LEVEL** indicates **NORMAL** or **FULL**. | **PATTERN SELECT** switch.<br>Wiring and connectors. |
| Unit will not operate and **BATTERY LEVEL FULL** indicator is flashing. | Battery Voltage. Too high!<br>(over 15 Volts) |
| Unit will not operate and **BATTERY LEVEL** indicates **LOW BATTERY** | Battery Voltage and recharge if required.<br>Wiring and connectors. |
| **SOLAR CHARGER** indicators not on with unit in full sun. | Inspect and clean solar array.<br>Solar array wiring or power cable. |
| Unit not providing continuous, uninterrupted operation. | Inspect and clean solar array.<br>Location and exposure to sun.<br>Battery condition and electrolyte level.<br>**LAMP INTENSITY** control on **AUTO**.<br>Photocell control for lamp brightness exposed to bright light at night. |
| Lamp pattern displayed is not correct. | Lamp type, condition, and terminals.<br>**PATTERN SELECT** switch and knob.<br>Control cable, connectors, and arrow panel wire harness. |


REV
DESCRIPTION
DATE
+ SENSE (RED) P1 PIN 2
- SENSE (BLK) P1 PIN 3
(-)
SENSE
(+)
6-VOLT
6-VOLT
6-VOLT
6-VOLT
12-VOLT
12-VOLT
12-VOLT
(BLK)
(BLK)
(GND)
(RED)
(RED)
(+12 V)
To ARROW PANEL
P1
GND (BLK) P1 PIN 4
BATTERY BANK
(8-D)
(PV-)
(BLK)
+12V (RED) P1 PIN 1
BATTERY BANK
(GC-2)
(RED or WHT)
(PV+)
1 2
1 2 3 4
P3 P1
P2
SOLAR ARRAY
CONNECTOR
P1
1 - +12 V
2 - +12 V
3 - GND
4 - GND
CONNECTOR
P3
1 - +20V (OPEN CIRCUIT)
2 - GND
SOLAR TECHNOLOGY, INC.
DESCRIPTION: WIRING DIAGRAM
USED ON: ARROW BOARD CONTROLLER
REV A
DRAWN BY: BB
DATE: 3/1/2000
SCALE: None
DWG NO. AB-25-930

| REV | DESCRIPTION | DATE |
|---|---|---|
| A | CHANGED P1 & P3 TO 4 POS. | 9/19/91 |

## P1 - BATTERY BANK

| PIN | WIRE COLOR | FUNCTION |
|---|---|---|
| 1 | RED | BATTERY + |
| 2 | RED | SENSE + |
| 3 | BLK | SENSE - |
| 4 | BLK | BATTERY - |

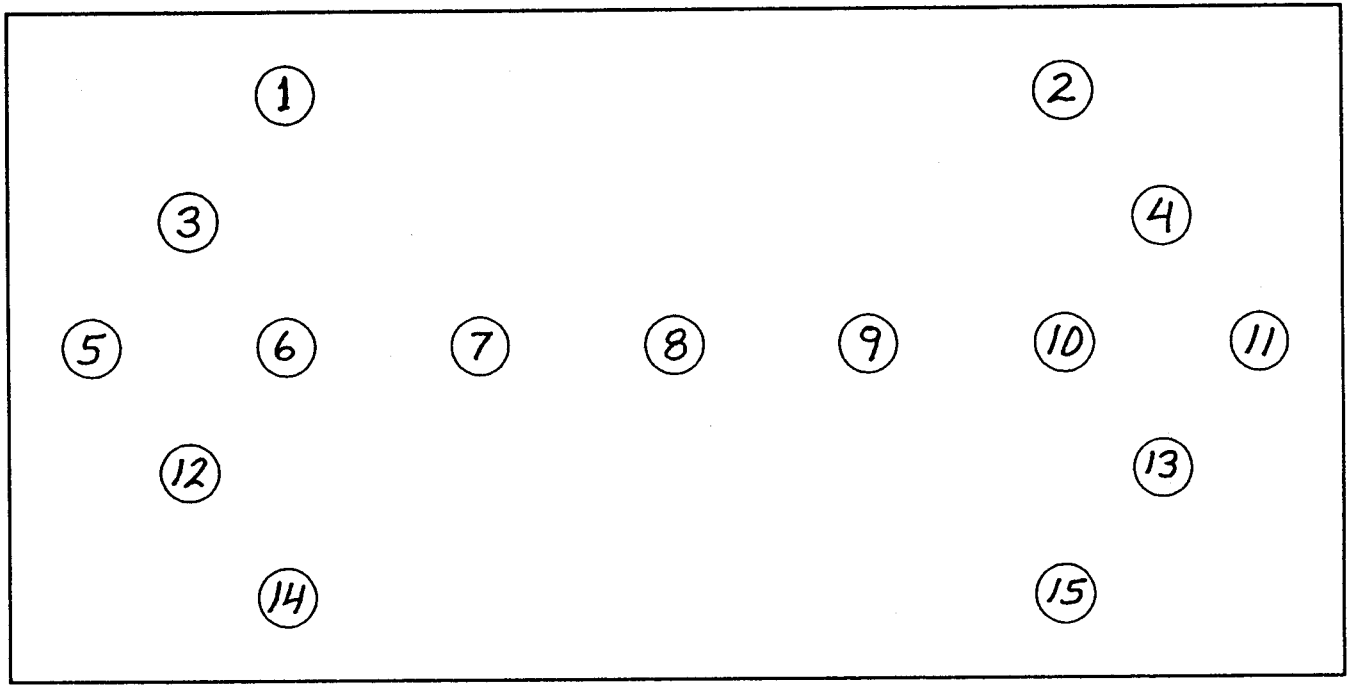
## P3 - SOLAR ARRAY

| PIN | WIRE COLOR | FUNCTION |
|---|---|---|
| 1 | RED or WHT | PV + |
| 2 | BLK | PV - |

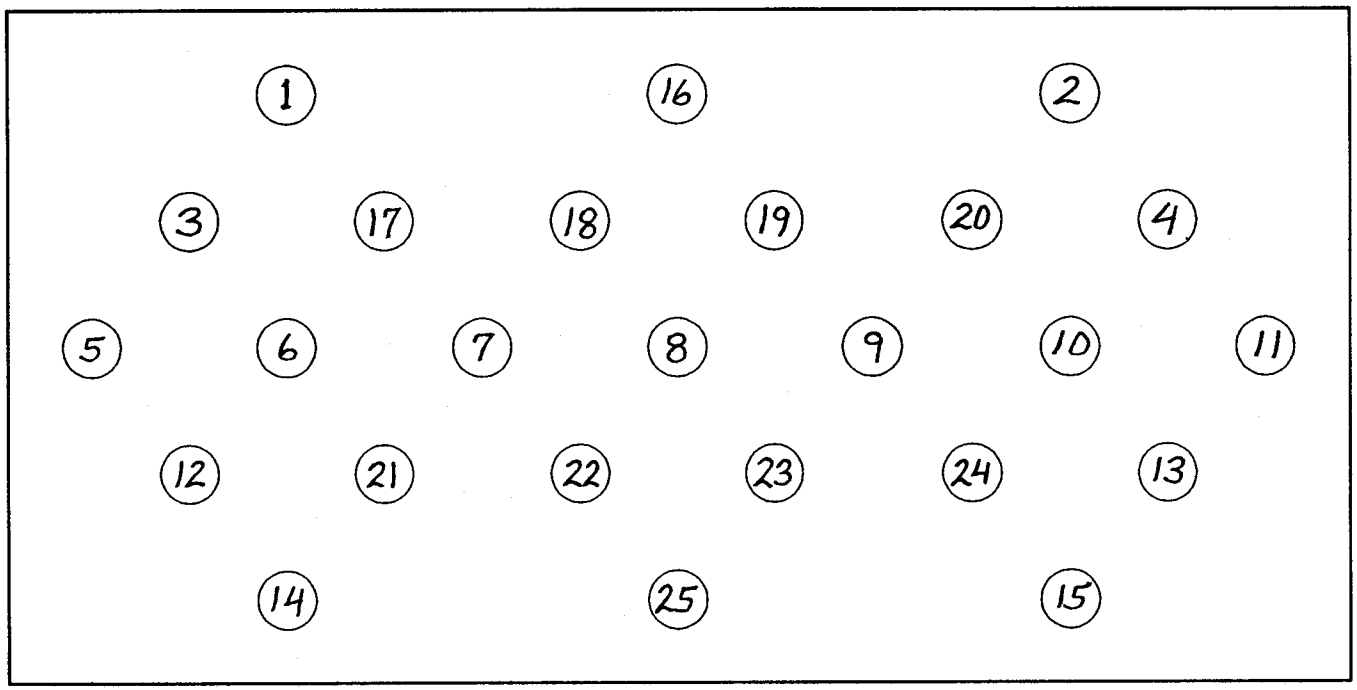
## P2 - ARROW PANEL CABLE

| PIN | WIRE COLOR | FUNCTION | |
|---|---|---|---|
| 1 | BRN | LAMP 1 - | |
| 2 | RED | LAMP 2 - | |
| 3 | ORN | LAMP 3 - | |
| 4 | YEL | LAMP 4 - | |
| 5 | GRN | LAMP 5 - | |
| 6 | BLU | LAMP 6 - | |
| 7 | VIO | LAMP 7 - | |
| 8 | GRY | LAMP 8 - | |
| 9 | WHT | LAMP 9 - | |
| 10 | WHT/RED/RED | LAMP 10 - | |
| 11 | WHT/BRN | LAMP 11 - | |
| 12 | WHT/RED | LAMP 12 - | |
| 13 | WHT/ORN | LAMP 13 - | |
| 14 | WHT/YEL | LAMP 14 - | |
| 15 | WHT/GRN | LAMP 15 - | |
| 16 | WHT/BLU | LAMP 16 - | |
| 17 | WHT/VIO | LAMP 17 - | |
| 18 | WHT/GRY | LAMP 18 - | |
| 19 | RED/YEL | LAMP 19 - | |
| 20 | WHT/BLK | LAMP 20 - | |
| 21 | WHT/BLK/BRN | LAMP 21 - | |
| 22 | WHT/BLK/RED | LAMP 22 - | |
| 23 | WHT/BLK/ORN | LAMP 23 - | |
| 24 | WHT/BLK/YEL | LAMP 24 - | |
| 25 | WHT/BLK/GRN | LAMP 25 - | |
| 26 | WHT/BLK/BLU | COM. POS. LAMPS 1, 3, 5, 12 & 14 | |
| 27 | WHT/BLK/VIO | COM. POS. LAMPS 2, 4, 11, 13 & 15 | |
| 28 | WHT/BLK/GRY | COM. POS. LAMPS 6, 7, 8, 9 & 10 | |
| 29 | RED/GRN | PHOTOCELL +5 VOLTS | |
| 30 | RED/BLK | COM. POS. LAMPS 16, 17, 18, 19 & 20 | |
| 31 | TAN | COM. POS. LAMPS 21, 22, 23, 24 & 25 | |
| 32 | PINK | COM. POS. REAR PANEL LAMPS LEFT, CENTER & RIGHT | |
| 33 | WHT/RED/BRN | PHOTOCELL SIGNAL | |
| 34 | WHT/RED/BLK | REAR PANEL LEFT LAMP | } AS VIEWED FROM FRONT OF ARROW PANEL |
| 35 | WHT/RED/GRN | REAR PANEL CENTER LAMP | |
| 36 | WHT/RED/BLU | REAR PANEL RIGHT LAMP | |
| 37 | WHT/RED/VIO | LOW BATTERY INDICATOR | |

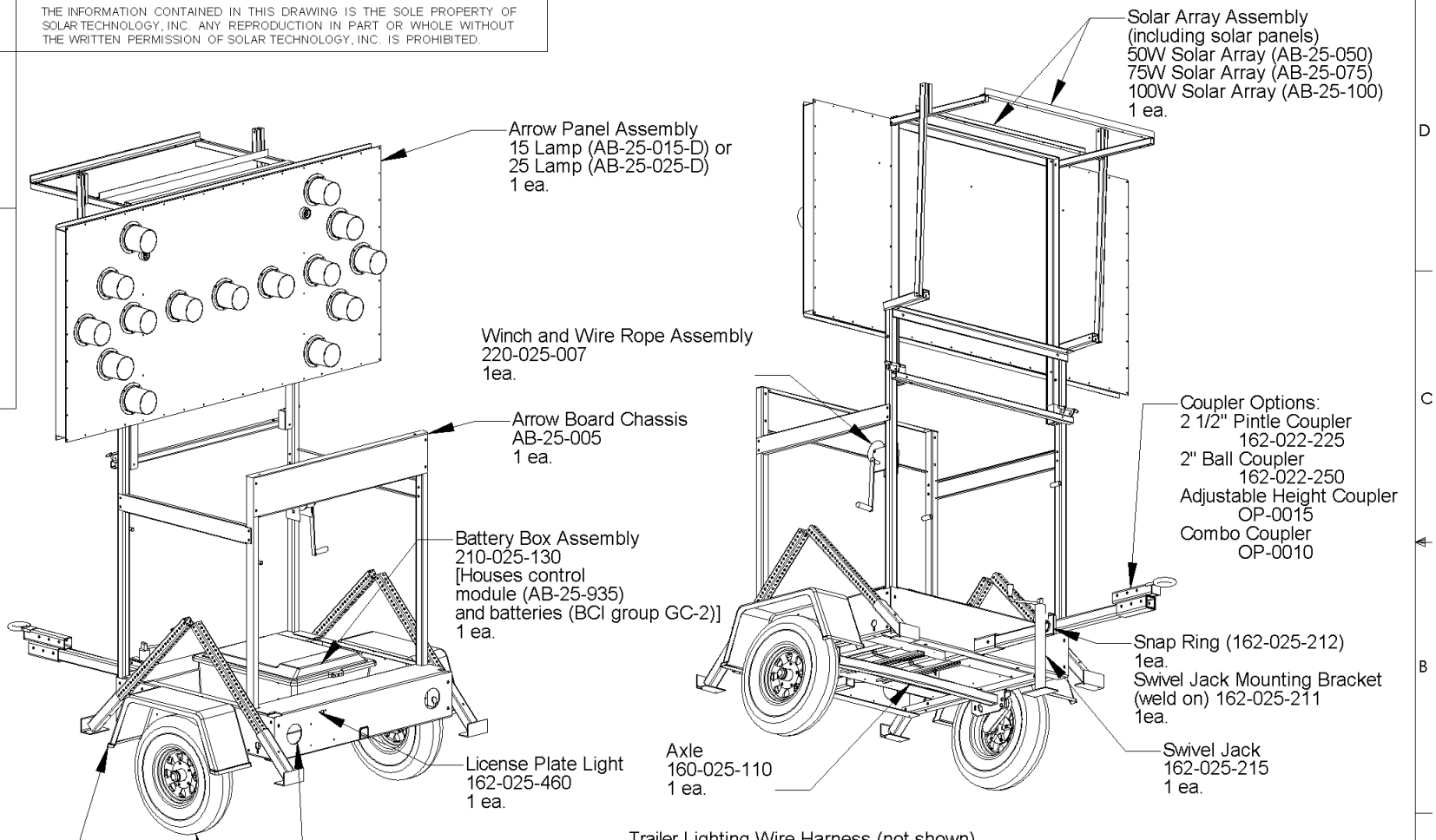
| | | | |
|---|---|---|---|
| SOLAR TECHNOLOGY, INC. | | | |
| DESCRIPTION: CONNECTOR PIN DESIGNATIONS | | | |
| USED ON: ARROW BOARD WIRE HARNESS | | | REV A |
| DRAWN BY: BLS | DATE: 8/1/91 | SCALE: NONE | DWG. NO. AB-25-610 |




| SOLAR TECHNOLOGY, INC. | | |
|---|---|---|
| Arrow Board - Lamp Pattern | | |
| Dn by: BLZ | Date: 2/8/91 | Rev 0 |




| SOLAR TECHNOLOGY, INC. | | |
|---|---|---|
| Arrow Board - Lamp Pattern | | |
| Dn by: BLZ | Date: 2/8/91 | Rev 0 |

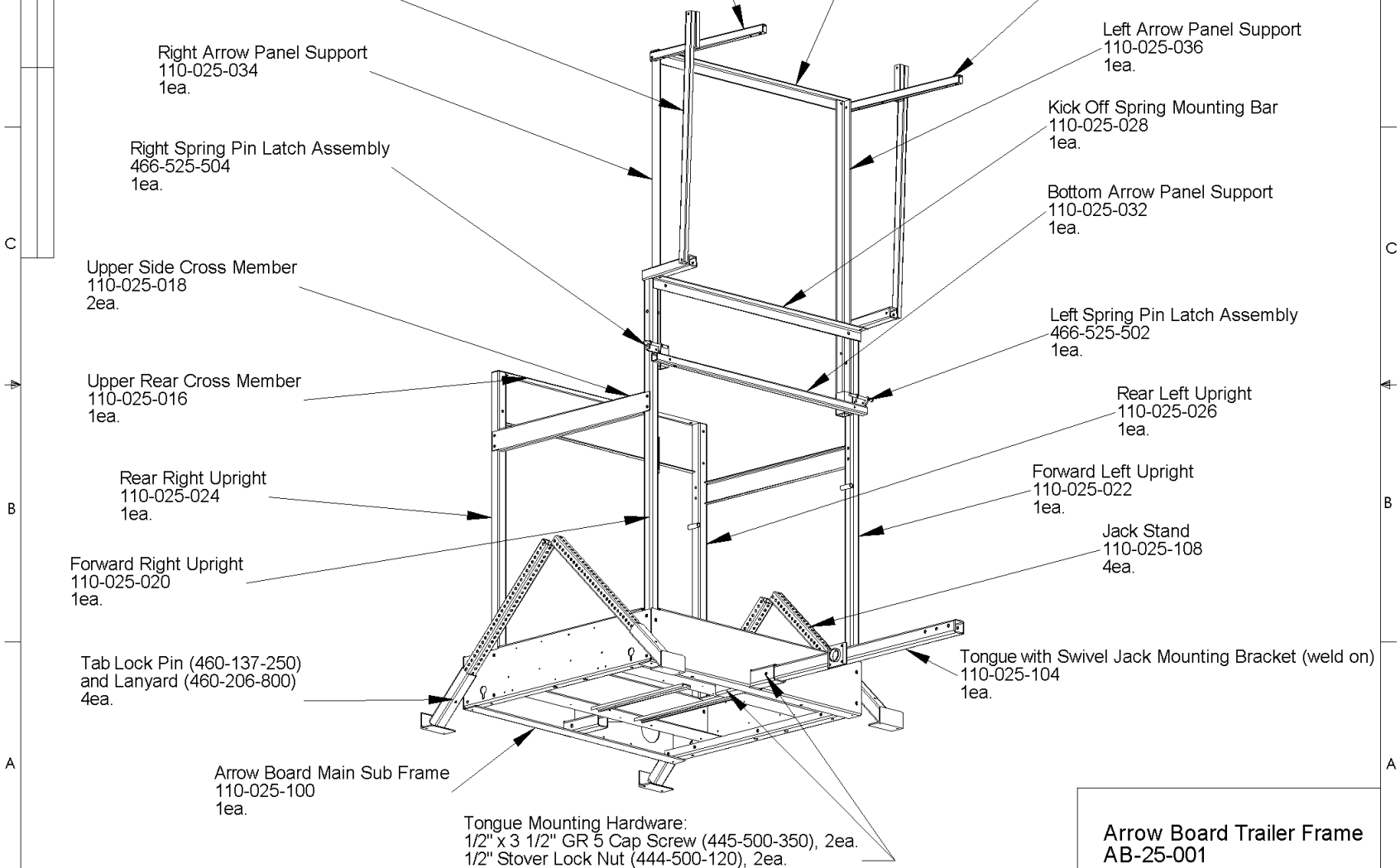


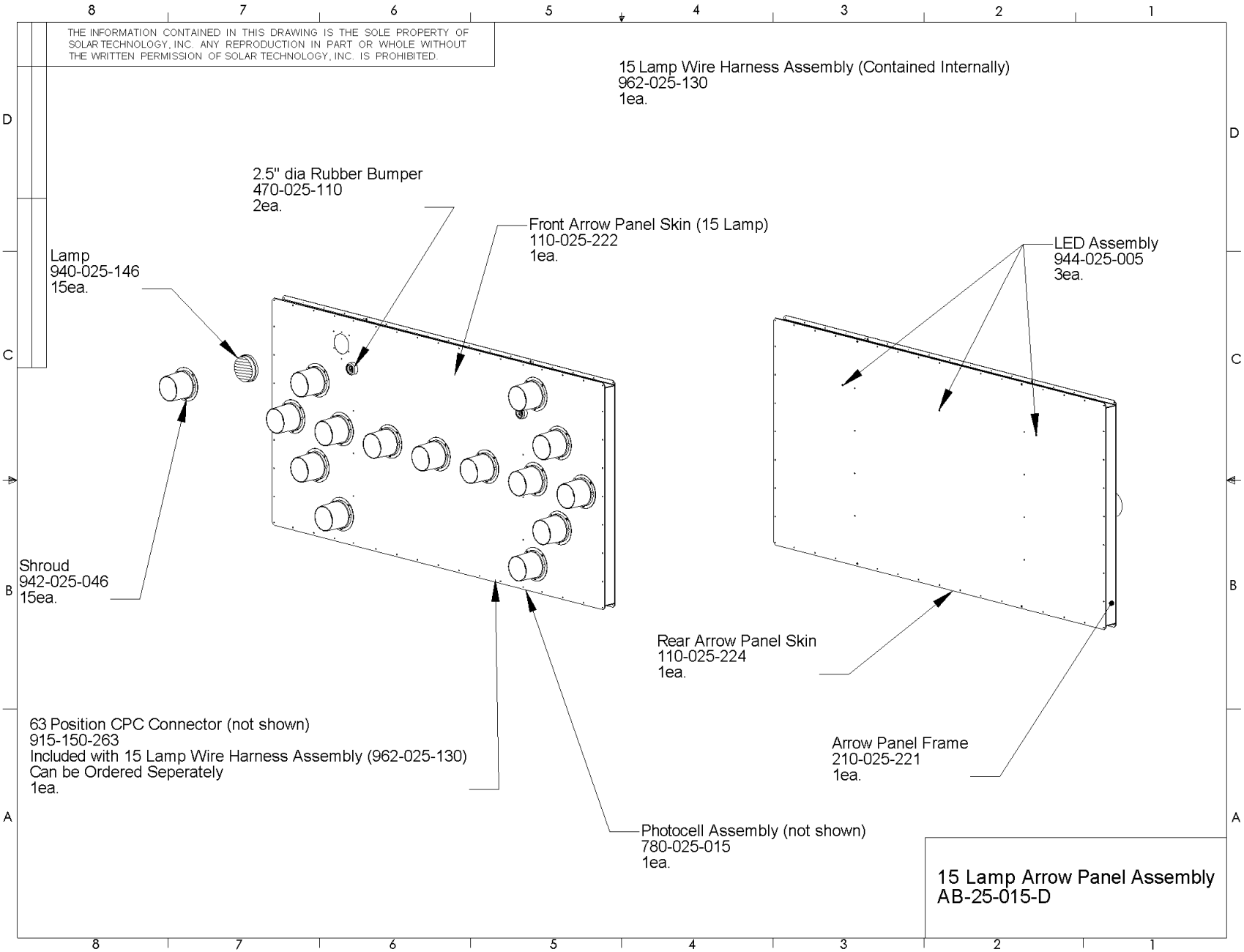

Trailer Lighting Wire Harness (not shown)
960-025-006
Only sold with complete trailer lighting kit (162-025-480).

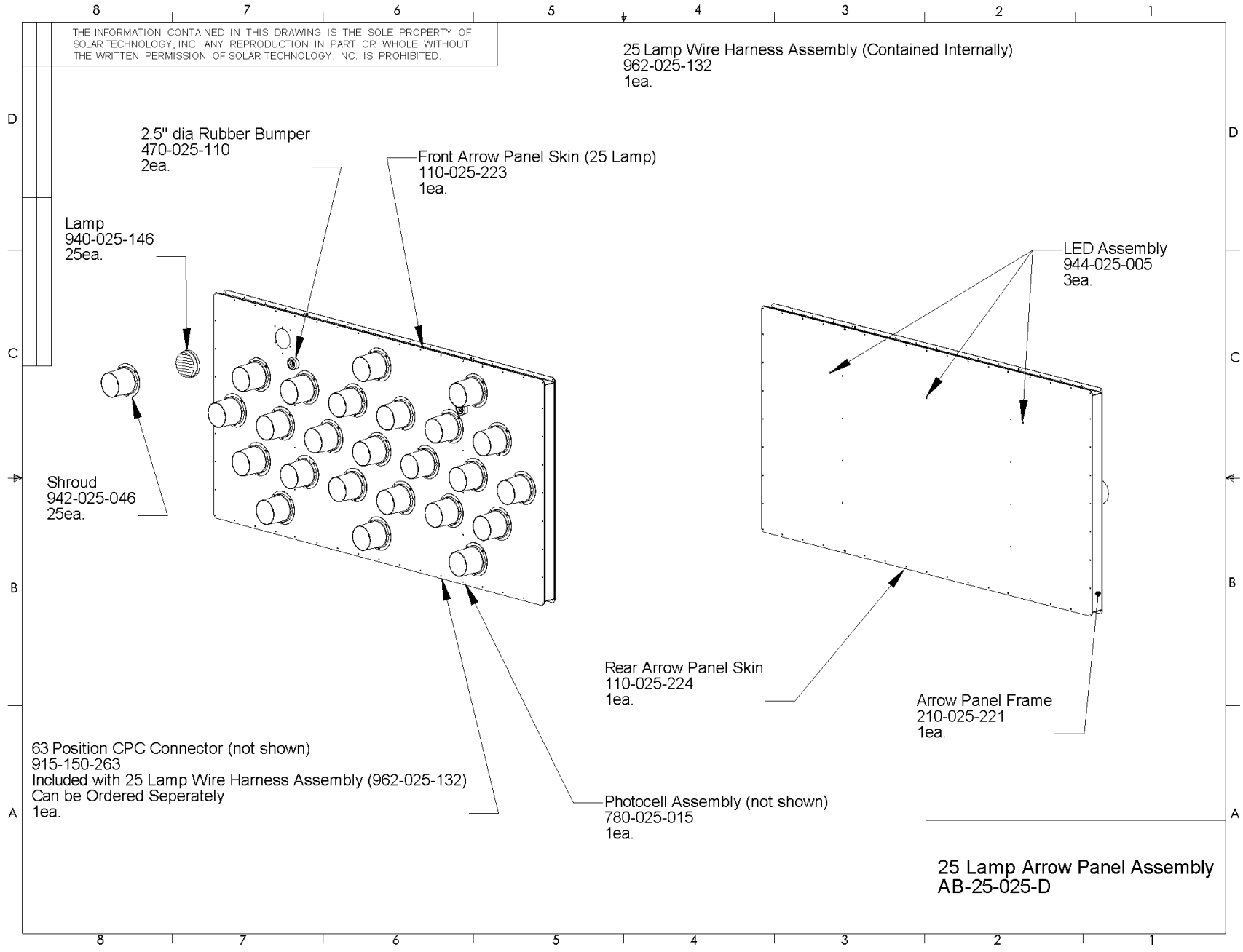
Arrow Panel Control Cable (grey)
Battery Box to Arrow Panel
962-025-144
1ea.

Solar Array Power Cable (white)
Battery Box to Solar Array
962-025-124
1ea.

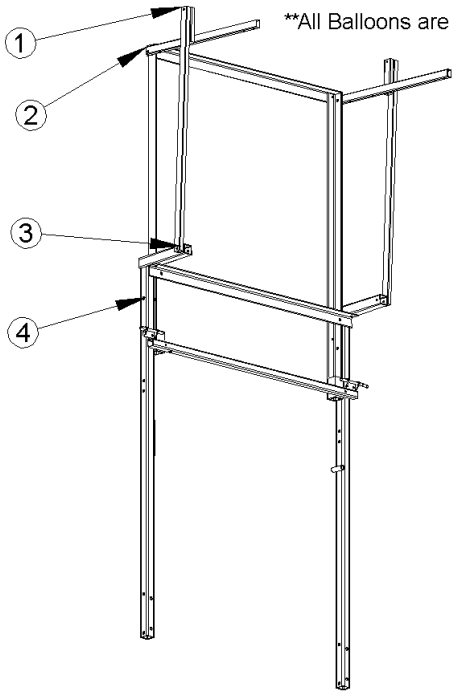
**Arrow Board Assembly**
15 LED 50W (AB-0515-D)
25 LED 50W (AB-0525-D)
15 LED 75W (AB-0715-D)
25 LED 75W (AB-0725-D)
15 LED 100W (AB-1015-D)
25 LED 100W (AB-1025-D)







**All Balloons are Referenced on Next Page**

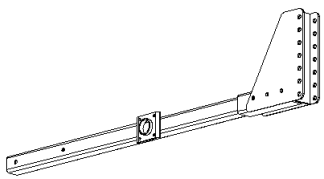



1.) 3/8" x 3" GR 5 Cap Screw (445-370-300), 2ea.
3/8" Flat Washer (444-375-210), 4ea.
3/8" Nylon Flat Washer (444-375-212), 4ea.
3/8" Stover Lock Nut (444-375-120), 2ea.

2.) 3/8" x 2" GR 5 Cap Screw (445-370-200), 2ea.
3/8" Flat Washer (444-375-210), 4ea.
3/8" Nylon Flat Washer (444-375-212), 4ea.
3/8" Stover Lock Nut (444-375-120), 2ea.

3.) 3/8" x 4 1/2" GR 5 Cap Screw (445-370-450), 2ea.
3/8" Flat Washer (444-375-210), 4ea.
3/8" Nylon Flat Washer (444-375-212), 4ea.
3/8" Stover Lock Nut (444-375-120), 2ea.
1/2" Hex Nut (444-500-110), 2ea.

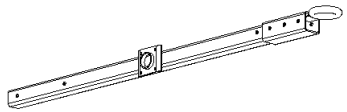
4.) 1/2" x 3 1/2" GR 5 Cap Screw (445-500-350), 2ea.
1/2" Flat Washer (444-500-210), 4ea.
1/2" Nylon Flat Washer (444-500-212), 4ea.
1/2" Stover Lock Nut (444-500-120), 2ea.



Mounting Hardware for
Adjustable Height Coupler (OP-0015):
1/2" x 4 1/2" GR 8 Cap Screw (447-500-450), 2ea.
1/2" Stover Lock Nut (444-500-120), 2ea.
1/2" Flat Washer (444-500-210), 4ea

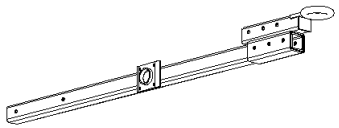
2" Ball Coupler (162-024-020) or 3" Pintle Ring Coupler (162-024-030) Mount to Front of Adjustable Height Coupler Using:
5/8" x 4 1/2" GR 8 Cap Screw (447-625-450), 2ea.
5/8" Flat Washer (444-625-210), 4ea.
5/8" Stover Lock Nut (444-625-120), 2ea.

Saftey Chains Get Mounted With:
7/16" x 5 1/2" GR8 Cap Screw (447-437-550), 1ea.
7/16" Flat Washer (444-437-210), 2ea.
1/2" Flat Washer (444-500-210), 4ea.
7/16" Stover Lock Nut (444-437-120), 1ea.



Mounting Hardware for 2 1/2" Pintle Coupler (162-022-225) and 2" Ball Coupler (162-022-250):
1/2" x 3 1/2" GR 5 Cap Screw (445-500-350), 2ea.
1/2" Stover Lock Nut (444-500-120), 2ea.

Safety Chains Get Mounted With:
7/16" x 4 1/2" GR 5 Cap Screw (445-430-450), 1ea.
7/16" Flat Washer (444-437-210), 2ea.
1/2" Flat Washer (444-500-210), 4ea.
7/16" Stover Lock Nut (444-437-120), 1ea.

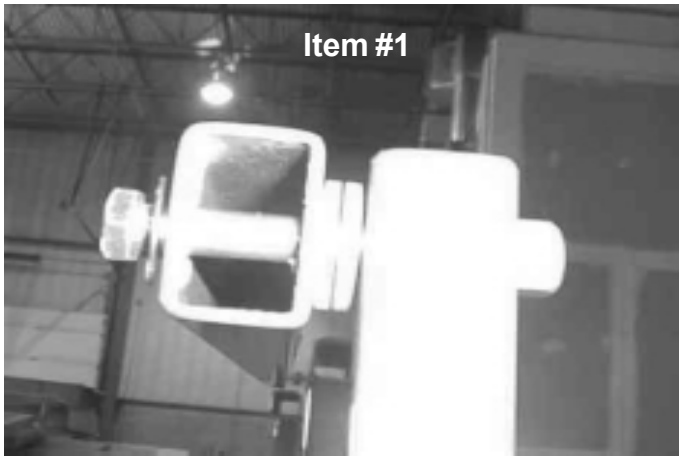


Mounting Hardware for Combination Coupler (OP-0010)
1/2" x 3 1/2" Clevis Pin (460-050-350), 2ea.

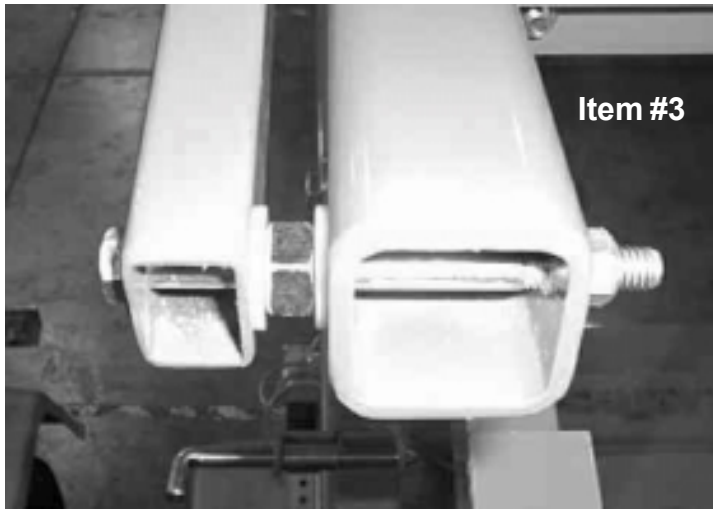
2" Ball Coupler is Inserted into back of Combo Coupler and Attached Using:
1/2" x 3 1/2" GR 5 Cap Screw (445-500-350), 2ea.
1/2" Stover Lock Nut (444-500-120), 2ea.

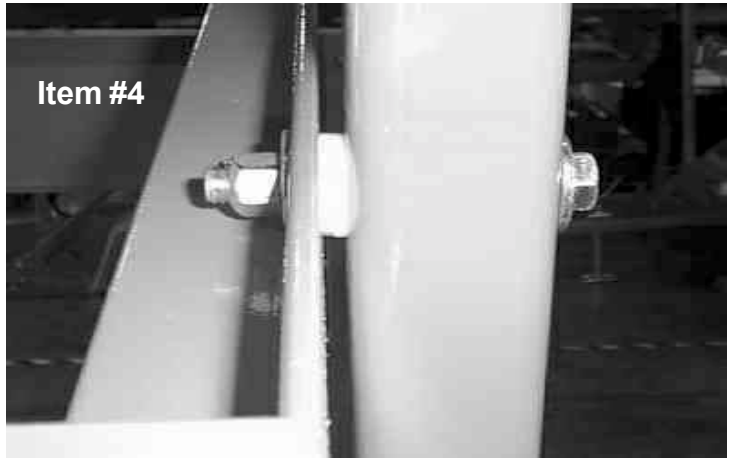
Safety Chains Get Mounted With:
7/16" x 4 1/2" GR 5 Cap Screw (445-430-450), 1ea.
7/16" Flat Washer (444-437-210), 2ea.
1/2" Flat Washer (444-500-210), 4ea.
7/16" Stover Lock Nut (444-437-120), 1ea.

**Arrow Board Superstructure Hardware (left)**
**Arrow Board Coupler Hardware (right)**





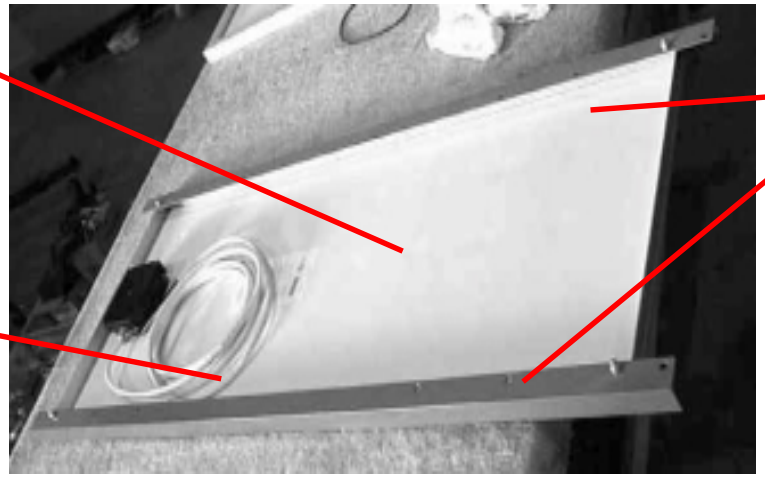



Hardware Photographs for
Arrow Board Superstructure
(Referenced from Previous Page)

50W Solar Panel
980-025-050
or 980-025-043
75W solar panel
980-024-075
1ea.

Solar Array Power Cable
962-025-124
1ea.

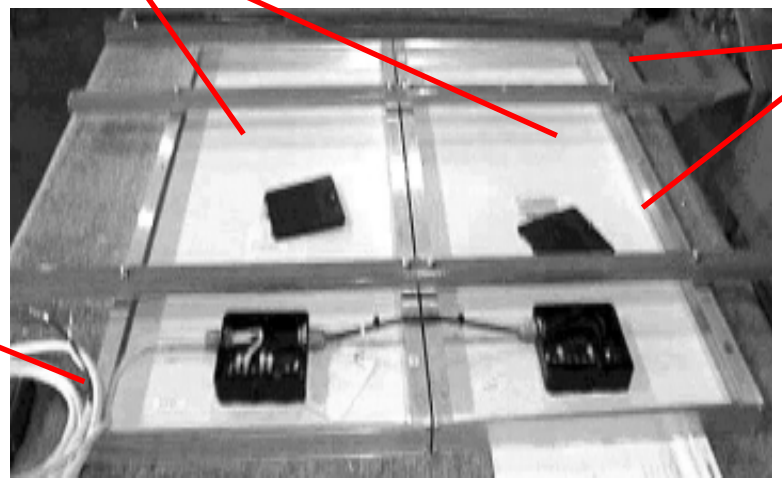


50W or 75W
Solar Array Mounting Bar
110-025-248
2ea.

50W Solar Array Assembly (AB-25-050)
75W Solar Array Assembly (AB-25-075)

50W Solar Panel
980-025-050
2ea.

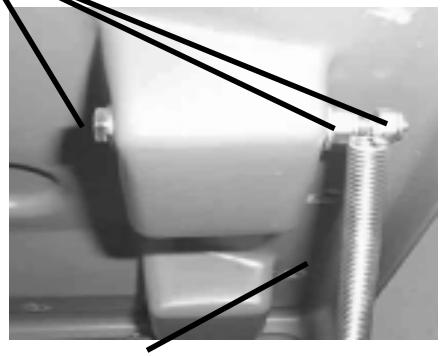
Solar Array Power Cable
962-025-124
1ea.



100W Solar Array Mounting Bar
110-025-246
2ea.

100W Solar Array Assembly (AB-25-100)

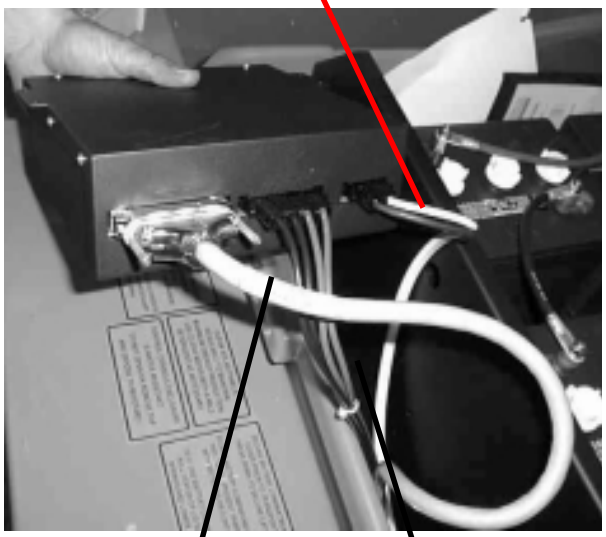
1/4 x 3 1/2 Cap Screw (442-250-350), 2ea.
1/4 Nylon Insert Lock Nut (444-250-130), 4ea.
1/4 flat washer (444-250-210), 4ea.

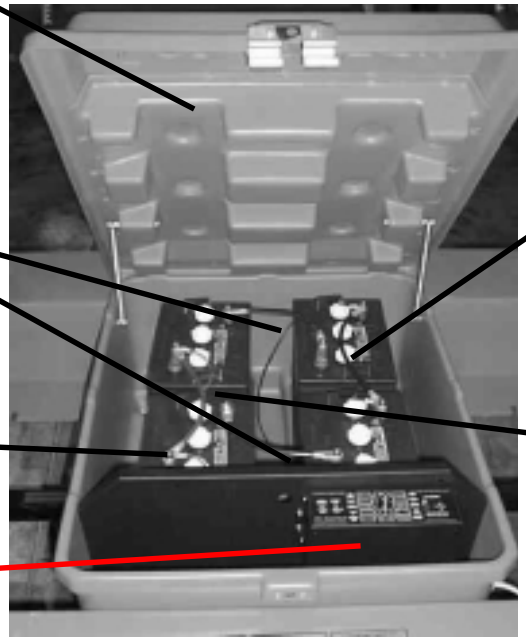


Support Spring (470-500-010), 2ea.

Battery Box Assembly (210-025-130) includes:
- Battery Box Lid (110-025-150), 1ea.
- Battery Box (110-025-140), 1ea.
- Lock Plate (110-025-145), 1ea.
- 20" Bent Leaf Hinge (466-060-020), 1ea.
- Lid Locking Plate (110-025-155), 1ea.
- Spring and Mounting Hardware (shown at right), 2ea.
- Divider Plate (110-025-160), 1ea.
- (also includes all assembly hardware)

Solar Array Power Cable
Battery Box to Solar Array
962-025-124
1ea.





Black 6 GA. 9-Inch
Battery Jumper
962-060-009
2ea.

Black 6 GA. 12"
Battery Jumper
962-060-012
1ea.

Battery
(BCI Group GC-2)
990-006-105
4ea.

Red 6 GA. 12"
Battery Jumper
962-062-012
1ea.

Control Module Assembly
780-125-025
1ea.

Arrow Panel Control Cable
Battery Box to Arrow Panel
962-025-144
1ea.

Battery Power Wire Harness
Battery Box to Control Module
962-025-120
1ea.

Battery Box Assembly 210-025-130
Battery Power Wire Harness 962-025-120
Arrow Panel Control Cable 962-025-144
Control Module AB-25-935

BOM NUMBER: AB-0515-D REV B
BOM DESCRIPTION: ARROW BOARD 15 LED 50 WATT
DATE 02/10/00
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| PART | 0004 | 990-006-105 | BATTERY, 6 VOLT, BCI GROUP NO. GC-2 | 4.0000 | EA |
| BOM | 0001 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOARD | 1.0000 | EA |
| BOM | 0002 | AB-25-015-D | ARROW PANEL ASS'Y - 15 LAMP, LED | 1.0000 | EA |
| BOM | 0005 | AB-25-050 | ARROW BOARD SOLAR ARRAY 50W | 1.0000 | EA |
| BOM | 0003 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER AB-0525-D REV B
BOM DESCRIPTION: ARROW BOARD 25 LED 50 WATT
DATE 02/10/00
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REO | UNIT |
|---|---|---|---|---|---|
| BOM | 0004 | 990-006-105 | BATTERY, 6 VOLT, BCI GROUP NO. GC-2 | 4.0000 | EA |
| BOM | 0001 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOARD | 1.0000 | EA |
| BOM | 0002 | AB-25-025-D | ARROW PANEL ASS'Y - 25 LAMP, LED | 1.0000 | EA |
| BOM | 0005 | AB-25-050 | ARROW BOARD SOLAR ARRAY 50W | 1.0000 | EA |
| BOM | 0003 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER AB-0715-D REV B
BOM DESCRIPTION: ARROW BOARD 15 LED 75 WATT
DATE 02/10/00
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REO | UNIT |
|---|---|---|---|---|---|
| BOM | 0004 | 990-006-105 | BATTERY, 6 VOLT, BCI GROUP NO. GC-2 | 4.0000 | EA |
| BOM | 0001 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOARD | 1.0000 | EA |
| BOM | 0002 | AB-25-015-D | ARROW PANEL ASS'Y - 15 LAMP, LED | 1.0000 | EA |
| BOM | 0005 | AB-25-075 | ARROW BOARD SOLAR ARRAY 75W | 1.0000 | EA |
| BOM | 0003 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER AB-0725-D REV B
BOM DESCRIPTION: ARROW BOARD 25 LED 75 WATT
DATE 02/10/00
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REO | UNIT |
|---|---|---|---|---|---|
| BOM | 0004 | 990-006-105 | BATTERY, 6 VOLT, BCI GROUP NO. GC-2 | 4.0000 | EA |
| BOM | 0001 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOARD | 1.0000 | EA |
| BOM | 0002 | AB-25-025-D | ARROW PANEL ASS'Y - 25 LAMP, LED | 1.0000 | EA |
| BOM | 0005 | AB-25-075 | ARROW BOARD SOLAR ARRAY 75W | 1.0000 | EA |
| BOM | 0003 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER: AB-1015 REV A
BOM DESCRIPTION: ARROW BOARD 15 LAMP 100 WATT MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| PART | 016 | 110-025-264 | SPOILER - ARROW BOARD - 150 WATT | 1.0000 | EA |
| PART | 002 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 4.0000 | EA |
| PART | 001 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 8.0000 | EA |
| PART | 006 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 13.0000 | EA |
| PART | 007 | 956-311-015 | CABLE TIE - 15 INCH | 7.0000 | EA |
| BOM | 008 | 962-025-144 | CABLE - ARROW PANEL CONTROL, STD, | 1.0000 | EA |
| PART | 015 | 990-012-908 | BATTERY 12 VOLT SCI GROUP SIZE 8D | 3.0000 | EA |
| BOM | 012 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOARD | 1.0000 | EA |
| BOM | 009 | AB-25-015 | ARROW PANEL ASSY, - 15 LAMP | 1.0000 | EA |
| BOM | 013 | AB-25-100 | SOLAR ARRAY, AB, 2-PANEL, 100 WATT | 1.0000 | EA |
| BOM | 011 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER AB-1025 REV A
BOW DESCRIPTION: ARROW BOARD 25 LAMP 100 WATT MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REO | UNIT |
|---|---|---|---|---|---|
| PART | 018 | 110-025-264 | SPOILER - ARROW BOARD - 150 WATT | 1.0000 | EA |
| PART | 002 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 4.0000 | EA |
| PART | 001 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 8.0000 | EA |
| PART | 006 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 13.0000 | EA |
| PART | 007 | 956-311-015 | CABLE TIE - 15 INCH | 7.0000 | EA |
| BOM | 008 | 962-025-144 | CABLE - ARROW PANEL CONTROL, STD. | 1.0000 | EA |
| PART | 017 | 990-012-908 | BATTERY 12 VOLT BCI GROUP SIZE 8D | 3.0000 | EA |
| BOM | 012 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOAR | 1.0000 | EA |
| BOM | 014 | AB-25-025 | ARROW PANEL ASSY. - 25 LAMP | 1.0000 | EA |
| BOM | 010 | AB-25-100 | SOLAR ARRAY, AB, 2-PANEL, 100 WATT | 1.0000 | EA |
| BOM | 011 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER AB-1015-D REV B
BOM DESCRIPTION: ARROW BOARD 15 LED 100 WATT
DATE 02/10/00
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REO | UNIT |
|---|---|---|---|---|---|
| BOM | 0004 | 990-006-105 | BATTERY, 6 VOLT, BCI GROUP NO. GC-2 | 4.0000 | EA |
| BOM | 0001 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOARD | 1.0000 | EA |
| BOM | 0002 | AB-25-015-D | ARROW PANEL ASS'Y - 15 LAMP, LED | 1.0000 | EA |
| BOM | 0005 | AB-25-100 | ARROW BOARD SOLAR ARRAY 100W | 1.0000 | EA |
| BOM | 0003 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER AB-1025-D REV B
BOM DESCRIPTION: ARROW BOARD 25 LED 100 WATT
DATE 02/10/00
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| BOM | 0004 | 990-006-105 | BATTERY, 6 VOLT, BCI GROUP NO. GC-2 | 4.0000 | EA |
| BOM | 0001 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOARD | 1.0000 | EA |
| BOM | 0002 | AB-25-025-D | ARROW PANEL ASS'Y - 25 LAMP, LED | 1.0000 | EA |
| BOM | 0005 | AB-25-100 | ARROW BOARD SOLAR ARRAY 100W | 1.0000 | EA |
| BOM | 0003 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER: AB-1515 REV A
BOM DESCRIPTION: ARROW BOARD 15 LAMP 150 WATT MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| PART | 016 | 110-025-264 | SPOILER - ARROW BOARD - 150 WATT | 1.0000 | EA |
| PART | 002 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 4.0000 | EA |
| PART | 001 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 8.0000 | EA |
| PART | 006 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 13.0000 | EA |
| PART | 007 | 956-311-015 | CABLE TIE - 15 INCH | 7.0000 | EA |
| BOM | 008 | 962-025-144 | CABLE - ARROW PANEL CONTROL, STD, | 1.0000 | EA |
| PART | 015 | 990-012-908 | BATTERY 12 VOLT SCI GROUP SIZE 8D | 3.0000 | EA |
| BOM | 012 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOARD | 1.0000 | EA |
| BOM | 009 | AB-25-015 | ARROW PANEL ASSY, - 15 LAMP | 1.0000 | EA |
| BOM | 013 | AB-25-150 | SOLAR ARRAY, AB, 2-PANEL, 150 WATT | 1.0000 | EA |
| BOM | 011 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER AB-1525 REV A
BOW DESCRIPTION: ARROW BOARD 25 LAMP 150 WATT MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| PART | 018 | 110-025-264 | SPOILER - ARROW BOARD - 150 WATT | 1.0000 | EA |
| PART | 002 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 4.0000 | EA |
| PART | 001 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 8.0000 | EA |
| PART | 006 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 13.0000 | EA |
| PART | 007 | 956-311-015 | CABLE TIE - 15 INCH | 7.0000 | EA |
| BOM | 008 | 962-025-144 | CABLE - ARROW PANEL CONTROL, STD. | 1.0000 | EA |
| PART | 017 | 990-012-908 | BATTERY 12 VOLT BCI GROUP SIZE 8D | 3.0000 | EA |
| BOM | 012 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOAR | 1.0000 | EA |
| BOM | 014 | AB-25-025 | ARROW PANEL ASSY. - 25 LAMP | 1.0000 | EA |
| BOM | 010 | AB-25-150 | SOLAR ARRAY, AB, 2-PANEL, 150 WATT | 1.0000 | EA |
| BOM | 011 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER: AB-1515-D REV A
BOM DESCRIPTION: ARROW BOARD 15 LED 150 WATT MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| PART | 016 | 110-025-264 | SPOILER - ARROW BOARD - 150 WATT | 1.0000 | EA |
| PART | 002 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 4.0000 | EA |
| PART | 001 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 8.0000 | EA |
| PART | 006 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 13.0000 | EA |
| PART | 007 | 956-311-015 | CABLE TIE - 15 INCH | 7.0000 | EA |
| BOM | 008 | 962-025-144 | CABLE - ARROW PANEL CONTROL, STD, | 1.0000 | EA |
| PART | 015 | 990-012-908 | BATTERY 12 VOLT SCI GROUP SIZE 8D | 3.0000 | EA |
| BOM | 012 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOARD | 1.0000 | EA |
| BOM | 009 | AB-25-015-D | ARROW PANEL ASSY, - 15 LAMP, LED | 1.0000 | EA |
| BOM | 013 | AB-25-150 | SOLAR ARRAY, AB, 2-PANEL, 150 WATT | 1.0000 | EA |
| BOM | 011 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER AB-1525-D REV A
BOW DESCRIPTION: ARROW BOARD 25 LED 150 WATT MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REO | UNIT |
|---|---|---|---|---|---|
| PART | 018 | 110-025-264 | SPOILER - ARROW BOARD - 150 WATT | 1.0000 | EA |
| PART | 002 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 4.0000 | EA |
| PART | 001 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 8.0000 | EA |
| PART | 006 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 13.0000 | EA |
| PART | 007 | 956-311-015 | CABLE TIE - 15 INCH | 7.0000 | EA |
| BOM | 008 | 962-025-144 | CABLE - ARROW PANEL CONTROL, STD. | 1.0000 | EA |
| PART | 017 | 990-012-908 | BATTERY 12 VOLT BCI GROUP SIZE 8D | 3.0000 | EA |
| BOM | 012 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOAR | 1.0000 | EA |
| BOM | 014 | AB-25-025-D | ARROW PANEL ASSY. - 25 LAMP, LED | 1.0000 | EA |
| BOM | 010 | AB-25-150 | SOLAR ARRAY, AB, 2-PANEL, 150 WATT | 1.0000 | EA |
| BOM | 011 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER: AB-2015 REV A
BOM DESCRIPTION: ARROW BOARD 15 LAMP 200 WATT MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| PART | 016 | 110-025-265 | SPOILER - ARROW BOARD - 200 WATT | 1.0000 | EA |
| PART | 002 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 4.0000 | EA |
| PART | 001 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 8.0000 | EA |
| PART | 006 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 13.0000 | EA |
| PART | 007 | 956-311-015 | CABLE TIE - 15 INCH | 7.0000 | EA |
| BOM | 008 | 962-025-144 | CABLE - ARROW PANEL CONTROL, STD, | 1.0000 | EA |
| PART | 015 | 990-012-908 | BATTERY 12 VOLT SCI GROUP SIZE 8D | 3.0000 | EA |
| BOM | 012 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOARD | 1.0000 | EA |
| BOM | 009 | AB-25-015 | ARROW PANEL ASSY, - 15 LAMP | 1.0000 | EA |
| BOM | 013 | AB-25-200 | SOLAR ARRAY, AB, 4-PANEL, 200 WATT | 1.0000 | EA |
| BOM | 011 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER AB-2025 REV A
BOW DESCRIPTION: ARROW BOARD 25 LAMP 200 WATT MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REO | UNIT |
|---|---|---|---|---|---|
| PART | 018 | 110-025-265 | SPOILER - ARROW BOARD - 200 WATT | 1.0000 | EA |
| PART | 002 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 4.0000 | EA |
| PART | 001 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 8.0000 | EA |
| PART | 006 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 13.0000 | EA |
| PART | 007 | 956-311-015 | CABLE TIE - 15 INCH | 7.0000 | EA |
| BOM | 008 | 962-025-144 | CABLE - ARROW PANEL CONTROL, STD. | 1.0000 | EA |
| PART | 017 | 990-012-908 | BATTERY 12 VOLT BCI GROUP SIZE 8D | 3.0000 | EA |
| BOM | 012 | AB-25-005 | TRAILER CHASSIS ASS'Y - ARROW BOAR | 1.0000 | EA |
| BOM | 014 | AB-25-025 | ARROW PANEL ASSY. - 25 LAMP | 1.0000 | EA |
| BOM | 010 | AB-25-200 | SOLAR ARRAY, AB, 4-PANEL, 200 WATT | 1.0000 | EA |
| BOM | 011 | AB-25-935 | ARROW BOARD CONTROL MODULE | 1.0000 | EA |

BOM NUMBER: AB-25-005 REV B
BOM DESCRIPTION: TRAILER CHASSIS ASS'Y - ARROW BOARD MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| PART | 0068 | 110-025-140 | PLASTIC BATTERY BOX - BOX | 1.0000 | EA |
| PART | 0069 | 110-025-145 | PLASTIC BATTERY BOX LOCK PLATE | 1.0000 | EA |
| PART | 0070 | 110-025-150 | PLASTIC BATTERY BOX - LID | 1.0000 | EA |
| PART | 0071 | 110-025-155 | PLASTIC BATTERY BOX LID LOCK PLATE | 1.0000 | EA |
| PART | 0072 | 110-025-160 | PLASTIC BATTERY BOX DIVIDER PLATE | 1.0000 | EA |
| PART | 0002 | 160-025-110 | AXLE ASS'Y #9 TORSION, 1400#, 50" | 1.0000 | EA |
| PART | 0003 | 160-025-210 | WHEEL / TIRE ASS'Y - B78-13 | 2.0000 | EA |
| PART | 0004 | 160-025-220 | FENDER - MOLDED HDPE - ORANGE | 2.0000 | EA |
| PART | 0005 | 162-025-042 | SAFETY CHAIN - 1/4" x 48" W / S-HOO | 2.0000 | EA |
| PART | 0006 | 162-025-212 | SWIVEL JACK RETAINING RING | 1.0000 | EA |
| PART | 0007 | 162-025-215 | SWIVEL JACK - TOP WIND - 2000 LB. | 1.0000 | EA |
| BOM | 0031 | 162-025-480 | TRLR LIGHTING KIT, CUSTOM - AB / MBII | 1.0000 | EA |
| PART | 0008 | 162-025-610 | WINCH - 1000 LB. W / AUTO BRAKE | 1.0000 | EA |
| PART | 0073 | 429-932-312 | SCREW PHIL PAN HD 10-32 THD ROLLIN | 15.0000 | EA |
| PART | 0074 | 442-250-100 | CAP SCREW - 1/4-20 x 1 HH/CS | 1.0000 | EA |
| PART | 0075 | 442-250-350 | SCREW 1/4-20 x 3 1/2 HH/CS | 1.0000 | EA |
| PART | 0038 | 443-256-050 | SCREW - 1/4-20 x 1/2 THREAD FORMIN | 38.0000 | EA |
| PART | 0066 | 443-256-151 | SCREW - 1/4-20 x 1 1/2 THRD FORMIN | 4.0000 | EA |
| PART | 0076 | 443-806-050 | SCREW - #8 x 1/2 HWH T/2 | 4.0000 | EA |
| PART | 0077 | 444-250-130 | NUT - NYLON INSERT LOCK 1/4-20 | 4.0000 | EA |
| PART | 0078 | 444-250-210 | WASHER - FLAT 1/4 | 2.0000 | EA |
| PART | 0039 | 444-250-220 | WASHER - FENDER - 1/4-1" OD | 32.000 | EA |
| PART | 0051 | 444-312-120 | NUT - STOVER LOCK 5/16-18 | 2.0000 | EA |
| PART | 0059 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 4.0000 | EA |
| PART | 0045 | 444-375-120 | NUT - STOVER LOCK 3/8-16 | 23.0000 | EA |
| PART | 0036 | 444-375-210 | WASHER - FLAT 3/8 | 2.0000 | EA |
| PART | 0053 | 444-375-212 | WAHER - NYLON - FLAT 3/8 | 12.0000 | EA |
| PART | 0035 | 444-437-120 | NUT - STOVER LOCK 7/16-14 | 1.0000 | EA |
| PART | 0037 | 444-437-210 | WASHER - FLAT 7 - 16 | 4.0000 | EA |
| PART | 0033 | 444-500-120 | NUT - STOVER LOCK 1/2 x 13 | 25.0000 | EA |
| PART | 0041 | 444-500-210 | WASHER - FLAT 1/2 | 20.0000 | EA |
| PART | 0048 | 444-500-212 | WASHER - NYLON - FLAT 1/2 | 8.0000 | EA |
| PART | 0055 | 445-310-100 | CAP SCREW - 5/16-18 x 1 HHCS GR5 | 2.0000 | EA |
| PART | 0056 | 445-310-125 | CAP SCREW - 5/16-18 x 1 1/4 HHCS GR5 | 2.0000 | EA |
| PART | 0049 | 445-310-450 | CAP SCREW - 5/16-18 x 4 1/2 HH/CS GR | 2.0000 | EA |
| PART | 0047 | 445-370-100 | CAP SCREW - 3/8-16 x 1 HH/CS GR5 | 2.0000 | EA |
| PART | 0054 | 445-370-200 | CAP SCREW - 3/8-16 x 2 HHCS GR5 | 2.0000 | EA |
| PART | 0043 | 445-370-275 | CAP SCREW - 3/8-16 x 2 3/4 HHCS GRG5 | 12.0000 | EA |
| PART | 0046 | 445-370-300 | CAP SCREW - 3/8-16 x 3 HH/CS GR5 | 5.0000 | EA |
| PART | 0052 | 445-370-400 | CAP SCREW - 3/8-16 x 4 HH/CS GR5 | 2.0000 | EA |
| PART | 0034 | 445-430-450 | CAP SCREW - 7/16-14 x 4 1/2 HH/CS GR | 1.0000 | EA |
| PART | 0040 | 445-500-300 | CAP SCREW - 1/2-13 x 3 HH/CS GR5 | 16.0000 | EA |
| PART | 0032 | 445-500-350 | CAP SCREW - 1/2-13 x 3 1/2 HH/CS GR5 | 8.0000 | EA |
| PART | 0057 | 450-312-110 | NUT - HEX 5/16-18 SS 18-8 | 12.0000 | EA |
| PART | 0050 | 450-312-210 | WASHER - FLAT 5/16 SS 18-8 | 4.0000 | EA |
| PART | 0058 | 450-312-310 | WAHER - SPLIT LOCK 5/16 SS 18-8 | 12.0000 | EA |
| PART | 0044 | 450-375-210 | WASHER - FLAT 3/8 SS 18-8 | 43.0000 | EA |
| PART | 0009 | 458-500-250 | EYE BOLT - 1/2-13 x 2 | 1.0000 | EA |
| PART | 0010 | 460-137-250 | TAB LOCK PIN - 3/8 x 2 3/4 | 4.0000 | EA |
| PART | 0011 | 460-206-800 | LANYARD - NYLON, BLACK, TYPE 2 | 4.0000 | EA |

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| PART | 0030 | 461-004-187 | DRIVE PIN #4 x 3/16 RND HD - ZINC | 2.0000 | EA |
| PART | 0079 | 461-187-250 | POP RIVET - ALUM 3/16 DIA x 1/4 | 8.0000 | EA |
| PART | 0013 | 462-025-001 | SEAL - LEAD W/ WIRE CABLE | 1.0000 | EA |
| PART | 0014 | 462-525-019 | WIRE ROPE - 1/4 INCH - 19 x 19 | 7.5000 | FT |
| PART | 0015 | 462-525-002 | CLAMP - WIRE ROPE - 1/4 INCH | 2.0000 | EA |
| PART | 0016 | 462-525-025 | THIMBLE - GALV. - 1/4 INCH | 1.0000 | EA |
| PART | 0080 | 466-060-020 | HINGE, 20" BENT LEAF, BAT. BOX SS | 1.0000 | EA |
| PART | 0017 | 470-212-200 | CAP - 2" SQ TUBING | 4.0000 | EA |
| PART | 0081 | 470-500-010 | SPRING, 1/2" DIA. 10" LOA, SUPPORT | 1.0000 | EA |
| PART | 0018 | 470-550-350 | SPRING - DIE - 1 x 3 - 1/2 ROD | 2.0000 | EA |
| PART | 0063 | 515-010-031 | DECAL, STI LOGO, 7" x 31" | 1.0000 | EA |
| PART | 0064 | 515-110-018 | DECAL, STI LOGO, 3" x 18" | 4.0000 | EA |
| PART | 0019 | 540-062-190 | TAG - ALUM - 5/8 x 1 19/32 | 1.0000 | EA |
| PART | 0020 | 550-025-100 | MANUAL, OPER & MAINT, ARROW BOARD | 1.0000 | EA |
| PART | 0067 | 956-025-300 | WIRE CLIP - PUSH ON - TRLR WIRE | 10.0000 | EA |
| PART | 0021 | 956-101-050 | STRAIN RELIEF - WATERTITE 1/2 NPT | 1.0000 | EA |
| PART | 0022 | 956-102-050 | LOCKNUT - 1/2 NPT | 1.0000 | EA |
| PART | 0060 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 11.0000 | EA |
| PART | 0061 | 956-311-015 | CABLE TIE - 15 INCH | 7.0000 | EA |
| PART | 0062 | 956-340-075 | CABLE TIE - ANCHORS | 10.0000 | EA |
| PART | 0023 | 956-410-375 | SHRINK TUBE - 3/8" | 0.1700 | EA |
| BOM | 0024 | 962-025-120 | WIRE HARNESS, BATTERY POWER, A.B. | 1.0000 | EA |
| BOM | 0025 | 962-025-124 | CABLE - SOLAR ARRAY POWER ASS'Y | 1.0000 | EA |
| BOM | 0026 | 962-025-144 | CABLE - ARROW PANEL CONTROL, STD. | 1.0000 | EA |
| PART | 0065 | 962-060-009 | JUMPER, BATTERY - 6 GA IN BLK | 2.0000 | EA |
| PART | 0027 | 962-060-012 | JUMPER, BATTERY - 6 GA - 12 IN BLK | 1.0000 | EA |
| PART | 0028 | 962-062-012 | JUMPER, BATTERY - 6 GA - 12 IN RED | 1.0000 | EA |
| BOM | 0029 | AB-25-001 | ARROW BOARD TRAILER FRAME PARTS | 1.0000 | EA |

BOM NUMBER: AB-25-001 REV B
BOM DESCRIPTION: TRAILER FRAME PARTS - ARROW BOARD
DATE 02/10/00
QTY 1.0000

| | ITEM | PARTNUMBER | DESCRIPTION | QTYREQ | UNIT |
|---|---|---|---|---|---|
| BOM | 0006 | 110-025-016 | AB FRAME UPPER REAR X-MEMBER | 1.0000 | EA |
| BOM | 0007 | 110-025-018 | AB FRAME UPPER SIDE X-MEMBER | 2.0000 | EA |
| BOM | 0004 | 110-025-020 | AB FRAME FWD UPRIGHT - RIGHT | 1.0000 | EA |
| BOM | 0005 | 110-025-022 | AB FRAME FWD UPRIGHT - LEFT | 1.0000 | EA |
| BOM | 0008 | 110-025-024 | AB FRAME REAR UPRIGHT - RIGHT | 1.0000 | EA |
| BOM | 0009 | 110-025-026 | AB FRAME REAR UPRIGHT - LEFT | 1.0000 | EA |
| BOM | 0012 | 110-025-028 | AB / MBII KICK OFF SPRING MTG BAR | 1.0000 | EA |
| BOM | 0013 | 110-025-030 | ARROW PANEL SUPPORT FRAME - TOP | 1.0000 | EA |
| BOM | 0014 | 110-025-032 | ARROW PANEL SUPPORT FRAME - BOTTOM | 1.0000 | EA |
| BOM | 0010 | 110-025-034 | ARROW PANEL SUPPORT FRAME - RIGHT | 1.0000 | EA |
| BOM | 0011 | 110-025-036 | ARROW PANEL SUPPORT FRAME - LEFT | 1.0000 | EA |
| BOM | 0015 | 110-025-038 | AB SOLAR ARRAY SUPPORT ARM | 2.0000 | EA |
| BOM | 0016 | 110-025-040 | AB SOLAR ARRAY MTG ARM - RIGHT | 1.0000 | EA |
| BOM | 0017 | 110-025-042 | AB SOLAR ARRAY MTG ARM - LEFT | 1.0000 | EA |
| BOM | 0001 | 110-025-100 | AB TRLR MAIN SUB-FRAME | 1.0000 | EA |
| BOM | 0003 | 110-025-104 | TONGUE - ARROW BOARD TRAILER | 1.0000 | EA |
| BOM | 0002 | 110-025-108 | JACK STAND - TRAILER - ARROW BOARD | 4.0000 | EA |

BOM NUMBER: AB-25-015 REV A
BOM DESCRIPTION: ARROW PANEL ASS'Y. 15 LAMP MODEL
DATE 02/10/00
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| BOM | 001 | 110-025-222 | ARROW PANEL FRONT PANEL - 15 LAMP | 1.0000 | EA |
| BOM | 002 | 110-025-224 | ARROW PANEL REAR PANEL | 1.0000 | EA |
| BOM | 003 | 210-025-221 | ARROW PANEL FRAME - TYPE C | 1.0000 | EA |
| PART | 004 | 429-602-050 | SCREW PHIL PAN HEAD #6 T/S | 45.0000 | EA |
| PART | 017 | 443-256-150 | SCREW 1/4-14xl 1/2 HWH T/3 | 2.0000 | EA |
| PART | 019 | 443-806-050 | SCREW - #8xl/2 HWH T/2 | 112.0000 | EA |
| PART | 021 | 444-250-220 | WASHER FENDER - 1/4 - 1" OD | 2.0000 | EA |
| PART | 024 | 461-090-066 | RIVET - PUSH IN NYLON - .090 DIA | 45.0000 | EA |
| PART | 006 | 470-025-110 | BUMPER RUBBER 2 1/2" DIA. | 2.0000 | EA |
| PART | 021 | 515-010-020 | DECAL, STI LOGO, 5" x 20" | 1.0000 | EA |
| PART | 020 | 515-209-012 | DECAL, "S" LOGO, 9" x 12" | 1.0000 | EA |
| PART | 022 | 515-800-020 | DECAL, 800 NUMBER, 3" x 20" | 1.0000 | EA |
| BOM | 007 | 780-025-010 | PHOTOCELL ASSY. | 1.0000 | EA |
| PART | 023 | 915-150-025 | SEAL - AMP CPC - SHELL SIZE 23 | 1.0000 | EA |
| PART | 009 | 940-025-039 | LAMP - PAR 36 W/YEL DIFFUSED LENS | 15.0000 | EA |
| PART | 010 | 942-025-036 | SHROUD - SM. BLK PLASTIC FOR PAR 36 | 15.0000 | EA |
| BOM | 008 | 944-025-003 | LED ASSY. FOR ARROW PANEL-HI BRITE | 3.0000 | EA |
| PART | 011 | 956-110-875 | GROMMET - 7/8"0.0. | 2.0000 | EA |
| PART | 013 | 956-310-450 | CABLE TIE 4 1/2" STD. | 15.0000 | EA |
| PART | 012 | 956-340-075 | CABLE TIE ANCHORS | 15.0000 | EA |
| PART | 014 | 962-025-130 | WIRE HARNESS ASS'Y - 15 LAMP PANEL | 1.0000 | EA |

BOM NUMBER: AB-25-025 REV A
BOM DESCRIPTION: ARROW PANEL ASS'Y. 25 LAMP MODEL
DATE 02/10/00
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| BOM | 001 | 110-025-223 | ARROW PANEL FRONT PANEL - 25 LAMP | 1.0000 | EA |
| BOM | 002 | 110-025-224 | ARROW PANEL REAR PANEL | 1.0000 | EA |
| BOM | 003 | 210-025-221 | ARROW PANEL FRAME - TYPE C | 1.0000 | EA |
| PART | 004 | 429-602-050 | SCREW PHIL PAN HEAD #6 T/S | 75.0000 | EA |
| PART | 017 | 443-256-150 | SCREW 1/4-14xl 1/2 HWH T/3 | 2.0000 | EA |
| PART | 019 | 443-806-050 | SCREW - #8xl/2 HWH T/2 | 112.0000 | EA |
| PART | 021 | 444-250-220 | WASHER FENDER - 1/4 - 1" OD | 2.0000 | EA |
| PART | 024 | 461-090-066 | RIVET - PUSH IN NYLON - .090 DIA | 75.0000 | EA |
| PART | 006 | 470-025-110 | BUMPER RUBBER 2 1/2" DIA. | 2.0000 | EA |
| PART | 021 | 515-010-020 | DECAL, STI LOGO, 5" x 20" | 1.0000 | EA |
| PART | 020 | 515-209-012 | DECAL, "S" LOGO, 9" x 12" | 1.0000 | EA |
| PART | 022 | 515-800-020 | DECAL, 800 NUMBER, 3" x 20" | 1.0000 | EA |
| BOM | 007 | 780-025-010 | PHOTOCELL ASSY. | 1.0000 | EA |
| PART | 023 | 915-150-025 | SEAL - AMP CPC - SHELL SIZE 23 | 1.0000 | EA |
| PART | 009 | 940-025-039 | LAMP - PAR 36 W/YEL DIFFUSED LENS | 25.0000 | EA |
| PART | 010 | 942-025-036 | SHROUD - SM. BLK PLASTIC FOR PAR 36 | 25.0000 | EA |
| BOM | 008 | 944-025-003 | LED ASSY. FOR ARROW PANEL-HI BRITE | 3.0000 | EA |
| PART | 011 | 956-110-875 | GROMMET - 7/8"0.0. | 2.0000 | EA |
| PART | 013 | 956-310-450 | CABLE TIE 4 1/2" STD. | 21.0000 | EA |
| PART | 012 | 956-340-075 | CABLE TIE ANCHORS | 21.0000 | EA |
| PART | 014 | 962-025-132 | WIRE HARNESS ASS'Y - 25 LAMP PANEL | 1.0000 | EA |

BOM NUMBER: AB-25-015-D REV A
BOM DESCRIPTION: ARROW PANEL ASS'Y. 15 LAMP, LED MODEL
DATE 02/10/00
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| BOM | 001 | 110-025-222 | ARROW PANEL FRONT PANEL - 15 LAMP | 1.0000 | EA |
| BOM | 002 | 110-025-224 | ARROW PANEL REAR PANEL | 1.0000 | EA |
| BOM | 003 | 210-025-221 | ARROW PANEL FRAME - TYPE C | 1.0000 | EA |
| PART | 004 | 429-602-050 | SCREW PHIL PAN HEAD #6 T/S | 45.0000 | EA |
| PART | 017 | 443-256-150 | SCREW 1/4-14xl 1/2 HWH T/3 | 2.0000 | EA |
| PART | 019 | 443-806-050 | SCREW - #8xl/2 HWH T/2 | 112.0000 | EA |
| PART | 021 | 444-250-220 | WASHER FENDER - 1/4 - 1" OD | 2.0000 | EA |
| PART | 006 | 470-025-110 | BUMPER RUBBER 2 1/2" DIA. | 2.0000 | EA |
| PART | 021 | 515-010-020 | DECAL, STI LOGO, 5" x 20" | 1.0000 | EA |
| PART | 020 | 515-209-012 | DECAL, "S" LOGO, 9" x 12" | 1.0000 | EA |
| PART | 022 | 515-800-020 | DECAL, 800 NUMBER, 3" x 20" | 1.0000 | EA |
| BOM | 007 | 780-025-010 | PHOTOCELL ASSY. | 1.0000 | EA |
| PART | 023 | 915-150-025 | SEAL - AMP CPC - SHELL SIZE 23 | 1.0000 | EA |
| PART | 009 | 940-025-146 | LAMP - PAR 46 LED, YELLOW, 8 x 30 | 15.0000 | EA |
| PART | 010 | 942-025-046 | SHROUD - LG. BLK PLASTIC FOR PAR 46 | 15.0000 | EA |
| BOM | 008 | 944-025-003 | LED ASSY. FOR ARROW PANEL-HI BRITE | 3.0000 | EA |
| PART | 011 | 956-110-875 | GROMMET - 7/8"0.0. | 2.0000 | EA |
| PART | 013 | 956-310-450 | CABLE TIE 4 1/2" STD. | 15.0000 | EA |
| PART | 012 | 956-340-075 | CABLE TIE ANCHORS | 15.0000 | EA |
| PART | 014 | 962-025-130 | WIRE HARNESS ASS'Y - 15 LAMP PANEL | 1.0000 | EA |

BOM NUMBER: AB-25-025-D REV A
BOM DESCRIPTION: ARROW PANEL ASS'Y. 25 LAMP, LED MODEL
DATE 02/10/00
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| BOM | 001 | 110-025-223 | ARROW PANEL FRONT PANEL - 25 LAMP | 1.0000 | EA |
| BOM | 002 | 110-025-224 | ARROW PANEL REAR PANEL | 1.0000 | EA |
| BOM | 003 | 210-025-221 | ARROW PANEL FRAME - TYPE C | 1.0000 | EA |
| PART | 004 | 429-602-050 | SCREW PHIL PAN HEAD #6 T/S | 75.0000 | EA |
| PART | 017 | 443-256-150 | SCREW 1/4-14xl 1/2 HWH T/3 | 2.0000 | EA |
| PART | 019 | 443-806-050 | SCREW - #8xl/2 HWH T/2 | 112.0000 | EA |
| PART | 021 | 444-250-220 | WASHER FENDER - 1/4 - 1" OD | 2.0000 | EA |
| PART | 006 | 470-025-110 | BUMPER RUBBER 2 1/2" DIA. | 2.0000 | EA |
| PART | 021 | 515-010-020 | DECAL, STI LOGO, 5" x 20" | 1.0000 | EA |
| PART | 020 | 515-209-012 | DECAL, "S" LOGO, 9" x 12" | 1.0000 | EA |
| PART | 022 | 515-800-020 | DECAL, 800 NUMBER, 3" x 20" | 1.0000 | EA |
| BOM | 007 | 780-025-010 | PHOTOCELL ASSY. | 1.0000 | EA |
| PART | 023 | 915-150-025 | SEAL - AMP CPC - SHELL SIZE 23 | 1.0000 | EA |
| PART | 009 | 940-025-146 | LAMP - PAR 46 LED, YELLOW, 8 x 30 | 25.0000 | EA |
| PART | 010 | 942-025-046 | SHROUD - LG. BLK PLASTIC FOR PAR 46 | 25.0000 | EA |
| BOM | 008 | 944-025-003 | LED ASSY. FOR ARROW PANEL-HI BRITE | 3.0000 | EA |
| PART | 011 | 956-110-875 | GROMMET - 7/8"0.0. | 2.0000 | EA |
| PART | 013 | 956-310-450 | CABLE TIE 4 1/2" STD. | 21.0000 | EA |
| PART | 012 | 956-340-075 | CABLE TIE ANCHORS | 21.0000 | EA |
| PART | 014 | 962-025-132 | WIRE HARNESS ASS'Y - 25 LAMP PANEL | 1.0000 | EA |

BOM NUMBER : AB-25-050 REV B
BOW DESCRIPTION: SOLAR ARRAY, AB, 1-PANEL, 50 WATT
DATE 02/10/00
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| BOM | 0014 | 110-025-248 | SA MTG BAR 50/75W - ARROW BOARD | 2.0000 | EA |
| PART | 0002 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 8.0000 | EA |
| PART | 0003 | 445-310-225 | CAP SCREW - 5/16-18 x 2 1/4 HH/CS GR | 4.0000 | EA |
| PART | 0004 | 448-310-075 | CAP SCRW - 5/16-18 x 3/4 HH/CS SS | 4.0000 | EA |
| PART | 0005 | 450-312-210 | WASHER - FLAT 5/16 SS 18-8 | 4.0000 | EA |
| PART | 0006 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 8.0000 | EA |
| PART | 0009 | 956-101-050 | STRAIN RELIEF - WATERTITE 1/2 NPT | 1.0000 | EA |
| PART | 0010 | 956-102-050 | LOCKNUT - 1/2 NPT | 1.0000 | EA |
| PART | 0013 | 980-025-050 | SOLAR PANEL - 50 WATT | 1.0000 | EA |

BOM NUMBER : AB-25-075 REV B
BOW DESCRIPTION: SOLAR ARRAY, AB, 1-PANEL, 75 WATT
DATE 02/10/00
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| BOM | 0023 | 110-025-248 | SA MTG BAR 50/75W - ARROW BOARD | 2.0000 | EA |
| PART | 0003 | 442-250-075 | CAP SCREW - 1/4-20 x 3/4 HH/CS | 4.0000 | EA |
| PART | 0004 | 444-250-130 | NUT - NYLON INSERT LOCK 1/4-20 | 4.0000 | EA |
| PART | 0005 | 444-250-310 | WASHER - SPLIT LOCK 1/4 | 4.0000 | EA |
| PART | 0006 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 4.0000 | EA |
| PART | 0002 | 445-310-225 | CAP SCREW - 5/16-18 x 2 1/4 HH/CS GR | 4.0000 | EA |
| PART | 0007 | 450-312-210 | WASHER - FLAT 5/16 SS 18-8 | 4.0000 | EA |
| PART | 0008 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 4.0000 | EA |
| PART | 0021 | 956-101-050 | STRAIN RELIEF - WATERTITE 1/2 NPT | 1.0000 | EA |
| PART | 0022 | 956-102-050 | LOCKNUT - 1/2 NPT | 1.0000 | EA |
| PART | 0017 | 980-024-075 | SOLAR PANEL - 75 WATT | 1.0000 | EA |

BOM NUMBER : AB-25-100 REV B
BOW DESCRIPTION: SOLAR ARRAY, AB, 2-PANEL, 100 WATT
DATE 02/10/00
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| BOM | 0027 | 110-025-246 | SA MTG BAR 100W - ARROW BOARD | 2.0000 | EA |
| PART | 0022 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 12.0000 | EA |
| PART | 0002 | 445-310-300 | CAP SCREW - 5/16-18 x 3 HH/CS GR5 | 4.0000 | EA |
| PART | 0015 | 448-310-150 | CAP SCREW - 5/16-18 x 1 1/2 HHCS SS | 8.0000 | EA |
| PART | 0019 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 12.0000 | EA |
| PART | 0008 | 956-101-050 | STRAIN RELIEF - WATERTITE 1/2 NPT | 3.0000 | EA |
| PART | 0017 | 956-102-050 | LOCKNUT - 1/2 NPT | 3.0000 | EA |
| PART | 0009 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 2.0000 | EA |
| PART | 0025 | 962-010-027 | JUMPER, SOLAR PANEL, 10GA, 27", BL | 1.0000 | EA |
| PART | 0026 | 962-012-027 | JUMPER, SOLAR PANEL, 10GA, 17", RE | 1.0000 | EA |
| PART | 0012 | 980-025-050 | SOLAR PANEL - 50 WATT | 2.0000 | EA |

BOM NUMBER : AB-25-075 REV A
BOW DESCRIPTION: SOLAR ARRAY, AB, 1-PANEL, 75 WATT MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| BOM | 016 | 110-025-253 | SOLAR ARRAY MTG. FRAME, 1-PANEL, 75W | 1.0000 | EA |
| PART | 003 | 442-250-075 | CAP SCREW - 1/4-20x3/4 HH/CS | 4.0000 | EA |
| PART | 004 | 444-250-130 | NUT - NYLON INSERT LOCK 1/4-20 | 4.0000 | EA |
| PART | 005 | 444-250-310 | WASHER - SPLIT LOCK 1/4 | 4.0000 | EA |
| PART | 006 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 4.0000 | EA |
| PART | 020 | 445-310-300 | CAP SCREW - 5/16-18x3 HH/CS GR5 | 4.0000 | EA |
| PART | 008 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 4.0000 | EA |
| PART | 020 | 950-012-200 | WIRE - 12 GA STRANDED - BLACK | 3.5000 | FT |
| PART | 021 | 950-012-202 | WIRE - 12 GA STRANDED - RED | 3.5000 | FT |
| PART | 008 | 956-101-050 | STRAIN RELIEF - WATERTITE 1/2 NPT | 1.0000 | EA |
| PART | 009 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 4.0000 | EA |
| PART | 024 | 956-340-075 | CABLE TIE - ANCHORS | 3.0000 | EA |
| PART | 012 | 980-025-075 | SOLAR PANEL - 75 WATT | 1.0000 | EA |

BOM NUMBER : AB-25-100 REV A
BOW DESCRIPTION: SOLAR ARRAY, AB, 2-PANEL, 100 WATT MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| BOM | 016 | 110-025-254 | SOLAR ARRAY MTG. BAR, 2-PANEL, 100 | 2.0000 | EA |
| PART | 022 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 12.0000 | EA |
| PART | 006 | 448-310-075 | CAP SCREW - 5/16-l8x3/4 HH/CS SS | 8.0000 | EA |
| PART | 018 | 448-311-300 | CAP SCREW - 5/16-l8x3 HH/FT SS | 4.0000 | EA |
| PART | 019 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 12.0000 | EA |
| PART | 020 | 950-012-200 | WIRE - 12 GA STRANDED - BLACK | 6.3500 | FT |
| PART | 021 | 950-012-202 | WIRE - 12 GA STRANDED - RED | 6.3500 | FT |
| PART | 008 | 956-101-050 | STRAIN RELIEF - WATERTITE 1/2 NPT | 2.0000 | EA |
| PART | 017 | 956-102-050 | LOCKNUT - 1/2 NPT | 2.0000 | EA |
| PART | 009 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 5.0000 | EA |
| PART | 024 | 956-340-075 | CABLE TIE - ANCHORS | 3.0000 | EA |
| PART | 012 | 980-025-050 | SOLAR PANEL - 50 WATT | 2.0000 | EA |

BOM NUMBER : AB-25-150 REV A
BOW DESCRIPTION: SOLAR ARRAY, AB, 2-PANEL, 150 WATT MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| BOM | 001 | 110-025-252 | SOLAR ARRAY SUPPORT BAR, AB-25-150 | 1.0000 | EA |
| BOM | 016 | 110-025-255 | SOLAR ARRAY MTG. BAR, 2-PANEL, 150 | 2.0000 | EA |
| PART | 003 | 442-250-075 | CAP SCREW - 1/4-20x3/4 HH/CS | 8.0000 | EA |
| PART | 004 | 444-250-130 | NUT - NYLON INSERT LOCK 1/4-20 | 8.0000 | EA |
| PART | 005 | 444-250-310 | WASHER - SPLIT LOCK 1/4 | 8.0000 | EA |
| PART | 018 | 444-312-120 | NUT- STOVER LOCK 5/16-18 | 2.0000 | EA |
| PART | 006 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 4.0000 | EA |
| PART | 020 | 445-310-300 | CAP SCREW - 5/16-l8x3 HH/CS | 2.0000 | EA |
| PART | 018 | 448-311-300 | CAP SCREW - 5/16-l8x3 HH/FT SS | 4.0000 | EA |
| PART | 019 | 450-312-210 | WASHER - FLAT 5/16 SS 18-8 | 4.0000 | EA |
| PART | 019 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 4.0000 | EA |
| PART | 020 | 950-012-200 | WIRE - 12 GA STRANDED - BLACK | 4.0000 | FT |
| PART | 021 | 950-012-202 | WIRE - 12 GA STRANDED - RED | 4.0000 | FT |
| PART | 008 | 956-101-050 | STRAIN RELIEF - WATERTITE 1/2 NPT | 1.0000 | EA |
| PART | 009 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 3.0000 | EA |
| PART | 012 | 980-024-075 | SOLAR PANEL - 75 WATT | 2.0000 | EA |

BOM NUMBER : AB-25-200 REV A
BOW DESCRIPTION: SOLAR ARRAY, AB, 4-PANEL, 200 WATT MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| BOM | 016 | 110-025-258 | SOLAR ARRAY MTG. BAR, 4-PANEL, 200 | 2.0000 | EA |
| PART | 022 | 444-312-130 | NUT - NYLON INSERT LOCK 5/16-18 | 20.0000 | EA |
| PART | 006 | 448-310-075 | CAP SCREW - 5/16-l8x3/4 HH/CS SS | 16.0000 | EA |
| PART | 018 | 448-311-300 | CAP SCREW - 5/16-l8x3 HH/FT SS | 4.0000 | EA |
| PART | 019 | 450-312-310 | WASHER - SPLIT LOCK 5/16 SS 18-8 | 20.0000 | EA |
| PART | 020 | 950-012-200 | WIRE - 12 GA STRANDED - BLACK | 11.0000 | FT |
| PART | 021 | 950-012-202 | WIRE - 12 GA STRANDED - RED | 11.0000 | FT |
| PART | 008 | 956-101-050 | STRAIN RELIEF - WATERTITE 1/2 NPT | 6.0000 | EA |
| PART | 017 | 956-102-050 | LOCKNUT - 1/2 NPT | 6.0000 | EA |
| PART | 009 | 956-310-675 | CABLE TIE - 6 3/4 BLK UV | 9.0000 | EA |
| PART | 024 | 956-340-075 | CABLE TIE - ANCHORS | 3.0000 | EA |
| PART | 012 | 980-025-050 | SOLAR PANEL - 50 WATT | 4.0000 | EA |

BOM NUMBER: OP-0010 REV A
BOM DESCRIPTION: COMBINATION COUPLER MODEL
DATE 05/17/97
QTY 1.0000

| | ITEM | PART NUMBER | DESCRIPTION | QTY REQ | UNIT |
|---|---|---|---|---|---|
| PART | 007 | 011-025-187 | STEEL BAR - 2 1/2 x 3/16 | 0.1250 | FT |
| BOM | 001 | 110-025-103 | COUPLER MT. - COMBINATION COUPLER | 1.0000 | EA |
| PART | 002 | 162-022-049 | PINTLE EYE (WELD-ON) | 1.0000 | EA |
| PART | 003 | 460-050-350 | CLEVIS PIN 1/2x3 112 (CP-240) | 2.0000 | EA |
| PART | 004 | 460-051-024 | RUE RING - 1/2- (RUE-241) | 2.0000 | EA |
| PART | 005 | 460-206-610 | LANYARD - I/l6x8 PVC TYPE 2 | 2.0000 | EA |