

SILENT SENTINEL

SOLAR POWERED ADVANCE WARNING ARROW PANEL

SERVICE & REPAIR MANUAL
(P/N 550-025-200)



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Harness the Power of the Sun

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SERVICE AND REPAIR MANUAL

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SILENT SENTINEL

ADVANCE WARNING ARROW PANELS

SERVICE, REPAIR & TROUBLESHOOTING

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 quickly. If you are unable to solve a problem on your own, our highly trained and knowledgeable factory personnel are always available to help you as needed.

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 either in the battery compartment or the arrow panel.

To remove the control module, simply remove the fasteners securing the control module and carefully remove the control module from either the arrow panel or 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 components 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 must not be attempted. The control module can only be repaired by skilled technicians 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 (Molex type connectors) or loosen rotating locking ring and remove connector (AMP CPC type connectors).

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.

<u>CABLE</u>	<u>CONNECTOR</u>
Battery Power (4 Wire Bundled or Female CPC)	P1
Arrow Panel Control (Gray Jacketed 37 pin D-Sub)	P2
Solar Array Power (2 Wire Jacketed or Male CPC)	P3

NOTE: It will take approximately 10-20 seconds for the control module to re-initialize after it is first powered. If the control module will not function after it is installed, disconnect **P1**, wait one minute

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.

<u>INDICATOR</u>	<u>VOLTAGE RANGE</u>
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 through 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 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 12-16 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:

<u>Temperature</u>	<u>Battery Voltage</u>
--------------------	------------------------

50 °F	14.4 Volts
70 °F	14.0 Volts
80 °F	13.7 Volts
100 °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 hy-

drometer 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 260 to 520 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.

<u>BATTERY CHARGER OUTPUT CAPACITY</u>	<u>HOURS REQ'D FOR FULL CHARGE</u>
20 Amps	18 to 48 hrs
40 Amps	9 to 24 hrs
60 Amps	6 to 16 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 batteries. The batteries should be of 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 run-time 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 fasteners securing the control module. Carefully remove the control module 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.

<u>SIGNAL PATTERN</u>	<u>LAMP BRIGHTNESS</u>	
	<u>LOW</u>	<u>HIGH</u>
Single Arrow	<0.25	1.0 - 1.2
Double Arrow	<0.25	1.2 - 1.5
Caution Bar	<0.25	0.7 - 1.0
4-Corner Caution	<0.25	0.3 - 0.6

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.

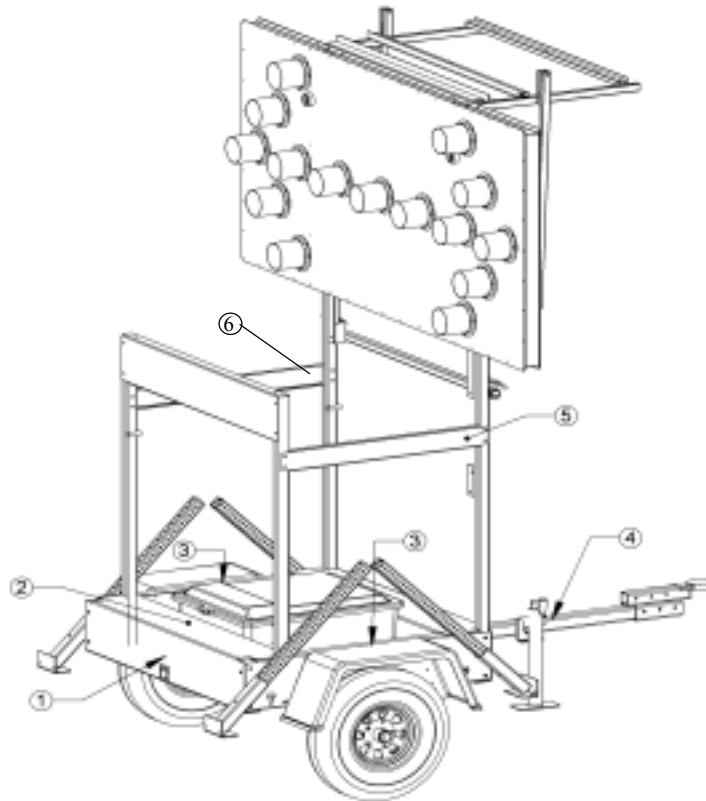
SYMPTOM	CHECK
Unit will not operate and BATTERY LEVEL indicates NORMAL or FULL .	PATTERN SELECT switch. Wiring and connectors.
Unit will not operate and BATTERY LEVEL FULL indicator is flashing.	Battery Voltage. Too high! (over 15 Volts)
Unit will not operate and BATTERY LEVEL indicates LOW BATTERY	Battery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

SILENT SENTINEL

ADVANCE WARNING ARROW PANELS

OPERATIONAL & SAFETY DECAL PLACEMENT

Operational & Safety Decals for Silent Sentinel Arrow Board



Decal at location #1:

**REAR HITCH RECEIVER
FOR TANDEM TOWING AT LOW SPEEDS
FOR OFF ROAD USE ONLY!!!**

**SELECT DRAWBAR AND HITCH SUCH THAT
TANDEM TRAILER TONGUE IS LEVEL OR
PITCHED FORWARD SLIGHTLY.**

Decal at location #5:

**PULL & TURN LATCH PINS TO LOCK
IN RETRACTED POSITION PRIOR TO
RAISING OR LOWERING SIGN PANEL.
TURN & RELEASE LATCH PINS TO LOCK
SIGN PANEL IN UPRIGHT POSITION.**

- CAUTION -

**CHECK FOR OVERHEAD OBSTRUCTIONS
BEFORE RAISING SIGN PANEL!**

Decal at location #3:

**CHECK TIRE PRESSURE REGULARLY
INFLATE TO: 26 PSI (180 kPa)**

**LUBRICATE WHEEL BEARINGS
ONCE EACH SEASON**

Decals at location #2:

**TO LATCH BATTERY COMPARTMENT
COVER, PRESS DOWN ON COVER UNTIL
BOTH LATCHES ARE SECURE. BATTERY
COMPARTMENT COVER MUST BE
LATCHED PRIOR TO TRANSPORT!**

**LOCK BATTERY COMPARTMENT WITH A
PADLOCK TO PREVENT TAMPERING WITH
BATTERIES OR CONTROLS.**

- CAUTION -

**BATTERIES PRODUCE EXPLOSIVE
GASES WHILE CHARGING!**

NO SMOKING!!!

AVOID OPEN FLAME OR SPARKS!

**CHECK FLUID LEVEL ONCE EACH MONTH
ADD DISTILLED WATER AS NECESSARY
FILL TO INDICATING RING**

**CONTROL CONSOLE ENCLOSURE
IS WATER RESISTANT.
DO NOT OPEN OR REMOVE TOP AND
EXPOSE TO MOISTURE!**

**CLEAN SOLAR PANELS
REGULARLY TO MAINTAIN
MAXIMUM ENERGY PRODUCTION.
USE CLEAR WATER WITH A MILD
DETERGENT AS NECESSARY.**

Decal at location #6:

**USE SIGHTING DEVICE BELOW TO
INSURE THAT SIGN PANEL IS AIMED
DIRECTLY TOWARD ONCOMING TRAFFIC.
ANGLE SIGN PANEL SLIGHTLY TOWARD
ROADWAY TO MAXIMIZE VISIBILITY.**

Decal at location #4:

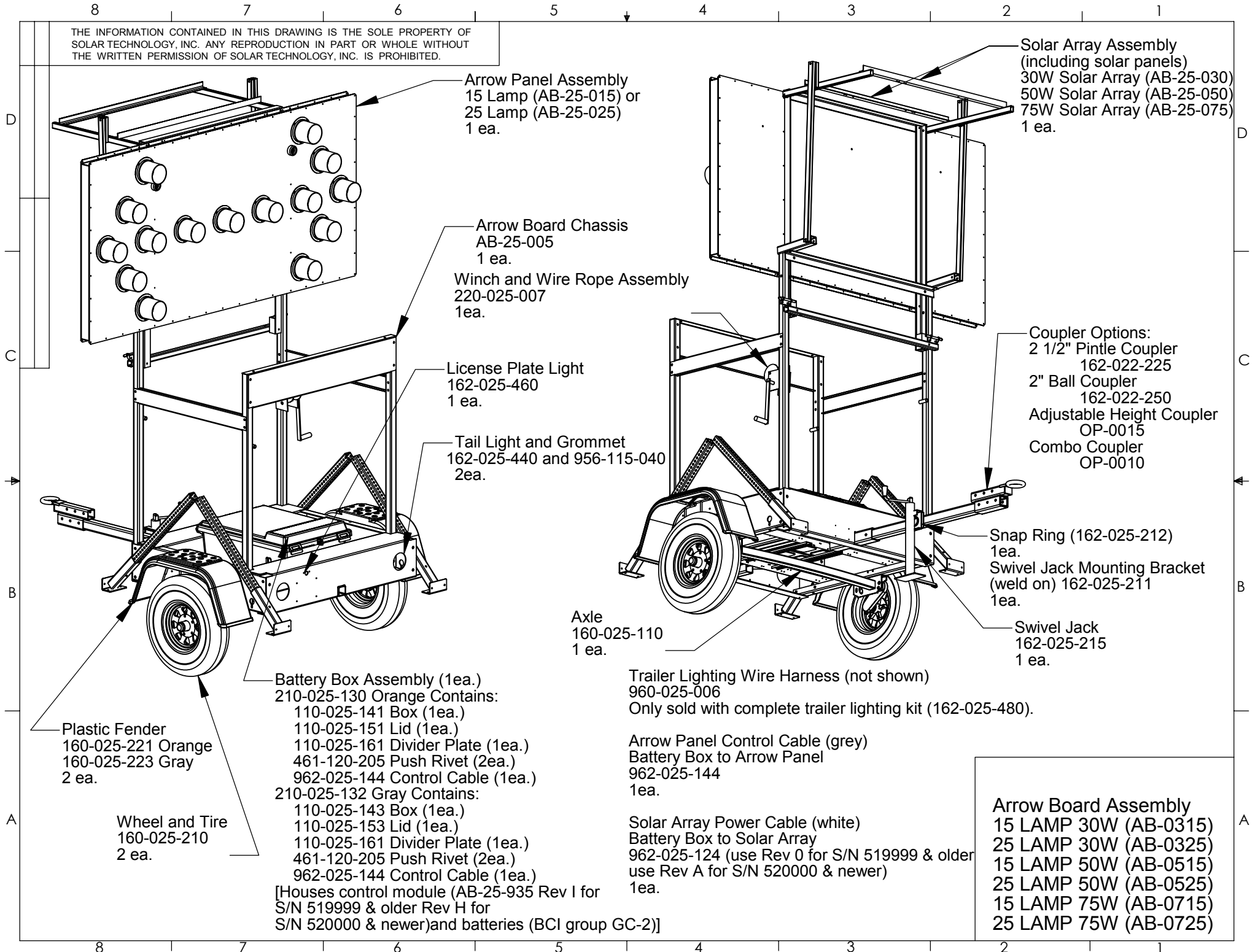
NOTE: PRIOR TO TOWING TRAILER:
1.) SECURE AND LOCK COUPLER
2.) CONNECT SAFETY CHAINS
3.) CHECK STOP AND TURN LIGHTS.
**4.) SWIVEL AND LOCK TONGUE JACK
TO HORIZONTAL POSITION.**

SILENT SENTINEL

ADVANCE WARNING ARROW PANELS

PARTS DIAGRAMS

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Arrow Panel Assembly
15 Lamp (AB-25-015) or
25 Lamp (AB-25-025)
1 ea.

Arrow Board Chassis
AB-25-005
1 ea.

Winch and Wire Rope Assembly
220-025-007
1ea.

License Plate Light
162-025-460
1 ea.

Tail Light and Grommet
162-025-440 and 956-115-040
2ea.

Solar Array Assembly
(including solar panels)
30W Solar Array (AB-25-030)
50W Solar Array (AB-25-050)
75W Solar Array (AB-25-075)
1 ea.

Coupler Options:
2 1/2" Pintle Coupler
162-022-225
2" Ball Coupler
162-022-250
Adjustable Height Coupler
OP-0015
Combo Coupler
OP-0010

Snap Ring (162-025-212)
1ea.

Swivel Jack Mounting Bracket
(weld on) 162-025-211
1ea.

Swivel Jack
162-025-215
1 ea.

Axle
160-025-110
1 ea.

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 (use Rev 0 for S/N 519999 & older
use Rev A for S/N 520000 & newer)
1ea.

Battery Box Assembly (1ea.)
210-025-130 Orange Contains:
110-025-141 Box (1ea.)
110-025-151 Lid (1ea.)
110-025-161 Divider Plate (1ea.)
461-120-205 Push Rivet (2ea.)
962-025-144 Control Cable (1ea.)
210-025-132 Gray Contains:
110-025-143 Box (1ea.)
110-025-153 Lid (1ea.)
110-025-161 Divider Plate (1ea.)
461-120-205 Push Rivet (2ea.)
962-025-144 Control Cable (1ea.)

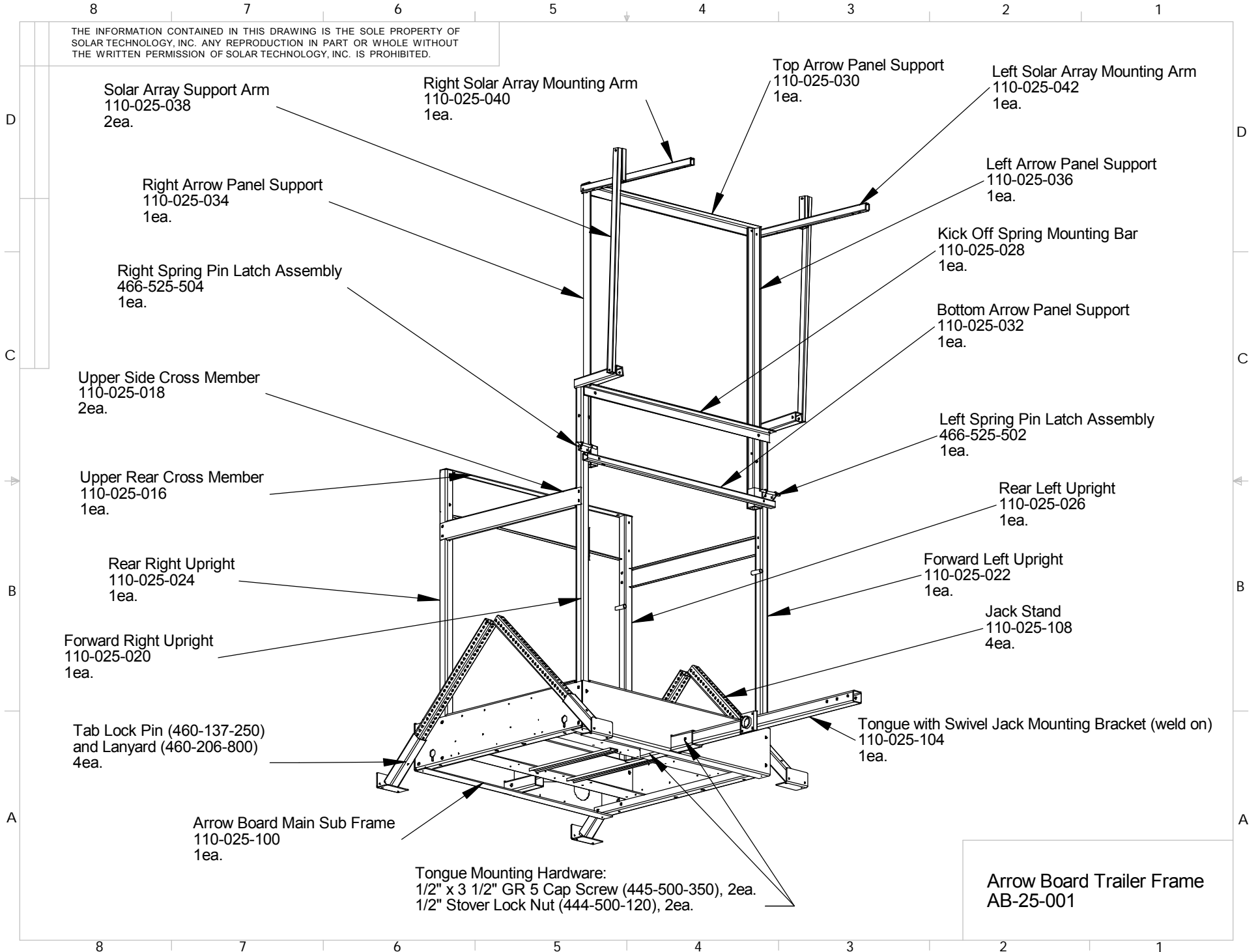
[Houses control module (AB-25-935 Rev I for
S/N 519999 & older Rev H for
S/N 520000 & newer)and batteries (BCI group GC-2)]

Plastic Fender
160-025-221 Orange
160-025-223 Gray
2 ea.

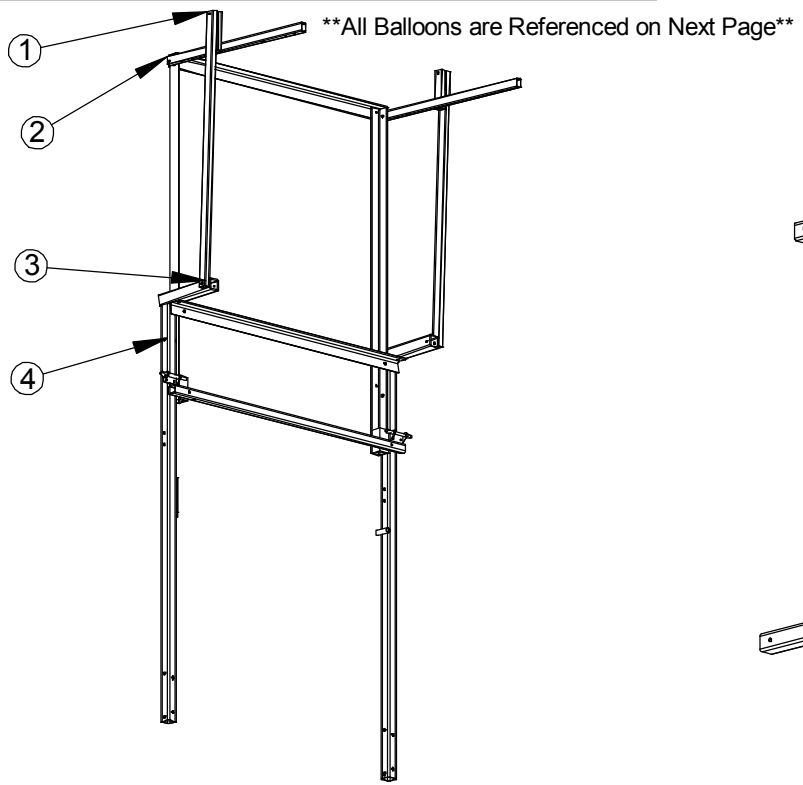
Wheel and Tire
160-025-210
2 ea.

Arrow Board Assembly
15 LAMP 30W (AB-0315)
25 LAMP 30W (AB-0325)
15 LAMP 50W (AB-0515)
25 LAMP 50W (AB-0525)
15 LAMP 75W (AB-0715)
25 LAMP 75W (AB-0725)

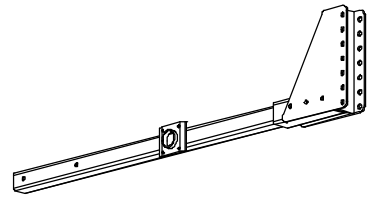
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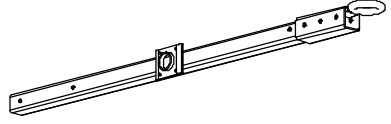
Mounting Hardware for Adjustable Height Coupler (OP-0015):
 1/2" x 4 1/2" GR 8 Cap Screw (447-500-450), 2ea.
 1/2" Stover Lock Nut (444-500-120), 2ea.
 1/2" Flat Washer (444-500-210), 4ea



2" Ball Coupler (162-024-020) or 3" Pinto 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.

Safety 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.

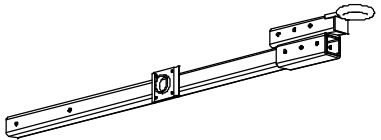
Mounting Hardware for 2 1/2" Pinto Coupler (162-022-225) and 2" Ball Coupler (162-022-250):
 1/2" x 3 1/2" GR 5 Cap Screw (445-500-350), 2ea.
 1/2" Stover Lock Nut (444-500-120), 2ea.



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.

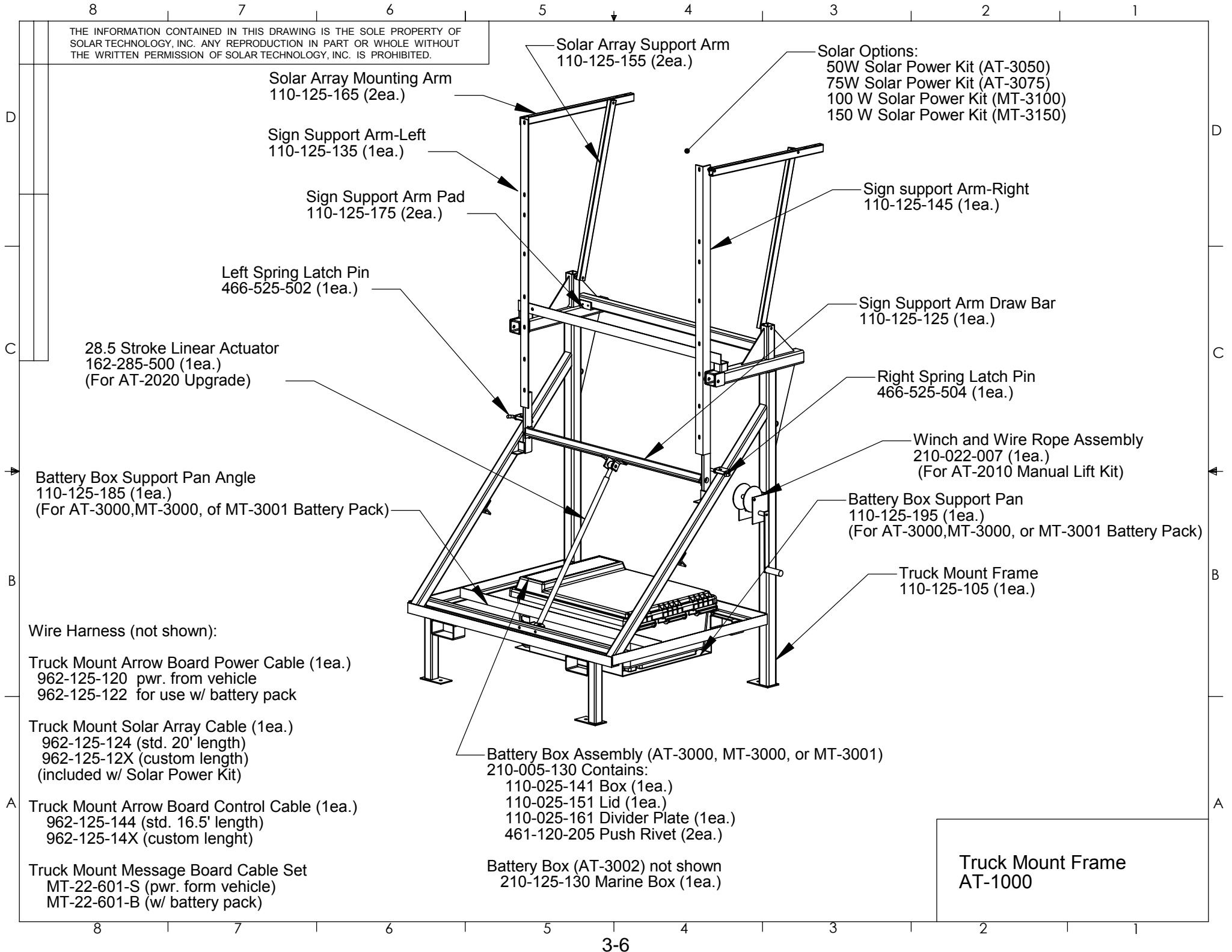


Safety Chains Get Mounted With:
 7/16" x 4 1/2" GR 5 Cap Screw (445-430-450), 1ea.
 7/16" Flat Washer (444-437-210), 2ea.
 1/2" Flat Washer (444-500-210), 4ea.
 7/16" Stover Lock Nut (444-437-120), 1ea.

- 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.

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

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Solar Array Mounting Arm
110-125-165 (2ea.)

Sign Support Arm-Left
110-125-135 (1ea.)

Sign Support Arm Pad
110-125-175 (2ea.)

Left Spring Latch Pin
466-525-502 (1ea.)

28.5 Stroke Linear Actuator
162-285-500 (1ea.)
(For AT-2020 Upgrade)

Battery Box Support Pan Angle
110-125-185 (1ea.)
(For AT-3000, MT-3000, or MT-3001 Battery Pack)

Wire Harness (not shown):
Truck Mount Arrow Board Power Cable (1ea.)
962-125-120 pwr. from vehicle
962-125-122 for use w/ battery pack
Truck Mount Solar Array Cable (1ea.)
962-125-124 (std. 20' length)
962-125-12X (custom length)
(included w/ Solar Power Kit)
Truck Mount Arrow Board Control Cable (1ea.)
962-125-144 (std. 16.5' length)
962-125-14X (custom length)

Truck Mount Message Board Cable Set
MT-22-601-S (pwr. from vehicle)
MT-22-601-B (w/ battery pack)

Solar Array Support Arm
110-125-155 (2ea.)

Solar Options:
50W Solar Power Kit (AT-3050)
75W Solar Power Kit (AT-3075)
100 W Solar Power Kit (MT-3100)
150 W Solar Power Kit (MT-3150)

Sign support Arm-Right
110-125-145 (1ea.)

Sign Support Arm Draw Bar
110-125-125 (1ea.)

Right Spring Latch Pin
466-525-504 (1ea.)

Winch and Wire Rope Assembly
210-022-007 (1ea.)
(For AT-2010 Manual Lift Kit)

Battery Box Support Pan
110-125-195 (1ea.)
(For AT-3000, MT-3000, or MT-3001 Battery Pack)

Truck Mount Frame
110-125-105 (1ea.)

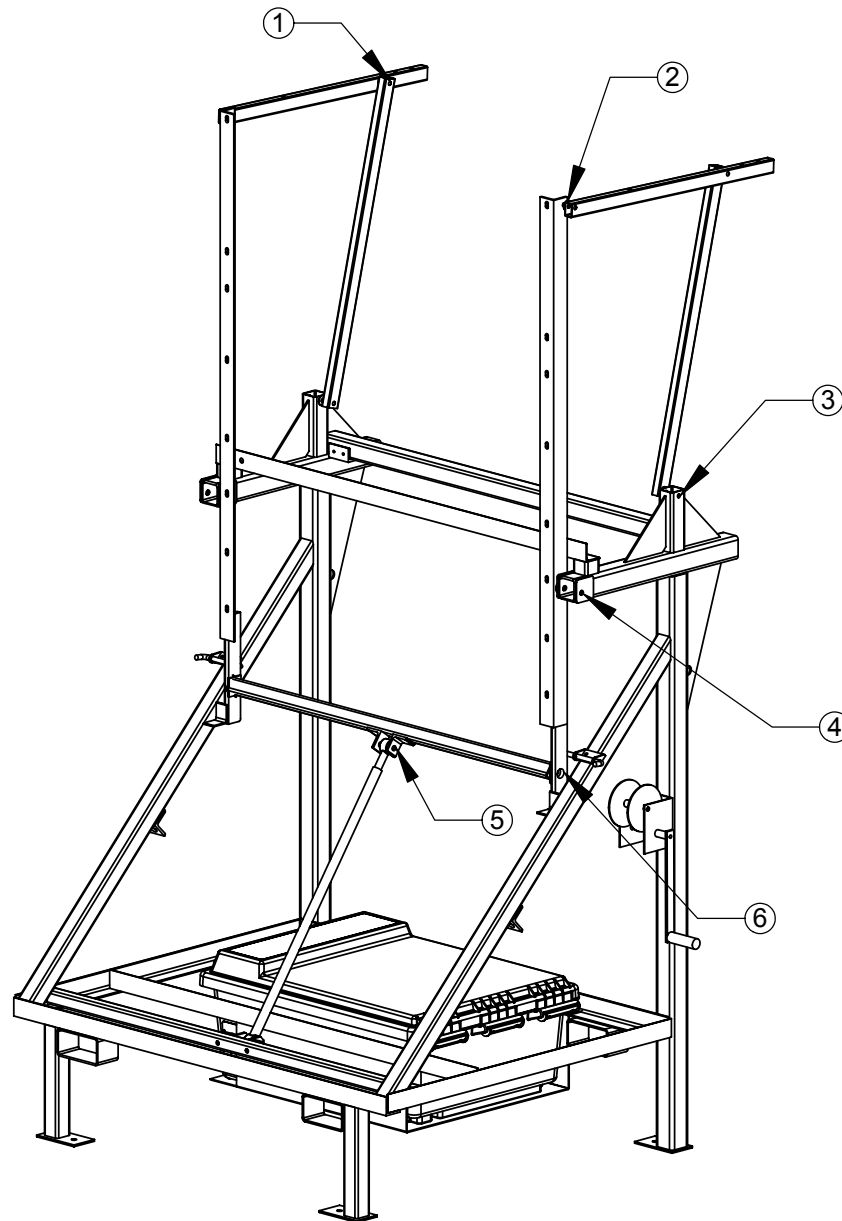
Battery Box Assembly (AT-3000, MT-3000, or MT-3001)
210-005-130 Contains:
110-025-141 Box (1ea.)
110-025-151 Lid (1ea.)
110-025-161 Divider Plate (1ea.)
461-120-205 Push Rivet (2ea.)

Battery Box (AT-3002) not shown
210-125-130 Marine Box (1ea.)

Truck Mount Frame
AT-1000

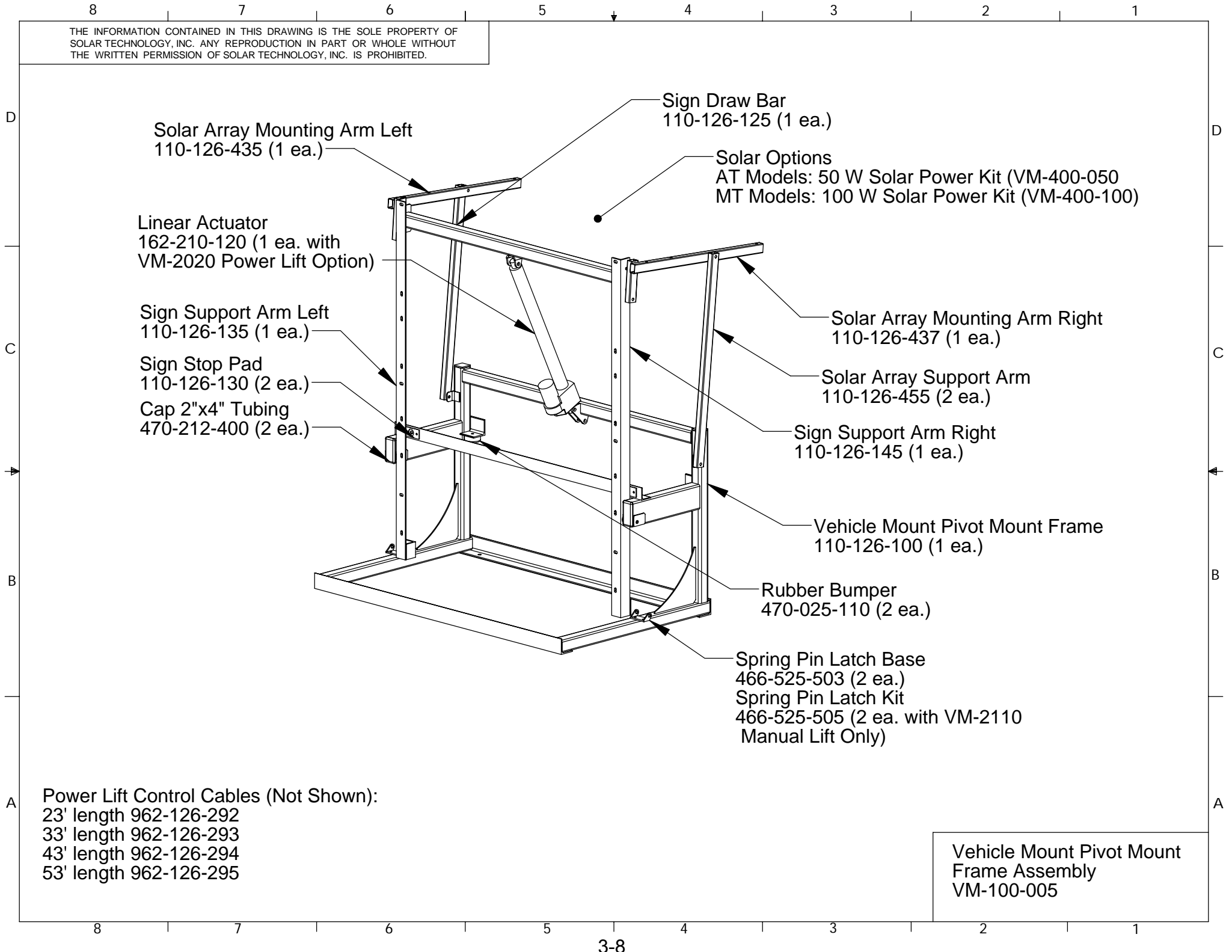
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- 1.) 3/8" x 3" GR 5 Cap Screw (445-370-300), 2ea.
 3/8" Nylon Flat Washer (444-375-212), 4ea.
 3/8" SS Flat Washer (450-375-210), 4ea.
 3/8" Stover Lock Nut (444-375-120), 4ea.
 Screws Point Out, Nylon Washers Between Tubes
- 2.) 3/8" x 2" GR 5 Cap Screw (445-370-200), 2ea.
 3/8" SS Flat Washer (450-375-210), 4ea.
 3/8" Stover Lock Nut (444-375-120), 2ea.
 3/8" Nylon Flat Washer (444-375-212), 4ea.
 Screws Point In, Nylon Washers Between Parts
- 3.) 3/8" x 4" GR 5 Cap Screw (445-370-400), 2ea.
 3/8" SS Flat Washer (450-375-210), 4ea.
 3/8" Nylon Flat Washer (444-375-212), 4ea.
 3/8" Stover Lock Nut (444-375-120), 2ea.
 Screws Point In, Nylon Washers Between Parts
- 4.) 1/2" x 4 1/2" GR 8 Cap Screw (447-500-450), 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.
 Screws Point In, Nylon Washers Between Parts
- 5.) 1/2" x 3" GR 5 Cap Screw (445-500-300), 1ea.
 1/2" Flat Washer (444-500-210), 4ea.
 1/2" Stover Lock Nut (444-500-120), 1ea.
 One Washer on Each Side of Each Mounting Tab. If Pulley Replaces Linear Actuator, Put 5/8" Hex Nuts (444-625-110) Between Mounting Tabs to Use for Spacers.
- 6.) 3/8" x 1 1/2" GR 5 Cap Screw (445-370-150), 2ea.
 3/8" Nylon Flat Washer (444-375-212), 4ea.
 3/8" SS Flat Washer (450-375-210), 2ea.
 Screw Goes into Draw Bar. Nylon Washer Goes Between Parts



Truck Mount (AT-1000)
 Superstructure Hardware

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Solar Array Mounting Arm Left
110-126-435 (1 ea.)

Sign Draw Bar
110-126-125 (1 ea.)

Linear Actuator
162-210-120 (1 ea. with
VM-2020 Power Lift Option)

Solar Options
AT Models: 50 W Solar Power Kit (VM-400-050)
MT Models: 100 W Solar Power Kit (VM-400-100)

Sign Support Arm Left
110-126-135 (1 ea.)

Solar Array Mounting Arm Right
110-126-437 (1 ea.)

Sign Stop Pad
110-126-130 (2 ea.)

Solar Array Support Arm
110-126-455 (2 ea.)

Cap 2"x4" Tubing
470-212-400 (2 ea.)

Sign Support Arm Right
110-126-145 (1 ea.)

Vehicle Mount Pivot Mount Frame
110-126-100 (1 ea.)

Rubber Bumper
470-025-110 (2 ea.)

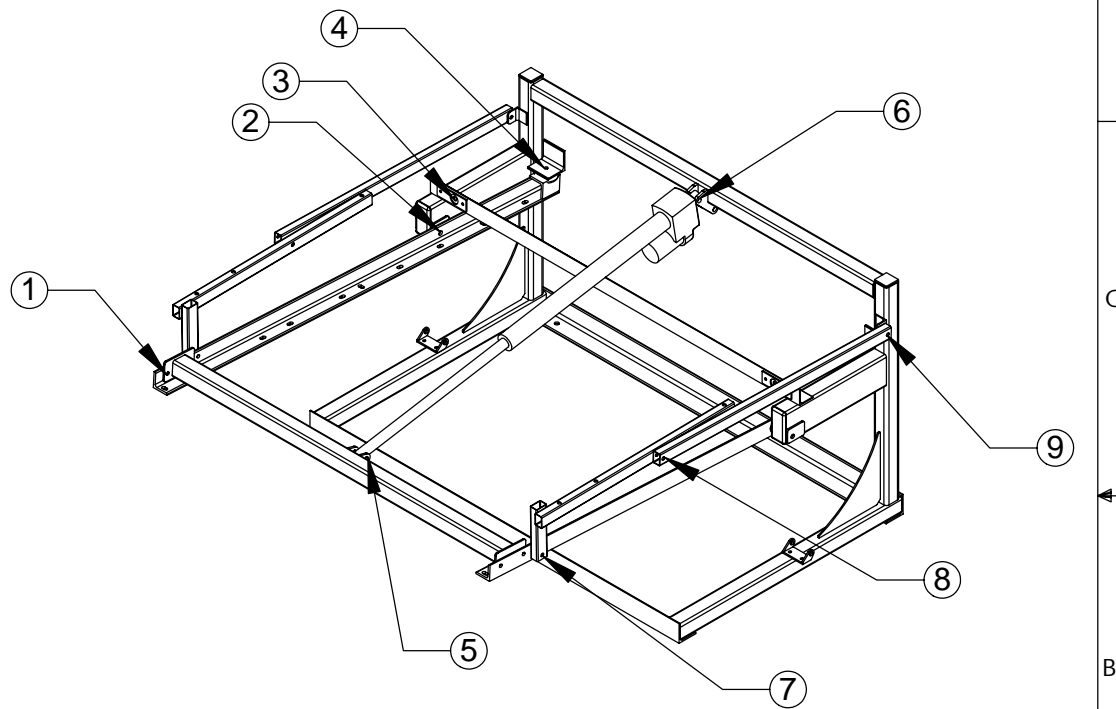
Spring Pin Latch Base
466-525-503 (2 ea.)
Spring Pin Latch Kit
466-525-505 (2 ea. with VM-2110
Manual Lift Only)

Power Lift Control Cables (Not Shown):
23' length 962-126-292
33' length 962-126-293
43' length 962-126-294
53' length 962-126-295

Vehicle Mount Pivot Mount
Frame Assembly
VM-100-005

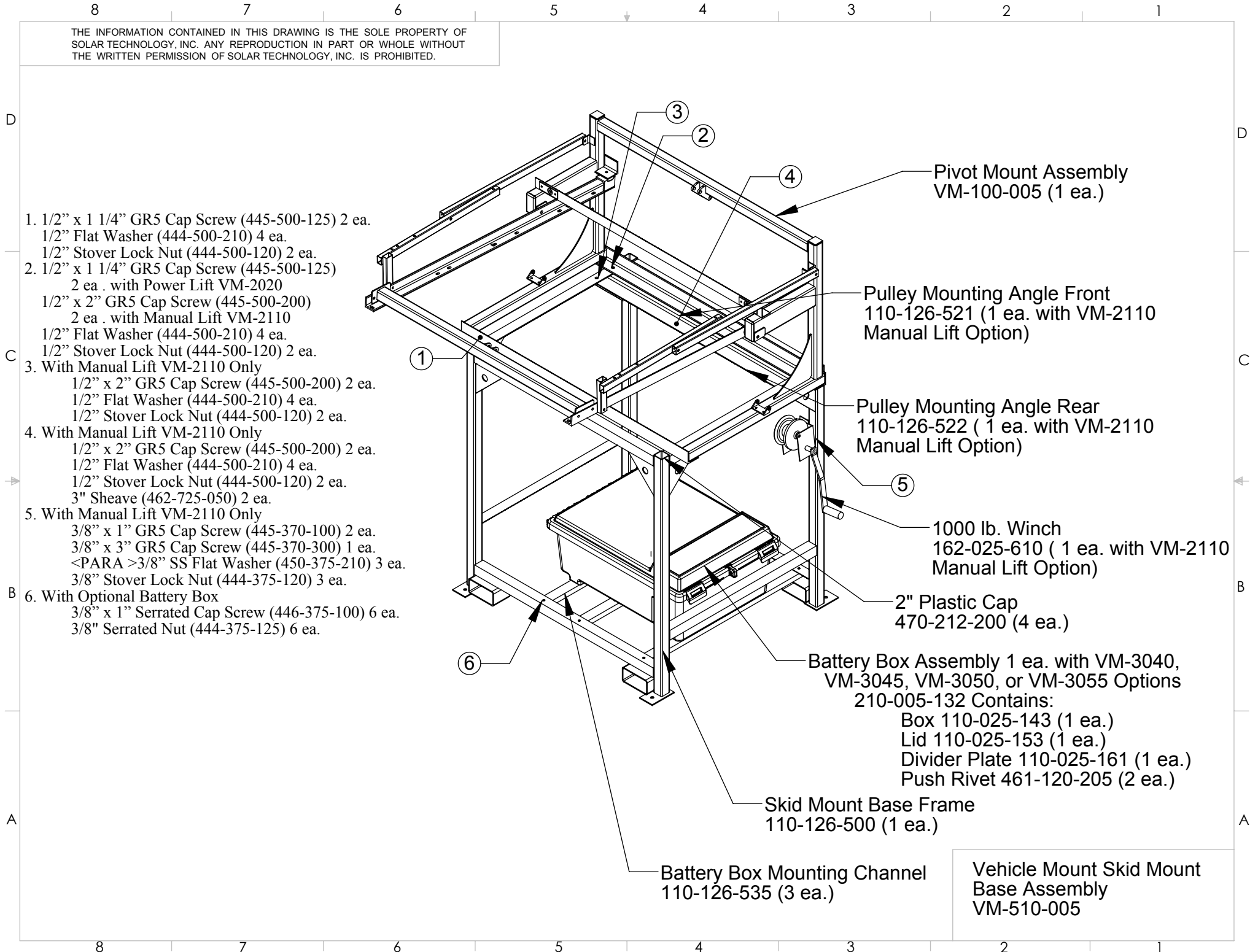
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1. 3/8" x 1" GR5 Cap Screw (445-370-100) 4 ea.
3/8" SS Flat Washer (450-375-210) 8 ea.
3/8" Stover Lock Nut (444-375-120) 4 ea.
Screws Point In
2. 1/2" x 4" GR8 Cap Screw (447-500-400) 2 ea.
1/2" Nylon Flat Washer (444-500-212) 4 ea.
1/2" Flat Washer (444-500-210) 4 ea.
1/2" Stover Lock Nut (444-500-120) 2 ea.
Screws Point In, Nylon Washers Between Parts
3. 1" x 3" Die Spring (470-550-350) 2 ea.
1/2" x 3 1/2" GR5 Cap Screw (445-500-350) 2 ea.
1/2" Stover Lock Nut (444-500-120) 2 ea.
1/4" x 3/4" Thd forming Screw (443-256-075) 4 ea.
4. 3/8" x 1 1/2" GR5 Cap Screw (445-370-150) 2 ea.
3/8" SS Flat Washer (450-375-210) 4 ea.
3/8" Stover Lock Nut (444-375-120) 2 ea.
5. 1/2" x 3 1/2" GR5 Cap Screw (445-500-350) 1 ea.
1/2" Nylon Flat Washer (444-500-212) between lift and bracket
2 ea. With Power Lift VM-2020
4 ea. With Manual Lift VM-2110
1/2" Flat Washer (444-500-210) 2 ea.
1/2" Stover Lock Nut (444-500-120) 1 ea.
6. With Power Lift VM-2020
1/2" x 3" GR5 Cap Screw (445-500-300) 1 ea.
1/2" Flat Washer (444-500-210) 2 ea.
1/2" Stover Lock Nut (444-500-120) 1 ea.
With Manual Lift VM-2110
1/2" x 3" GR5 Cap Screw (445-500-300) 2 ea.
1/2" x 2" GR5 Cap Screw (445-500-200) 1 ea.
1/2" Flat Washer (444-500-210) 6 ea.
1/2" Stover Lock Nut (444-500-120) 3 ea.
3" Sheave (462-725-050) 1 ea.
Sheave Mounting Bracket (110-126-201) 1 ea.
7. 3/8" x 2 1/4" GR5 Cap Screw (445-370-225) 2 ea.
3/8" Nylon Flat Washer (444-375-212) 8 ea.
3/8" SS Flat Washer (450-375-210) 4 ea.
3/8" Stover Lock Nut (444-375-120) 2 ea.
Screws Point In, Nylon Washers Between Parts
8. 3/8" x 3" GR5 Cap Screw (445-370-300) 2 ea.
3/8" Nylon Flat Washer (444-375-212) 4 ea.
3/8" SS Flat Washer (450-375-210) 4 ea.
3/8" Stover Lock Nut (444-375-120) 2 ea.
Screws Point In, Nylon Washers Between Parts
9. 3/8" x 2" GR5 Cap Screw (445-370-200) 2 ea.
3/8" Nylon Flat Washer (444-375-212) 4 ea.
3/8" SS Flat Washer (450-375-210) 4 ea.
3/8" Stover Lock Nut (444-375-120) 2 ea.
Screws Point In, Nylon Washers Between Parts



Vehicle Mount Pivot Mount
Frame Hardware
VM-100-005

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- 1. 1/2" x 1 1/4" GR5 Cap Screw (445-500-125) 2 ea.
1/2" Flat Washer (444-500-210) 4 ea.
1/2" Stover Lock Nut (444-500-120) 2 ea.
- 2. 1/2" x 1 1/4" GR5 Cap Screw (445-500-125)
2 ea. with Power Lift VM-2020
1/2" x 2" GR5 Cap Screw (445-500-200)
2 ea. with Manual Lift VM-2110
1/2" Flat Washer (444-500-210) 4 ea.
1/2" Stover Lock Nut (444-500-120) 2 ea.
- 3. With Manual Lift VM-2110 Only
1/2" x 2" GR5 Cap Screw (445-500-200) 2 ea.
1/2" Flat Washer (444-500-210) 4 ea.
1/2" Stover Lock Nut (444-500-120) 2 ea.
- 4. With Manual Lift VM-2110 Only
1/2" x 2" GR5 Cap Screw (445-500-200) 2 ea.
1/2" Flat Washer (444-500-210) 4 ea.
1/2" Stover Lock Nut (444-500-120) 2 ea.
3" Sheave (462-725-050) 2 ea.
- 5. With Manual Lift VM-2110 Only
3/8" x 1" GR5 Cap Screw (445-370-100) 2 ea.
3/8" x 3" GR5 Cap Screw (445-370-300) 1 ea.
<PARA >3/8" SS Flat Washer (450-375-210) 3 ea.
3/8" Stover Lock Nut (444-375-120) 3 ea.
- 6. With Optional Battery Box
3/8" x 1" Serrated Cap Screw (446-375-100) 6 ea.
3/8" Serrated Nut (444-375-125) 6 ea.

- Pivot Mount Assembly VM-100-005 (1 ea.)
- Pulley Mounting Angle Front 110-126-521 (1 ea. with VM-2110 Manual Lift Option)
- Pulley Mounting Angle Rear 110-126-522 (1 ea. with VM-2110 Manual Lift Option)
- 1000 lb. Winch 162-025-610 (1 ea. with VM-2110 Manual Lift Option)
- 2" Plastic Cap 470-212-200 (4 ea.)
- Battery Box Assembly 1 ea. with VM-3040, VM-3045, VM-3050, or VM-3055 Options
210-005-132 Contains:
Box 110-025-143 (1 ea.)
Lid 110-025-153 (1 ea.)
Divider Plate 110-025-161 (1 ea.)
Push Rivet 461-120-205 (2 ea.)
- Skid Mount Base Frame 110-126-500 (1 ea.)
- Battery Box Mounting Channel 110-126-535 (3 ea.)

Vehicle Mount Skid Mount Base Assembly VM-510-005

8 7 6 5 4 3 2 1

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15 Lamp Wire Harness Assembly (Contained Internally)
962-025-130
1ea.

2.5" dia Rubber Bumper
470-025-110
2ea.

Lamp
940-025-146
15ea.

Front Arrow Panel Skin (15 Lamp)
110-025-222 (C-size 48"x96")
110-025-226 (C-size w/ MTO Flap Kit)
110-125-122 (B-size 30"x60")
110-125-222 (B-size 36"x72")

LED Assembly
944-025-005
3ea.

Shroud
942-025-046
15ea.

63 Position CPC Connector (not shown)
915-150-263
Included with 15 Lamp Wire Harness Assembly (962-025-130)
Can be Ordered Separately
1ea.

Rear Arrow Panel Skin
110-025-224 (C-size 48"x96")
110-125-124 (B-size 30"x60")
110-125-224 (B-size 36"x72")

Arrow Panel Frame
210-025-221 (C-size 48"x96")
210-125-121 (B-size 30"x60")
210-125-221 (B-size 36"x72")

Photocell Assembly (not shown)
780-025-015
1ea.

15 Lamp Arrow Panel Assembly
AB-25-015 (C-size 48"x96")
AB-25-115 (B-size 30"x60")
AB-25-215 (B-size 36"x72")

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25 Lamp Wire Harness Assembly (Contained Internally)
962-025-132
1ea.

2.5" dia Rubber Bumper
470-025-110
2ea.

Front Arrow Panel Skin (25 Lamp)
110-025-223 (C-size 48"x96")
110-125-123 (B-size 30"x60")
110-125-223 (B-size 36"x72")

Lamp
940-025-146
25ea.

LED Assembly
944-025-005
3ea.

Shroud
942-025-046
25ea.

63 Position CPC Connector (not shown)
915-150-263
Included with 25 Lamp Wire Harness Assembly (962-025-132)
Can be Ordered Separately
1ea.

Rear Arrow Panel Skin
110-025-224 (C-size 48"x96")
110-125-124 (B-size 30"x60")
110-125-224 (B-size 36"x72")

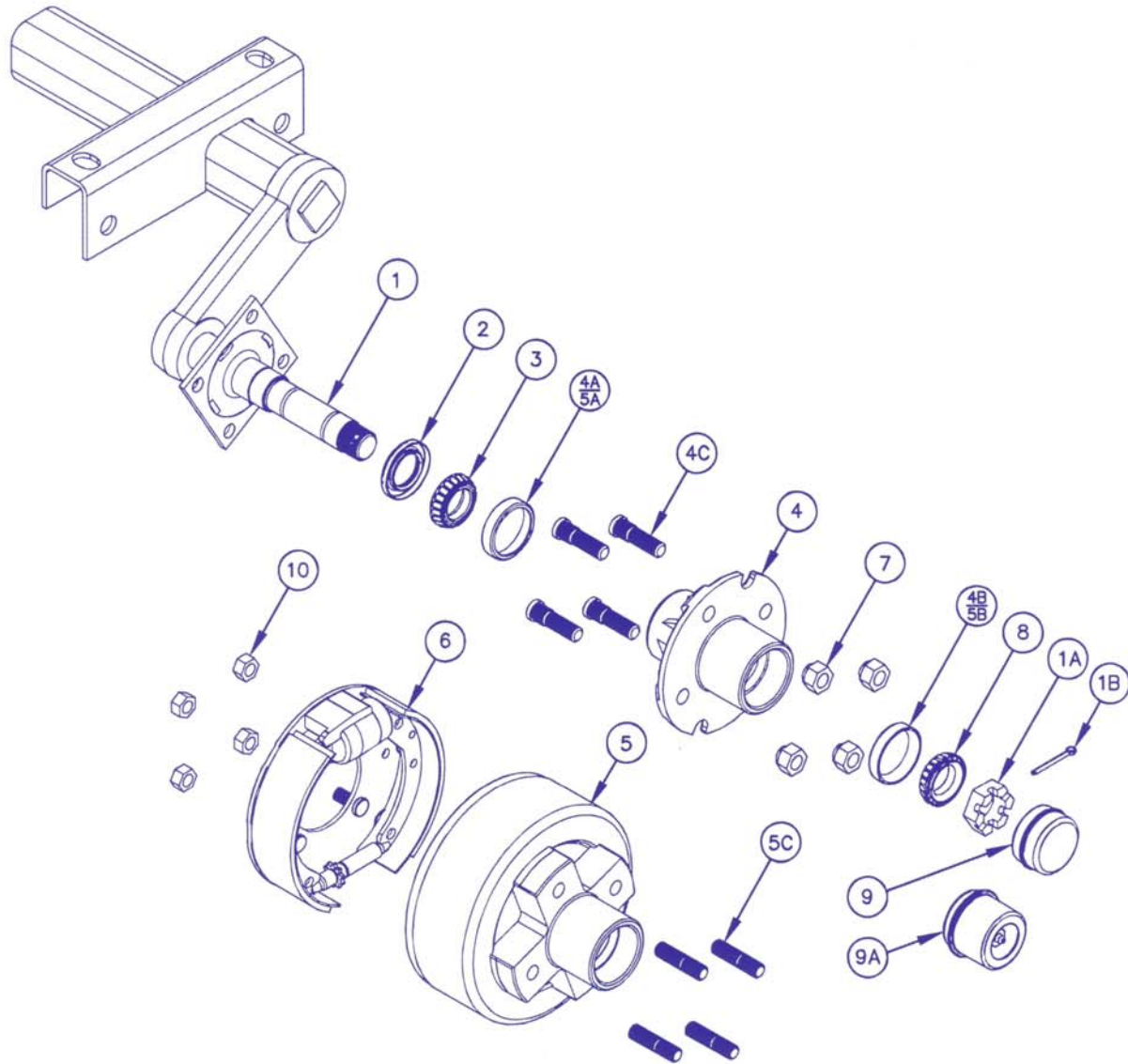
Photocell Assembly (not shown)
780-025-015
1ea.

Arrow Panel Frame
210-025-221 (C-size 48"x96")
210-125-121 (B-size 30"x60")
210-125-221 (B-size 36"x72")

25 Lamp Arrow Panel Assembly
AB-25-025 (C-size 48"x96")
AB-25-125 (B-size 30"x60")
AB-25-225 (B-size 36"x72")

1000-2000 lb. Rubber Torsion Hub and Drum Options

Axles are available in beam only and with hubs or drums assembled and greased.



Detail	Part Number	Description
1	To Be Assigned	Rubber Torsion Axle - 1000-2000 lbs.
1A	SN-1000	Spindle Nut - 1"-14
1B	SCP-103	Cotter Pin - 5/32" x 1 1/2"
2	SL-122-1	Grease Seal - 1 1/4" I.D.
	SL-150-1	Grease Seal - 1 1/2" I.D.
3	L44643	Inner Bearing Cone - 1" I.D.
	L44649	Inner Bearing Cone - 1 1/16" I.D.
4	1-100-04-00	Idler Hub - 4 on 4"
	1-150-04-00	Idler Hub - 5 on 4 1/2" (5 9/16" Dia. Flange)
	1-151-04-00	Idler Hub - 5 on 4 1/2" (6 1/2" Dia. Flange)
4A	L44610	Inner Bearing Cup
4B	L44610	Outer Bearing Cup
4C	ST-502-04	Pressed-in Stud - 1/2"-20

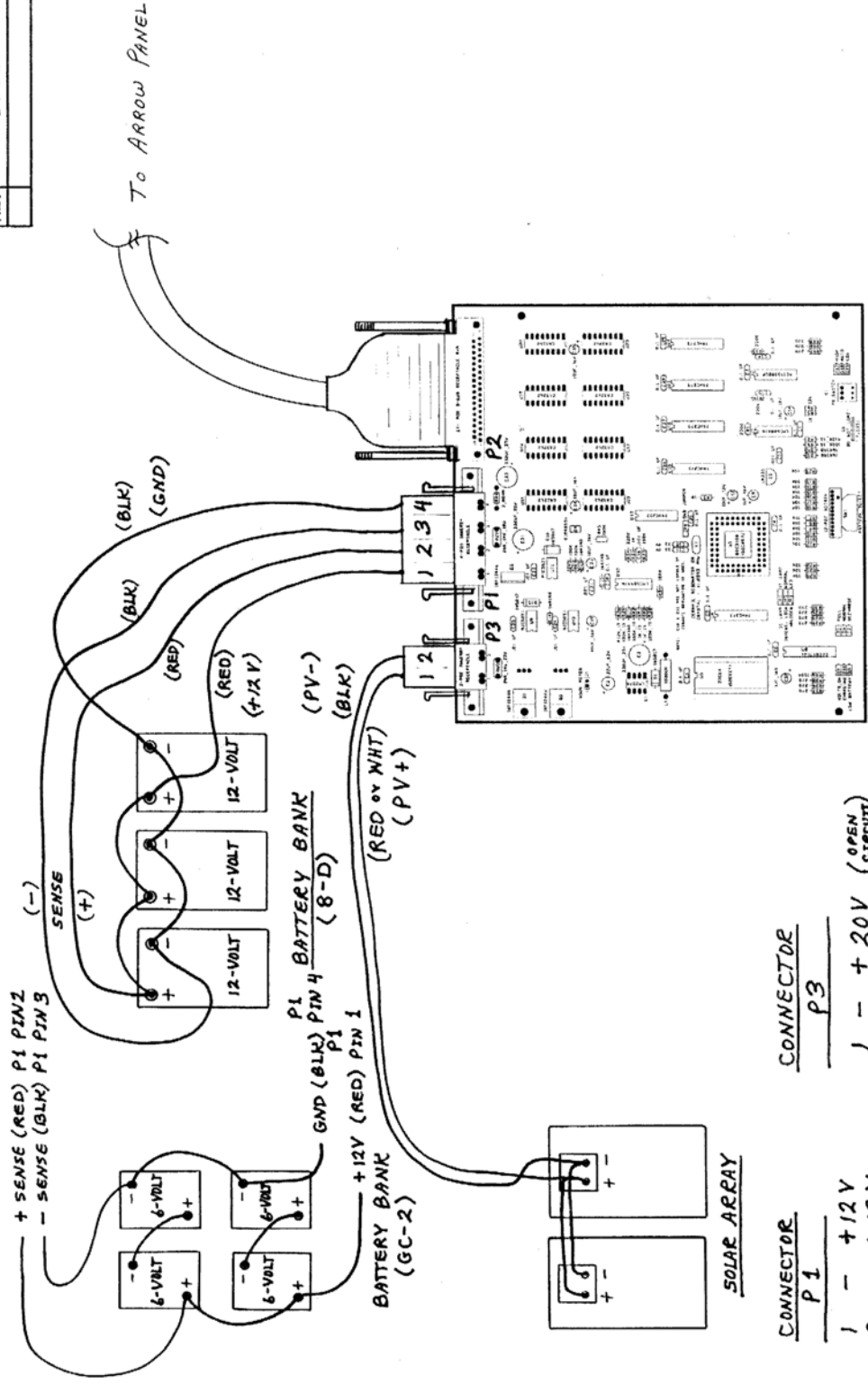
Detail	Part Number	Description
5	5-700A-04-00	Brake Drum - 4 on 4"
	5-700C-04-00	Brake Drum - 5 on 4 1/2"
5A	L44610	Inner Bearing Cup
5B	L44610	Outer Bearing Cup
5C	ST-500	Screwed-in Stud - 1/2"-20
6	EBLH-0700 EBRH-0700	Electric Brake - 7" x 1 1/4"
	HBLH-0700 HBRH-0700	Hydraulic Brake - 7" x 1 3/4"
7	STN-506	Stud Nut - 1/2"-20 x 60°
8	L44643	Outer Bearing Cone - 1" I.D.
	L44649	Outer Bearing Cone - 1 1/16" I.D.
9	1505	Dust Cap
9A	GC-1980-01	Sure Lube Grease Cap
10	FLN-437	Flange Lock Nut - 7/16"-20

SILENT SENTINEL

ADVANCE WARNING ARROW PANELS

WIRING DIAGRAMS

REV	DESCRIPTION	DATE



SOLAR ARRAY

CONNECTOR	PIN	WIRE COLOR / DESCRIPTION
P1	1	+ 12V
	2	+ 12V
	3	GND
	4	GND

BATTERY BANK (GC-2)

CONNECTOR	PIN	WIRE COLOR / DESCRIPTION
P3	1	+ 20V (OPEN CIRCUIT)
	2	GND

SOLAR TECHNOLOGY, INC.			
DESCRIPTION: WIRING DIAGRAM			
USED ON:	ARROW BOARD CONTROLLER	REV A	
DRAWN BY:	BQ	DATE:	3/11/2000
	SCALE:	NONE	DWG. NO. 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

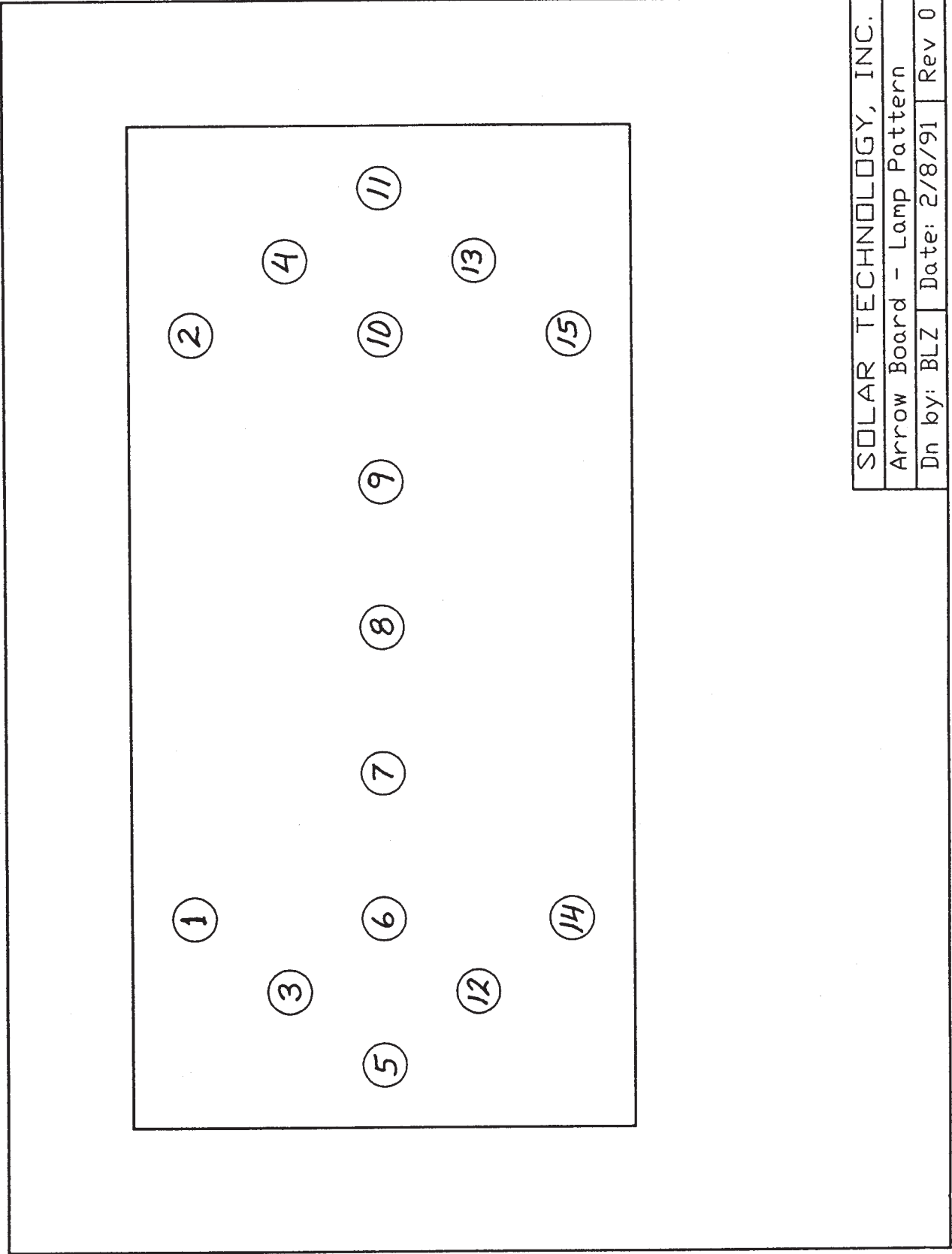
PIN	WIRE COLOR	FUNCTION
1	RED or WHT	PV +
2	BLK	PV -

P2 - ARROW PANEL CABLE

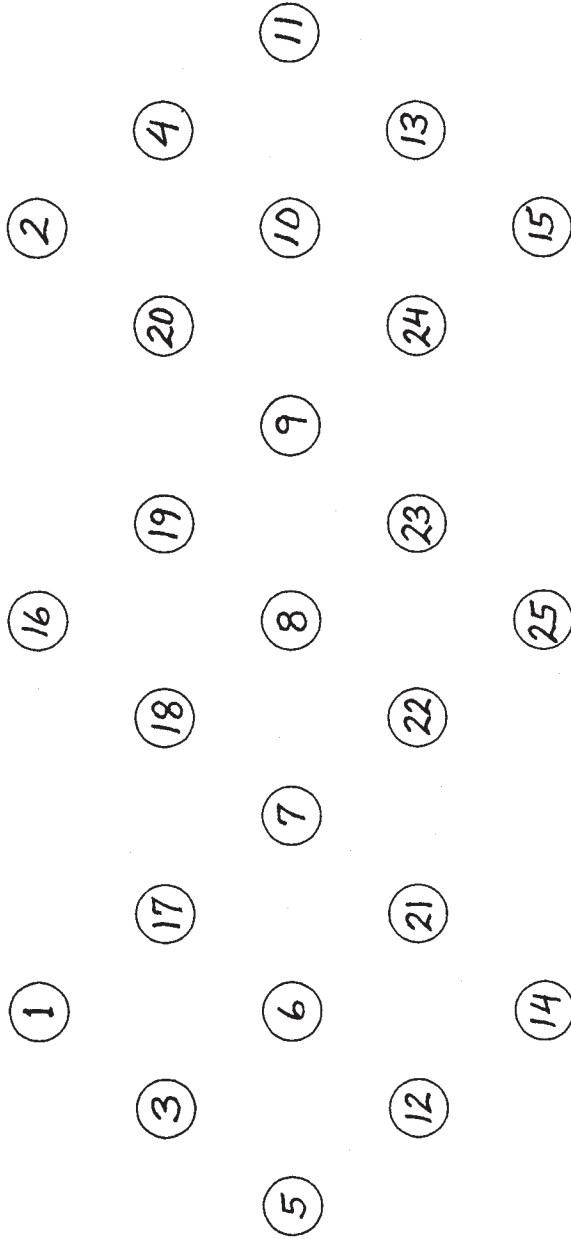
PIN	WIRE COLOR	FUNCTION
1	BRN	LAMP 1
2	RED	LAMP 2
3	ORN	LAMP 3
4	YEL	LAMP 4
5	GRN	LAMP 5
6	BLU	LAMP 6
7	VIO	LAMP 7
8	GRY	LAMP 8
9	WHT	LAMP 9
10	WHT/RED/RED	LAMP 10
11	WHT/BRN	LAMP 11
12	WHT/RED	LAMP 12
13	WHT/ORN	LAMP 13
14	WHT/YEL	LAMP 14
15	WHT/GRN	LAMP 15
16	WHT/BLU	LAMP 16
17	WHT/VIO	LAMP 17
18	WHT/GRY	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/GRY	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/GRN	PHOTOCELL SIGNAL
34	WHT/RED/BLK	REAR PANEL LEFT LAMP
35	WHT/RED/GRN	REAR PANEL CENTER LAMP
36	WHT/RED/BLU	REAR PANEL RIGHT LAMP
37	WHT/RED/VIO	LOW BATTERY INDICATOR

AS VIEWED FROM FRONT OF ARROW PANEL

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



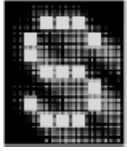
SOLAR TECHNOLOGY, INC.	
Arrow Board - Lamp Pattern	
Dn by: BLZ	Date: 2/8/91
Rev 0	



SOLAR TECHNOLOGY, INC.

Arrow Board - Lamp Pattern

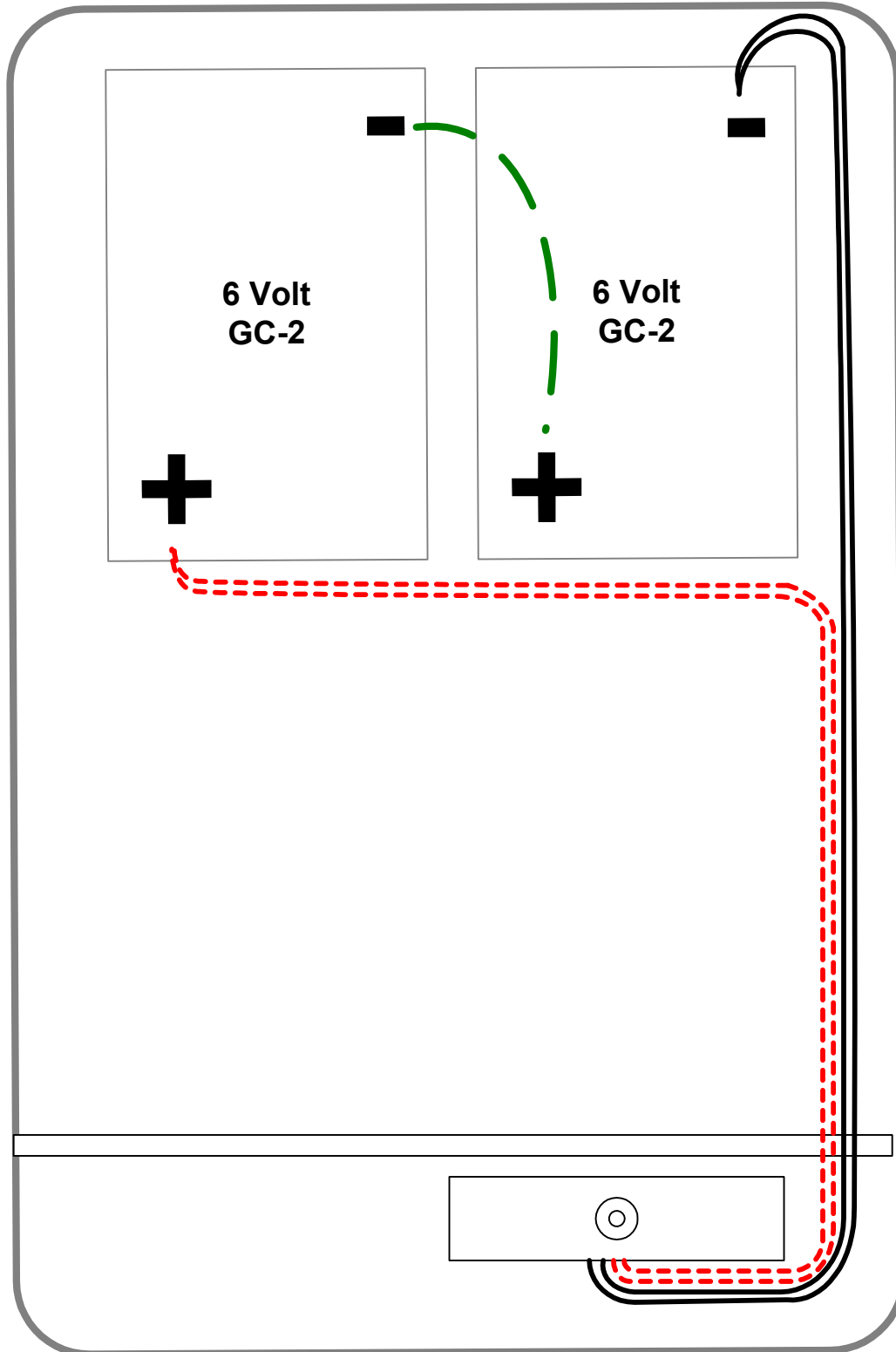
Dn by: BLZ Date: 2/8/91 Rev 0



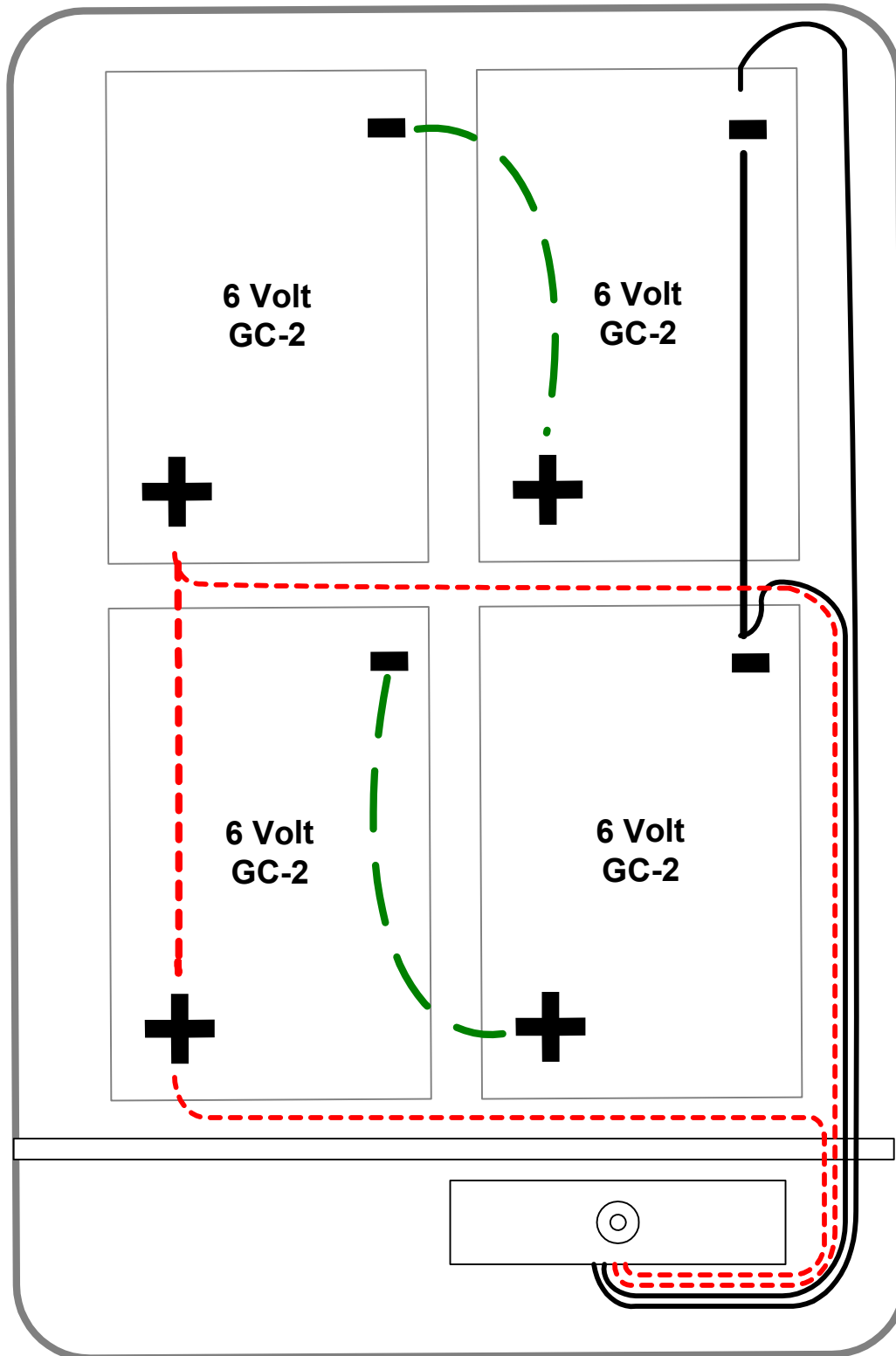
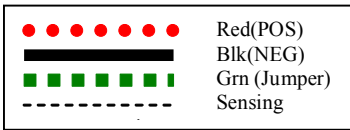
SOLARTECH

● ● ● ● ● ● ● ●	Red(POS)
— — — — —	Blk(NEG)
■ ■ ■ ■ ■ ■ ■ ■	Grn (Jumper)
- - - - -	Sensing

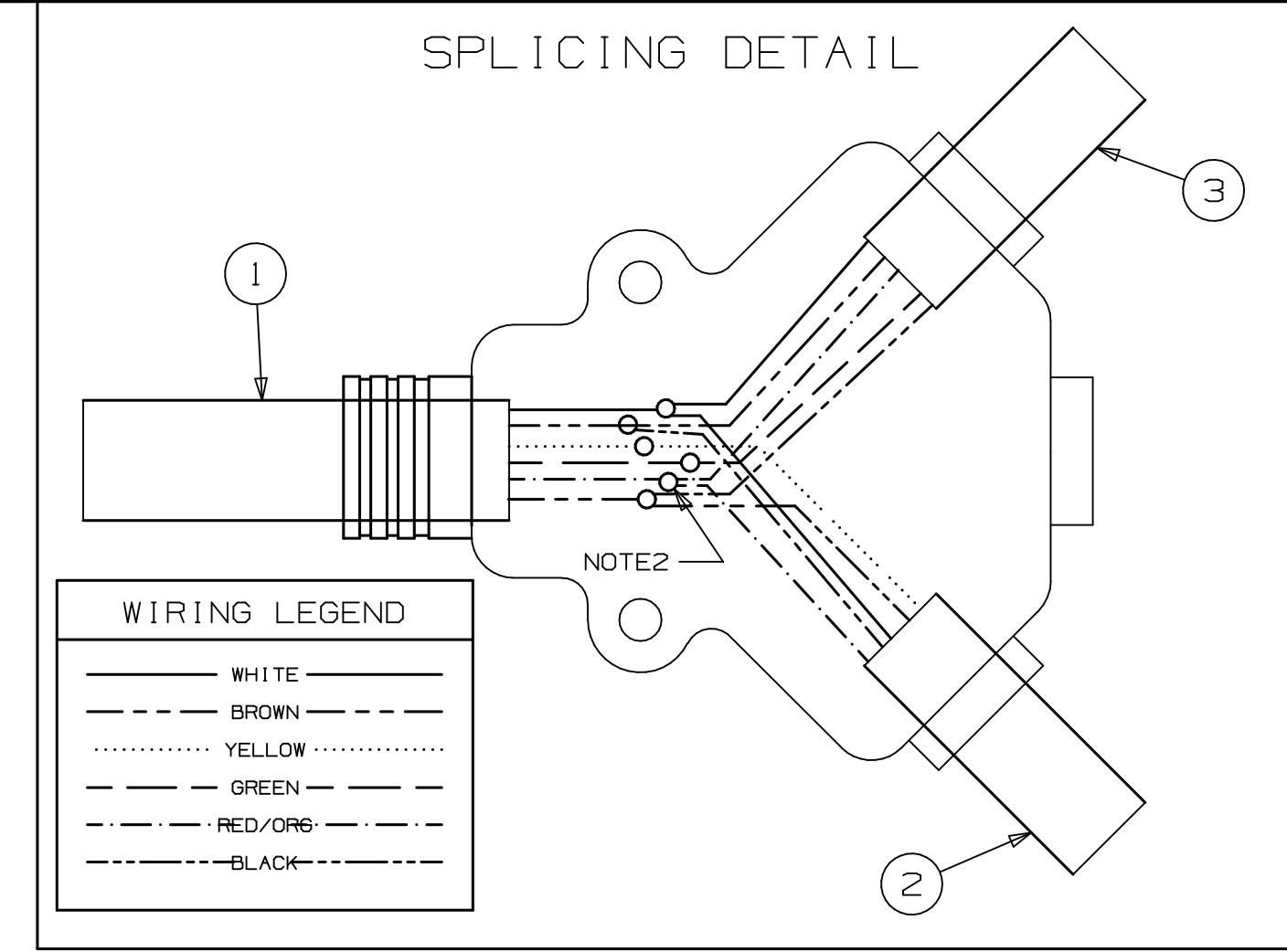
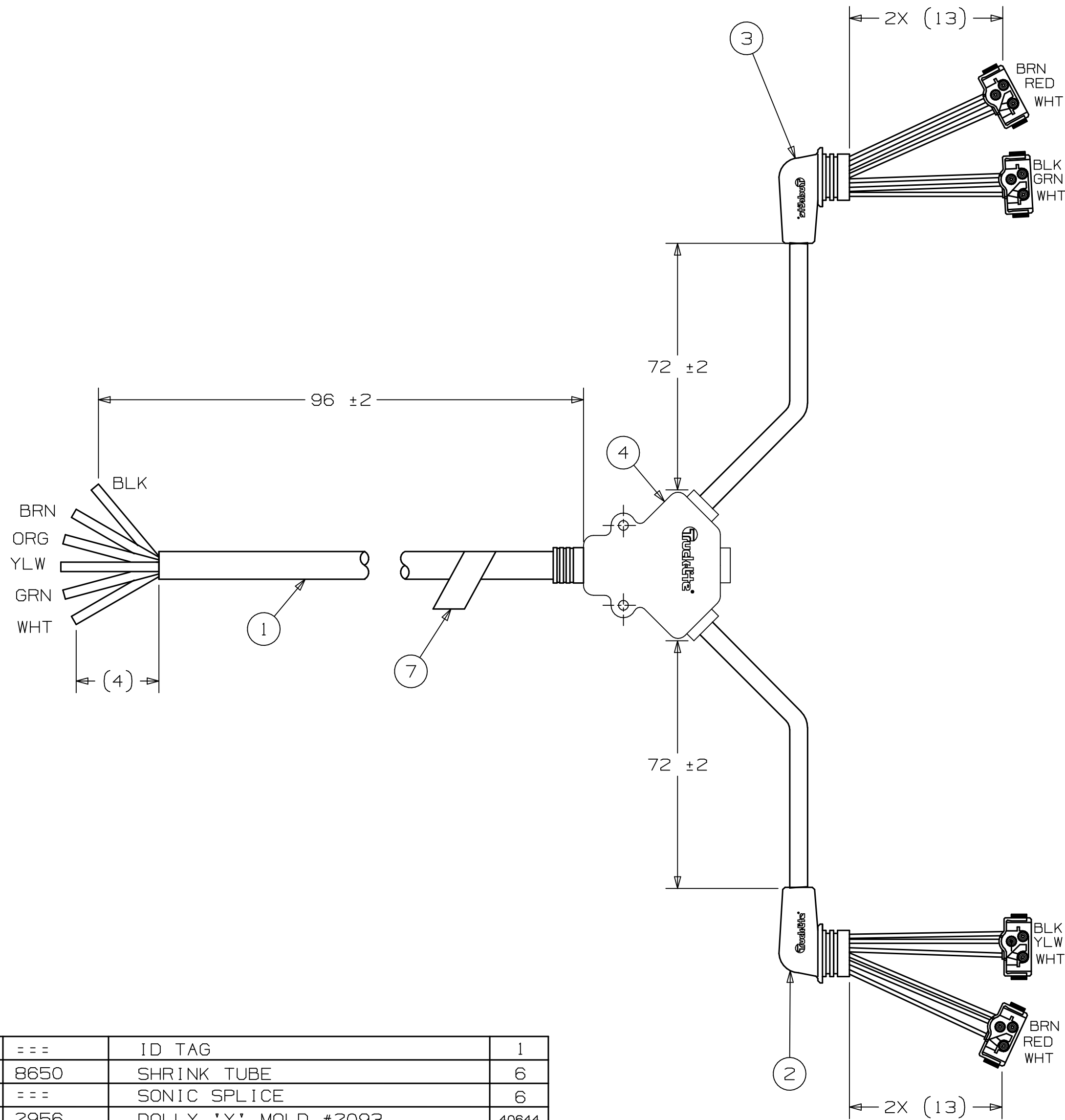
Arrow Board Battery Wiring Diagram - 2 Batteries



Arrow Board Battery Wiring Diagram - 4 Batteries



- NOTES:
 1. 100% ELECTRICAL CHECK.
 2. SPLICE ORG WIRE FROM 6 COND MAIN TO RED WIRES FROM 5 COND SUB-ASS'YS.



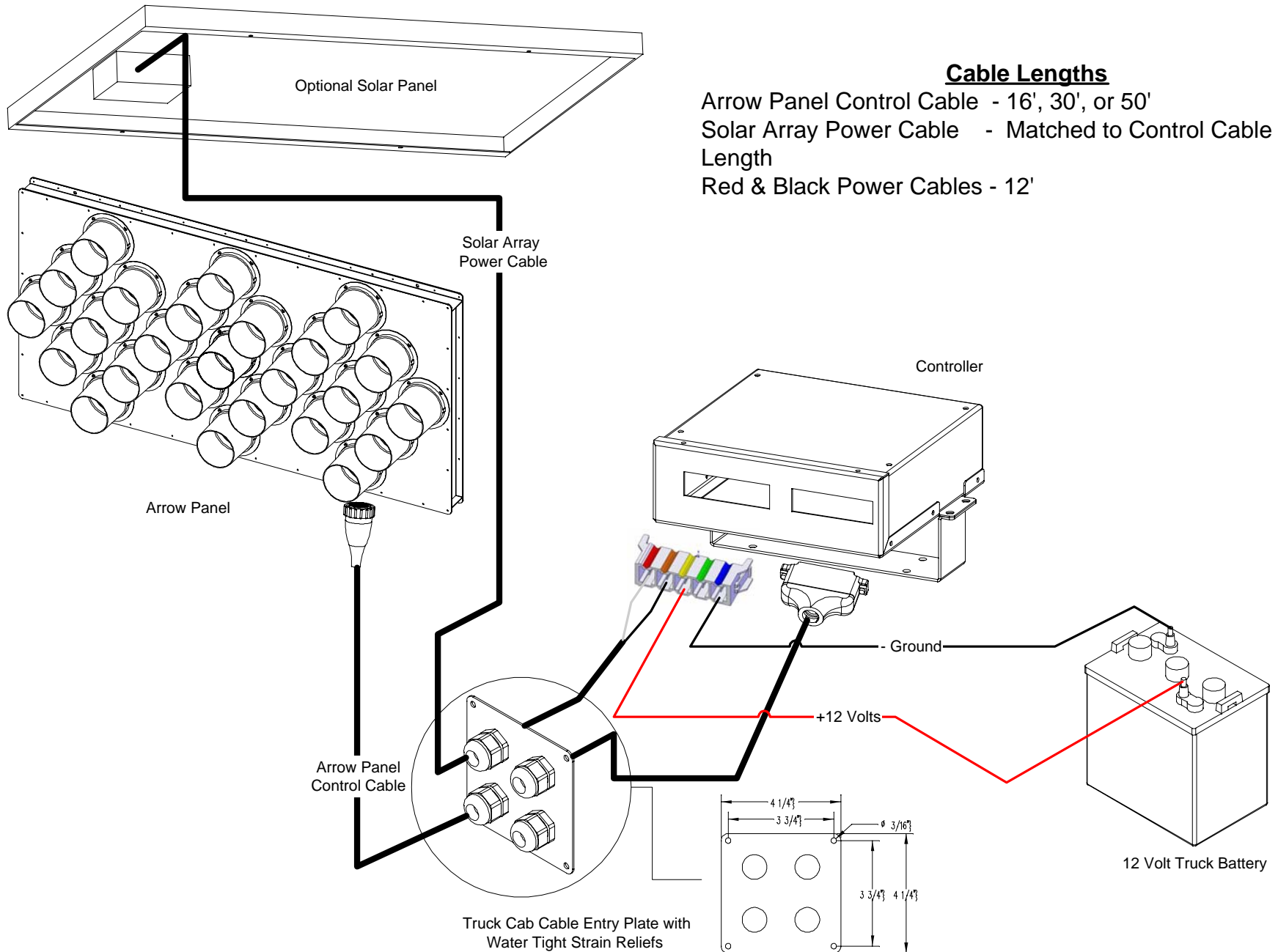
7	===	ID TAG	1
6	8650	SHRINK TUBE	6
5	===	SONIC SPLICE	6
4	2956	DOLLY 'Y' MOLD #2093	.40644
3	A22630	RH ST/T SUB-ASS'Y	1
2	A22629	LH ST/T SUB-ASS'Y	1
1	A22626	6 COND SUB-ASS'Y 1-1	1
ITEM	PART NO.	DESCRIPTION	REQ.

4-9

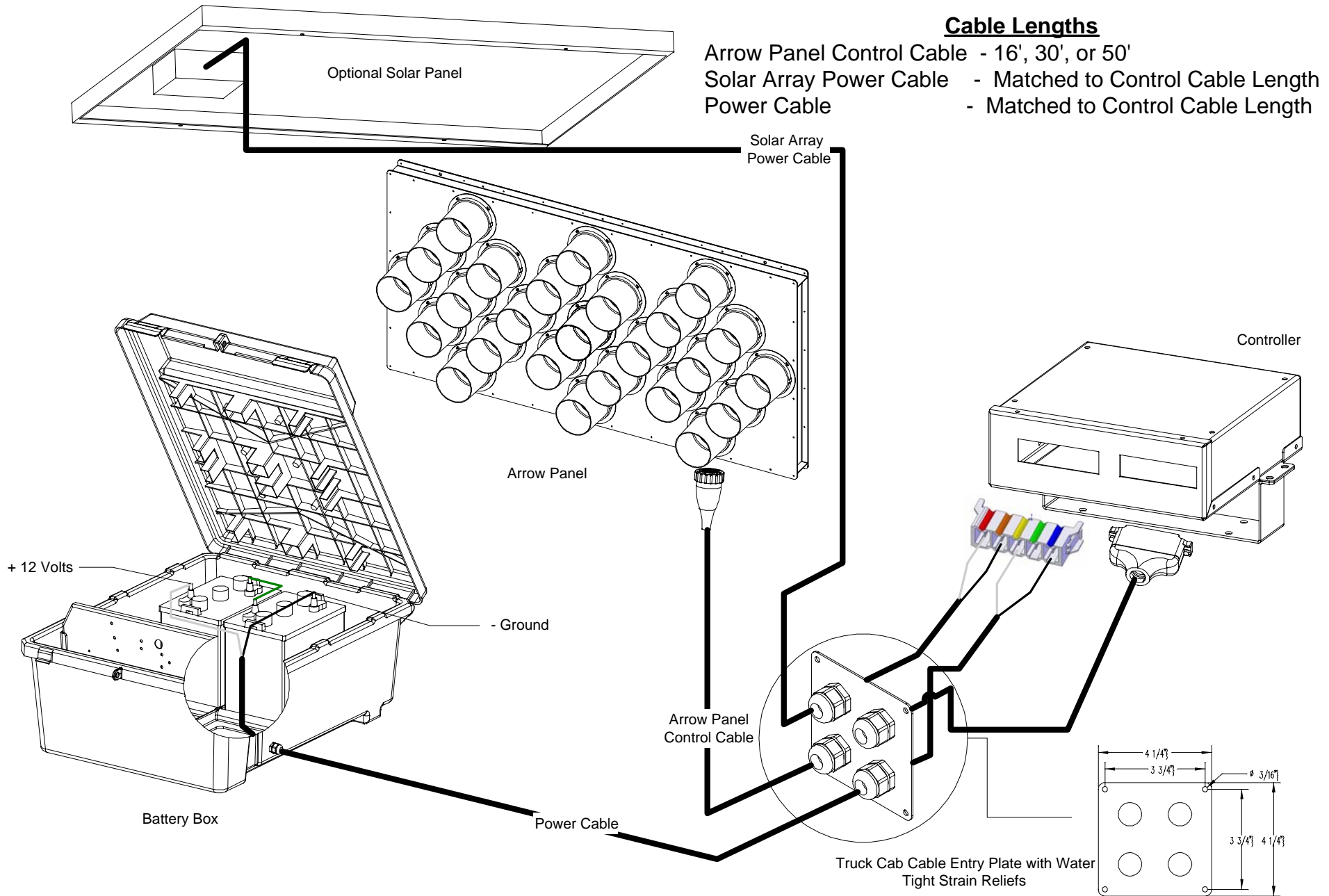
0	04-17-01	RELEASE	16568A	CDG	-
A	2-28-01	PRELIMINARY F/HDHR6597-01	16568	CDG	-
REV	DATE	DESCRIPTION	ECN	DWN	APVD

REVISION HISTORY					
REFERENCE DRW. NO.	THIRD ANGLE PROJECTION	DIMENSIONS ARE IN INCHES			
-		WIRE STRIP LENGTH TOL: ± 1/32			
CUST./SUPPLIER PART NO.	CAD DATA SOURCE	CABLE JACKET STRIP LENGTH: 0 to less than 2 ± 1/8			
-	UNIGRAPHICS	2 to ... ± 1/2			
		CABLE CUT LENGTH: 0 to less than 250 ± 1 1/2	TOL. 'A': ± 2	TOL. 'B': ± 1	
		250 to less than 500 ± 2			
		500 to ... ± 2 1/2			
TRUCK-LITE CO., INC. FALCONER, NEW YORK USA					
HARN-SS DOLLY S/T/T					
SCALE:	MOLD/TOOL NO.:	PART NO.:	DRW. NO.:		
NTS	-	51504	28392C0		

Cable Diagram: Vehicle Mount Arrow Board, In Cab Mount without Battery Pack



Cable Diagram: Vehicle Mount Arrow Board, In Cab Mount With Battery Pack



Cable Diagram: Vehicle Mount Power Lift

