

# Silent Sentinel Solar Powered Advanced Warning **Arrow Panels**

## **Service and Repair Manual**



**Part Number 550-025-200**



*As Reliable as the Sun*

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550-024-400

Second edition: 05 May 2008

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# SILENT MESSENGER

## SERVICE AND REPAIR MANUAL

### TABLE OF CONTENTS

1.	Maintenance .....	1-1
	Cleaning .....	1-1
	Lubrication .....	1-3
	Adjustments .....	1-5
	Batteries .....	1-7
	Control Console .....	1-10
2.	Troubleshooting and Repair .....	2-1
	Control Console .....	2-1
	Sign Display Panel .....	2-3
	Solar Energy Management System .....	2-6
	Hydraulic System (SILENT MESSENGER) .....	2-8
	Winch and Cable System (SILENT MESSENGER II AND III) .....	2-8
3.	Parts Diagrams Silent Messenger Series .....	3-1
	Silent Messenger Large (#10) Axle & Hubs .....	3-9
	Silent Messenger Brake Actuator .....	3-11
	Silent Messenger Hydraulic Pump .....	3-13
4.	Parts Diagrams Silent Messenger II Series .....	4-1
	Silent Messenger II Standard Trailer .....	4-3
	Silent Messenger II Lift-n-Rotate Trailer .....	4-7
	Silent Messenger II Low Profile Double-Sided Trailer .....	4-11
	Silent Messenger II Small (#9) Axle & Hubs .....	4-13
	Silent Messenger II Incident Response Trailer (IRT) .....	4-15
	Silent Messenger II Lift-n-Rotate Double Sided Trailer .....	4-19
	Silent Messenger II Large (#10) Axle & Hubs .....	4-25
	Silent Messenger II Brake Actuator .....	4-27
	Silent Messenger II Hydraulic Pump .....	4-29
5.	Parts Diagrams Silent Messenger III Series .....	5-1
	Silent Messenger III Small (#9) Axle & Hubs .....	5-7
6.	Parts Diagrams Vehicle Mount Models .....	6-1
	Pivot Mount Frame .....	6-3
	Skid Base with Pivot Mount Frame .....	6-5
	AT-1000 Skid Mount Frame .....	6-6
7.	Parts Diagrams Silent Messenger Sign Cases .....	7-1
	Silent Messenger Sign Case (MB-24-318) .....	7-3
	Silent Messenger II Sign Case (MB-22-448) .....	7-4
	Silent Messenger III Sign Case (MB-23-448) .....	7-5

8.	Wiring Diagrams .....	8-1
	Wiring Diagram: Message Board Battery Wiring Diagram Small Trailer - 4/8 Batteries .....	8-3
	Wiring Diagram: Message Board Battery Wiring Diagram Large Trailer - 8 Batteries .....	8-4
	Wiring Diagram: Message Board Battery Wiring Diagram Large Trailer - 12 Batteries .....	8-5
	Wiring Diagram: Silent Messenger Energy Management System .....	8-6
	Wiring Diagram: Trailer Lighting Wire Harness - Large Trailer .....	8-7
	Wiring Diagram: Trailer Lighting Wire Harness - Small Trailer .....	8-8
	Wiring Diagram: Sign Case Wiring Diagram .....	8-9
	Wiring Diagram: Vehicle Mount Message Board - In-Cab Controls w/o battery pack .....	8-10
	Wiring Diagram: Vehicle Mount Message Board - In-Cab Controls with battery pack .....	8-11
	Wiring Diagram: Vehicle Mount - Pivoting Mount Power Lift Controls .....	8-13

# **SILENT MESSENGER**

**PORTABLE CHANGEABLE MESSAGE SIGNS**

**Maintenance**



## **1. MAINTENANCE**

The **SILENT MESSENGER SOL-R-SIGN** is designed and manufactured to provide years of trouble free service, while demanding a minimum amount of care and maintenance. Aside from keeping the display panel and the solar array clean and free from debris, the **SILENT MESSENGER** will consume very little of your equipment maintenance resources.

### **- CLEANING -**

The sign panel should be cleaned periodically as required to maintain optimum visibility of the display. Use plenty of water to minimize scratching of the surface by abrasive dust and debris that may have accumulated on the door panel. A mild detergent can be used to remove any accumulated oil or grease deposits. Rinse the surface thoroughly to completely remove the dirt and detergent residue. Avoid using strong alkali detergents or petroleum-based solvents. Certain solvents will cause severe damage to the polycarbonate surface and are not necessary for effective cleaning. Periodic application of a cleaning and polishing product such as Novus Plastic Polish or KleenMaster Brilliance will dramatically improve the service life of the polycarbonate panel as well as help to reduce dirt accumulation in the field.

The solar panels used in the solar array have a tempered glass upper surface and can be cleaned using the same techniques as those employed in cleaning the door panel. In the event that the solar array becomes covered with snow, the excess snow should be removed as soon as possible. It is not necessary, nor desirable, to aggressively scrape frozen snow or ice accumulation from the panels. If the majority of the snow is removed, sunlight will usually melt any remaining accumulation within a few days and the solar array will be back to full energy production.

### **- SILENT MESSENGER & SILENT MESSENGER II/III LIFT & ROTATE -**

The solar arrays can be tilted for cleaning by releasing the spring locking tabs from the support arms and gently pushing the arms toward the back of the sign panel to unlock them. Pull down on the back edge of the solar array and it will continue to swing down to a near vertical position for easy inspection and cleaning. Simply reverse the procedure to return the solar arrays to their normal operation position. Make certain that the spring locking tabs are fully engaged when the support arms are returned to their upright and locked position.

### **- SILENT MESSENGER II AND III -**

When the sign panel is in the transport position, the trailer can be tilted back onto the rear jack stands to facilitate cleaning the solar array. Simply retract the rear jack stands fully and lift up on the tongue until the trailer tilts toward the rear and rests on the rear jack stands. Pull down on the tongue to return the trailer to the transport position.

General overall cleaning of the entire unit is recommended as a part of the routine maintenance schedule to optimize the performance and life expectancy of the message sign. Urethane coatings are among the most durable and corrosion resistant finishes available today. However, regular cleaning to remove dirt and corrosive compound accumulation will go a long way toward maximizing the appearance and life expectancy of the finish. A mild detergent and plenty of water is all that should be required to remove accumulated dust and road film. Avoid using strong alkali or abrasive cleaning compounds. They are not necessary and may damage the finish.



## **- LUBRICATION -**

Although, under typical operating conditions, very little lubrication service is required, it is still an important aspect of maintaining trouble free operation and minimizing rust and corrosion problems.

## **- SILENT MESSENGER -**

The sign panel mast mechanism employs nylatron wear pads at the top of the lower mast section and at the bottom of the upper mast section to ensure that the mast will raise, lower, and rotate with minimum effort and no need for lubrication. It is, however, recommended that a small amount of lithium grease or chain lubricant be applied to the rotor plate and dual cam locking mechanism pivot points located at the bottom of the upper mast section. This will help prevent rust and corrosion from forming inside and around the locking mechanism and restricting the free rotation of the sign panel.

The swivel jacks, located at each corner of the trailer should also be lubricated regularly. Apply a small amount of chain lube at the swivel bearing between the jack and the mounting plate as well as at the hole located at the top of the swivel jack outer tube to lubricate the internal screw mechanism. Lubricating these and other pivot points not only ensures that these mechanisms remain free and easy to operate, but also that rust and corrosion are kept to a minimum.

Check the brake fluid level in the hydraulic surge brake actuator located at the front end of the trailer tongue at least once a month. Refill as required with clean brake fluid rated for DOT 3 applications. Periodically lubricate the surge brake actuator to ensure that the brake mechanism will continue to operate freely. Use a lithium-based lubricant applied with a grease gun to the zerk fittings on the side of the actuator.

The trailer axle wheel bearings should be cleaned and repacked with a good grade of lithium-based bearing grease at least once a year, more frequently if the trailer is used heavily, particularly in excessively dusty environments or if the axle has been submerged in water. Remove the dust cap from the axle hub, remove and discard the cotter key, and remove the castle head nut. Remove the wheel and hub from the axle spindle, being careful to prevent the bearings from falling and becoming contaminated with dirt and grit. While the hub and brake drum are removed, inspect the condition of the lining on the brake shoes and inside surface of the brake drum. Replace the brake shoes if the lining is worn to within 1/16 inch or less and recondition the brake drums, if required. Clean the old grease from the bearings, hub, and spindle. Repack with clean wheel bearing grease and reassemble. Always replace the cotter key with a new one to ensure secure retention of the spindle nut.

The hydraulic system used to raise and lower the sign panel mast does not require any regularly scheduled maintenance. The hydraulic fluid reservoir should be checked periodically to make certain that the fluid is at the level indicated on the side of the reservoir. Add Dexron II ATF hydraulic fluid as required to maintain the appropriate level. Make certain that the reservoir fill cap is replaced securely to prevent hydraulic fluid loss or contamination.

## **- SILENT MESSENGER II AND III -**

The sign panel lifting mechanism employs a winch and cable mechanism with a pair of sheaves on the sign panel support frame lower crossmember. Apply a small amount of chain lube at each sheave bearing sleeve and at the lube points on the winch.

The swivel jack, located on the tongue of the trailer should also be lubricated regularly. Apply a small amount of chain lube at the swivel bearing between the jack and the mounting plate as well as at the hole located at the top of the swivel jack outer tube to lubricate the internal screw mechanism. Lubricating these and other pivot points not only ensures that these mechanisms remain free and easy to operate, but also that rust and corrosion are kept to a minimum.

The trailer axle wheel bearings should be cleaned and repacked with a good grade of lithium-based bearing grease at least once a year, more frequently if the trailer is used heavily, particularly in excessively dusty environments or if the axle has been submerged in water. Remove the dust cap from the axle hub, remove and discard the cotter key, and remove the castle head nut. Remove the wheel and hub from the axle spindle, being careful to prevent the bearings from falling and becoming contaminated with dirt and grit. Clean the old grease from the bearings, hub, and spindle. Repack with clean wheel bearing grease and reassemble. Always replace the cotter key with a new one to ensure secure retention of the spindle nut.

## - ADJUSTMENTS -

Because of the unique design of the telescoping mast assembly used on the **SILENT MESSENGER**, maintenance has been kept to an absolute minimum. As mentioned above, no lubrication of the telescoping mast sections is required. From time to time, however, the nylatron wear pads, located at the top of the lower mast section and at the bottom of the upper mast section, may require adjustment. Raise the sign panel approximately two feet above the transport position and check for play at the bottom of the upper mast section by placing the locking lever in the locked position and attempting to rotate the sign panel assembly about the lower mast section. If there is more than a slight amount of play, the bottom wear pads may need to be adjusted.

To adjust the bottom wear pads, located on the indexing plate at the bottom of the upper mast section, you will need a 5/32 inch hex key. The objective is to have the nylatron pads snug against the lower mast. The set screws have been secured at the factory with a thread locking compound which may need to be broken loose prior to adjusting the lower wear pads. After the set screws have been loosened, gently turn each screw in until it stops. Back the set screw out 1/4 to 1/2 turn and re-secure with a suitable thread locking compound. Repeat procedure for all eight set screws at the bottom of the upper mast section.

The upper wear pads should not require adjustment under normal operating conditions, unless the hydraulic cylinder needs to be removed for service. If the upper wear pads should require adjustment, the hydraulic cylinder cover plate, located on the top of the upper mast section must be removed and the hydraulic cylinder must be partially extended. The solar arrays must be unlocked and pivoted into the inspection and cleaning position to gain clear access to the cover plate. See the repair section of the manual for additional information.

The sign panel support cradles should also be inspected periodically to ensure that they are providing proper support for the mast and sign panel assembly during transport. The bottom of the sign panel does not need to be in direct contact with the rubber pads when it is fully lowered. There may be some clearance to allow for normal movement of the mast and sign panel assembly during transport. The purpose of the round rubber pad is to support the sign panel when the mast assembly comes under excessive stress during transport to prevent any damage to the mast and sign panel assembly.

The vertical face of the sign support cradle should fit snugly against the sign panel when the sign panel is lowered into the transport position. The sign support cradles position can be adjusted by loosening the four screws that secure the cradle to the trailer frame, and sliding the cradle toward the rear of the sign panel until it is snug, then tighten the four screws to hold the cradle in position. Adjust both cradles so that each cradle is in approximately the same position to ensure that the sign panel is in line with the trailer tongue during transport. This will minimize wind loading on the sign panel during transport.

The hydraulic surge brake system installed on the **SILENT MESSENGER SOL-R-SIGN** trailer incorporates an automatic adjustment feature which, under normal operating circumstances, should not require any manual adjustment of the brakes. The brake shoes are

automatically adjusted for lining wear whenever the trailer is moving rearward up an incline. Activating the brakes while the trailer is backing uphill causes the brake adjuster to activate and compensate for brake shoe lining wear. The brakes can also be adjusted manually using a brake adjustment tool via the access port in the inside surface of the brake mechanism backing plate. The hydraulic surge brake system can be checked very easily by raising the trailer with the four outrigger swivel jacks until the wheels are off the road surface and using a tow vehicle coupled to the trailer to apply and release pressure to the brake actuator. Both wheels should lock up when pressure is applied to the actuator and release when the rearward pressure is released. The brakes can be checked for proper adjustment at this time as well. The wheels should rotate freely with the brake shoes just slightly rubbing the brake drums with no force applied to the brake actuator. Adjust the brake shoe position if necessary.

## - BATTERIES -

When servicing the batteries, as with any lead acid type battery, there are a few precautions that should be observed:

1.) Never expose the area over and around an open battery compartment to a spark or open flame. Lead acid type batteries produce hydrogen gas during a recharge cycle and an accumulation of the gas exposed to a spark or flame could result in an explosion! Since hydrogen gas is much lighter than air and dissipates very quickly, the only area of concern is immediately above and around the battery compartment.

2.) Always exercise extreme care when using metal tools around the battery terminals. The batteries used in the **SILENT MESSENGER** have an extremely large energy storage capacity and can generate several thousand Amperes of current if the terminals are shorted out by a metal tool. This high current will cause the tool to heat up very quickly and possibly spray molten metal at the point of contact. The battery bank operates at a very low voltage level, specifically 12 Volts, which is not high enough to present any danger of electrical shock. However, the battery bank's ability to generate very high current necessitates the exercising of extreme caution when working around the battery terminals.

3.) The electrolyte used in lead acid batteries, whether liquid or gel, is highly corrosive and can cause skin irritation and burns. Use caution, whenever batteries are being serviced or replaced, to avoid spillage or case damage. If any of the electrolyte comes into contact with skin or clothing, remove it immediately by flushing with plenty of clean water.

***Gloves and safety goggles should be worn anytime service or repair work is being performed on the batteries or electrical terminals!***

The batteries, in general, require very little care and maintenance. The most important aspect of optimizing the service life of the batteries is fluid level maintenance. The electrolyte level must always be maintained at a level above the plates inside the battery. If the electrolyte level drops below the tops of the plates, the portion of the plates that have been exposed will be permanently damaged. The electrolyte level is very easily maintained by simply adding distilled water as needed.

Simply remove the vent caps from each cell of the battery, check the level of the fluid, and add distilled water, if necessary, to bring the electrolyte level up to the indicator ring located in the opening. A battery water dispenser, available at most auto parts supply stores, will expedite and simplify the process.

Battery fluid level should be checked every three to four months in temperate climates and every 30 days in very warm climates. Remember, if the fluid level is not maintained, the useful life of the batteries will be dramatically shortened!

The only other maintenance items that should be performed on the batteries can be completed at the same time that the electrolyte level is being checked. Make sure that the fasteners

holding the cables on the battery terminals are tight and that any fluid or residue buildup on the tops of the batteries is removed. Use a damp cloth or sponge to wipe off any buildup. This will help prevent corrosion of the terminals and the battery compartment and minimize breakdowns due to loose or corroded electrical terminals.

From time to time, the battery bank may require a maintenance recharge using an auxiliary line-powered battery charger to optimize the energy storage capacity of the battery bank. If the **SILENT MESSENGER** is operating in extremely low temperatures with limited sunlight availability, the battery bank may become discharged to the point where the system is shut down to conserve power and prevent over-discharging the battery bank. If this should happen, the battery bank should be recharged by an auxiliary battery charger as soon as possible. If the batteries are allowed to remain in a discharged state in low temperatures, the electrolyte may freeze and permanently damage the batteries.

The **SILENT MESSENGER** uses a very high energy storage capacity battery bank. Recharging this battery bank is not like recharging an automobile battery. The charging process requires a large amount of energy which means that a typical household auto battery charger is not going to do the job! The battery bank consists of six-volt batteries wired in a series and parallel combination to create a 12-volt battery bank with appropriate energy storage capacity. The battery charger must be for 12-Volt batteries and must have a suitable output current rating.

**SILENT MESSENGER:** A 60-Amp battery charger will fully recharge a depleted battery bank in 24 to 36 hours. A 120-Amp charger in about 12 to 18 hours.

**SILENT MESSENGER II AND III:** A 40-Amp battery charger will fully recharge a depleted battery bank in 20 to 24 hours. A 60-Amp charger in about 12 to 15 hours.

So as you can see, it takes a high capacity battery charger and a substantial amount of time to fully recharge the high capacity battery bank used in the **SILENT MESSENGER**.

To charge the battery bank simply connect the positive (**RED**) lead from the battery charger to the positive (**POS**) terminal of one of the batteries in the battery bank with a **RED** jumper wire 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 a **BLACK** jumper wire attached.

**NOTE:** *Do not connect the charger leads to the battery terminals that have jumper wires connecting the negative (**NEG**) terminal of one battery to the positive (**POS**) terminal of another battery in the battery bank!!! These wires connect two 6-Volt batteries in series to produce the 12-Volt power required by the **SILENT MESSENGER's** electrical system.*

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

Do not attempt to charge the battery bank by connecting the battery bank to a running automobile! This will not cause harm to either the car or the message sign. However, since the alternator in the vehicle is connected through a charge regulation system to an already

charged battery (the vehicle's), the voltage generated will not be sufficient to produce an adequate flow of energy into the message sign's battery bank. You must use a line-powered auxiliary battery charger with sufficient capacity to do the job right.

Properly maintained batteries will provide long service life. Protect your investment! Take care of your batteries!

**- QUERTY KEYBOARD CONTROL CONSOLE (P/N - MB-22-905) -**

The Main **CONTROL CONSOLE** for the Message Board includes a Central Processing Unit (CPU) Board that contains a battery to provide backup power for the nonvolatile memory. The nonvolatile memory contains all user files and records. The backup battery should be replaced once a year to insure that none of the user files are lost or corrupted when main power is switched off. Use a suitable high-energy lithium battery as a replacement. The following batteries are acceptable substitutes:

Duracell	DL2032
Eveready	ECR2032
Ray-O-Vac	BR2032
Panasonic	BR2032
Radio Shack	CR2032

Carefully replace the battery while the Main Power switch is in the **ON** position. This will insure that any user created messages and sequences are retained in memory while the backup battery is out of service. Do not allow the metal battery case to come into contact with any components on the circuit boards! Possible damage to the CPU Board or the Power Supply and Interface Board that would not be covered by the warranty could occur.



# **SILENT MESSENGER**

**PORTABLE CHANGEABLE MESSAGE SIGNS**

**Troubleshooting and Repair**



## 2. TROUBLESHOOTING & REPAIR

Even with the finest quality equipment, things do occasionally go wrong. That's when the true quality begins to show through. Quality in design! Designed in conveniences that optimize service and repair, and get the equipment back on the job as quickly and efficiently as possible. The **SILENT MESSENGER** has been designed precisely that way! Modular construction that simplifies repairs and minimizes costs. Easy servicing to minimize downtime. And finally, the ability to upgrade and maximize the service life of your investment. Designed-in quality that protects your investment now and into the future!

### - MAIN CONTROL CONSOLE -

The **MAIN CONTROL CONSOLE** provides several built-in troubleshooting aids as part of the basic operating programs. The ability to check battery voltage, ambient light levels, display character modules, automatic shutdown voltage set points, library file status, and more, right there in the field, allows much of the service and many of the repairs to be completed at the work site without the need to transport the unit to a service center.

Many test and troubleshooting functions are available in the **MAIN CONTROL CONSOLE** operating software. Refer to section 5 of this manual for instructions on how to use these built-in test and troubleshooting functions. This section of the manual also lists the factory defaults for various system operating parameters. Compare the current settings with the factory defaults to check for any discrepancies that could effect system operation. If any operating parameter settings are different from the factory defaults and you wish to correct them, refer to section 5 of this manual for instructions.

### **QWERTY KEYBOARD MAIN CONTROL CONSOLE (P/N - MB-22-905):**

If at any time the display panel on the control console remains completely blank after **MAIN POWER** is switched on, check the **CONTRAST** control located on the front left-hand corner of the Power Supply and Interface Circuit Board in the Control Console. Remove the eight (8) #8 phillips head screws securing the top cover of the Control Console and remove the top. Exercise care since the top of the Control Console has several cables connected to the Power Supply and Interface Circuit Board. Locate the **CONTRAST** adjustment control on the circuit board and rotate the control while watching the display panel on the Control Console front panel. It may be necessary to turn the control several revolutions before observing any effect on the display. Adjust the **CONTRAST** control for the best quality display. Under average ambient temperature conditions the **CONTRAST** control should never require any adjustment, however under relatively low ambient temperature conditions, typically 20 degrees Fahrenheit (-8 degrees Celsius), the **CONTRAST** control may require minor adjustment to improve the visibility of the display. (Note: there is no contrast adjustment on the *Mega-Tech* Touch-Screen Control Console.)

**Control Console will not power up!**

In the event that the unit fails to power up when **MAIN POWER** is switched **ON**, check the **MAIN POWER SWITCH / CIRCUIT BREAKER** to make certain that it has not tripped. The **MAIN POWER SWITCH** includes an automatic electrical circuit protection device to protect the electrical system in the event of an over-current condition. If the **MAIN POWER SWITCH** is tripped, switch it **OFF** and back **ON**. If it trips again, contact technical support at the factory for assistance. Check the display on the **ENERGY MANAGEMENT SYSTEM CONTROL UNIT** to determine if the **BATTERY BANK** voltage is greater than 12.0 Volts. If the **BATTERY BANK** voltage is zero, check the wiring between the batteries and the **ENERGY MANAGEMENT SYSTEM CONTROL UNIT**. If the **BATTERY BANK** voltage is less than 12.0 Volts, recharge the **BATTERY BANK** using a line-powered auxiliary battery charger.

Check all **CONTROL CONSOLE** and **ENERGY MANAGEMENT SYSTEM CONTROL UNIT** electrical connections. If all cables and connectors are in place and the control console still fails to power up, contact the technical support group at the **SOLAR TECH** factory for further assistance.

## - SIGN DISPLAY PANEL -

When the **MAIN POWER** is switched **ON**, the system goes through several hardware check and initialization routines before the data files are updated and sequences are displayed. The main message display panel momentarily flashes all of the pixels on shortly after **MAIN POWER** is switched **ON**. This indicates that power has been applied to the main display panel and all character modules are active. If one or more of the display modules fails to flash or display the programmed messages correctly, it means that a display module(s) is either defective or is not receiving power. The sign display panel needs to be checked!

### **Display Modules are not working properly!**

Messages are sent to the main display panel by the control console in much the same way that a host computer sends information to workstations in a computer network. The messages are sent to display module #1 first, then on to display module #2, then to #3, and so on. If one or more of the display modules is not correctly displaying the messages, the problem is usually with the first display module that is not working. It is important to remember that the display modules are completely interchangeable and are not position dependent. That is, any display module will function in any position without the need to set any switches or install any jumpers on the circuit board. Therefore, if a display module is not working properly, simply interchange the module with the last one in the bottom row, #24, to verify if the suspected display module is indeed bad or if it is the next one in line that is faulty. The display modules can be swapped in and out while the message sign is powered and operating. This feature dramatically reduces the amount of time required to troubleshoot and repair the display panel. When "hot swapping" display modules, that is, interchanging display modules with power on, exercise caution to avoid contacting any exposed terminals on the back of the display module with the metal mounting frame.

**NOTE:** Electrostatic discharge can damage the circuitry on the display module circuit board. If a display module must be returned to the factory for service, immediately upon removing it from the sign panel frame, place the module in an antistatic bag or wrap the module in antistatic material for safe transport. If antistatic material is not available, wrapping the display module circuit board in aluminum foil will provide adequate protection.

To access the interior of the sign panel, unlock the sign panel door latches by gently lifting up at the end of the latch toward the rear of the sign panel and unhooking the latch from the door frame. Make sure that all of the door latches have been disengaged before attempting to open the door. Firmly grasp the center of the door at the bottom edge and pull forward and up until the door supports reach the end of their travel and stop any further upward movement of the door. Now gently allow the door to lower until the door supports engage and hold the door in the open position. You will now have access to the entire sign panel for service and repair. Each display module is held in place by 1/4-turn wing head fasteners. Simply turn each fastener 1/4 turn counterclockwise to unlock the fastener, then gently lift the display from the mounting rails. The power and control signal connector is a locking-type connector and must be unlocked before it can be removed. Press the tabs on the ends of the power connector and pull straight out to remove it. You may have to rock the connector from side to side to loosen it from the mating receptacle on the circuit board.

If you remove display module #17 you will be able to see the Sign Panel Interconnect Circuit Board. This board provides for distribution of power and control signals to the entire sign panel. The Sign Panel Interconnect Board also includes LEDs to indicate that power is available to the sign panel and that data is being sent to the sign panel from the Control Console and that the sign panel is returning data to the Control Console so the Control Console can verify that the sign panel is working.

If one or more of the display modules is not working properly, the **SIGN PANEL FAILSAFE FEATURE** will disconnect power to the display modules. If this condition exists, the **POWER IN** indicator on the Sign Panel Interconnect Board will be **ON** but the **POWER OUT** indicator will be **OFF**. If this is the case, follow the instructions in the Sign Panel Failsafe Status section of the Check System Status Menu to temporarily disable the **SIGN PANEL FAILSAFE FEATURE** so you can locate the problem display module in the sign panel.

After exchanging the suspect display module, check the connector along the bottom edge of the display module circuit board to make sure that the plug and cables are all present and seated completely into the connector and the locking tabs are engaged. Carefully position the display module in the center of the opening, taking care to make sure that the fasteners slip into the mating receptacles, then gently but firmly press on the module and rotate each fastener clockwise until it locks into place. The wing heads should be oriented vertically when the fasteners are locked. Check for proper display function prior to closing the sign panel door. When everything is working properly on the main display panel, grasp the door frame in the center of the bottom edge, lift up until the door supports again hit their stops, and lower the door into the closed position. Make sure that the bottom of the door frame rides up and over the protective lip at the bottom edge of the sign case frame. Secure the door in the closed position by hooking and latching all of the door panel latches located around the perimeter of the sign panel case. The weather-strip seal will compress as the door latches are secured.

(Note: For Mega-Tech Touch-Screen Control Consoles follow instructions provided on Control Console Display.)

### **Sequence is not displayed as anticipated!**

There are several reasons why a sequence you just added to the **SEQUENCE QUEUE** is not displayed as expected. The most likely situation is that another sequence was previously placed in the **QUEUE**, to be displayed forever (continuously) and will be displayed indefinitely until it is removed from the **QUEUE**. In order to more fully understand how the **SEQUENCE QUEUE** works, think of adding a sequence to the **QUEUE** in the same way as getting in line at a service counter. The first person in line is waited on first and remains at the counter until they are finished being served. When the first person is finished, the second person in line moves up to the counter. When the second person is finished, the third person moves up to the counter to be waited on, and so on and so on. If the first person in line takes forever, as it so frequently seems, then the second person will never be waited on. And so it is with the **SEQUENCE QUEUE**. Once a sequence has been added to the **QUEUE**, to be displayed forever, it will literally remain there forever. In order for another sequence added to the **QUEUE** to be displayed, the first sequence must be removed (deleted) from the **QUEUE**.

Use the **CHECK QUEUE LIBRARY** special function key (**F8**) while in the **USER MENU** or the **CHECK CONTENTS OF QUEUE** function in the **SEQUENCE QUEUE LIBRARY MENU** to examine the current contents of the **SEQUENCE QUEUE** to determine if there are any conflicting entries. Remember, even if the sequences entered into the **QUEUE** were not specified "to be displayed forever", but were assigned start and stop times, it is still important to check for conflicts or overlapping start and stop times. This can also cause unexpected sequences to be displayed on the message sign. Remove any unnecessary entries in the **QUEUE** and check for any remaining conflicts. If in doubt, simply remove all current entries from the **QUEUE** and add the desired sequences with the appropriate display time parameters.

If sequences have been added to the **SEQUENCE QUEUE** with start and stop times and the sequences are not coming on and off as expected, check to make sure that you entered the start and stop times using 24-hour format for the hour setting and check the clock/calender setting to make sure that the time and date are correct. Use the **CHECK SYSTEM SETTINGS MENU** in the **SUPERVISOR MENU** to check the current time and date settings and to make any necessary adjustments.

Finally, if the display comes on in the morning and goes off in the evening, the automatic low voltage shutdown set point may be incorrect. The low voltage shutdown feature protects the battery bank from becoming over discharged in the event that the solar electric generator is not producing sufficient energy output to recharge the batteries. The factory default setting for low voltage shutdown is 10.7 Volts. If this set point is inadvertently changed to an excessively high voltage, such as 12.8 Volts, the display will shut off at night when the battery voltage drops below 12.8 Volts and automatically switch back on in the morning when output from the solar array boosts the battery voltage back up over 12.8 Volts. The low voltage shutdown setpoint should not be changed from the factory default setting of 10.7 Volts without first consulting with factory technical personnel to discuss the particular situation to determine if altering the setpoint will improve reliability and operation or indeed make matters worse!

If all of the above checks have been performed and you are still unable to get the desired sequence to display, it may be time to call for help. Make certain that you have:

1. Added the required messages to the **MESSAGE LIBRARY**
2. Added the desired sequence to the **SEQUENCE LIBRARY**
3. Added the sequence to the **SEQUENCE DISPLAY QUEUE**
4. Checked that the Sign Panel Display is set to **ON**

prior to contacting the factory.

(Note: For Mega-Tech Touch-Screen Control Consoles follow instructions provided on Control Console Display.)

If all else fails, call for help! **SOLAR TECH** technical support personnel are always available to assist you.

## - SOLAR ENERGY MANAGEMENT SYSTEM -

The **SILENT MESSENGER's SOLAR ENERGY MANAGEMENT SYSTEM** consists of a multi-panel solar array, an **ENERGY MANAGEMENT SYSTEM CONTROL UNIT**, and a battery bank. The solar array, consisting of multiple photo voltaic panels, generates electricity whenever the array is exposed to sunlight. The **ENERGY MANAGEMENT SYSTEM CONTROL UNIT** monitors the solar array output, ambient temperature, the battery bank condition and regulates the flow of power generated by the solar array into the battery bank. Together the system components provide an economical, renewable source of energy for the **SILENT MESSENGER's** display panel and control console.

When everything is working properly the solar power system will provide more than enough energy to operate the **SILENT MESSENGER** continuously, in all kinds of weather, in any geographical location. If the battery bank voltage is not being properly maintained by the solar power system, it is time to perform some preventive and possibly some corrective maintenance to alleviate the problem.

The first step in correcting a low battery voltage situation is to make certain that the upper surface of the solar panels is clean. Dirty solar panels may work fine in the summer time when plenty of sunlight is available. However as Fall approaches and the days become shorter, the reduced amount of available sunlight is unable to penetrate the dust and dirt buildup and generate enough energy to completely recharge the battery bank. Clean the surface with water and a mild detergent or with a window cleaning product.

The next step is to check the output from the solar array and the power currently being consumed by the message board. The **ENERGY MANAGEMENT SYSTEM CONTROL UNIT**, in addition to regulating the flow of power into the battery bank, also monitors the power output of the solar array, the power supplied by the battery bank, and the overall condition of the battery bank.

During daylight hours, when adequate sunlight is available, the **ENERGY MANAGEMENT SYSTEM CONTROL UNIT** will display the solar array voltage and current supplied to the battery bank as well as the present battery bank voltage and current being used by the message display panel and control console. At noon on a bright sunny day, while the **SILENT MESSENGER** is displaying a typical sequence of messages, the current supplied by the solar array should be approximately 1 1/2 to 3 times the current used from the battery bank to operate the unit. This will insure continuous, uninterrupted operation. If the current supplied by the solar array is not adequate, the battery bank will eventually discharge and the unit will automatically shut down.

During the night, the **ENERGY MANAGEMENT SYSTEM CONTROL UNIT** continues to monitor the solar array and the battery bank. The output from the solar array will, of course, be zero during the night, however the output voltage of the battery bank will be displayed along with the current being consumed by the unit from the battery bank. The **CHARGING** indicator will flash and the LCD screen will also display the message "**SOLAR TECH**" and the **ENERGY MANAGEMENT SYSTEM CONTROL UNIT's** current firmware version, indicating that the charging circuit is inactive.



If the battery bank voltage drops below 10.7 Volts, the **ENERGY MANAGEMENT SYSTEM CONTROL UNIT** will automatically switch power to the message board off. Main power will remain off until the battery bank is recharged to a voltage of 12.0 Volts or greater. The solar array, when it receives adequate sunlight, will provide the necessary energy to recharge the battery bank. However, if the battery bank is discharged to the point where the automatic low battery voltage shutdown feature disconnects main power, the battery bank should be recharged by an auxiliary battery charger capable of providing at least 15 Amps per pair of six-volt batteries in the battery bank. This will insure that the batteries have completely recovered and will help insure maximum service life.

If the current output from the solar array is inadequate the solar array must be checked further. The solar array should generate a minimum current of 2 to 3 Amps per solar panel in good sunlight. Make certain that the upper surface of the solar panels is completely cleaned prior to checking output current. Dirt and dust accumulation on the upper surface of the solar panels will significantly reduce the output current. If the current reading is lower than expected, each solar panel should be evaluated individually. Open the junction boxes on the bottom of the solar panels and remove the red wire from the terminal block to isolate the solar panels. Check each panel for proper output voltage and current. If one solar panel is not operating properly, the power output for the entire array can be adversely affected. When all testing is complete and the problem solar panel has been located and replaced, reconnect the leads to the solar panels and reconnect the solar array power output leads to the charge controller, observing correct polarity. Make certain that all connections are secure and that all wire terminals are properly tightened. Install the junction box covers and tighten screws to insure a weather-tight seal.

To check message board energy consumption, using Quick Programming or standard programming in the User Menu if you would like to save the sequence permanently, to create a single-message sequence as follows:

**CAUTION**  
**CAUTION**  
**CAUTION**

using three-line normal character size (font).

For the **SILENT MESSENGER** current consumption during daylight hours, with the display at full intensity, should be approximately 8.5 Amps. The current consumed by the message board during night time operation should be significantly less than the current consumed during daylight hours. During the night the battery bank current should be approximately 1.2 Amps.

For the **SILENT MESSENGER II** current consumption during daylight hours, with the display at full intensity, should be approximately 6.5 Amps. The current consumed by the message board during night time operation should be significantly less than the current consumed during daylight hours. During the night the battery bank current should be approximately 1.2 Amps.

For the **SILENT MESSENGER III** current consumption during daylight hours, with the display at full intensity, should be approximately 4.5 Amps. The current consumed by the message

board during nighttime operation should be significantly less than the current consumed during daylight hours. During the night the battery bank current should be approximately 1.2 Amps.

Use the **CHECK AMBIENT LIGHT LEVEL** feature in the **CHECK SYSTEM STATUS** Menu to verify that the sign panel display brightness is at high for daylight current consumption measurements and at low for night time measurements.

**SolarTech** factory service technicians are available for assistance in selecting the proper test equipment and performing solar panel power output checks.

### **- SILENT MESSENGER HYDRAULIC SYSTEM -**

The electrohydraulic power system for raising and lowering the sign panel consists of a power unit, a connecting line, a velocity fuse, and a single acting ram cylinder. The system provides power to lift the sign panel into the operating position and hold it there safely during normal operation. The velocity fuse provides a safeguard against unexpected rapid descent of the sign panel in the event of a power unit failure or hydraulic line rupture.

To raise the sign panel, simply pull on the lever to apply power to the hydraulic pump and pressure to the cylinder. To lower the sign panel, push on the lever. The sign panel rate of descent is controlled by a flow control valve located in the power unit. The velocity fuse should not activate under normal operating conditions! If the fuse should set, check the hydraulic system thoroughly for ruptured hoses or leaking fittings. The velocity fuse can be reset by applying pressure to the system until the pressure on the line side of the fuse exceeds the pressure on the load side. If the system will not pressurize, the cause of the problem must be resolved and the velocity fuse must be reset. The sign panel can then be safely lowered.

The power unit reservoir may require additional hydraulic fluid from time to time. Raise the sign panel to its full height operating position and check the fluid level in the reservoir. There should be about 1 to 1 1/2 inches of oil in the reservoir with the cylinder fully extended. If fluid is required use Dexron II ATF (Automatic Transmission Fluid) only. Do not overfill!

### **- SILENT MESSENGER II & III WINCH AND CABLE SYSTEM -**

If the automatic brake mechanism on the winch fails to properly control the descent of the sign panel, the entire winch should be replaced. Replace the wire rope if it should become kinked or frayed. Keep equipment safe by keeping it properly maintained!

# **SILENT MESSENGER**

**PORTABLE CHANGEABLE MESSAGE SIGNS**

**Parts Diagrams:  
Silent Messenger Series**



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Front 150W Solar Array  
 MB-24-150-F  
 Includes:  
 MB Solar Array Frame  
 110-024-340  
 75W Solar Panel, 2ea.  
 980-024-075

Rear 150W Solar Array  
 MB-24-150-R  
 Includes:  
 MB Solar Array Frame  
 110-024-340  
 75W Solar Panel, 2ea.  
 980-024-075

Rear 225W Solar Array  
 MB-24-225-R  
 Includes:  
 MB Solar Array Frame  
 110-024-340  
 75W Solar Panel, 3ea.  
 980-024-075

Front 225W Solar Array  
 MB-24-225-F  
 Includes:  
 MB Solar Array Frame  
 110-024-340  
 75W Solar Panel, 3ea.  
 980-024-075

MB-1548 consists of:  
 - MB-24-150-F (2 panel), 1 ea.

MB-2248 consists of:  
 - MB-24-225-F (3 panel), 1 ea.

MB-3048 consists of:  
 - MB-24-150-F (2 panel), 1ea.  
 - MB-24-150-R (2 panel), 1ea.

MB-3748 consists of:  
 - MB-24-225-F (3 panel), 1ea.  
 - MB-24-150-R (2 panel), 1ea.

MB-4048 consists of:  
 - MB-24-225-F (3 panel), 1ea.  
 - MB-24-225-R (3 panel), 1ea.

Message Board Mast Assembly  
 (includes sign and sign support assemblies)  
 MB-24-103 (1ea.)

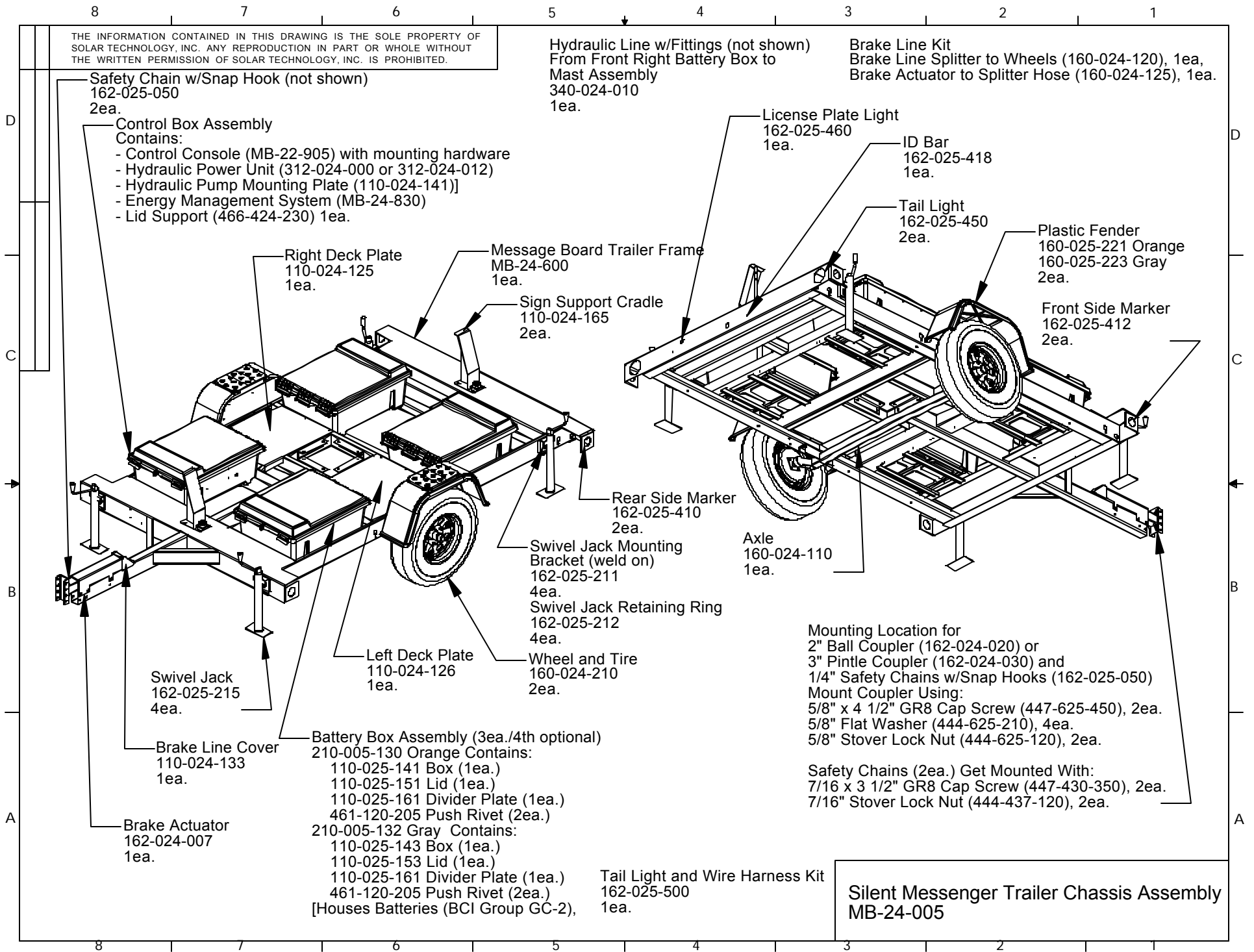
Solar Array Power Cable  
 962-124-107 (1ea.)

Sign Power and Control Cable  
 (Battery Box to Display Panel)  
 962-124-109 (1ea.)

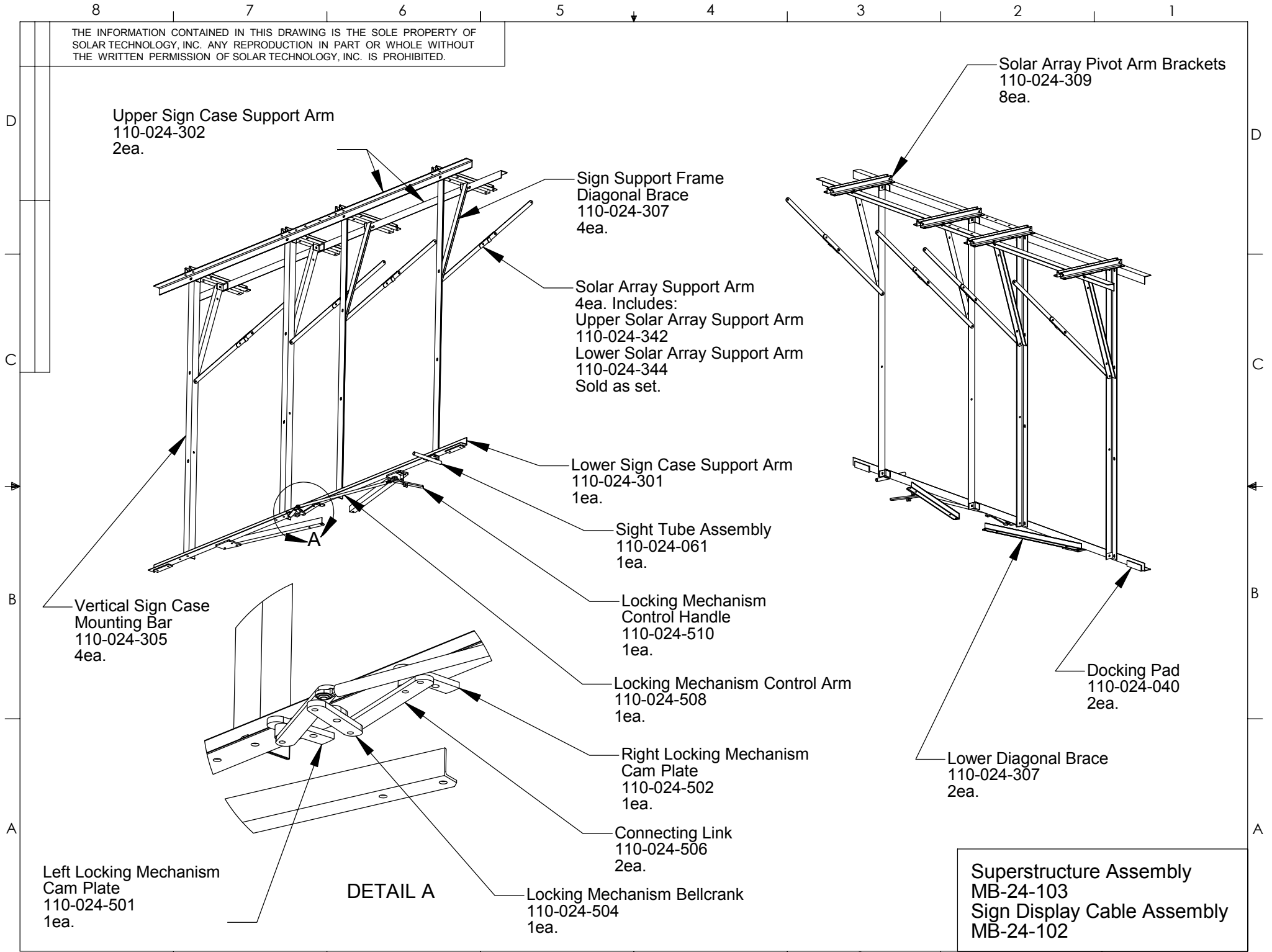
Message Board Trailer Chassis Assembly  
 MB-24-005  
 1ea.

Battery Box Power Cables  
 (Battery Box to Battery Box)  
 962-124-045 (45" Front to Rear) - 1 ea. (2 ea. for models with 4th battery box installed)  
 962-124-032 (30" Front to Front) - 1 ea.  
 962-124-036 (36" Rear to Rear) - 1 ea. (only for models with 4th battery box installed)  
 962-124-090 (90" Front to Rear) - 1 ea. (for models with only 3 battery boxes installed)

Silent Messenger Assembly  
 MB-1548 - 150W, 2 Panel  
 MB-2248 - 225W, 3 Panel  
 MB-3048 - 300W, 4 Panel  
 MB-3748 - 375W, 5 Panel  
 MB-4048 - 450W, 6 Panel



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Upper Sign Case Support Arm  
110-024-302  
2ea.

Sign Support Frame  
Diagonal Brace  
110-024-307  
4ea.

Solar Array Support Arm  
4ea. Includes:  
Upper Solar Array Support Arm  
110-024-342  
Lower Solar Array Support Arm  
110-024-344  
Sold as set.

Lower Sign Case Support Arm  
110-024-301  
1ea.

Sight Tube Assembly  
110-024-061  
1ea.

Locking Mechanism  
Control Handle  
110-024-510  
1ea.

Locking Mechanism Control Arm  
110-024-508  
1ea.

Right Locking Mechanism  
Cam Plate  
110-024-502  
1ea.

Connecting Link  
110-024-506  
2ea.

Locking Mechanism Bellcrank  
110-024-504  
1ea.

Solar Array Pivot Arm Brackets  
110-024-309  
8ea.

Docking Pad  
110-024-040  
2ea.

Lower Diagonal Brace  
110-024-307  
2ea.

Vertical Sign Case  
Mounting Bar  
110-024-305  
4ea.

Left Locking Mechanism  
Cam Plate  
110-024-501  
1ea.

DETAIL A

Superstructure Assembly  
MB-24-103  
Sign Display Cable Assembly  
MB-24-102

8 7 6 5 4 3 2 1

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Upper Mast and Hydraulic Cylinder Cover Plate  
110-024-025  
1ea.

58" Stroke Hydraulic Cylinder (310-024-550),  
Velocity Fuse (473-375-910), and  
Compression Fitting Enclosed in Mast Assembly  
1ea.

Upper Mast Weldment  
110-024-116  
1ea.

Rotor Plate Cover Assembly  
110-024-024  
1ea.

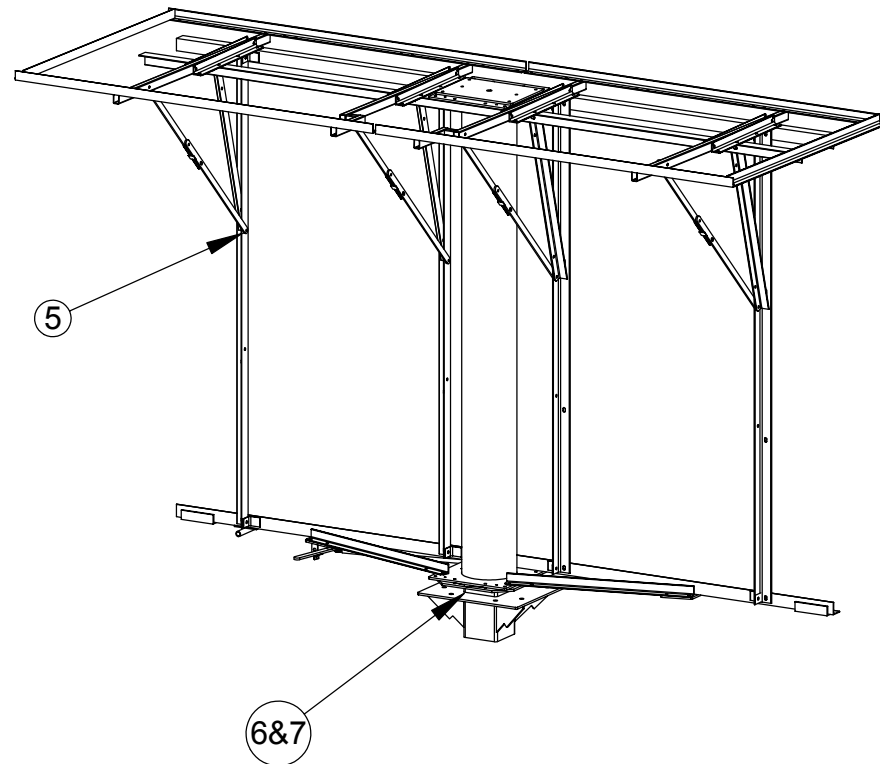
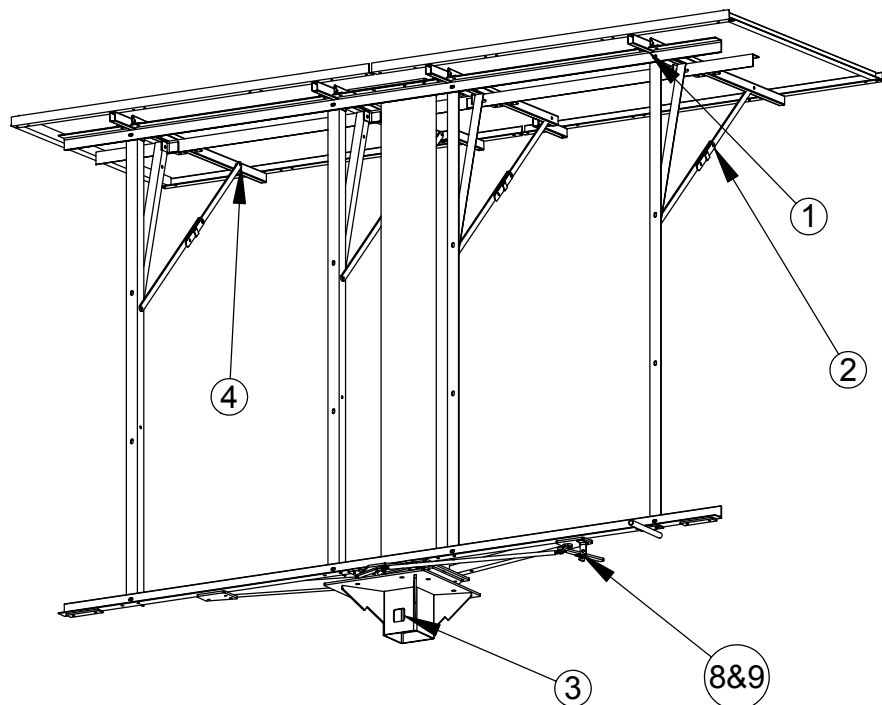
Upper Mast Rotor Plate Assembly  
110-024-027  
1ea.  
[Includes Rotor Plate (110-024-026),  
Wear Pads (110-024-031),  
Compression Springs (470-501-375),  
and Mounting Hardware]

Lower Mast Weldment  
110-024-114  
1ea.

Silent Messenger Mast Assembly  
MB-24-101



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- 1.) 3/8" x 2 1/2" GR5 Cap Screws (445-370-250), 4ea.  
 3/8" SS Flat Washer (450-375-210), 8ea.  
 3/8" Nylon Flat Washer (444-375-212), 8ea.  
 3/8" Nylon Insert Lock Nut (444-375-130), 4ea.

- 2.) 3/8" x 1 1/2" GR5 Cap Screw (445-370-150), 4ea.  
 3/8" SS Flat Washer (450-375-210), 8ea.  
 3/8" Nylon Flat Washer (444-375-212), 4ea.  
 3/8" Nylon Insert Lock Nut (444-375-130), 4ea.

- 3.) Flared Fitting (Part of Hydraulic Line w/Fittings Kit (340-024-010), 1ea.  
 Velocity Fuse (473-375-910), 1ea.  
 Velocity Fuse Screws into Hydraulic Cylinder (310-024-550)  
 Flared Fitting Screws into Velocity Fuse

- 4.) 3/8" x 2 1/2" GR5 Cap Screw (445-370-250), 4ea. (Nut Side In)  
 3/8" SS Flat Washer (450-375-210), 16ea.  
 3/8" Stover Lock Nut (444-375-120), 4ea.  
 1/2" Hex Nut (444-500-110), 4ea.

- 5.) 3/8" x 1 1/2" FT SS Cap Screw (448-376-150), 4ea.  
 3/8" Serrated Flange Hex Nut (444-375-125), 4ea.  
 3/8" Nylon Insert Lock Nut (444-375-130), 4ea.  
 3/8" SS Flat Washer (450-375-210), 8ea.

- 6.) Attach Control Arm (110-024-508) to the Crank Weldment (110-024-504) Using the Bottom Right Hole with:  
 5/16" x 1" GR5 Cap Screw (445-310-100), 1ea.  
 5/16" Stover Lock Nut (444-312-120), 1ea.

- 7.) Attach the Crank Weldment (110-024-504) to the Mast Rotor Cover Plate Assembly (110-024-024):  
 3/8" x 2" GR5 Cap Screw (445-370-200), 1ea.  
 3/8" Nylon Flat Washer (444-375-212), 1ea.  
 3/8" Stover Lock Nut (444-375-120), 1ea.

- 8.) Attach Control Handle (110-024-510) to the Lower Sign Case Support Arm (110-024-301) using:  
 3/8" x 2" GR5 Cap Screw (445-370-200), 1ea.  
 3/8" SS Flat Washer (450-375-210), 1ea.  
 3/8" Stover Lock Nut (444-375-120), 1ea.  
 3/8" Nylon Flat Washer (444-375-212), 1ea.

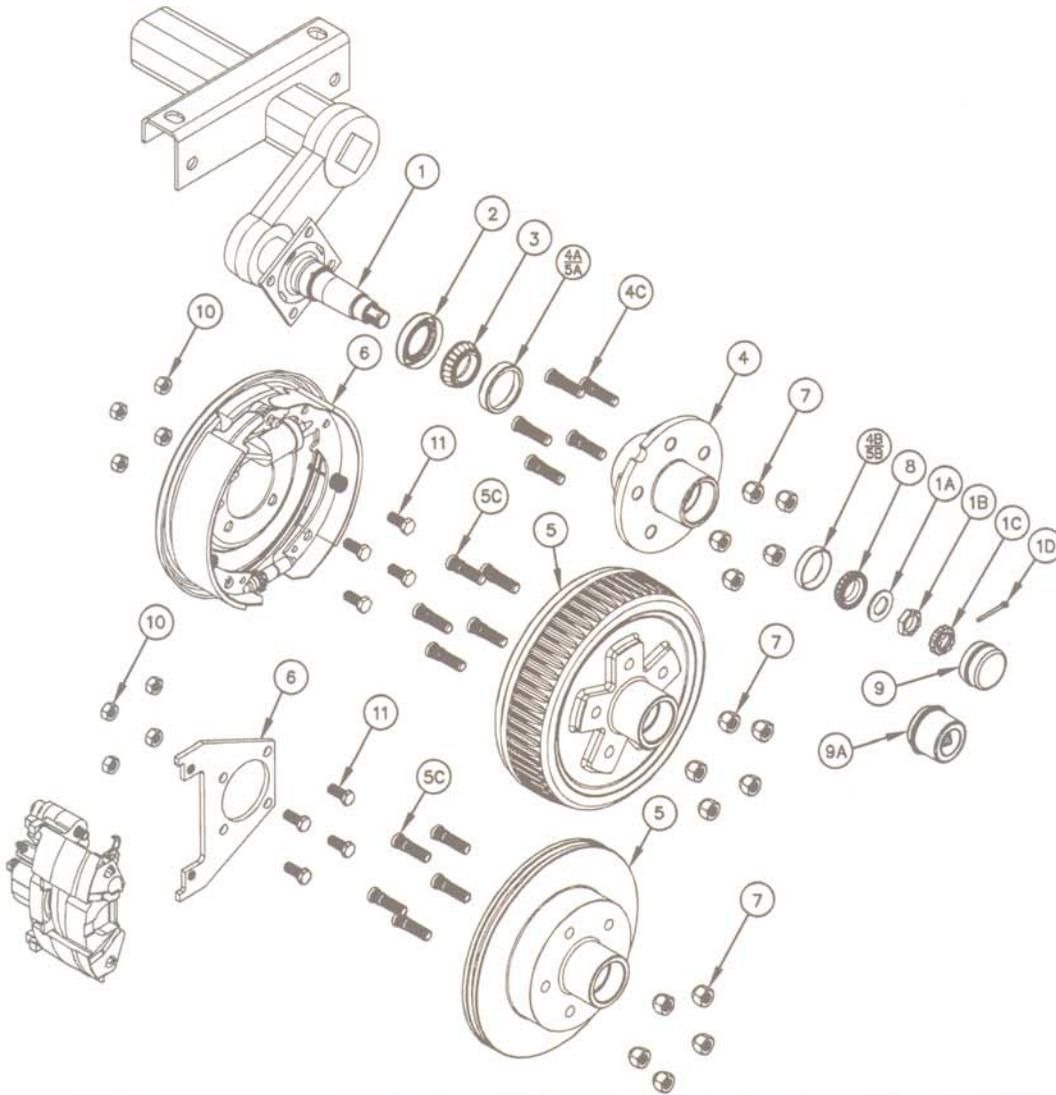
- 9.) Attach Control Handle (110-024-510) to the Control Arm (110-024-508) Using:  
 5/16" x 1" GR5 Cap Screw (445-310-100), 1ea.  
 5/16" SS Flat Washer (450-312-210), 2ea.  
 5/16" Stover Lock Nut (444-312-120), 1ea.

Silent Messenger MB-24-103  
 Superstructure Hardware



# 2500-3700 lb. Rubber Torsion Hub and Drum Options

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

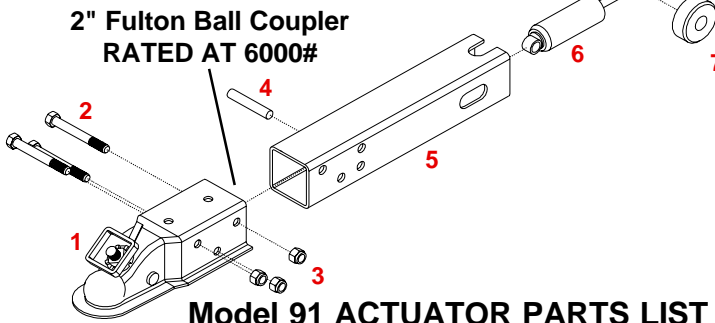
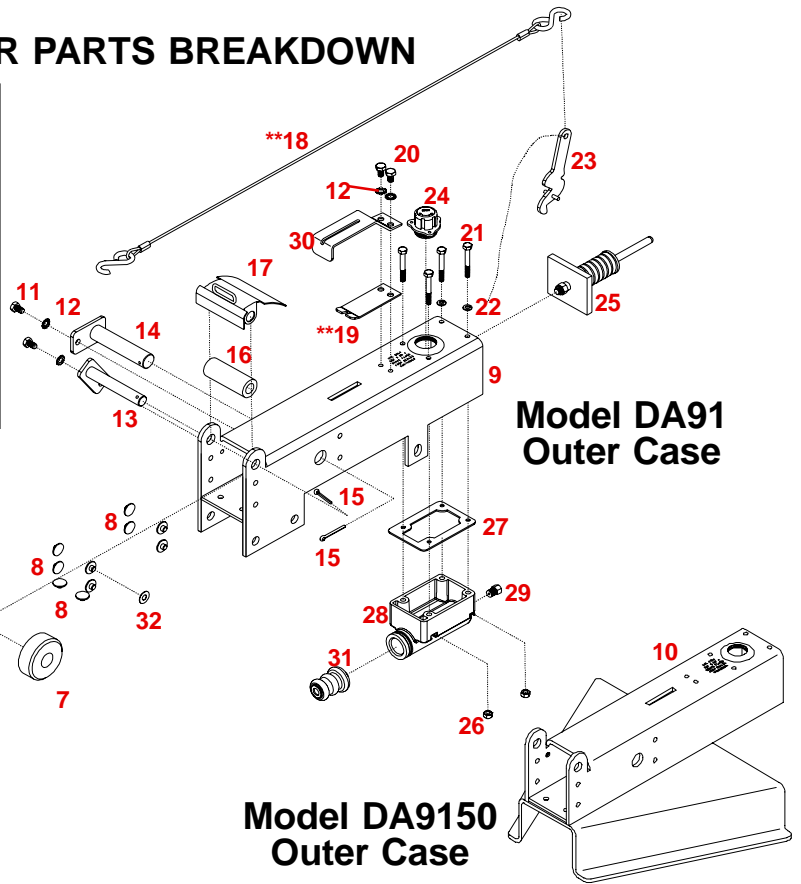
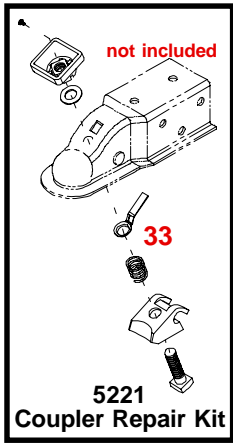


Detail	Part Number	Description
1	To Be Assigned	Rubber Torsion Axle - 2500-3700 lbs.
1A	DW-813	Spindle Washer - 13/16" - 'D' Flat
1B	SN-813	Spindle Nut - 13/16"-20
1C	LS-813	Spindle Nut Lock Shield
1D	SCP-103	Cotter Pin - 5/32" x 1 1/2"
2	SL-168	Grease Seal - 1.688" I.D.
	SL-173	Grease Seal - 1.719" I.D.
3	L68149	Inner Bearing Cone - 1.378" I.D.
4	1-1000-04-00	Idler Hub - 5 on 4 1/2" (6 1/2" Dia. Flange)
	1-1050-04-00	Idler Hub - 5 on 4 1/2" (5 9/16" Dia. Flange)
	1-1000-14-00	Idler Hub - 5 on 5" (6 1/2" Dia. Flange)
4A	L68111	Inner Bearing Cup
4B	L44610	Outer Bearing Cup
4C	ST-504	Pressed-in Stud - 1/2"-20 (1000 Series)
	ST-502-04	Pressed-in Stud - 1/2"-20 (1050 Series)

Detail	Part Number	Description
5	5-1000-04-00	Brake Drum - 5 on 4 1/2"
	5-1000-14-00	Brake Drum - 5 on 5"
	9-1001-04-00	Disc Brake Rotor - 5 on 4 1/2"
5A	L68111	Inner Bearing Cup
5B	L44610	Outer Bearing Cup
5C	ST-502-04	Pressed-in Stud - 1/2"-20
6	EBLH-1000 EBRH-1000	Electric Brake - 10" x 2 1/4"
	HBLH-1000 HBRH-1000	Hydraulic Brake - 10" x 2 1/4"
	HBLH-1001 HBRH-1001	Free Backing Hydraulic Brake - 10" x 2 1/4"
	DBCL-1001 DBCR-1001	Disc Brake Caliper Assembly
	7	STN-506
8	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
11	FB-437	Flange Bolt - 7/16"-20 x 1" Hex (hydraulic brakes only)

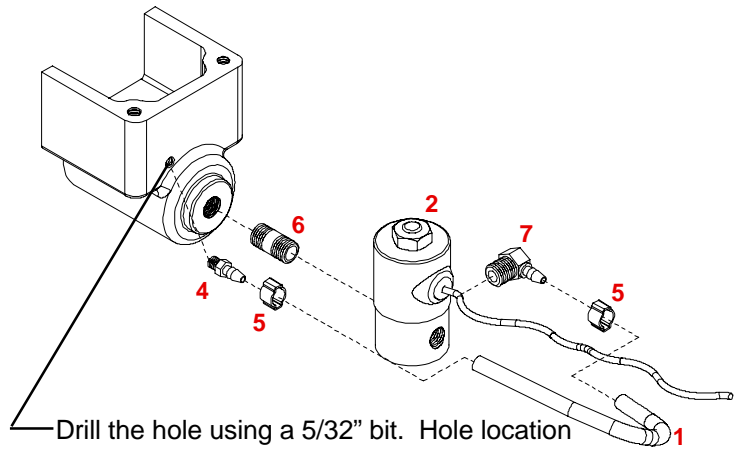


# ACTUATOR PARTS BREAKDOWN



REF. NO.	PART NO.	QTY.	DESCRIPTION
1.	05432	1	6000# 2" Ball Coupler
2.	01896	3	1/2"-13UNC x 4" Hex Head Bolt (gr.5)
3.	02178	3	1/2"-13UNC Nylon Insert Lock Nut
4.	05441-95	1	Front Shock Pin 5/8" dia. x 3" lg. (shown)
-	05426-95	1	Front Shock Pin for straight tube actuators
5.	05440-??	1	Straight Actuator Slider Tube
6.	SB12426	1	Damper/ Shock
7.	05403	2	Brake Actuator Roller
8.	05401	10	Nylatron Wear Button
9.	05975-??	1	Straight Mount Outer Case
10.	05967-??	1	50 degree Mount Outer Case
11.	04305	2	5/16"-18UNC x 1/2" Hex Head Bolt (gr.5)
12.	05424	4	5/16" External Tooth Lock Washer
13.	05423-??	1	Top Roller Pin
14.	05422-??	1	Inner Roller Pin
15.	02363	2	5/32" x 1 1/4" Cotter Pin
16.	05402	1	Top Roller
17.	05419-??	1	Top Roller Cover (6,000# rating)
**18.	05408	1	3/32" Cable with hooks (both ends)
-	SB10555	-	Replacement S-Hooks ONLY
**19.	05693-??	1	Emergency Lever Spring
20.	05961	2	5/16"-18UNC x 5/8" Hex Head Bolt (gr.5)
21.	00618	4	1/4"-20UNC x 2" Hex Head Bolt
22.	00057	4	1/4" Lock Washer
*23.	05951	1	Emergency Lever
24.	03876	1	Master Cylinder Cap w/ Diaphragm & O-ring
-	05849	1	O-Ring Only (not shown)
25.	05977	1	Push Rod Assembly
26.	00062	4	1/4"-20 UNC Hex Nut
27.	05681	-	Cast Master Cyl. Gasket ONLY
-	09153	-	Plastic Master Cyl. Gasket ONLY
28.	05680	1	Cast Master Cylinder w/ gasket 05681
-	10616	1	Master Cylinder w/ gasket 09153
29.	SB12098	1	.018 Connector Orifice
30.	03866-??	1	Lever Guide
31.	05687	1	Master Cylinder Protective Boot
32.	09420	6	Washer 3/4"OD x 21/64"ID SS
-	5401	-	Lever Replacement Kit (incl. items w/**)
-	5398/5680	-	Master Cylinder Repair Kit w/ gasket
-	5221	-	Coupler Repair Kit
33.	02920	-	Thumb Lock ONLY

## (OPTIONAL) FREE BACKING SOLENOID KIT (5404) PARTS BREAKDOWN



### KIT #5404 PARTS LIST

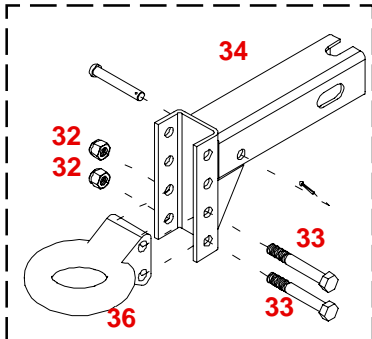
REF. NO.	PART NO.	QTY.	DESCRIPTION
1.	04594	-	EPDM Black Tubing
2.	05561	1	Solenoid Valve
3.	09153	1	Master Cylinder Gasket (not shown)
4.	10373	1	Brass Fitting Str. .2 HB x 10-32 NF
5.	10374	2	Crimp Clamp
6.	10375	1	Straight Nipple 1/8" MPT x 1/8" MPT
7.	10376	1	Brass Elbow 1/8" MPT x .2 HB

**Note:** -?? = -30 Black                      -91 Yellow Chromate  
 -95 Plated                                      -97 Primed Red  
 Please indicate when ordering parts

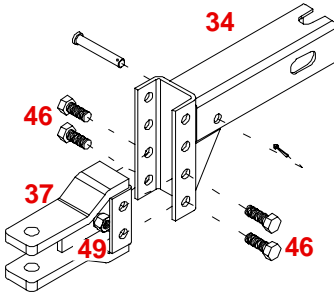
Please order replacement parts by **PART NO.** and **DESCRIPTION**

**See page 18 for Available Hitch Configurations.**

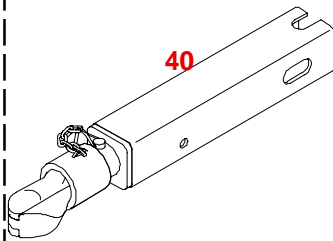
# AVAILABLE HITCH CONFIGURATIONS



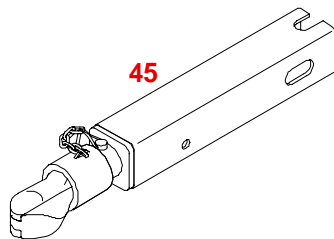
**Channel Down with Pintle  
RATED AT 7500#**



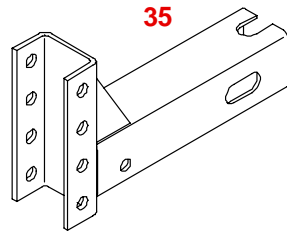
**Channel Down with Clevis  
RATED AT 7500#**



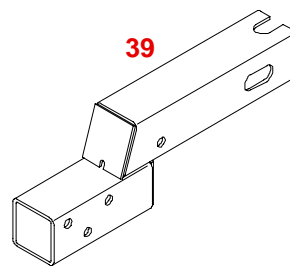
**2-5/16" Bulldog Ball  
Coupler welded to  
straight slider tube  
RATED AT 7500#**



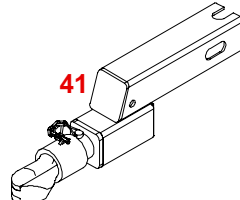
**2" Bulldog Ball Coupler  
welded to straight  
slider tube  
RATED AT 7000#**



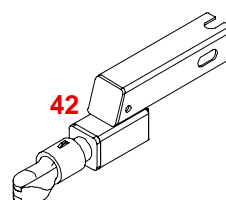
**Clevis Channel Up  
RATED AT 7500#**



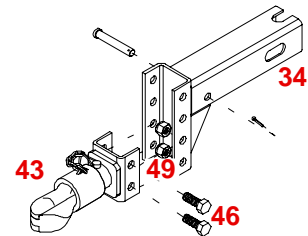
**Model 91 Drop Slider Tube**



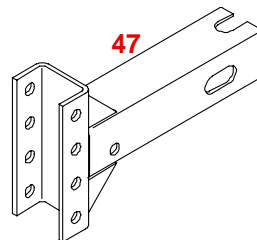
**2-5/16" Bulldog Ball  
Coupler welded to  
drop slider tube  
RATED AT 7500#**



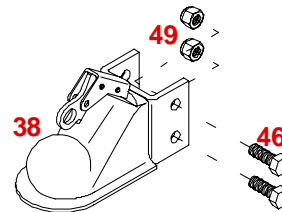
**2" Bulldog Ball  
Coupler welded to  
drop slider tube  
RATED AT 7000#**



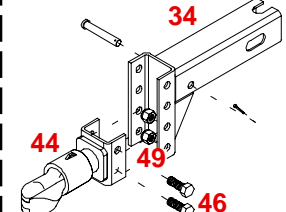
**2-5/16" Bulldog Ball Coupler  
welded to clevis channel  
RATED AT 7500#**



**Clevis Channel Centered  
RATED AT 7500#**



**2-5/16" Lever Lock  
Bolt On Coupler  
RATED AT 7500#**



**2" Bulldog Ball Coupler  
welded to clevis channel  
RATED AT 7000#**

## PARTS LIST

REF. NO.	PART NO.	QTY.	DESCRIPTION
32.	02587	2	5/8"-11UNC Nylon Insert Lock Nut
33.	02434	2	5/8"-11UNC x 4 1/2" Hex Head Bolt (Gr. 5)
34.	05937-??	1	Clevis Channel Down
35.	05991-??	1	Clevis Channel Up
36.	09557-??	1	Pintle Ring (10 Ton Capacity)
37.	05593-??	1	Clevis
38.	07678-??	1	2-5/16" Lever Lock Bolt On Coupler
39.	05421-??	1	Drop Slider Tube
40.	05990-??	1	2-5/16" Bulldog Coupler Welded to Straight Slider Tube
41.	05594-97	1	2-5/16" Bulldog Coupler Welded to Drop Slider Tube
42.	05822-97	1	2" Bulldog Coupler Welded to Drop Slider Tube
43.	05557-??	1	2-5/16" Bulldog Coupler Welded to Clevis Channel
44.	05823-??	1	2" Bulldog Coupler Welded to Clevis Channel
45.	05835-97	1	2" Bulldog Coupler Welded to Straight Slider Tube
46.	04051	4	5/8"-11UNC x 1-1/2" Hex Head Bolt (Gr.5)
47.	03734-??	1	Clevis Channel Centered
49.	03730	4	5/8" Stover Locknut

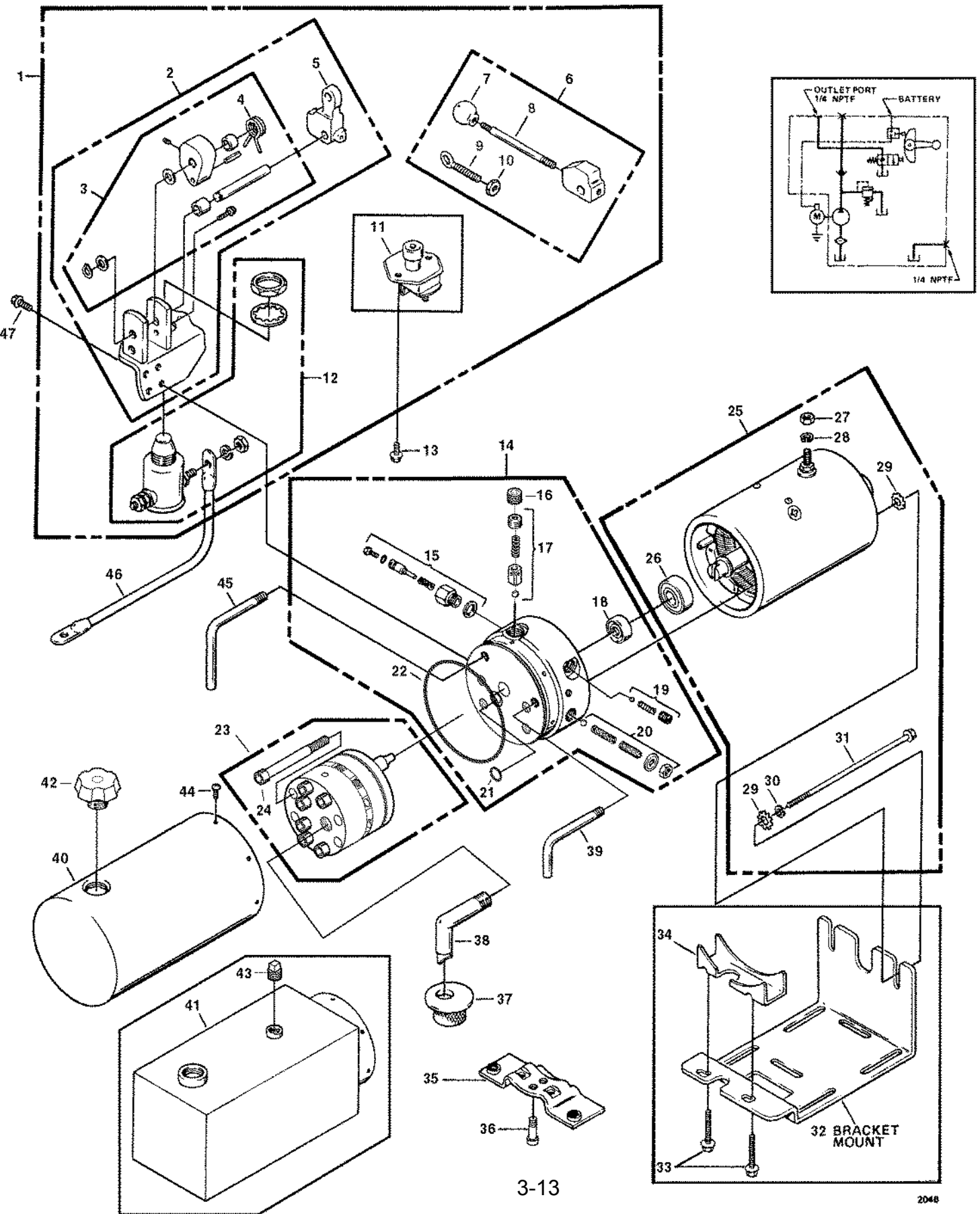
**Note:** -?? = -95 Plated      -97 Primed Red  
Please indicate when ordering parts

Please order replacement parts by **PART NO.** and **DESCRIPTION.**

RATED CAPACITY	
2" Bulldog Ball Coupler	7000 lbs.
2" Fulton Ball Coupler	6000 lbs.
Channel Up and Chan. Down Hitch	7500 lbs.
2-5/16" Ball Couplers	7500 lbs.

The Model 91 brake actuator has a maximum load rating depending on which coupler you own, (see table at right), and 600 lbs. tongue load. The units actual rating is limited to that of the ball and the hitch being used or the trailers \*GVWR shown on the manufacturers certification label, whichever is lower.

\*(Gross Vehicle Weight Rating)



# M-301

Ref. No.	Part No.	Description	No. Req.
1	03411	BRACKET ASSEMBLY, With 5 & 12	1
	03321	BRACKET ASSEMBLY, With 5 & 11	1
	03412	BRACKET ASSEMBLY, With 6 & 12	1
	03413	BRACKET ASSEMBLY, With 6 & 11	1
2	03437	• BRACKET ASSEMBLY, With 5	1
	03440	• BRACKET ASSEMBLY, With 6	1
3	03660	•• PARTS KIT, Bracket Assembly	1
4	00018	••• SPRING, Torsion	1
5	00391	•• HANDLE ASSEMBLY	1
6	00175	• PARTS KIT, Handle Assembly	1
7	01157	•• BALL, Plastic	1
8	01326	•• ROD, Handle 4"	1
9	01327	•• EYE BOLT, Rod Control 5/16-18 x 1-7/8"	1
10	07790	•• NUT, Hex 5/16-18	1
11	03308	• SWITCH, Start	1
12	03322	• SWITCH, Start, (canister type)	1
13	07886	SCREW, Hex Washer Head, tap tite 1/4-20 x 1/2"	2
14	12421	BASE ASSEMBLY, Modular	1
15	00235	• PARTS KIT, Plunger	1
16	02349	• PLUG, Pipe, 3/8" NPT	1
17	07526	• PARTS KIT, Check Valve (main)	1
18	02159	• SEAL	1
19	00078	• PARTS KIT, Check Valve (descending)	1
20	03766	• PARTS KIT, Relief Valve	1
21	00120	• O-RING, Industrial (1/2" x 5/8" x 1/16")	1
22	02352	• O-RING, Industrial (3-5/8" x 3-7/8" x 1/8")	1
23	K12171-150	PUMP ASSEMBLY, Modular	1
	K12171-200	PUMP ASSEMBLY, Modular	1
	K12171-250	PUMP ASSEMBLY, Modular	1
	K12171-270	PUMP ASSEMBLY, Modular	1
	K12171-330	PUMP ASSEMBLY, Modular	1
	K12171-380	PUMP ASSEMBLY, Modular	1
	K12171-510	PUMP ASSEMBLY, Modular	1
24	07819	• SCREW, 1/4-20 x 2 3/4 Socket Head Cap (For Pump Assembly -150 & -200)	4
	07818	• SCREW, 1/4-20 x 3 Socket Head Cap (For Pump Assembly -250, -270, -330, -380)	4
	07837	• SCREW, 1/4-20 x 3 1/4 Socket Head Cap (For Pump Assembly -510)	4

Ref. No.	Part No.	Description	No. Req.
25	08111	MOTOR, Electric, 12 VDC	1
	08112	MOTOR, Electric, 12 VDC	1
	08120	MOTOR, Electric, 24 VDC	1
26	02318	• BEARING, Base, motor	1
27	07625	• NUT, Hex 5/16-24	1
28	07781	• WASHER, Lock 5/16"	1
29	07737	• WASHER, Star 1/4"	4
30	07795	• WASHER, Lock 1/4"	2
31	07738	• SCREW, Hex Head Cap 1/4-20 x 6-1/2"	2
		FOR FURTHER BREAKDOWN OF MOTOR, SEE MOTOR SECTION	
32	02238	BRACKET, Mounting	1
33	07717	SCREW, Hex Head, thread forming 1/4-20 x 1-3/8"	2
34	01329	ADAPTER, Pump Mounting Bracket	1
35	04559	BRACKET, Plate Mount 5.00" C to C	1
	04560	BRACKET, Plate Mount 3.25" C to C	1
36	07592	SCREW, Socket Head Cap, 3/8 -16 x 1	2
37	01134	SCREEN, Filter (suction)	1
38	01209	TUBE, Filter Suction 3/8 NPT 90 Deg.	1
39	13059	TUBE, Return (1/8")	1
40	14076	RESERVOIR, 4-1/2" Dia. x 8", 76 in <sup>3</sup> usable	1
	14070	RESERVOIR, 4-1/2" Dia. x 10", 102 in <sup>3</sup> usable	1
	14071	RESERVOIR, 4-1/2" Dia. x 12", 127 in <sup>3</sup> usable	1
41	06678	RESERVOIR, 5" x 5" x 10", 211 in <sup>3</sup> usable	1
	06685	RESERVOIR, 5" x 5" x 12", 249 in <sup>3</sup> usable	1
	06686	RESERVOIR, 5" x 5" x 15", 306 in <sup>3</sup> usable	1
42	01143	PLUG, Vent (plastic)	1
43	01108	PLUG, Square Head, 1/4 NPT	1
44	07703	SCREW, Thread Forming 10-24 x 3/8"	6
45	13058	TUBE, Return (1/8 NPT)	1
46	01373	CABLE, Insulated, with lugs 9" 6 ga.	1
47	07815	SCREW, Hex Washer Head, tap tite 1/4-20 x 5/8"	4



U.S.A.:  
**MONARCH HYDRAULICS, INC.**  
 P.O. Box 1764, Grand Rapids, Michigan 49501-1764, U.S.A.  
 Telephone: (616) 458-1306  
 Telefax: (616) 458-1616  
<http://www.monarchhyd.com>  
 Form No. 2155-01

CANADA:  
**FLUID-PACK INTERNATIONAL LIMITED**  
 A Part of the Monarch Hydraulics Group  
 460 Newbold St., London, Ontario, Canada N6E 1K3  
 Telephone: (519) 686-5900  
 Telefax: (519) 686-8976



# **SILENT MESSENGER**

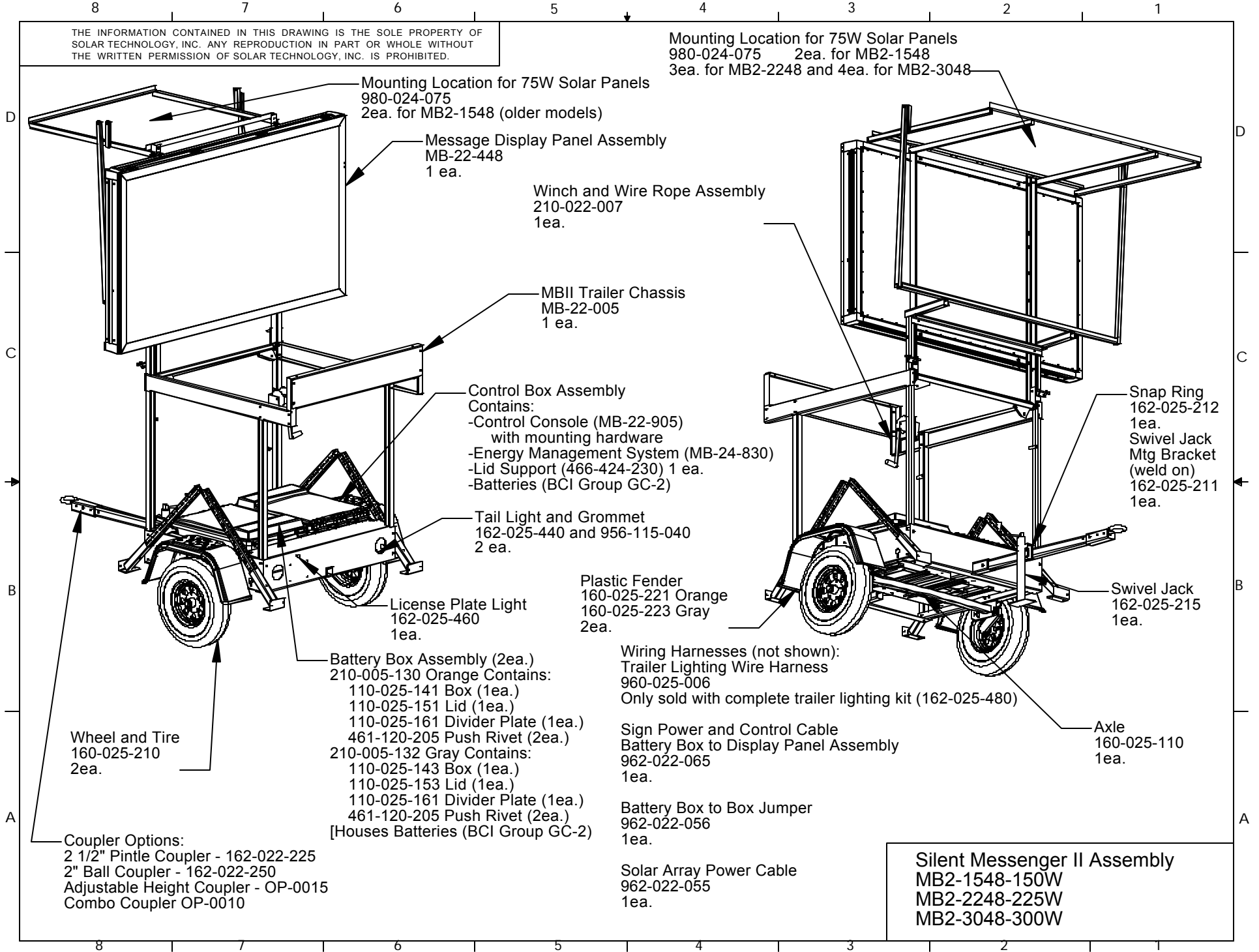
**PORTABLE CHANGEABLE MESSAGE SIGNS**

**Parts Diagrams:  
Silent Messenger II Series**



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Mounting Location for 75W Solar Panels  
 980-024-075 2ea. for MB2-1548  
 3ea. for MB2-2248 and 4ea. for MB2-3048



Mounting Location for 75W Solar Panels  
 980-024-075  
 2ea. for MB2-1548 (older models)

Message Display Panel Assembly  
 MB-22-448  
 1 ea.

Winch and Wire Rope Assembly  
 210-022-007  
 1ea.

MBII Trailer Chassis  
 MB-22-005  
 1 ea.

Control Box Assembly  
 Contains:  
 -Control Console (MB-22-905)  
 with mounting hardware  
 -Energy Management System (MB-24-830)  
 -Lid Support (466-424-230) 1 ea.  
 -Batteries (BCI Group GC-2)

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

License Plate Light  
 162-025-460  
 1ea.

Battery Box Assembly (2ea.)  
 210-005-130 Orange Contains:  
 110-025-141 Box (1ea.)  
 110-025-151 Lid (1ea.)  
 110-025-161 Divider Plate (1ea.)  
 461-120-205 Push Rivet (2ea.)  
 210-005-132 Gray Contains:  
 110-025-143 Box (1ea.)  
 110-025-153 Lid (1ea.)  
 110-025-161 Divider Plate (1ea.)  
 461-120-205 Push Rivet (2ea.)  
 [Houses Batteries (BCI Group GC-2)]

Wheel and Tire  
 160-025-210  
 2ea.

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

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

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

Sign Power and Control Cable  
 Battery Box to Display Panel Assembly  
 962-022-065  
 1ea.

Battery Box to Box Jumper  
 962-022-056  
 1ea.

Solar Array Power Cable  
 962-022-055  
 1ea.

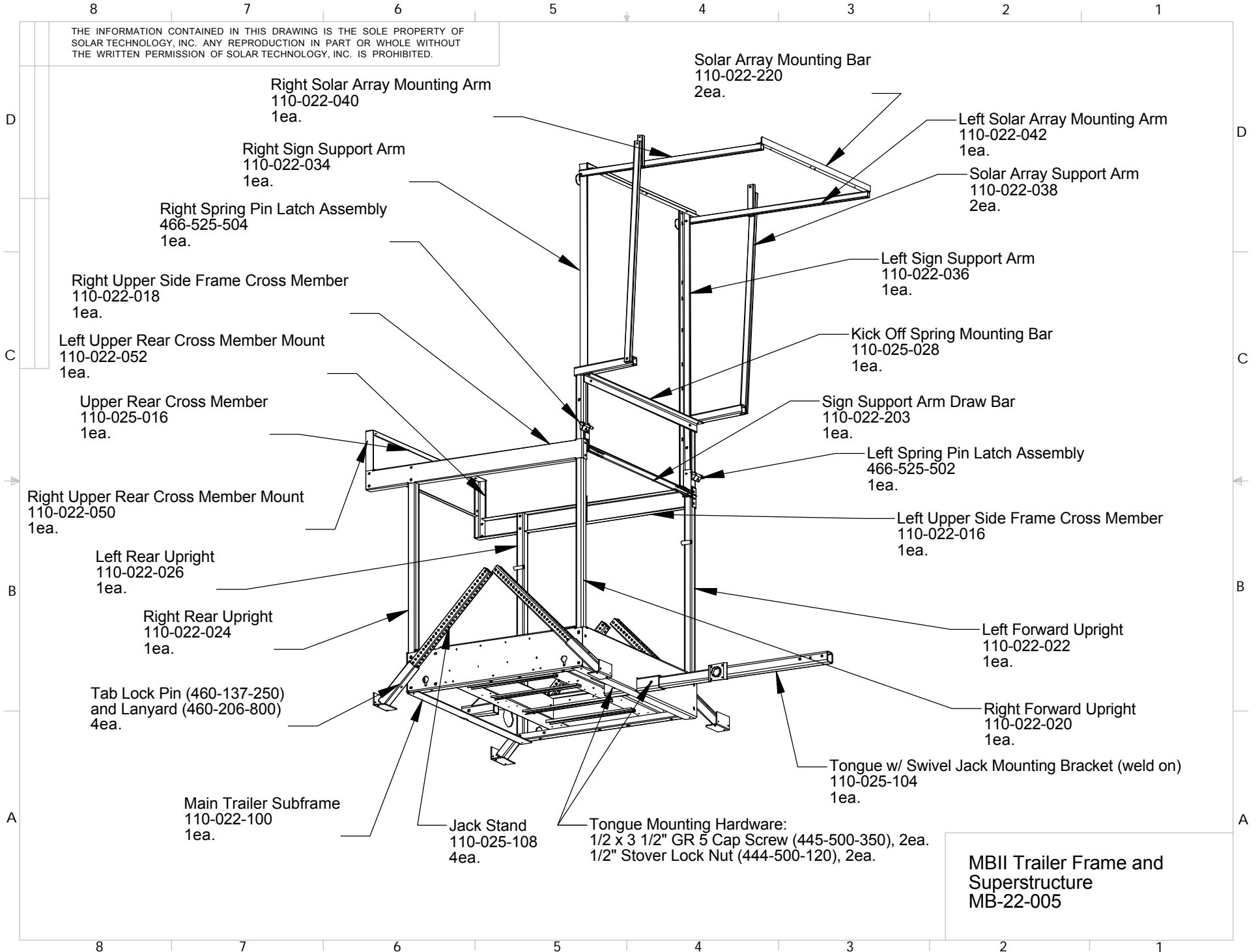
Silent Messenger II Assembly  
 MB2-1548-150W  
 MB2-2248-225W  
 MB2-3048-300W

Snap Ring  
 162-025-212  
 1ea.  
 Swivel Jack Mtg Bracket  
 (weld on)  
 162-025-211  
 1ea.

Swivel Jack  
 162-025-215  
 1ea.

Axle  
 160-025-110  
 1ea.

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8 7 6 5 4 3 2 1

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D

Right Solar Array Mounting Arm  
110-022-040  
1ea.

Solar Array Mounting Bar  
110-022-225  
2ea.

D

Solar Array Mounting Arm  
110-022-044  
2ea.

Left Solar Array Mounting Arm  
110-022-042  
1ea.

C

Solar Array Support Arm  
110-022-038  
2ea.

C

Solar Array Support Arm Mounting Bar  
110-022-215  
1ea.

B

B

Remainder of Trailer Frame is identical to the MB2-1548 configuration.

A

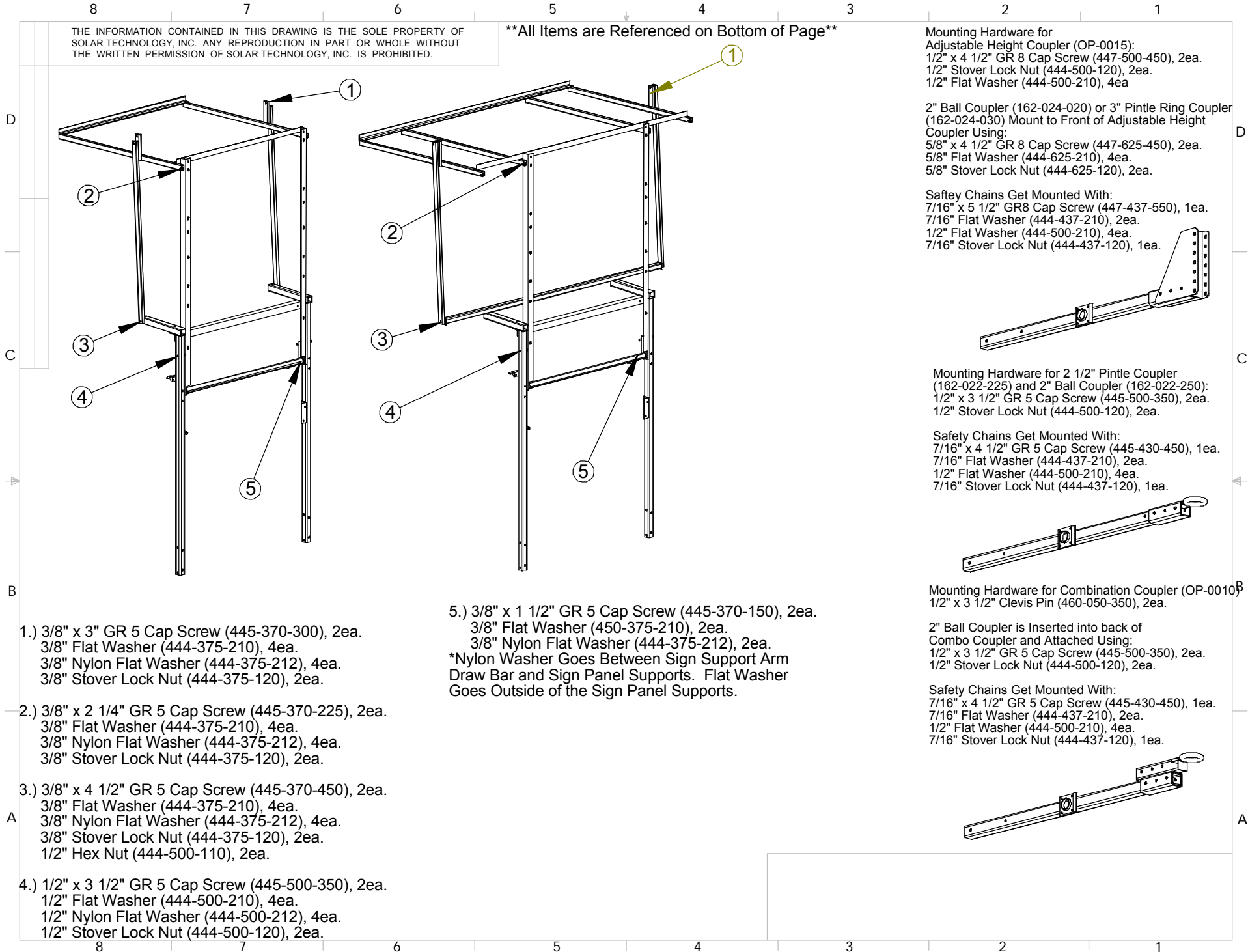
A

MBII Trailer Frame and Superstructure for MB2-1548, MB2-2248 and MB2-3048

8 7 6 5 4 3 2 1

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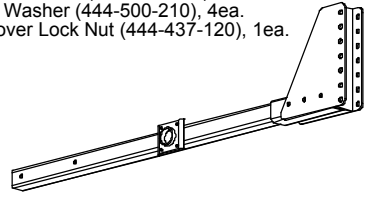
**\*\*All Items are Referenced on Bottom of Page\*\***



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

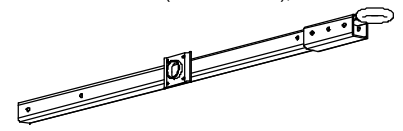
2" Ball Coupler (162-024-020) or 3" Pintle Ring Coupler (162-024-030) Mount to Front of Adjustable Height Coupler Using:  
 5/8" x 4 1/2" GR 8 Cap Screw (447-625-450), 2ea.  
 5/8" Flat Washer (444-625-210), 4ea.  
 5/8" Stover Lock Nut (444-625-120), 2ea.

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" 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.

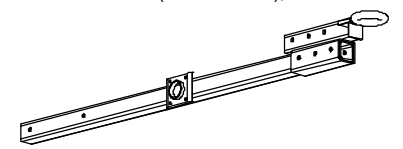
Safety Chains Get Mounted With:  
 7/16" x 4 1/2" GR 5 Cap Screw (445-430-450), 1ea.  
 7/16" Flat Washer (444-437-210), 2ea.  
 1/2" Flat Washer (444-500-210), 4ea.  
 7/16" Stover Lock Nut (444-437-120), 1ea.



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.

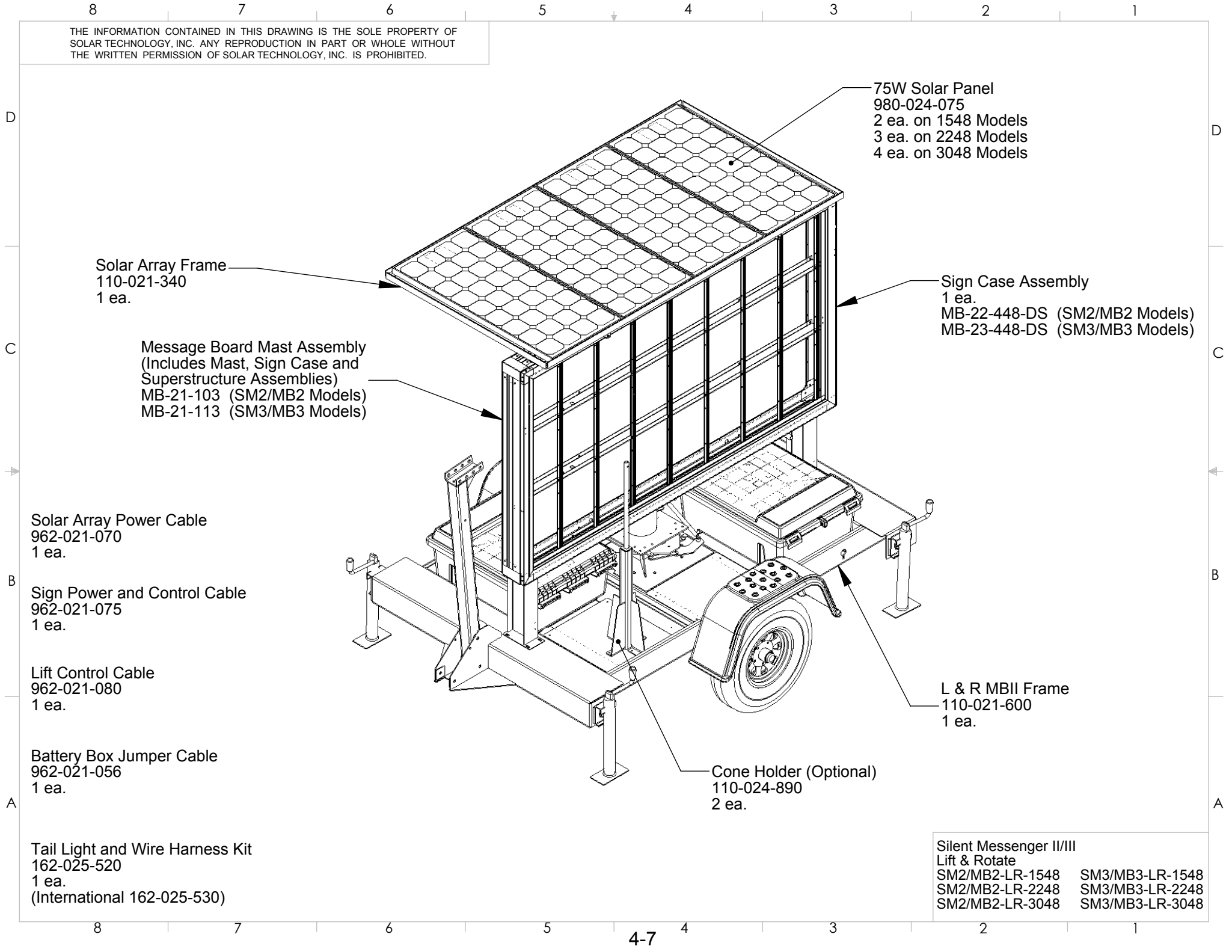
Safety Chains Get Mounted With:  
 7/16" x 4 1/2" GR 5 Cap Screw (445-430-450), 1ea.  
 7/16" Flat Washer (444-437-210), 2ea.  
 1/2" Flat Washer (444-500-210), 4ea.  
 7/16" Stover Lock Nut (444-437-120), 1ea.



- 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 1/4" GR 5 Cap Screw (445-370-225), 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.

- 5.) 3/8" x 1 1/2" GR 5 Cap Screw (445-370-150), 2ea.  
 3/8" Flat Washer (450-375-210), 2ea.  
 3/8" Nylon Flat Washer (444-375-212), 2ea.  
 \*Nylon Washer Goes Between Sign Support Arm Draw Bar and Sign Panel Supports. Flat Washer Goes Outside of the Sign Panel Supports.

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75W Solar Panel  
980-024-075  
2 ea. on 1548 Models  
3 ea. on 2248 Models  
4 ea. on 3048 Models

Solar Array Frame  
110-021-340  
1 ea.

Sign Case Assembly  
1 ea.  
MB-22-448-DS (SM2/MB2 Models)  
MB-23-448-DS (SM3/MB3 Models)

Message Board Mast Assembly  
(Includes Mast, Sign Case and  
Superstructure Assemblies)  
MB-21-103 (SM2/MB2 Models)  
MB-21-113 (SM3/MB3 Models)

Solar Array Power Cable  
962-021-070  
1 ea.

Sign Power and Control Cable  
962-021-075  
1 ea.

Lift Control Cable  
962-021-080  
1 ea.

Battery Box Jumper Cable  
962-021-056  
1 ea.

L & R MBII Frame  
110-021-600  
1 ea.

Cone Holder (Optional)  
110-024-890  
2 ea.

Tail Light and Wire Harness Kit  
162-025-520  
1 ea.  
(International 162-025-530)

Silent Messenger II/III Lift & Rotate	
SM2/MB2-LR-1548	SM3/MB3-LR-1548
SM2/MB2-LR-2248	SM3/MB3-LR-2248
SM2/MB2-LR-3048	SM3/MB3-LR-3048

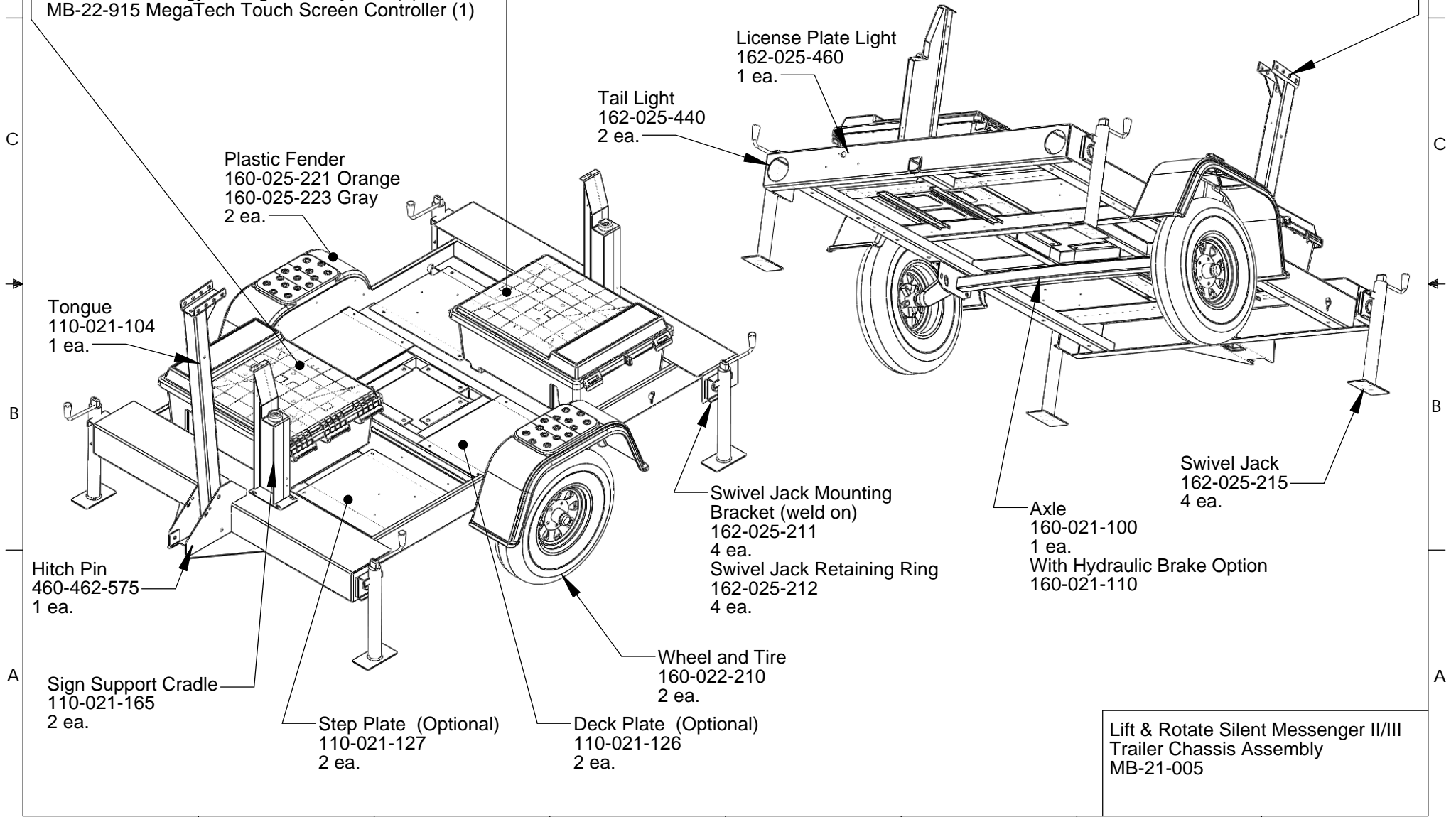
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**Control Box, 1 ea. Contains:**  
 110-025-141 Orange Box (1) (Gray 110-025-143)  
 110-025-151 Orange Lid (1) (Gray 110-025-153)  
 110-021-138 Toggle Switch Mount (1)  
 110-025-161 Divider Plate (1)  
 461-120-205 Push Rivet (2)  
 466-424-230 Lid Support (1)  
 990-006-105 Standard Battery (4)  
 990-006-205 Gel Cell Battery (4) (Optional)  
 MB-24-830 Energy Management System (1)  
 MB-22-915 MegaTech Touch Screen Controller (1)

**Battery Box (Optional) Contains:**  
 110-025-141 Orange Box (1) (Gray 110-025-143)  
 110-025-151 Orange Lid (1) (Gray 110-025-153)  
 110-025-161 Divider Plate (1)  
 461-120-205 Push Rivet (2)  
 990-006-105 Standard Battery (4)  
 990-006-205 Gel Cell Battery (4) (Optional)

**Mounting Location for:**  
 2" Ball Coupler (162-024-020) or  
 3" Pintle Coupler (162-024-030) and  
 1/4" Safety Chains w/ Snap Hooks (162-025-050)  
**Mount Coupler Using:**  
 5/8" x 4 1/2" GR8 Cap Screw (447-625-450), 2 ea.  
 5/8" Flat Washer (444-625-210), 2 ea.  
 5/8" Stover Lock Nut (444-625-120), 2 ea.

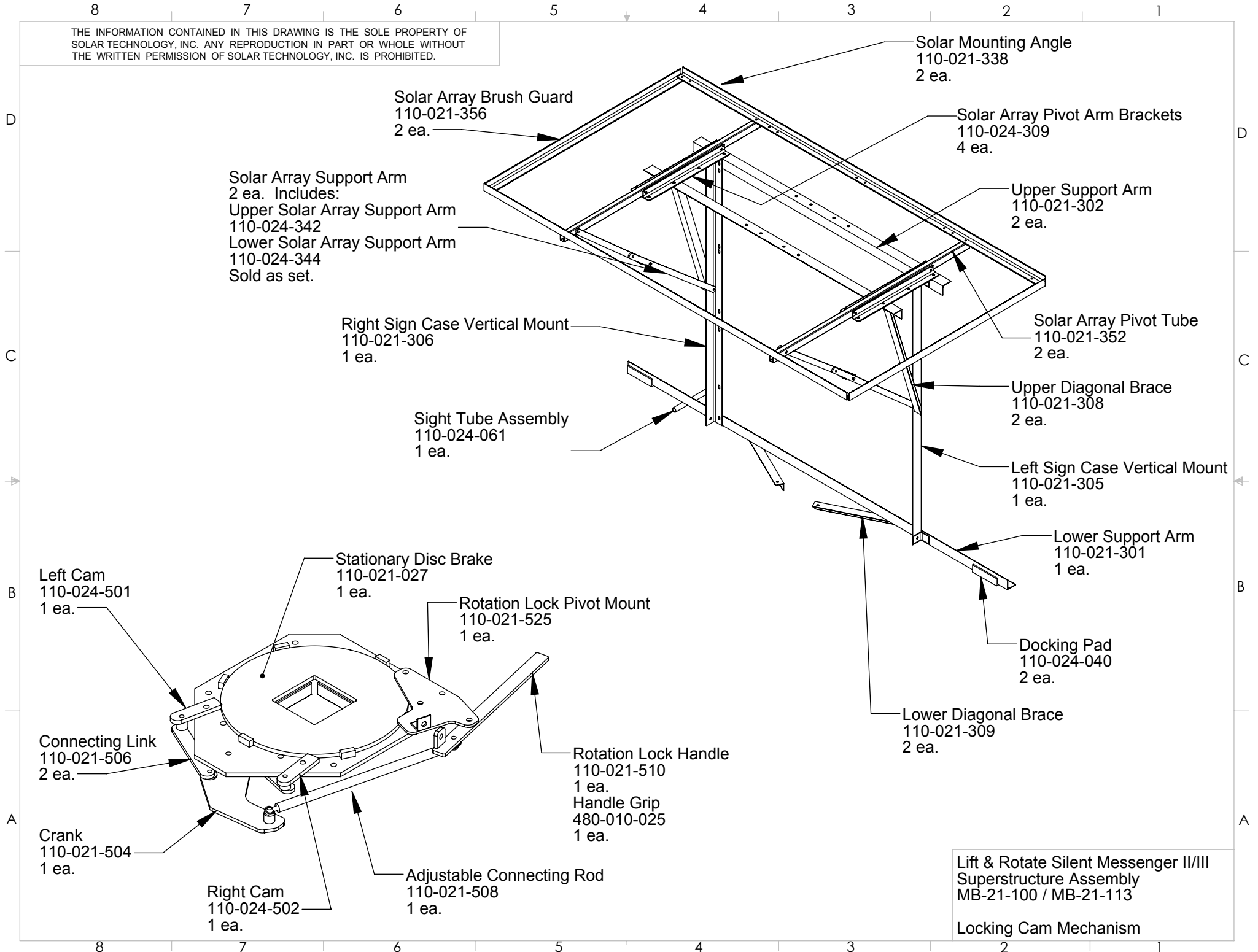
**Safety Chains (162-025-050) 2 ea. Mount With:**  
 7/16" x 3 1/2" GR8 Cap Screw (447-430-350), 2 ea.  
 7/16" Stover Lock Nut (444-437-120), 2 ea.



**Lift & Rotate Silent Messenger II/III Trailer Chassis Assembly MB-21-005**



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Solar Array Brush Guard  
110-021-356  
2 ea.

Solar Mounting Angle  
110-021-338  
2 ea.

Solar Array Pivot Arm Brackets  
110-024-309  
4 ea.

Solar Array Support Arm  
2 ea. Includes:  
Upper Solar Array Support Arm  
110-024-342  
Lower Solar Array Support Arm  
110-024-344  
Sold as set.

Upper Support Arm  
110-021-302  
2 ea.

Right Sign Case Vertical Mount  
110-021-306  
1 ea.

Solar Array Pivot Tube  
110-021-352  
2 ea.

Sight Tube Assembly  
110-024-061  
1 ea.

Upper Diagonal Brace  
110-021-308  
2 ea.

Left Sign Case Vertical Mount  
110-021-305  
1 ea.

Lower Support Arm  
110-021-301  
1 ea.

Left Cam  
110-024-501  
1 ea.

Stationary Disc Brake  
110-021-027  
1 ea.

Rotation Lock Pivot Mount  
110-021-525  
1 ea.

Docking Pad  
110-024-040  
2 ea.

Connecting Link  
110-021-506  
2 ea.

Rotation Lock Handle  
110-021-510  
1 ea.

Handle Grip  
480-010-025  
1 ea.

Crank  
110-021-504  
1 ea.

Right Cam  
110-024-502  
1 ea.

Adjustable Connecting Rod  
110-021-508  
1 ea.

Lift & Rotate Silent Messenger II/III  
Superstructure Assembly  
MB-21-100 / MB-21-113

Locking Cam Mechanism

8 7 6 5 4 3 2 1

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Upper Mast  
110-021-116  
1 ea.

Upper Wear Pads  
110-021-030  
4 ea.

Actuator Cover and Top Mount  
110-021-025  
1 ea.

Linear Actuator  
162-390-600  
1 ea.

Lower Mast  
110-021-114  
1 ea.

Lower Wear Pads  
110-024-031  
4 ea.

Actuator Extension  
110-021-037  
1 ea.

Thrust Bearing  
474-500-125  
1 ea.

Actuator Lower Mount  
110-021-035  
1 ea.

Lift & Rotate Silent Messenger II/III  
Mast Assembly  
Actuator Assembly

8 7 6 5 4 3 2 1

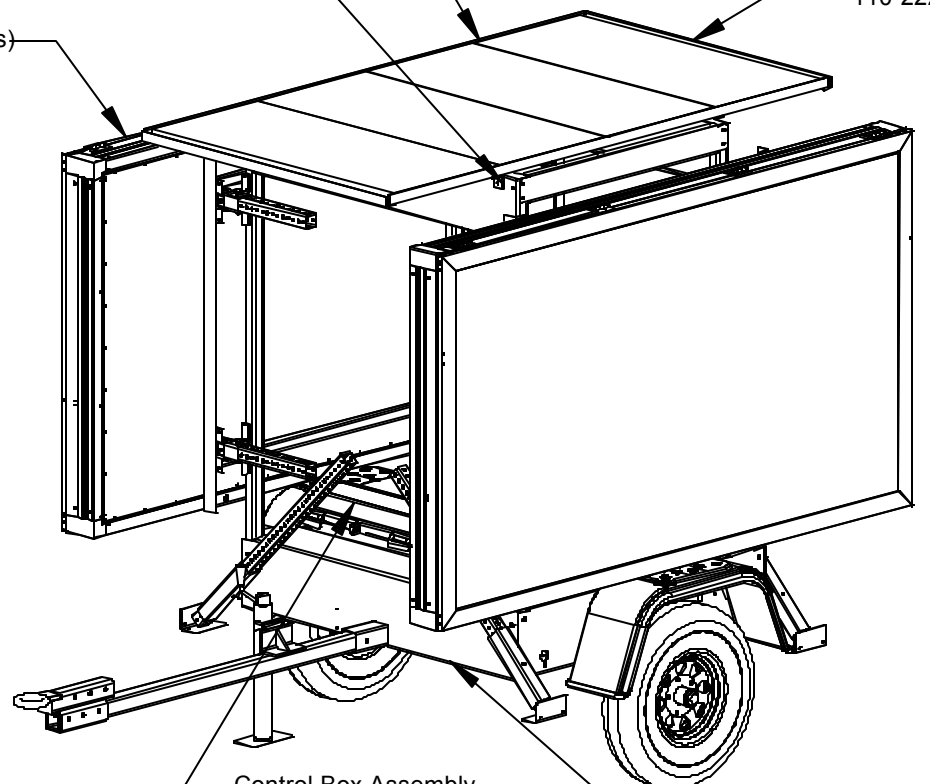
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Solar Array Mtg. Angle  
110-222-110 (2ea.)

Sign Panel Assemblies  
MB-22-448-DS MBII Sign Panels 4.5'x8'  
MB-23-448-DS MBIII Sign Panels  
(Does not include LED Display Modules)

Solar Array Reinf. Angle  
110-222-120

Solar Array Brush Guard  
110-222-100 (2ea.)



Trailer Lighting Kit  
162-025-480 (1ea.)

Control Box Assembly  
Contains:

- Control Console MB-22-905 (1ea.) with mounting hardware
- Energy Management System MB-24-830 (2ea.)
- Lid Support 466-424-230 (2ea.)

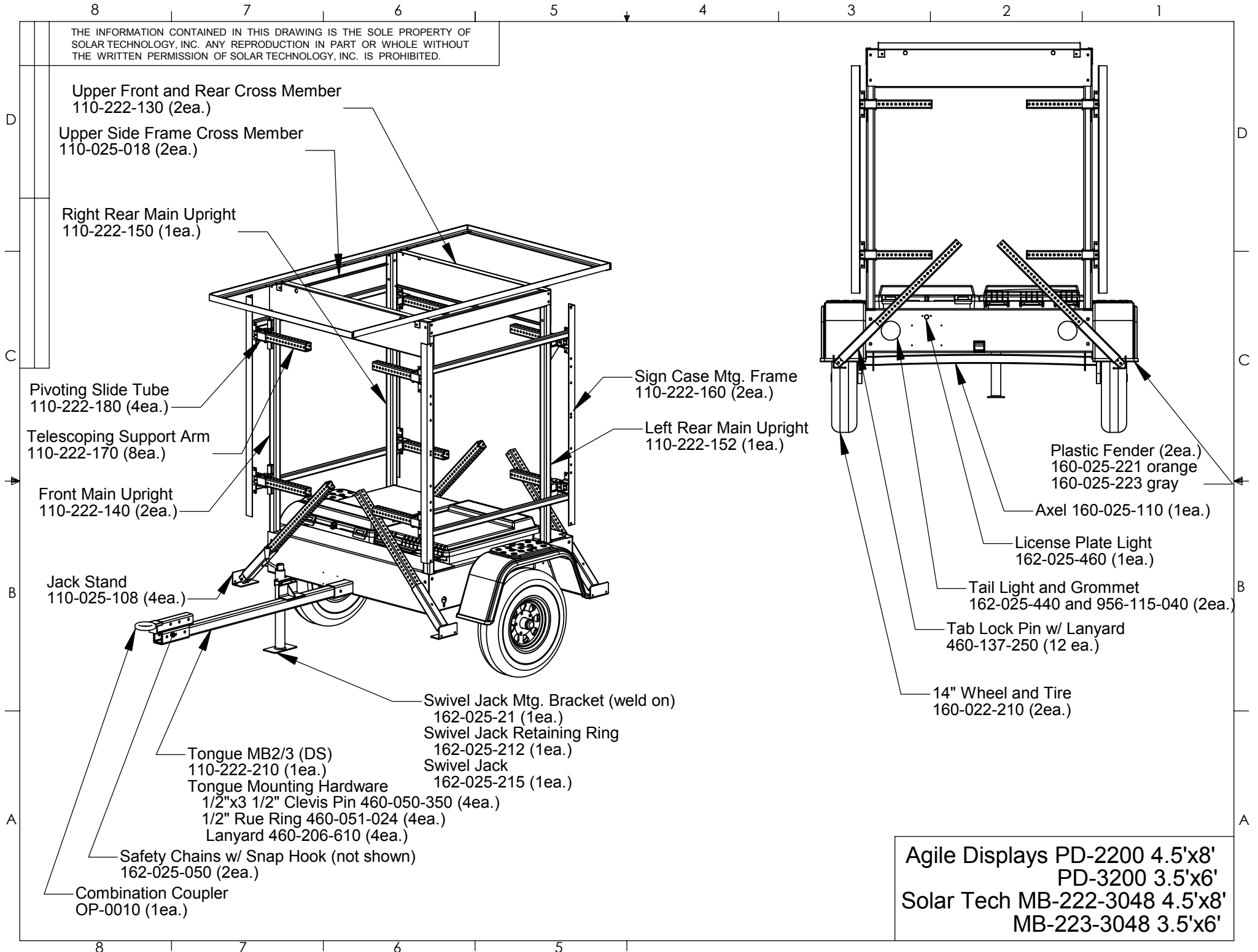
Double Side Main Trailer Frame  
110-222-200 (1ea.)

Cable Set MB2/3 DS  
MB-222-601 (1ea.) Contains:  
962-022-066 Battery Power Wire Harness (2ea.)  
962-222-010 Box to Box Jumper (1ea.)  
962-222-020 Sign Power and Control Cable (2ea.)  
962-222-030 Solar Array Power Cable (1ea.)

Battery Box Assembly (2ea.)  
210-005-130 orange Contains:  
110-025-141 Box (1ea.)  
110-025-151 Lid (1ea.)  
110-025-161 Divider Plate (1ea.)  
461-120-205 Push Rivet (2ea.)  
210-005-132 gray Contains:  
110-025-143 Box (1ea.)  
110-025-153 Lid (1ea.)  
110-025-161 Divider Palte (1ea.)  
461-120-205 Push Rivet (2ea.)

Agile Displays PD-2200 4.5'x8'  
PD-3200 3.5'x6'  
Solar Tech MB-222-3048 4.5'x8'  
MB-223-3048 3.5'x6'

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Upper Front and Rear Cross Member  
110-222-130 (2ea.)

Upper Side Frame Cross Member  
110-025-018 (2ea.)

Right Rear Main Upright  
110-222-150 (1ea.)

Pivoting Slide Tube  
110-222-180 (4ea.)

Telescoping Support Arm  
110-222-170 (8ea.)

Front Main Upright  
110-222-140 (2ea.)

Jack Stand  
110-025-108 (4ea.)

Swivel Jack Mtg. Bracket (weld on)  
162-025-21 (1ea.)

Swivel Jack Retaining Ring  
162-025-212 (1ea.)

Swivel Jack  
162-025-215 (1ea.)

Tongue MB2/3 (DS)  
110-222-210 (1ea.)

Tongue Mounting Hardware

1/2"x3 1/2" Clevis Pin 460-050-350 (4ea.)

1/2" Rue Ring 460-051-024 (4ea.)

Lanyard 460-206-610 (4ea.)

Safety Chains w/ Snap Hook (not shown)  
162-025-050 (2ea.)

Combination Coupler  
OP-0010 (1ea.)

Sign Case Mtg. Frame  
110-222-160 (2ea.)

Left Rear Main Upright  
110-222-152 (1ea.)

Plastic Fender (2ea.)  
160-025-221 orange  
160-025-223 gray

Axel 160-025-110 (1ea.)

License Plate Light  
162-025-460 (1ea.)

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

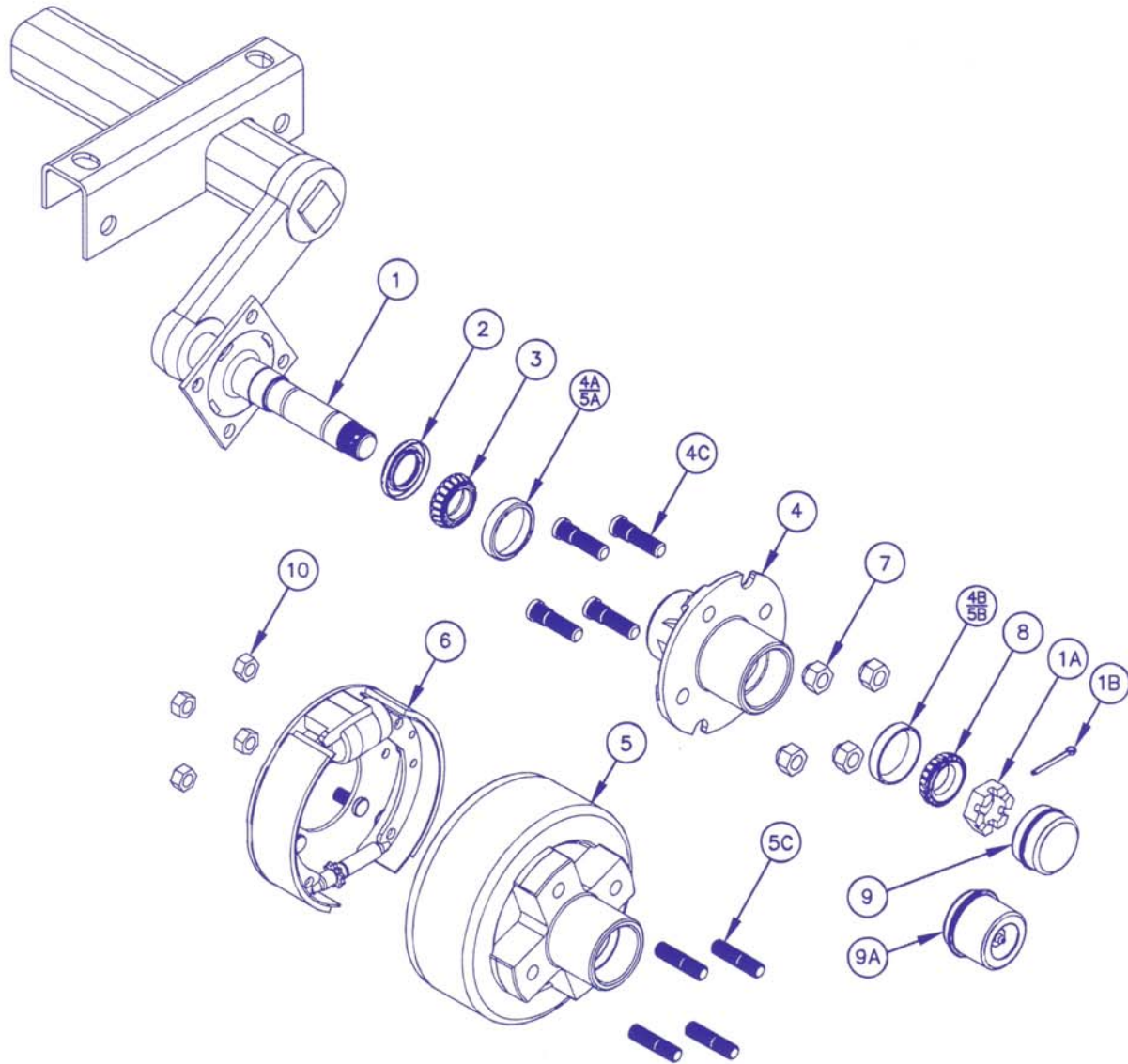
Tab Lock Pin w/ Lanyard  
460-137-250 (12 ea.)

14" Wheel and Tire  
160-022-210 (2ea.)

Agile Displays PD-2200 4.5'x8'  
PD-3200 3.5'x6'  
Solar Tech MB-222-3048 4.5'x8'  
MB-223-3048 3.5'x6'

# 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



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75 Watt Solar Panel  
980-024-075  
150W Model - 2 ea.  
225W Model - 3 ea.  
300W Model - 4 ea.

Cone Holder  
110-024-890  
3 ea.

42" Traffic Barrel  
165-015-042  
10 ea.

Front Barrel Base Holder  
110-024-880  
1 ea.

Barrel Chute Swing Bar  
110-024-886  
1 ea.

Barrel Base Swing Bar  
110-024-884  
1 ea.

Rubber Barrel Base  
165-015-125  
10 ea.

Rear Barrel Base Holder  
110-024-883  
1 ea.

Barrel Chute Rear Support  
110-024-888  
1 ea.

Barrel Chute  
110-024-885  
1 ea.

Incident Response Trailer  
IRT-112-1548

Trailer Assembly

Wheel and Tire Assembly  
160-024-210  
Standard - 2 ea.  
w/ Optional Spare - 3 ea.

28" Traffic Cone  
165-005-128  
25 ea.

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Brake Line Kit  
 Brake Line Splitter to Wheels (160-024-120) 1 ea.  
 Brake Actuator to Splitter Hose (160-024-125) 1 ea.

Hydraulic Line w/ Fittings (not shown)  
 From Front PS Battery Box to Mast Assembly  
 340-024-010  
 1 ea.

Sign Support Cradle  
 110-024-165  
 2 ea.

Message Board  
 Trailer Frame  
 MB-24-600  
 1 ea.

Deck Plate  
 Left - 110-024-126  
 Right - 110-024-125  
 1 each side

Plastic Fender  
 160-025-221  
 2 ea.

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

Swivel Jack Retaining Ring  
 162-025-212  
 5 ea.

Swivel Jack  
 162-025-215  
 4 ea.

Brake Line Cover  
 110-024-133  
 1 ea.

Brake Actuator  
 162-024-007  
 1 ea.

Mounting Point for:  
 Swivel Wheel Trailer Jack  
 162-025-200  
 1 ea. (Optional)

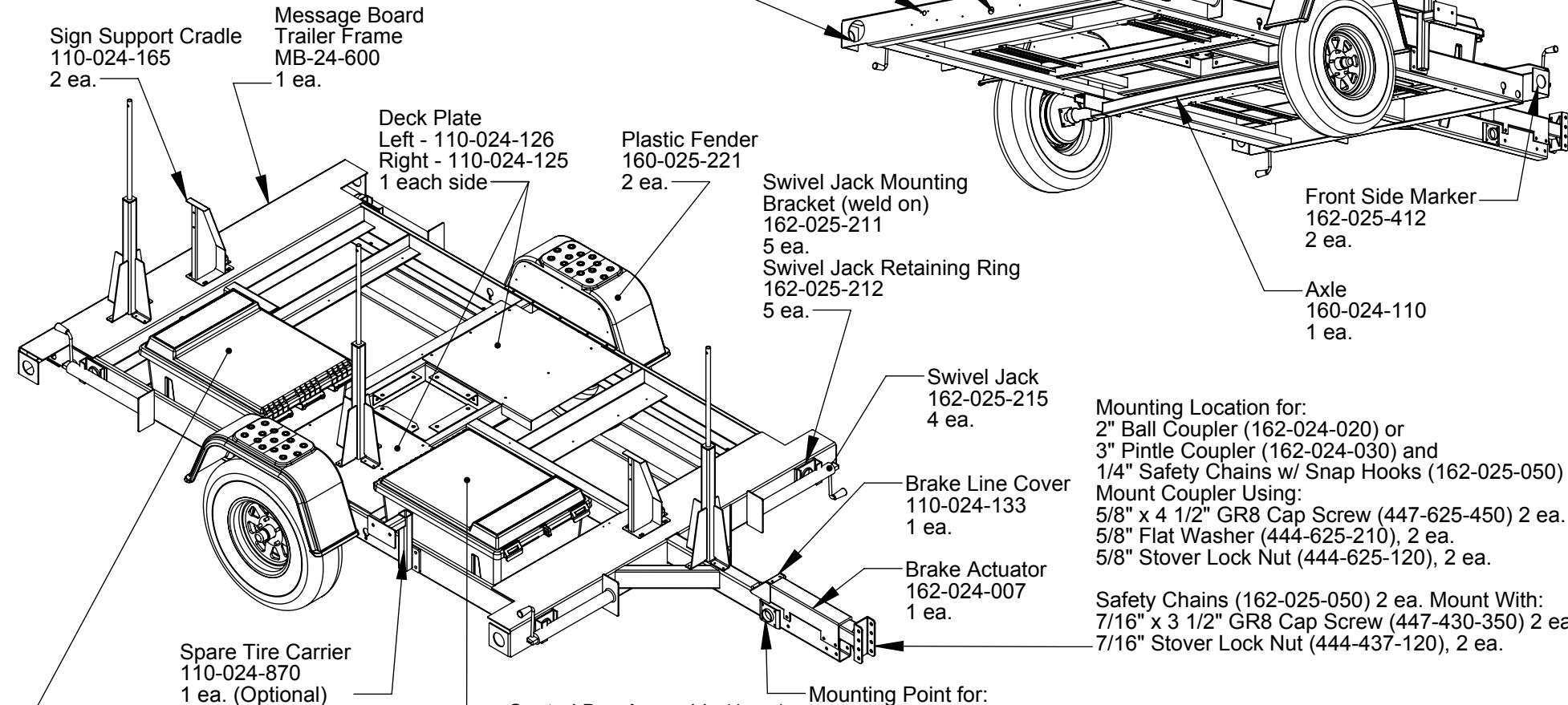
Mounting Location for:  
 2" Ball Coupler (162-024-020) or  
 3" Pintle Coupler (162-024-030) and  
 1/4" Safety Chains w/ Snap Hooks (162-025-050)  
 Mount Coupler Using:  
 5/8" x 4 1/2" GR8 Cap Screw (447-625-450) 2 ea.  
 5/8" Flat Washer (444-625-210), 2 ea.  
 5/8" Stover Lock Nut (444-625-120), 2 ea.

Safety Chains (162-025-050) 2 ea. Mount With:  
 7/16" x 3 1/2" GR8 Cap Screw (447-430-350) 2 ea.  
 7/16" Stover Lock Nut (444-437-120), 2 ea.

Tail Light and Wire Harness Kit  
 162-025-500  
 1 ea.  
 (International 162-025-510)

Incident Response Trailer  
 IRT-112-1548

Frame Assembly



Battery Box Assembly (1 ea.)  
 Contains:  
 -110-025-141 Box (1)  
 -110-025-151 Lid (1)  
 -110-025-161 Divider Plate (1)  
 -461-120-205 Push Rivet (2)  
 -466-424-230 Lid Support (1)  
 -990-006-105 Standard Battery (4)  
 or  
 -990-006-205 Gel Cell Battery (4)

Control Box Assembly (1 ea.)  
 Contains:  
 -110-025-141 Box (1)  
 -110-025-151 Lid (1)  
 -110-025-161 Divider Plate (1)  
 -461-120-205 Push Rivet (2)  
 -466-424-230 Lid Support (1)  
 -312-024-000 Hydraulic Power Unit (1)  
 -110-024-141 Hydraulic Pump Mounting Plate (1)  
 -MB-24-830 Energy Management System (1)  
 -MB-22-915 MegaTech Touch Screen Controller



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Solar Array Mounting Arm Weldment  
110-224-220  
2 ea.

Solar Array Mounting Angle  
110-224-230  
2 ea.

MB-DS Sign Mounting Angle Left  
110-224-105  
1 ea.

Solar Array Brush Guard  
110-224-240  
2 ea.

Single Sided Top  
Support Arm Spacer  
110-224-027  
1 ea.

Docking Pad  
110-024-040  
2 ea.

MB-DS Sign Case  
Support Arm Bottom  
110-224-070  
1 ea.

2 1/2" Rubber Bumper  
(Not Pictured)  
470-025-110  
2 per Solar Array

Stationary Disc Brake Plate  
110-024-027  
1 ea.

Diagonal Brace  
110-224-120  
4 ea.

Handle  
110-024-510  
1 ea.

Right Hand Cam  
110-024-502  
1 ea.

Left Hand Cam  
110-024-501  
1 ea.

Control Arm  
110-024-508  
1 ea.

Crank  
110-024-504  
1 ea.

Connecting Link  
110-024-506  
2 ea.

Pivot Arm Mounting Bracket  
110-224-205  
4 ea.

Upper Mast Cover Plate  
110-024-025  
1 ea.

MB-DS Sign Case  
Support Arm Top  
110-224-080  
2 ea.

Spring Pin Latch Base  
466-525-503  
2 ea.

MB-DS Solar Array  
Latching Bracket  
110-224-210  
2 ea.

MB-DS Sign  
Mounting Angle Right  
110-224-100  
1 ea.

Bottom Sign Case  
Support Arm Stiffener  
110-224-110  
2 ea.

Sight Tube  
110-224-130  
1 ea.

Incident Response Trailer  
IRT-112-1548

Superstructure Assembly  
Locking Cam Assembly

8 7 6 5 4 3 2 1

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Upper Mast and Hydraulic Cylinder Cover Plate  
110-024-025  
1ea.

58" Stroke Hydraulic Cylinder (310-024-550),  
Velocity Fuse (473-375-910), and  
Compression Fitting Enclosed in Mast Assembly  
1ea.

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Upper Mast Weldment  
110-024-116  
1ea.

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Rotor Plate Cover Assembly  
110-024-024  
1ea.

Upper Mast Rotor Plate Assembly  
110-024-027  
1ea.  
[Includes Rotor Plate (110-024-026),  
Wear Pads (110-024-030),  
Compression Springs (470-501-375),  
and Mounting Hardware]

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Lower Mast Weldment  
110-024-114  
1ea.

Silent Messenger Mast Assembly  
MB-24-101

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8 7 6 5 4 3 2 1

8 7 6 5 4 3 2 1

8 7 6 5 4 3 2 1

8 7 6 5 4 3 2 1

8 7 6 5 4 3 2 1

8 7 6 5 4 3 2 1

8 7 6 5 4 3 2 1

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**Sign Panel Assemblies**

MB-22-448-DS MBII Sign Panels 4.5'x8' (2 ea.)  
 MB-23-448-DS MBIII Sign Panels 3.5'x6' (2 ea.)  
 (Does not include LED Display Modules)

**Solar Array Power Cable**  
 962-224-010 (1 ea.)

Slave Sign Panel

**Sign Power & Control Cables**  
 962-224-040 Master Sign Panel (1 ea.)  
 962-224-050 Slave Sign Panel (1 ea.)

**Power Cable Battery to Master Energy Management System 30" Slave Control Box**  
 962-224-030 (1ea.)

**Battery Box Power Cable (Battery Box to Battery Box)**  
 962-124-045 (45" front to rear) (2ea.)  
 962-124-036 (36" rear to rear) (1ea.)

**Solar Array 300 Watt - MB-224-300**  
 Includes:  
 Mounting Frame - 110-224-340 (1 ea.)  
 Solar Panel 75 Watt - 980-024-075 (4 ea.)

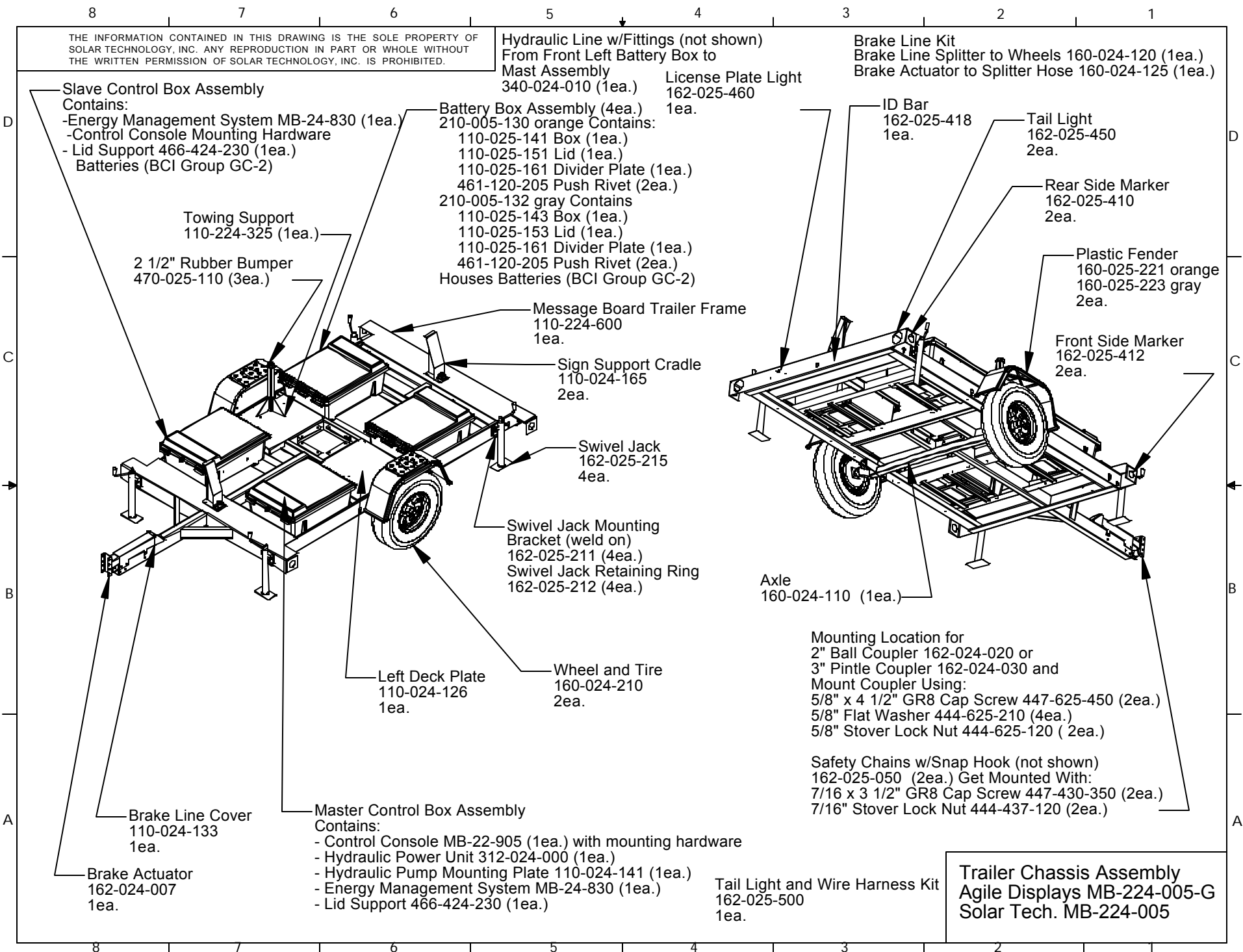
**Mast Assembly**  
 MB-224-103 Solar Tech.  
 MB-224-103-G Agile Displays

Master Sign Panel

**Message Board Trailer Chassis Assembly**  
 MB-224-005 SolarTech  
 MB-224-005-G Agile Displays

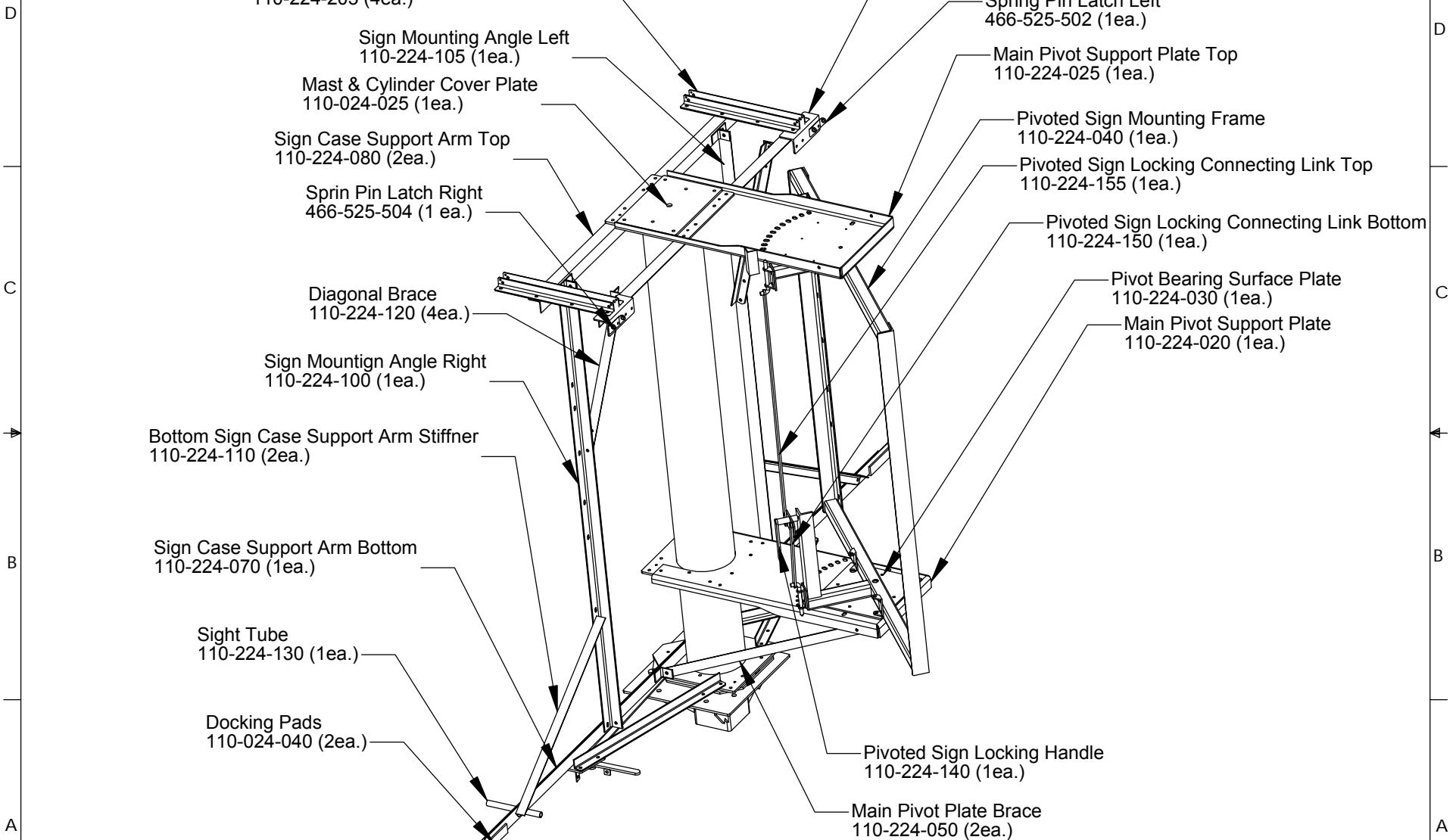
Master Control Box

Agile Displays PD-2201 4.5'x8'  
 PD-3201 3.5'x6'  
 SolarTech MB-122-3048 4.5'x8'  
 MB-123-3048 3.5'x6'



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Solar Array Pivot Arm Mounting Bracket  
110-224-205 (4ea.)

Sign Mounting Angle Left  
110-224-105 (1ea.)

Mast & Cylinder Cover Plate  
110-024-025 (1ea.)

Sign Case Support Arm Top  
110-224-080 (2ea.)

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

Diagonal Brace  
110-224-120 (4ea.)

Sign Mountign Angle Right  
110-224-100 (1ea.)

Bottom Sign Case Support Arm Stiffner  
110-224-110 (2ea.)

Sign Case Support Arm Bottom  
110-224-070 (1ea.)

Sight Tube  
110-224-130 (1ea.)

Docking Pads  
110-024-040 (2ea.)

Solar Array Latching Bracket  
110-224-210 (2ea.)

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

Main Pivot Support Plate Top  
110-224-025 (1ea.)

Pivoted Sign Mounting Frame  
110-224-040 (1ea.)

Pivoted Sign Locking Connecting Link Top  
110-224-155 (1ea.)

Pivoted Sign Locking Connecting Link Bottom  
110-224-150 (1ea.)

Pivot Bearing Surface Plate  
110-224-030 (1ea.)

Main Pivot Support Plate  
110-224-020 (1ea.)

Pivoted Sign Locking Handle  
110-224-140 (1ea.)

Main Pivot Plate Brace  
110-224-050 (2ea.)

Super Structure Assembly  
Agile Displays MB-224-103-G  
Solar Tech. MB-224-103

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Upper Mast Weldment  
110-224-090 (1ea.)

310-024-550 58" Stroke Hydraulic Cylinder (1ea.)  
473-375-910 Velocity Fuse (1ea.)  
110-024-030 Upper Wear Pads (4ea.)  
110-024-032 Bracket Upper Wear Pads (4ea.)

Lower Mast Weldment  
110-224-095 (1ea.)

Locking Mechanism  
Control Handle  
110-024-510 (1ea.)  
Grab Handle Vinyl  
480-010-025 (1ea.)

Upper Mast Rotor Plate Assembly  
110-024-027 (1ea.)  
Includes:  
110-024-026 Rotor Plate (1ea.)  
110-024-031 Wear Pads (4 ea.)  
470-501-375 Compression Springs (8ea.)  
Mounting Hardware

Left Locking Mechanism Cam Plate  
110-024-501 (1ea.)

Locking Mechanism Bellcrank  
110-024-504 (1ea.)

Locking Mechanism Control Arm  
110-024-508 (1ea.)

Connecting Link  
110-024-506 (2ea.)

Right Locking Mechanism Cam Plate  
110-024-502 (1ea.)

Rotor Plate Cover Assembly  
110-024-024 (1ea.)

Super Structure Assembly  
Agile Displays MB-224-103-G  
Solar Tech. MB-224-103

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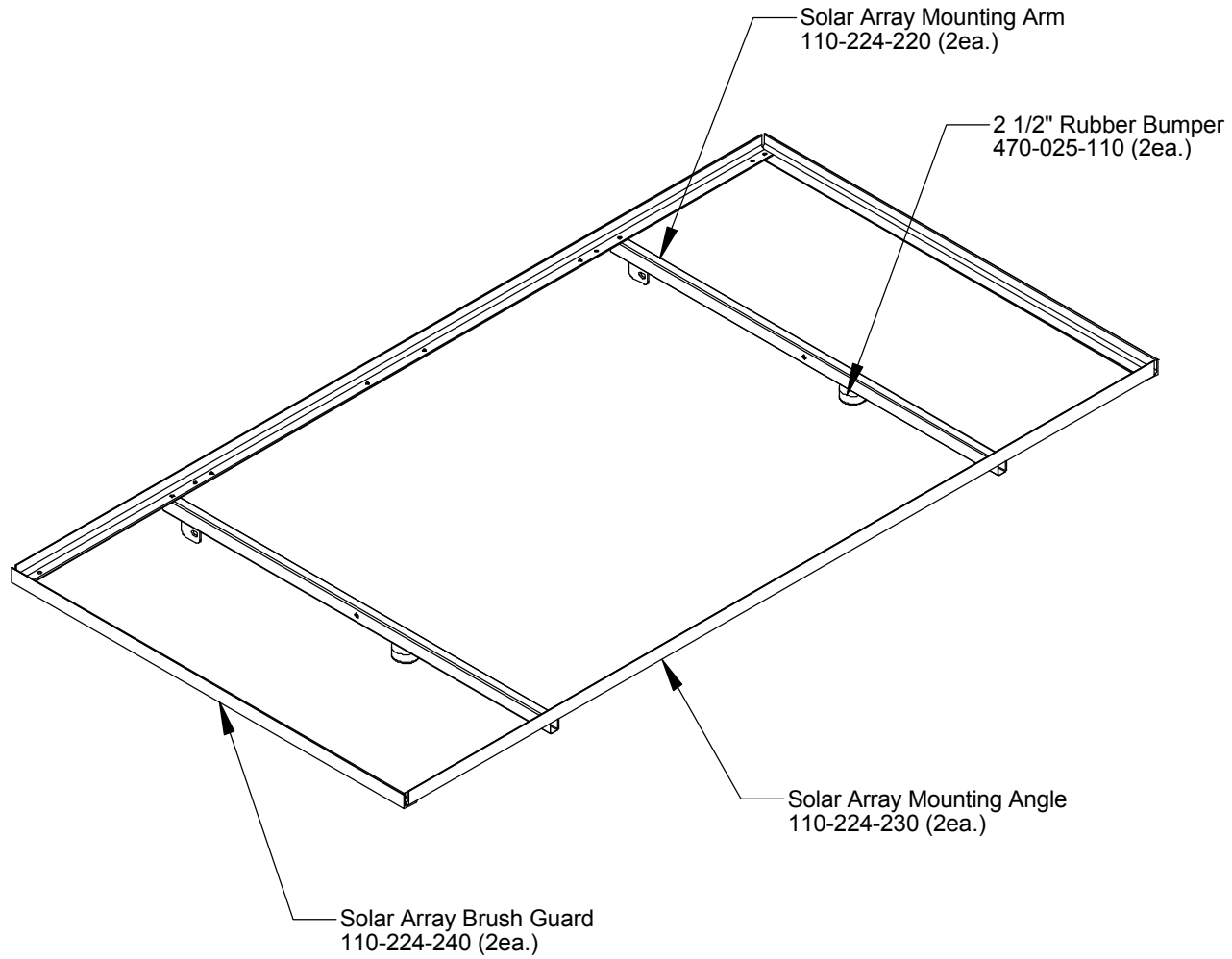
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Double Sided  
Solar Array Mounting Frame

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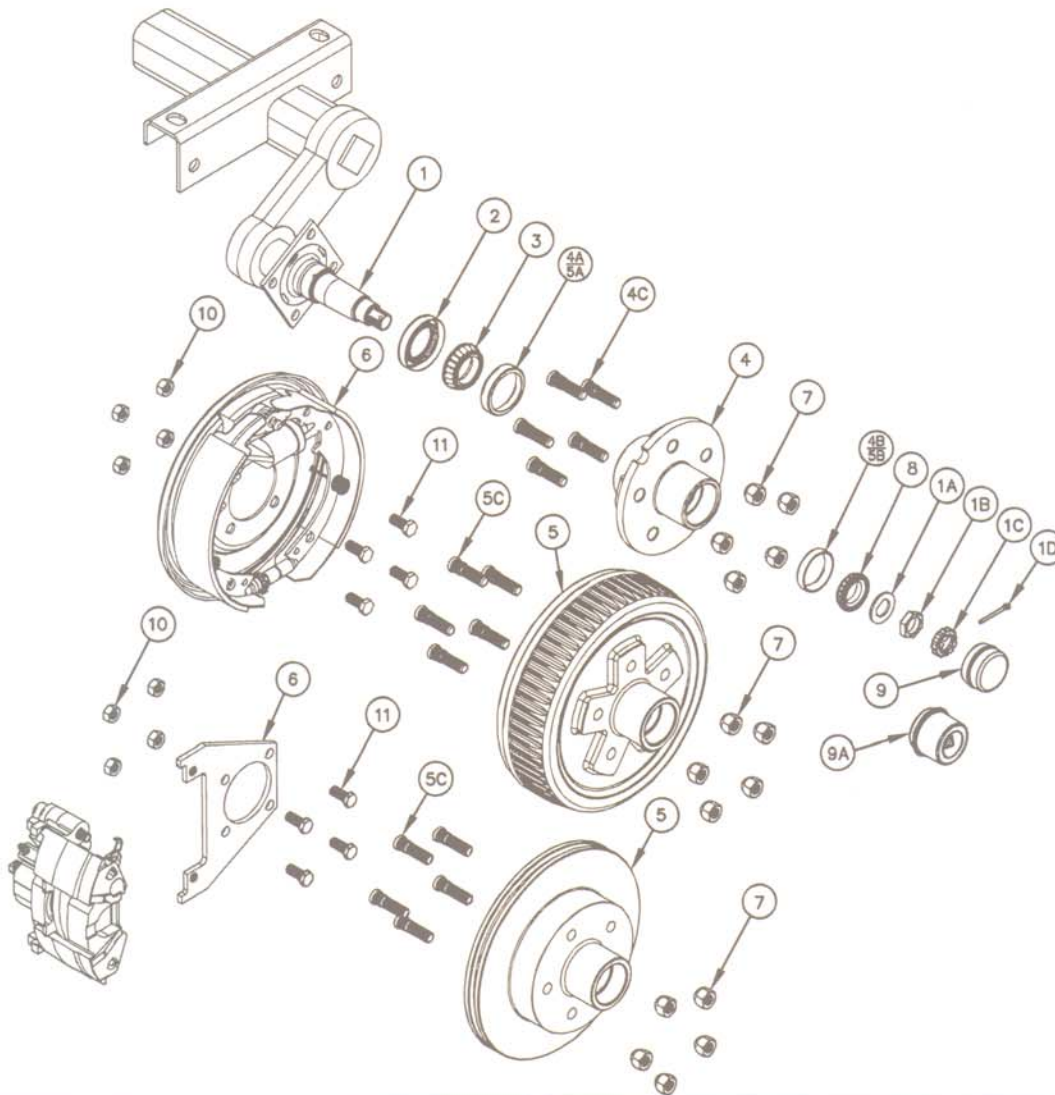
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# 2500-3700 lb. Rubber Torsion Hub and Drum Options

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

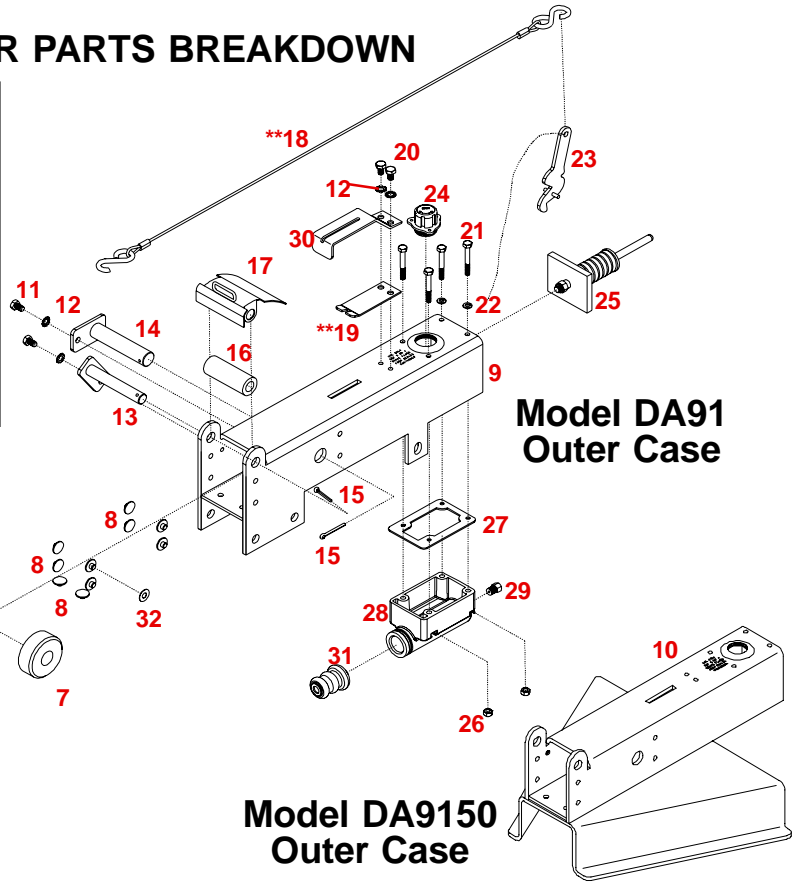
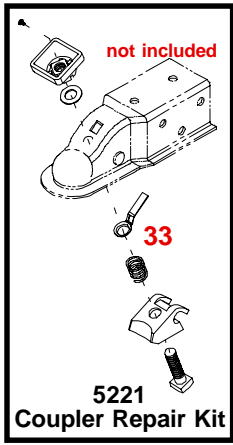


Detail	Part Number	Description
1	To Be Assigned	Rubber Torsion Axle - 2500-3700 lbs.
1A	DW-813	Spindle Washer - 13/16" - 'D' Flat
1B	SN-813	Spindle Nut - 13/16"-20
1C	LS-813	Spindle Nut Lock Shield
1D	SCP-103	Cotter Pin - 5/32" x 1 1/2"
2	SL-168	Grease Seal - 1.688" I.D.
	SL-173	Grease Seal - 1.719" I.D.
3	L68149	Inner Bearing Cone - 1.378" I.D.
4	1-1000-04-00	Idler Hub - 5 on 4 1/2" (6 1/2" Dia. Flange)
	1-1050-04-00	Idler Hub - 5 on 4 1/2" (5 9/16" Dia. Flange)
	1-1000-14-00	Idler Hub - 5 on 5" (6 1/2" Dia. Flange)
4A	L68111	Inner Bearing Cup
4B	L44610	Outer Bearing Cup
4C	ST-504	Pressed-in Stud - 1/2"-20 (1000 Series)
	ST-502-04	Pressed-in Stud - 1/2"-20 (1050 Series)

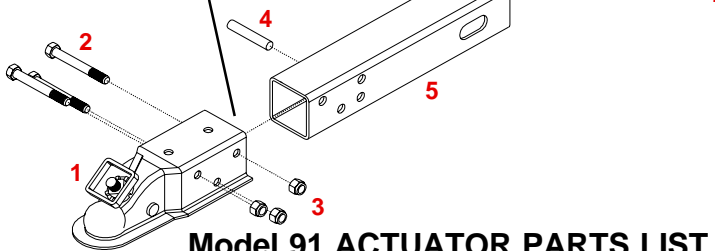
Detail	Part Number	Description
5	5-1000-04-00	Brake Drum - 5 on 4 1/2"
	5-1000-14-00	Brake Drum - 5 on 5"
	9-1001-04-00	Disc Brake Rotor - 5 on 4 1/2"
5A	L68111	Inner Bearing Cup
5B	L44610	Outer Bearing Cup
5C	ST-502-04	Pressed-in Stud - 1/2"-20
6	EBLH-1000 EBRH-1000	Electric Brake - 10" x 2 1/4"
	HBLH-1000 HBRH-1000	Hydraulic Brake - 10" x 2 1/4"
	HBLH-1001 HBRH-1001	Free Backing Hydraulic Brake - 10" x 2 1/4"
	DBCL-1001 DBCR-1001	Disc Brake Caliper Assembly
	7	STN-506
8	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
11	FB-437	Flange Bolt - 7/16"-20 x 1" Hex (hydraulic brakes only)



# ACTUATOR PARTS BREAKDOWN

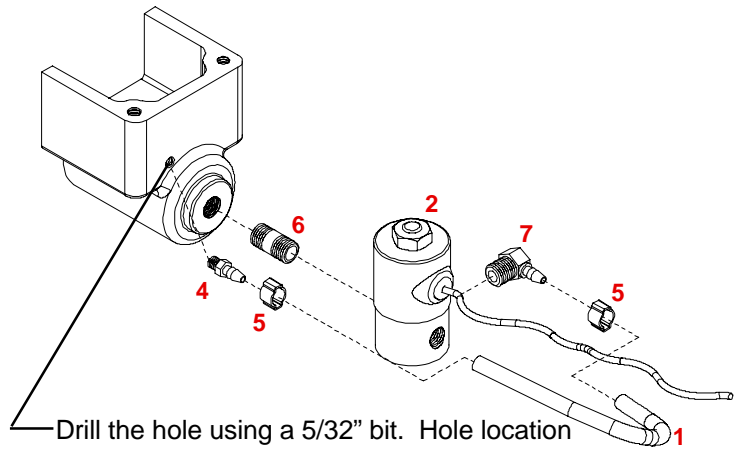


**2" Fulton Ball Coupler  
RATED AT 6000#**



REF. NO.	PART NO.	QTY.	DESCRIPTION
1.	05432	1	6000# 2" Ball Coupler
2.	01896	3	1/2"-13UNC x 4" Hex Head Bolt (gr.5)
3.	02178	3	1/2"-13UNC Nylon Insert Lock Nut
4.	05441-95	1	Front Shock Pin 5/8" dia. x 3" lg. (shown)
-	05426-95	1	Front Shock Pin for straight tube actuators
5.	05440-??	1	Straight Actuator Slider Tube
6.	SB12426	1	Damper/ Shock
7.	05403	2	Brake Actuator Roller
8.	05401	10	Nylatron Wear Button
9.	05975-??	1	Straight Mount Outer Case
10.	05967-??	1	50 degree Mount Outer Case
11.	04305	2	5/16"-18UNC x 1/2" Hex Head Bolt (gr.5)
12.	05424	4	5/16" External Tooth Lock Washer
13.	05423-??	1	Top Roller Pin
14.	05422-??	1	Inner Roller Pin
15.	02363	2	5/32" x 1 1/4" Cotter Pin
16.	05402	1	Top Roller
17.	05419-??	1	Top Roller Cover (6,000# rating)
**18.	05408	1	3/32" Cable with hooks (both ends)
-	SB10555	-	Replacement S-Hooks ONLY
**19.	05693-??	1	Emergency Lever Spring
20.	05961	2	5/16"-18UNC x 5/8" Hex Head Bolt (gr.5)
21.	00618	4	1/4"-20UNC x 2" Hex Head Bolt
22.	00057	4	1/4" Lock Washer
*23.	05951	1	Emergency Lever
24.	03876	1	Master Cylinder Cap w/ Diaphragm & O-ring
-	05849	1	O-Ring Only (not shown)
25.	05977	1	Push Rod Assembly
26.	00062	4	1/4"-20 UNC Hex Nut
27.	05681	-	Cast Master Cyl. Gasket ONLY
-	09153	-	Plastic Master Cyl. Gasket ONLY
28.	05680	1	Cast Master Cylinder w/ gasket 05681
-	10616	1	Master Cylinder w/ gasket 09153
29.	SB12098	1	.018 Connector Orifice
30.	03866-??	1	Lever Guide
31.	05687	1	Master Cylinder Protective Boot
32.	09420	6	Washer 3/4"OD x 21/64"ID SS
-	5401	-	Lever Replacement Kit (incl. items w/**)
-	5398/5680	-	Master Cylinder Repair Kit w/ gasket
-	5221	-	Coupler Repair Kit
33.	02920	-	Thumb Lock ONLY

## (OPTIONAL) FREE BACKING SOLENOID KIT (5404) PARTS BREAKDOWN



### KIT #5404 PARTS LIST

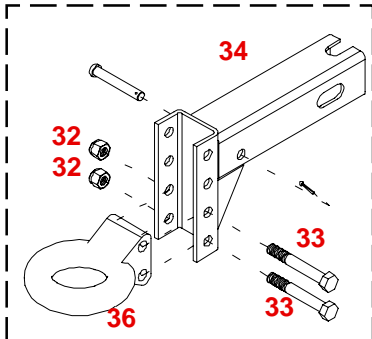
REF. NO.	PART NO.	QTY.	DESCRIPTION
1.	04594	-	EPDM Black Tubing
2.	05561	1	Solenoid Valve
3.	09153	1	Master Cylinder Gasket (not shown)
4.	10373	1	Brass Fitting Str. .2 HB x 10-32 NF
5.	10374	2	Crimp Clamp
6.	10375	1	Straight Nipple 1/8" MPT x 1/8" MPT
7.	10376	1	Brass Elbow 1/8" MPT x .2 HB

**Note:** -?? = -30 Black                      -91 Yellow Chromate  
 -95 Plated                                      -97 Primed Red  
 Please indicate when ordering parts

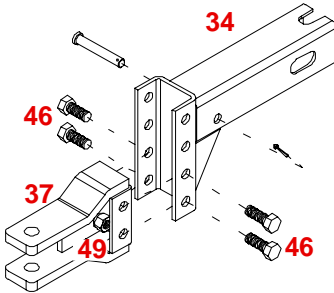
Please order replacement parts by **PART NO.** and **DESCRIPTION**

**See page 18 for Available Hitch Configurations.**

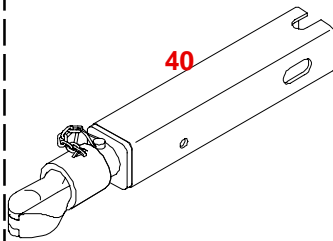
# AVAILABLE HITCH CONFIGURATIONS



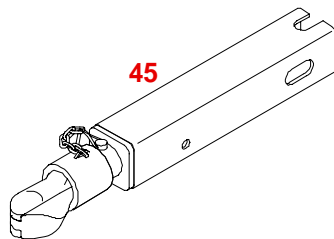
**Channel Down with Pintle  
RATED AT 7500#**



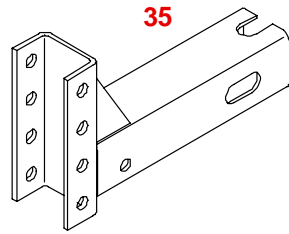
**Channel Down with Clevis  
RATED AT 7500#**



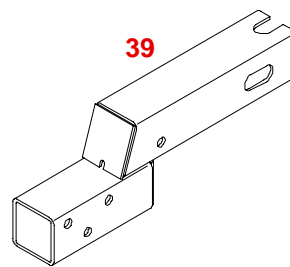
**2-5/16" Bulldog Ball  
Coupler welded to  
straight slider tube  
RATED AT 7500#**



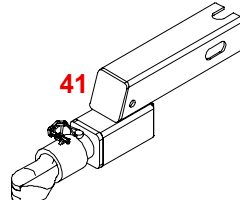
**2" Bulldog Ball Coupler  
welded to straight  
slider tube  
RATED AT 7000#**



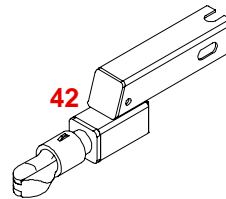
**Clevis Channel Up  
RATED AT 7500#**



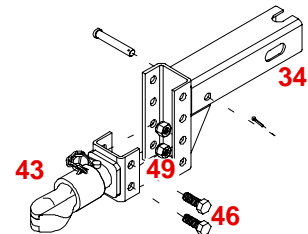
**Model 91 Drop Slider Tube**



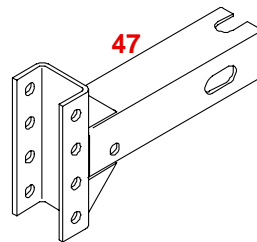
**2-5/16" Bulldog Ball  
Coupler welded to  
drop slider tube  
RATED AT 7500#**



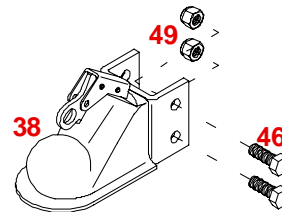
**2" Bulldog Ball  
Coupler welded to  
drop slider tube  
RATED AT 7000#**



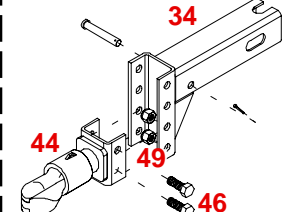
**2-5/16" Bulldog Ball Coupler  
welded to clevis channel  
RATED AT 7500#**



**Clevis Channel Centered  
RATED AT 7500#**



**2-5/16" Lever Lock  
Bolt On Coupler  
RATED AT 7500#**



**2" Bulldog Ball Coupler  
welded to clevis channel  
RATED AT 7000#**

## PARTS LIST

REF. NO.	PART NO.	QTY.	DESCRIPTION
32.	02587	2	5/8"-11UNC Nylon Insert Lock Nut
33.	02434	2	5/8"-11UNC x 4 1/2" Hex Head Bolt (Gr. 5)
34.	05937-??	1	Clevis Channel Down
35.	05991-??	1	Clevis Channel Up
36.	09557-??	1	Pintle Ring (10 Ton Capacity)
37.	05593-??	1	Clevis
38.	07678-??	1	2-5/16" Lever Lock Bolt On Coupler
39.	05421-??	1	Drop Slider Tube
40.	05990-??	1	2-5/16" Bulldog Coupler Welded to Straight Slider Tube
41.	05594-97	1	2-5/16" Bulldog Coupler Welded to Drop Slider Tube
42.	05822-97	1	2" Bulldog Coupler Welded to Drop Slider Tube
43.	05557-??	1	2-5/16" Bulldog Coupler Welded to Clevis Channel
44.	05823-??	1	2" Bulldog Coupler Welded to Clevis Channel
45.	05835-97	1	2" Bulldog Coupler Welded to Straight Slider Tube
46.	04051	4	5/8"-11UNC x 1-1/2" Hex Head Bolt (Gr.5)
47.	03734-??	1	Clevis Channel Centered
49.	03730	4	5/8" Stover Locknut

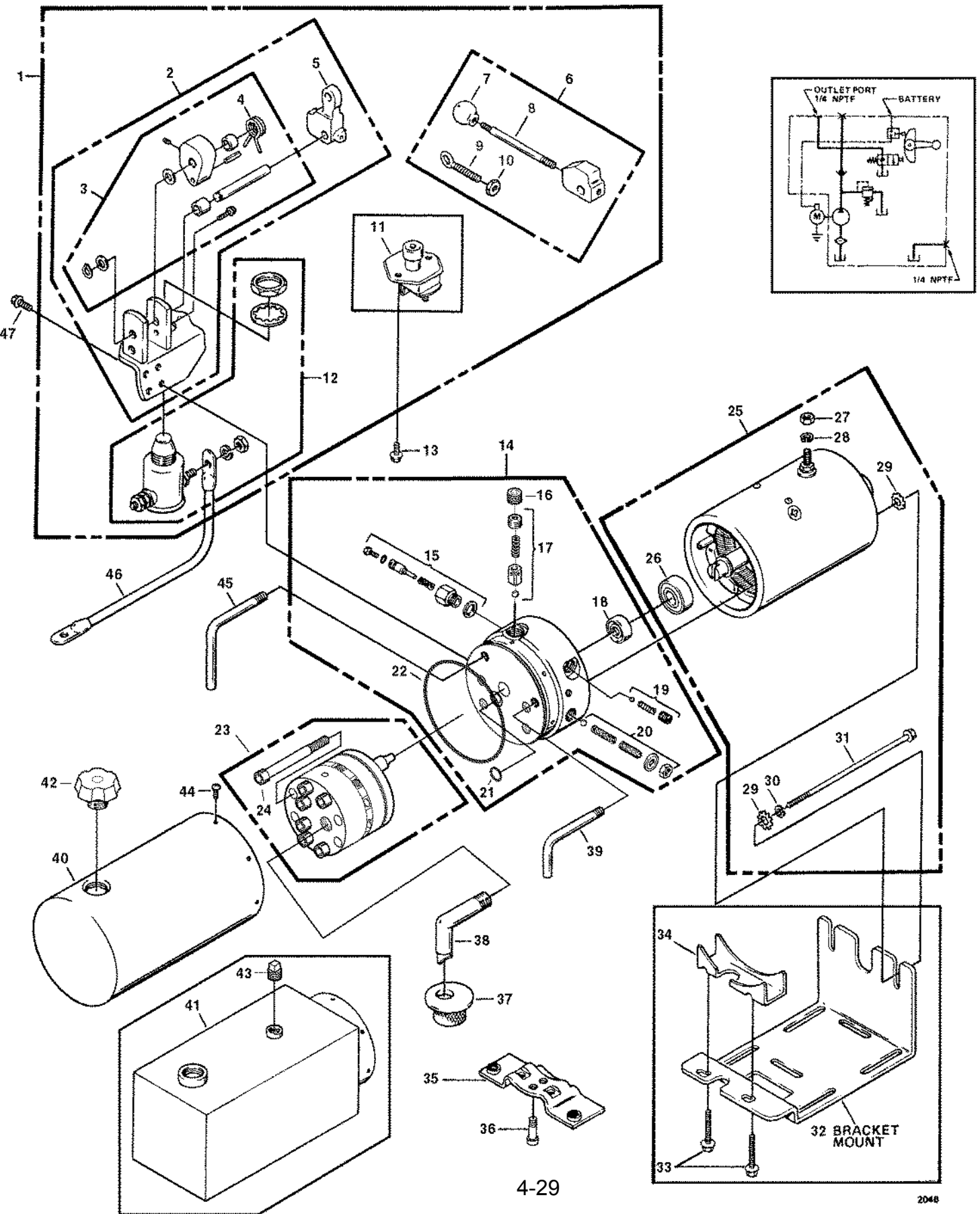
**Note:** -?? = -95 Plated      -97 Primed Red  
Please indicate when ordering parts

Please order replacement parts by **PART NO.** and **DESCRIPTION.**

RATED CAPACITY	
2" Bulldog Ball Coupler	7000 lbs.
2" Fulton Ball Coupler	6000 lbs.
Channel Up and Chan. Down Hitch	7500 lbs.
2-5/16" Ball Couplers	7500 lbs.

The Model 91 brake actuator has a maximum load rating depending on which coupler you own, (see table at right), and 600 lbs. tongue load. The units actual rating is limited to that of the ball and the hitch being used or the trailers \*GVWR shown on the manufacturers certification label, whichever is lower.

\*(Gross Vehicle Weight Rating)



# M-301

Ref. No.	Part No.	Description	No. Req.
1	03411	BRACKET ASSEMBLY, With 5 & 12	1
	03321	BRACKET ASSEMBLY, With 5 & 11	1
	03412	BRACKET ASSEMBLY, With 6 & 12	1
	03413	BRACKET ASSEMBLY, With 6 & 11	1
2	03437	• BRACKET ASSEMBLY, With 5	1
	03440	• BRACKET ASSEMBLY, With 6	1
3	03660	•• PARTS KIT, Bracket Assembly	1
4	00018	••• SPRING, Torsion	1
5	00391	•• HANDLE ASSEMBLY	1
6	00175	• PARTS KIT, Handle Assembly	1
7	01157	•• BALL, Plastic	1
8	01326	•• ROD, Handle 4"	1
9	01327	•• EYE BOLT, Rod Control 5/16-18 x 1-7/8"	1
10	07790	•• NUT, Hex 5/16-18	1
11	03308	• SWITCH, Start	1
12	03322	• SWITCH, Start, (canister type)	1
13	07886	SCREW, Hex Washer Head, tap tite 1/4-20 x 1/2"	2
14	12421	BASE ASSEMBLY, Modular	1
15	00235	• PARTS KIT, Plunger	1
16	02349	• PLUG, Pipe, 3/8" NPT	1
17	07526	• PARTS KIT, Check Valve (main)	1
18	02159	• SEAL	1
19	00078	• PARTS KIT, Check Valve (descending)	1
20	03766	• PARTS KIT, Relief Valve	1
21	00120	• O-RING, Industrial (1/2" x 5/8" x 1/16")	1
22	02352	• O-RING, Industrial (3-5/8" x 3-7/8" x 1/8")	1
23	K12171-150	PUMP ASSEMBLY, Modular	1
	K12171-200	PUMP ASSEMBLY, Modular	1
	K12171-250	PUMP ASSEMBLY, Modular	1
	K12171-270	PUMP ASSEMBLY, Modular	1
	K12171-330	PUMP ASSEMBLY, Modular	1
	K12171-380	PUMP ASSEMBLY, Modular	1
	K12171-510	PUMP ASSEMBLY, Modular	1
24	07819	• SCREW, 1/4-20 x 2 3/4 Socket Head Cap (For Pump Assembly -150 & -200)	4
	07818	• SCREW, 1/4-20 x 3 Socket Head Cap (For Pump Assembly -250, -270, -330, -380)	4
	07837	• SCREW, 1/4-20 x 3 1/4 Socket Head Cap (For Pump Assembly -510)	4

Ref. No.	Part No.	Description	No. Req.
25	08111	MOTOR, Electric, 12 VDC	1
	08112	MOTOR, Electric, 12 VDC	1
	08120	MOTOR, Electric, 24 VDC	1
26	02318	• BEARING, Base, motor	1
27	07625	• NUT, Hex 5/16-24	1
28	07781	• WASHER, Lock 5/16"	1
29	07737	• WASHER, Star 1/4"	4
30	07795	• WASHER, Lock 1/4"	2
31	07738	• SCREW, Hex Head Cap 1/4-20 x 6-1/2"	2
		FOR FURTHER BREAKDOWN OF MOTOR, SEE MOTOR SECTION	
32	02238	BRACKET, Mounting	1
33	07717	SCREW, Hex Head, thread forming 1/4-20 x 1-3/8"	2
34	01329	ADAPTER, Pump Mounting Bracket	1
35	04559	BRACKET, Plate Mount 5.00" C to C	1
	04560	BRACKET, Plate Mount 3.25" C to C	1
36	07592	SCREW, Socket Head Cap, 3/8 -16 x 1	2
37	01134	SCREEN, Filter (suction)	1
38	01209	TUBE, Filter Suction 3/8 NPT 90 Deg.	1
39	13059	TUBE, Return (1/8")	1
40	14076	RESERVOIR, 4-1/2" Dia. x 8", 76 in <sup>3</sup> usable	1
	14070	RESERVOIR, 4-1/2" Dia. x 10", 102 in <sup>3</sup> usable	1
	14071	RESERVOIR, 4-1/2" Dia. x 12", 127 in <sup>3</sup> usable	1
41	06678	RESERVOIR, 5" x 5" x 10", 211 in <sup>3</sup> usable	1
	06685	RESERVOIR, 5" x 5" x 12", 249 in <sup>3</sup> usable	1
	06686	RESERVOIR, 5" x 5" x 15", 306 in <sup>3</sup> usable	1
42	01143	PLUG, Vent (plastic)	1
43	01108	PLUG, Square Head, 1/4 NPT	1
44	07703	SCREW, Thread Forming 10-24 x 3/8"	6
45	13058	TUBE, Return (1/8 NPT)	1
46	01373	CABLE, Insulated, with lugs 9" 6 ga.	1
47	07815	SCREW, Hex Washer Head, tap tite 1/4-20 x 5/8"	4



U.S.A.:  
**MONARCH HYDRAULICS, INC.**  
 P.O. Box 1764, Grand Rapids, Michigan 49501-1764, U.S.A.  
 Telephone: (616) 458-1306  
 Telefax: (616) 458-1616  
<http://www.monarchhyd.com>  
 Form No. 2155-01

CANADA:  
**FLUID-PACK INTERNATIONAL LIMITED**  
 A Part of the Monarch Hydraulics Group  
 460 Newbold St., London, Ontario, Canada N6E 1K3  
 Telephone: (519) 686-5900  
 Telefax: (519) 686-8976

# **SILENT MESSENGER**

**PORTABLE CHANGEABLE MESSAGE SIGNS**

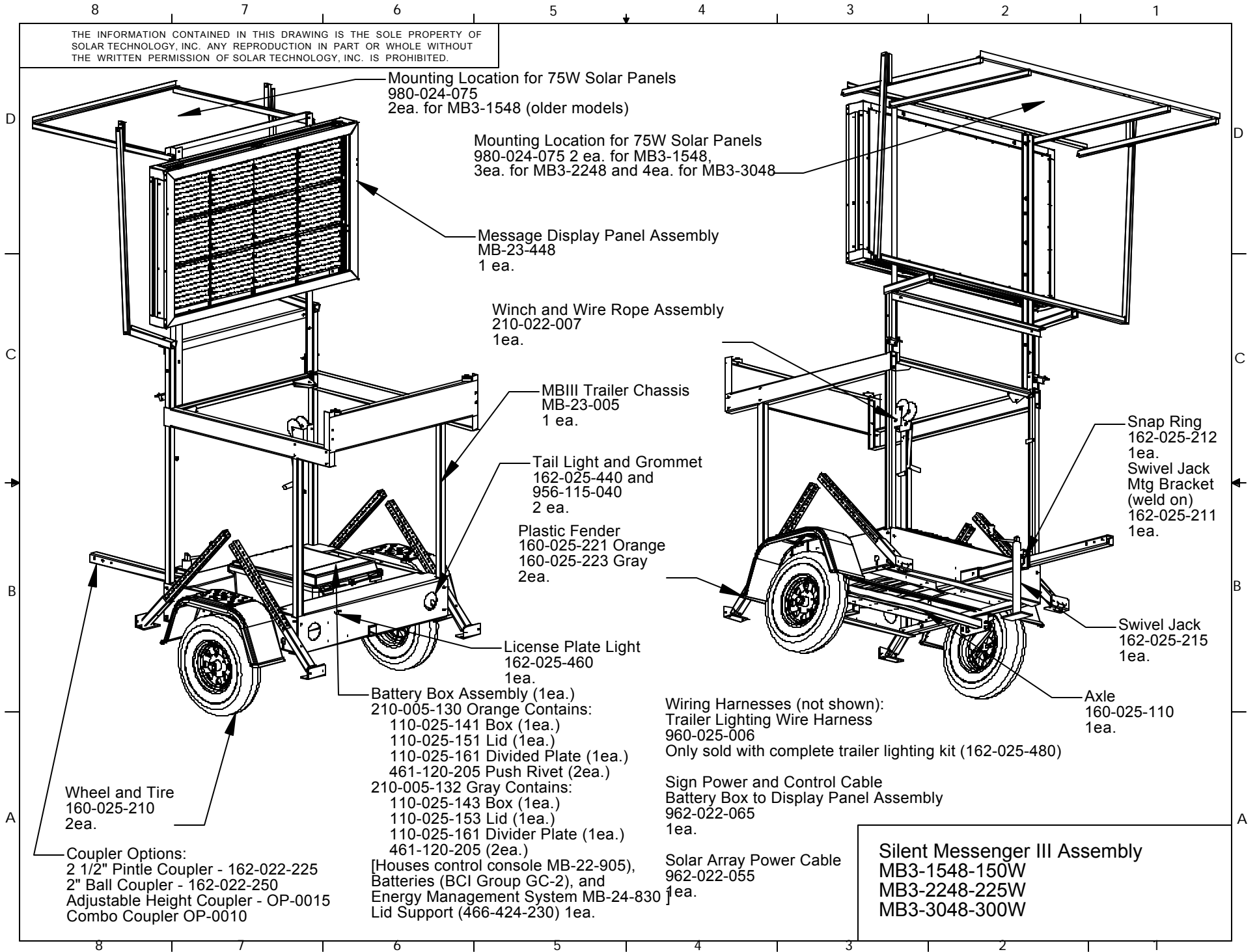
**Parts Diagrams:**

**Silent Messenger III Series**

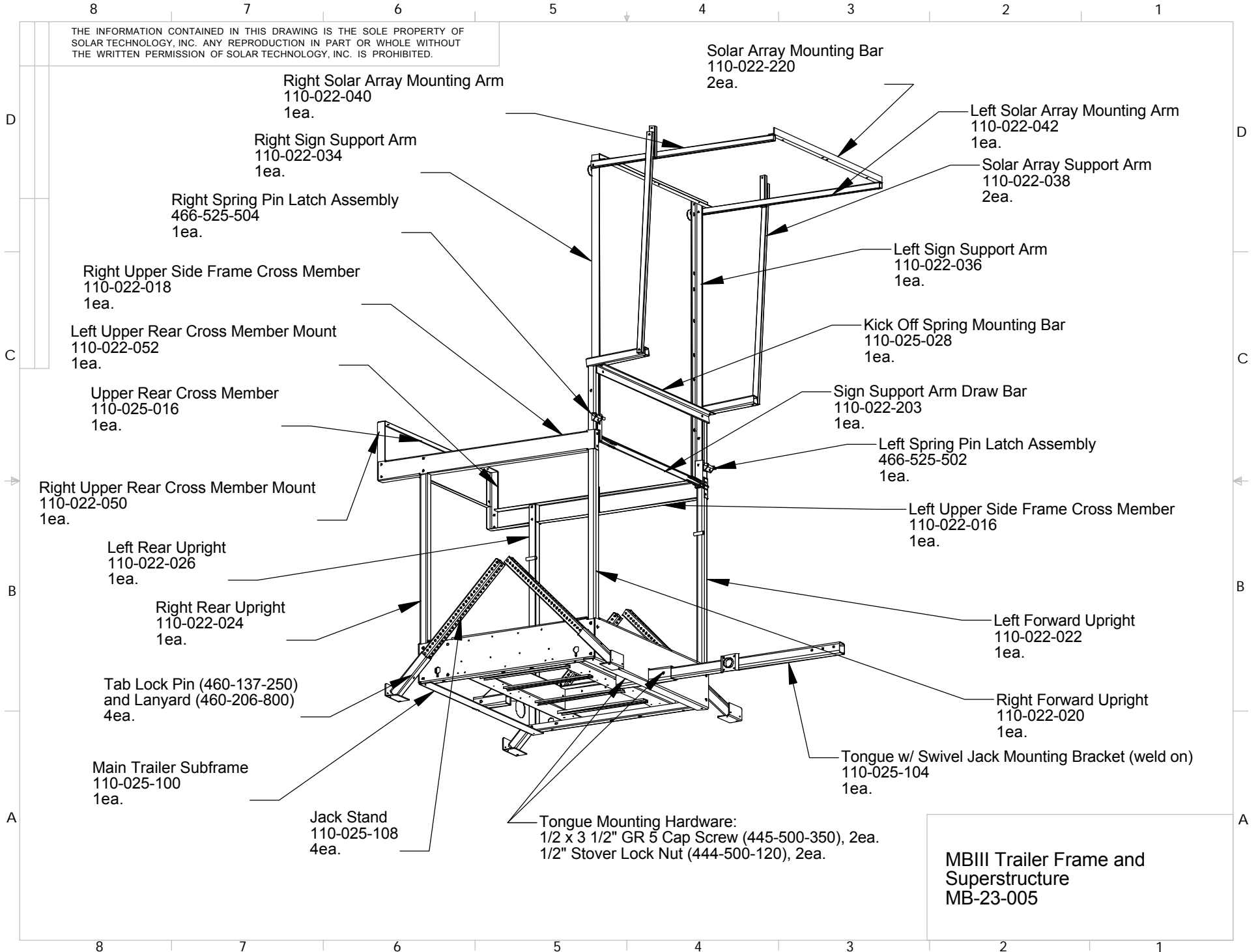




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**MBIII Trailer Frame and Superstructure**  
MB-23-005

8 7 6 5 4 3 2 1

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D

C

B

A

D

C

B

A

Right Solar Array Mounting Arm  
110-022-040  
1ea.

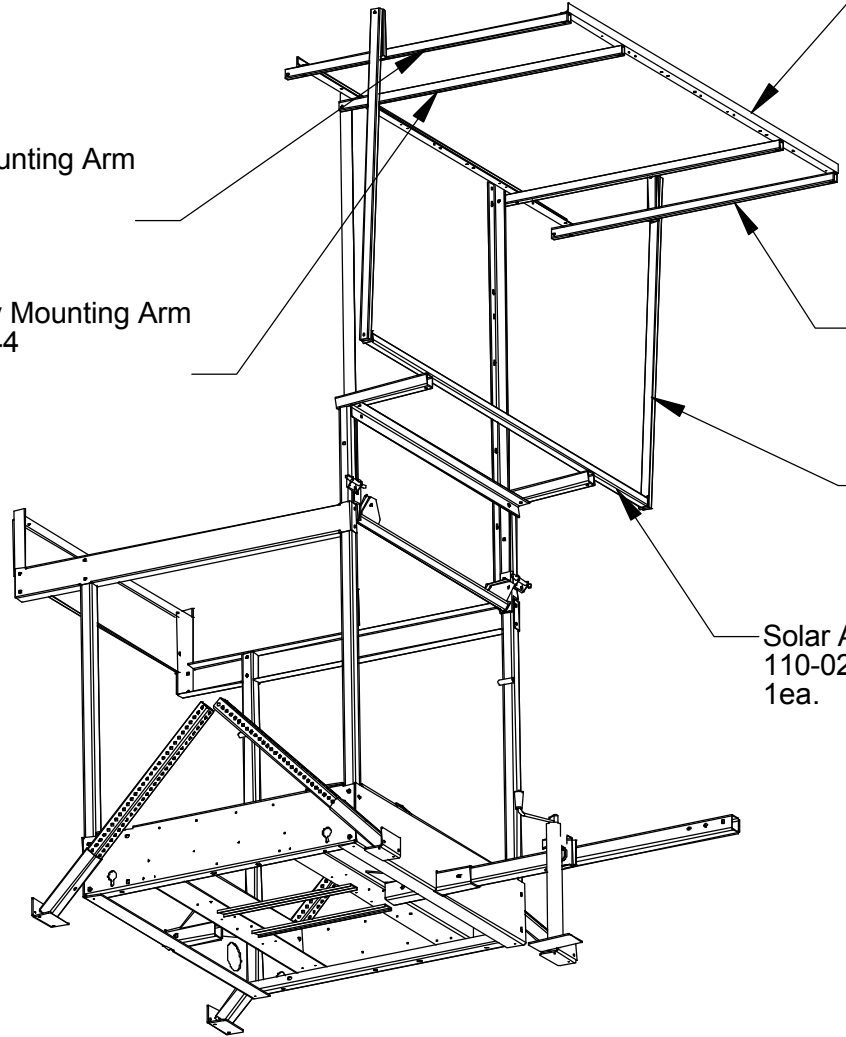
Solar Array Mounting Arm  
110-022-044  
2ea.

Solar Array Mounting Bar  
110-022-225  
2ea.

Left Solar Array Mounting Arm  
110-022-042  
1ea.

Solar Array Support Arm  
110-022-038  
2ea.

Solar Array Support Arm Mounting Bar  
110-022-215  
1ea.



MBIII Trailer Frame and  
Superstructure for MB3-1548,  
MB3-2248 and MB3-3048

8

7

6

5

4

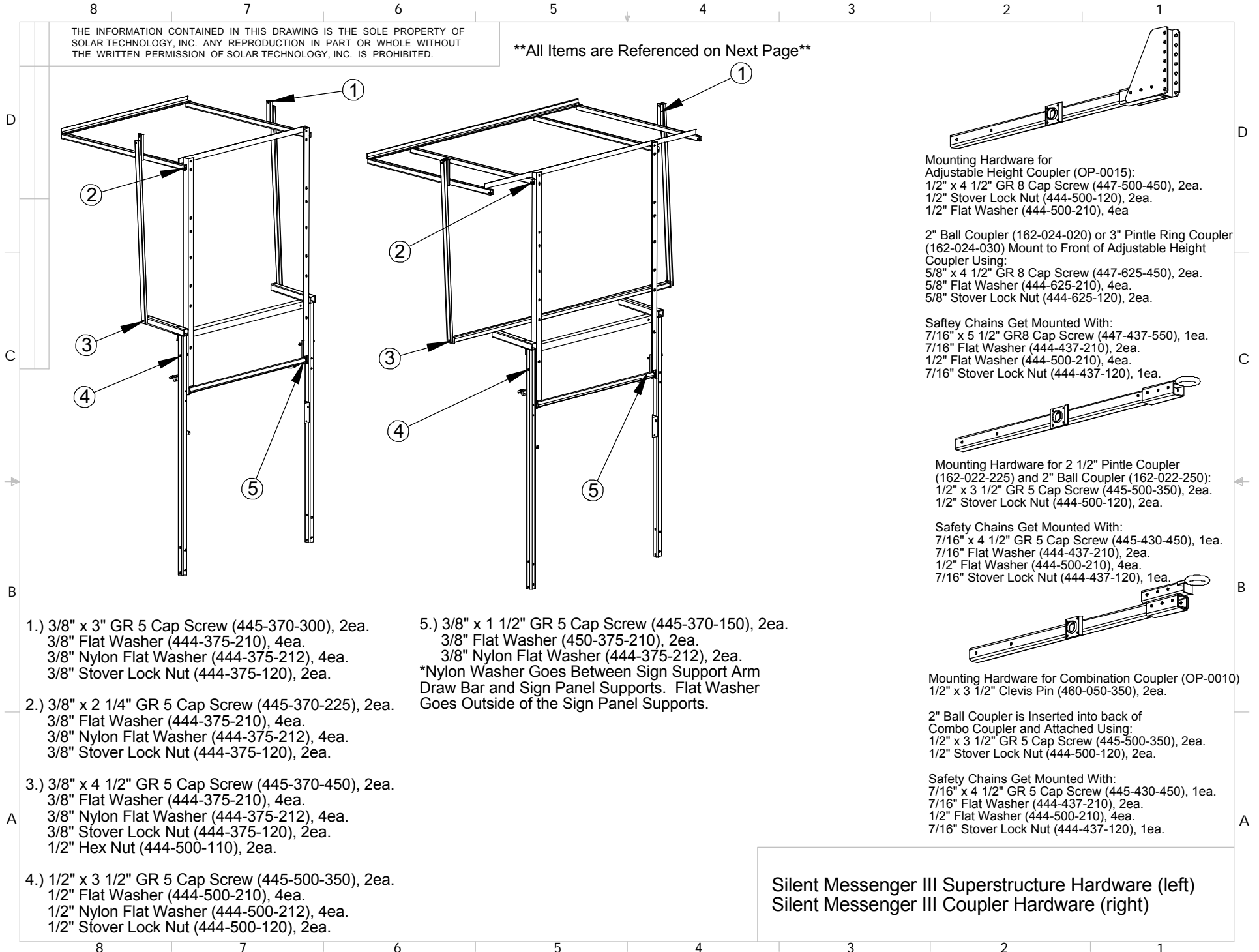
3

2

1

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**\*\*All Items 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 1/4" GR 5 Cap Screw (445-370-225), 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.

- 5.) 3/8" x 1 1/2" GR 5 Cap Screw (445-370-150), 2ea.  
 3/8" Flat Washer (450-375-210), 2ea.  
 3/8" Nylon Flat Washer (444-375-212), 2ea.  
 \*Nylon Washer Goes Between Sign Support Arm  
 Draw Bar and Sign Panel Supports. Flat Washer  
 Goes Outside of the Sign Panel Supports.

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.

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" 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.

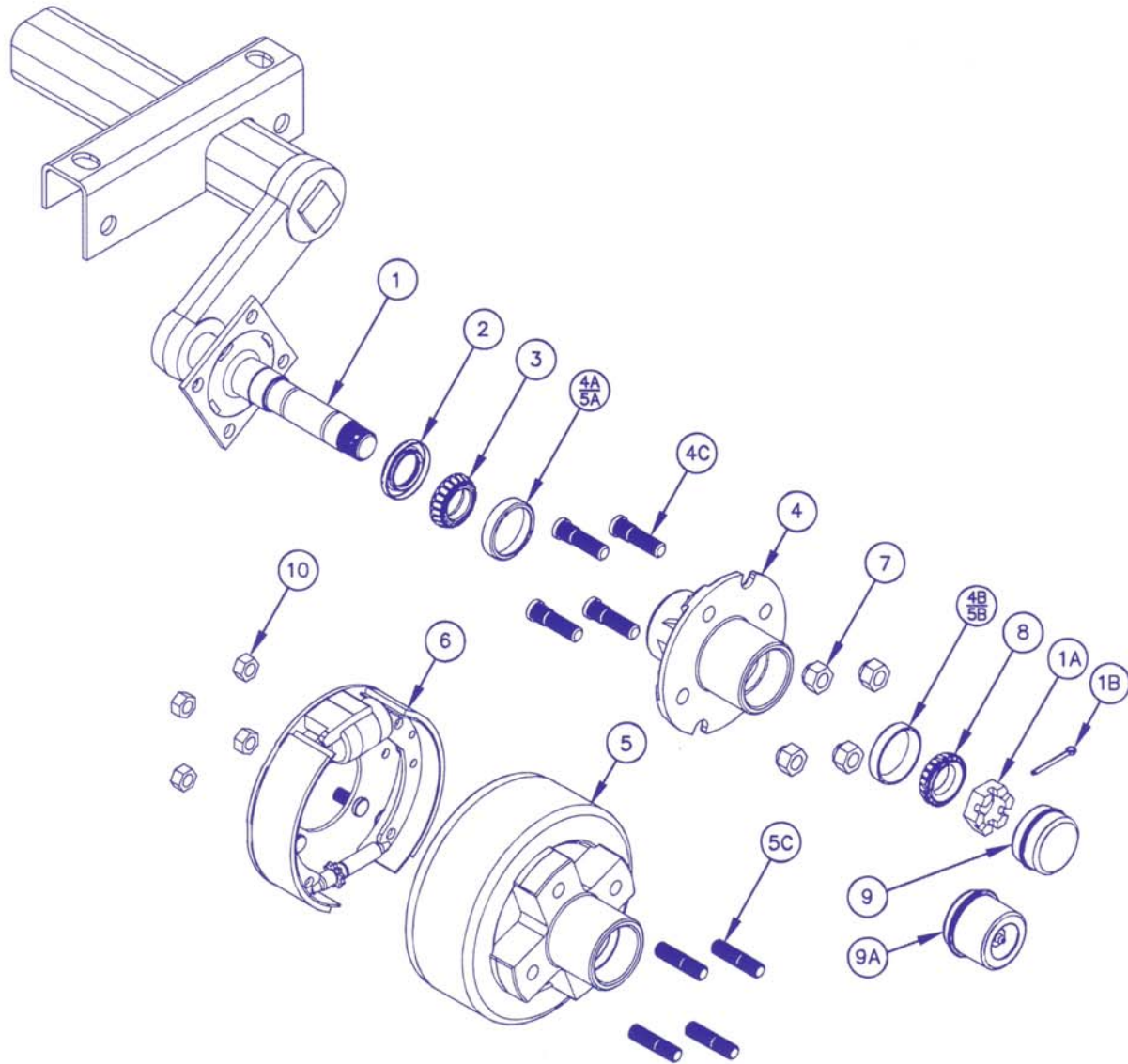
2" Ball Coupler is Inserted into back of  
 Combo Coupler and Attached Using:  
 1/2" x 3 1/2" GR 5 Cap Screw (445-500-350), 2ea.  
 1/2" Stover Lock Nut (444-500-120), 2ea.

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.

Silent Messenger III Superstructure Hardware (left)  
 Silent Messenger III Coupler Hardware (right)

# 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 MESSENGER**

**PORTABLE CHANGEABLE MESSAGE SIGNS**

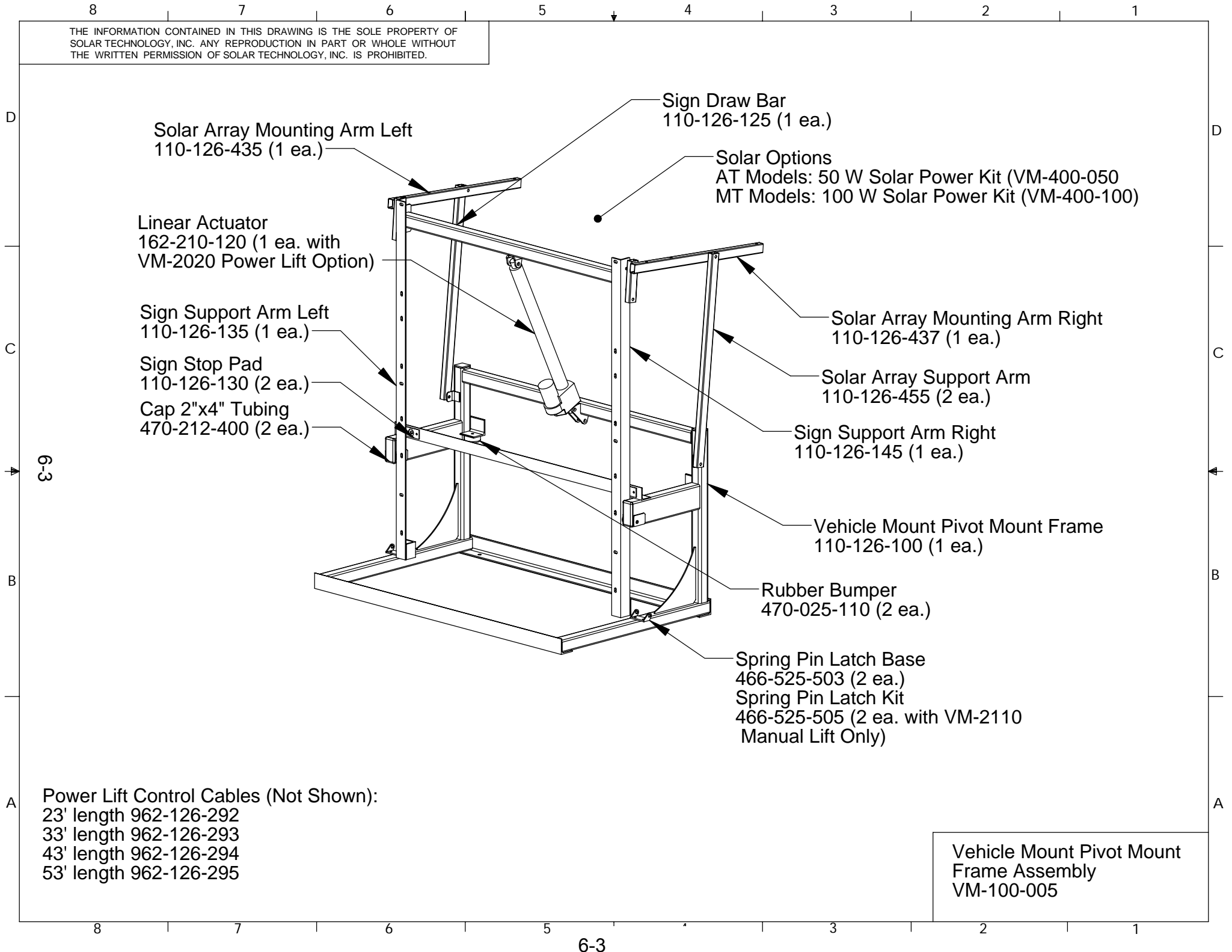
**Parts Diagrams:**

**Silent Messenger Vehicle Mount Series**





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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.)

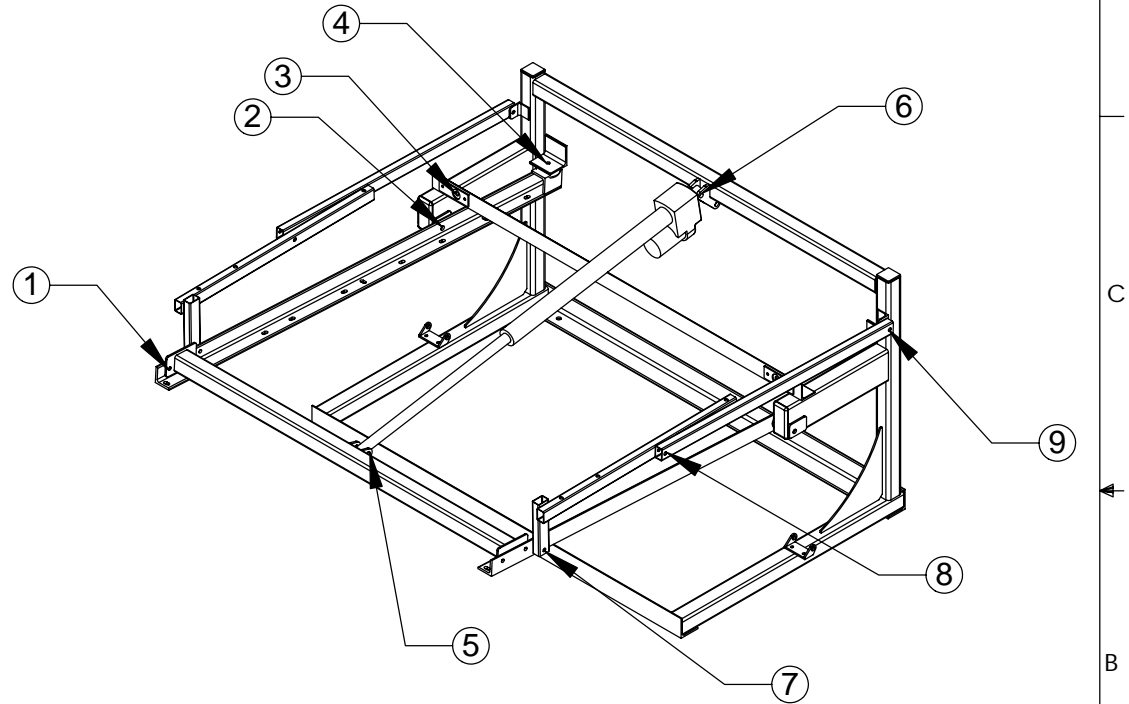
Spring Pin Latch Base  
466-525-503 (2 ea.)  
Spring Pin Latch Kit  
466-525-505 (2 ea. with VM-2110  
Manual Lift Only)

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

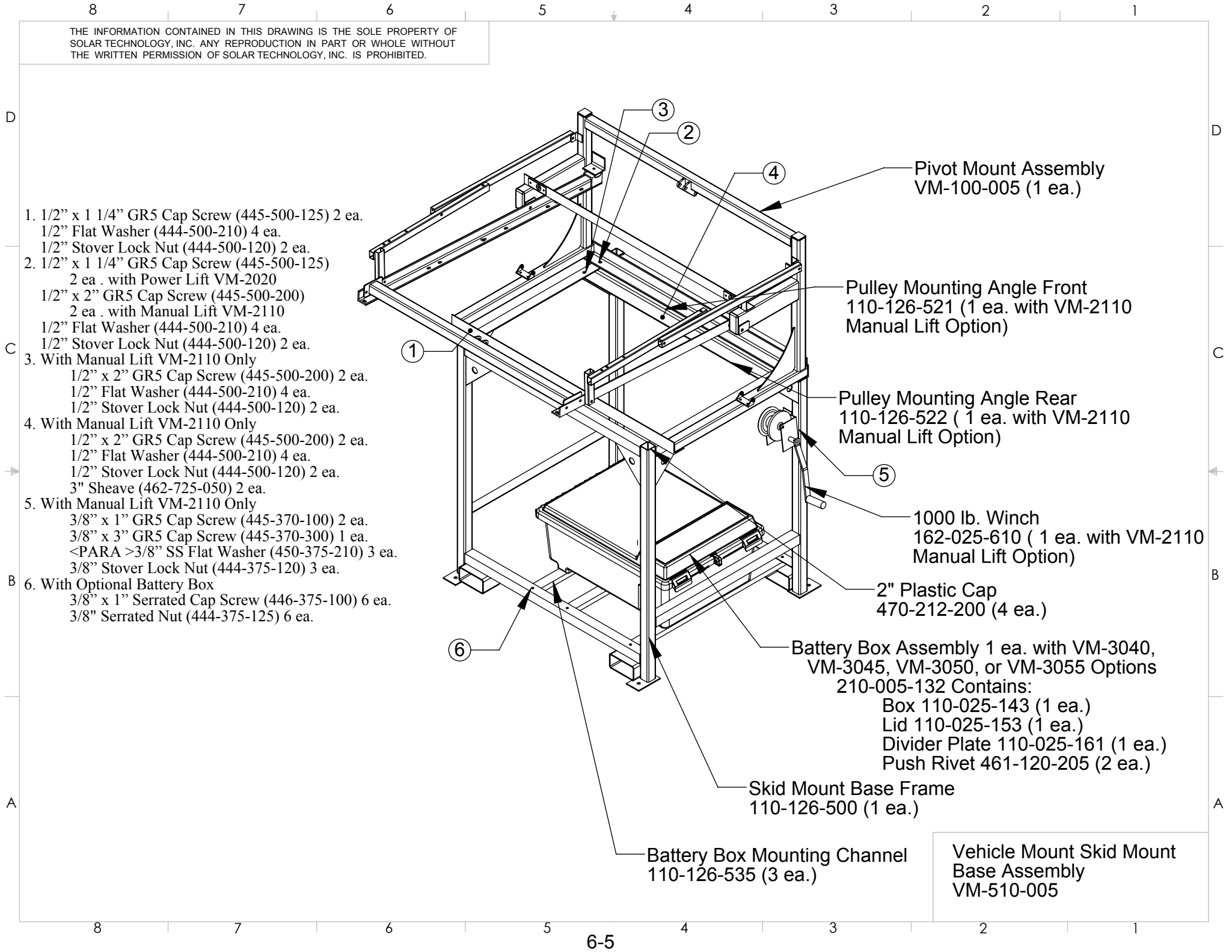
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1. 3/8" x 1" GR5 Cap Screw (445-370-100) 4 ea.  
3/8" SS Flat Washer (450-375-210) 8 ea.  
3/8" Stover Lock Nut (444-375-120) 4 ea.  
Screws Point In
2. 1/2" x 4" GR8 Cap Screw (447-500-400) 2 ea.  
1/2" Nylon Flat Washer (444-500-212) 4 ea.  
1/2" 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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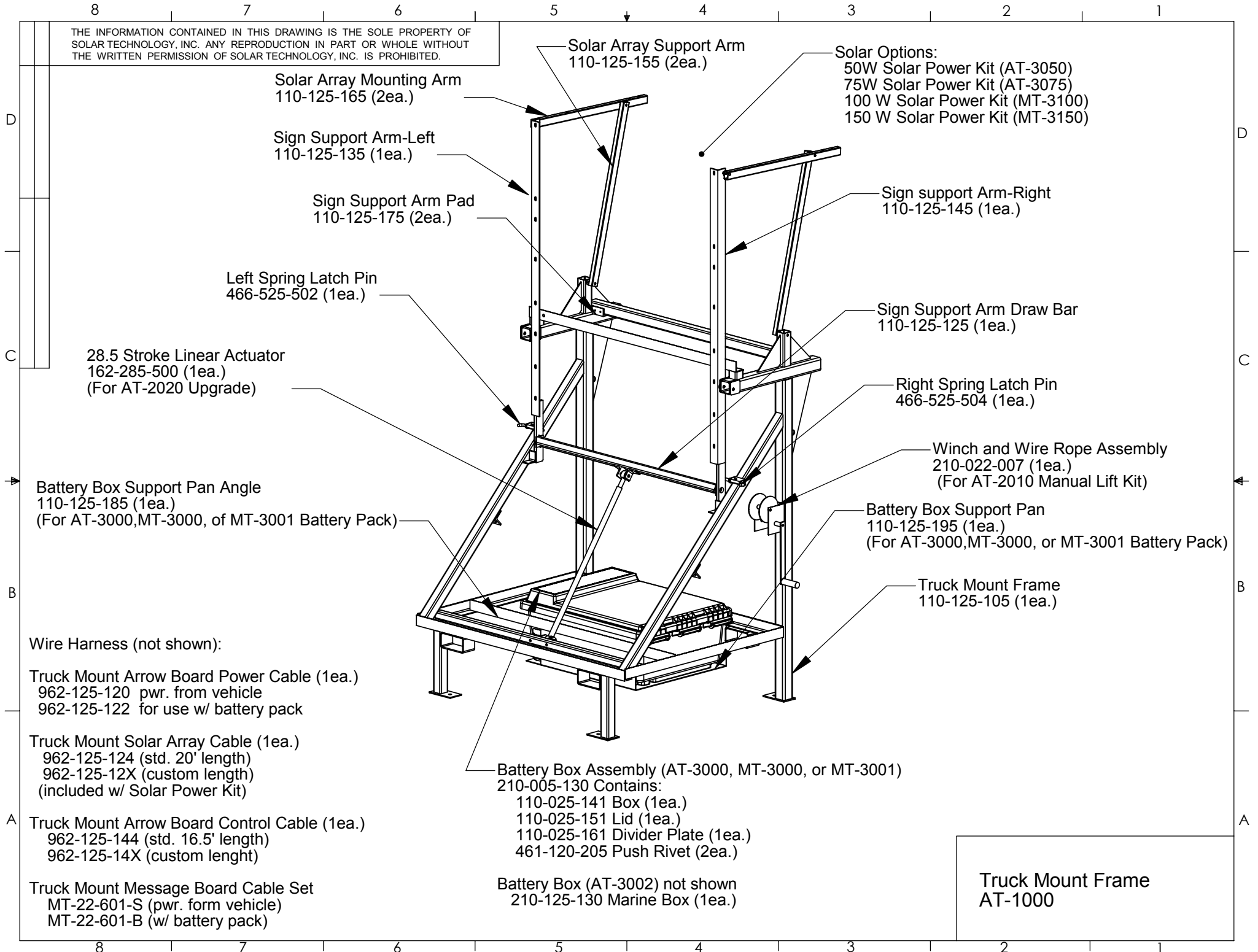


- 1. 1/2" x 1 1/4" GR5 Cap Screw (445-500-125) 2 ea.  
1/2" Flat Washer (444-500-210) 4 ea.  
1/2" Stover Lock Nut (444-500-120) 2 ea.
- 2. 1/2" x 1 1/4" GR5 Cap Screw (445-500-125) 2 ea. with Power Lift VM-2020  
1/2" x 2" GR5 Cap Screw (445-500-200) 2 ea. with Manual Lift VM-2110  
1/2" Flat Washer (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

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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.)

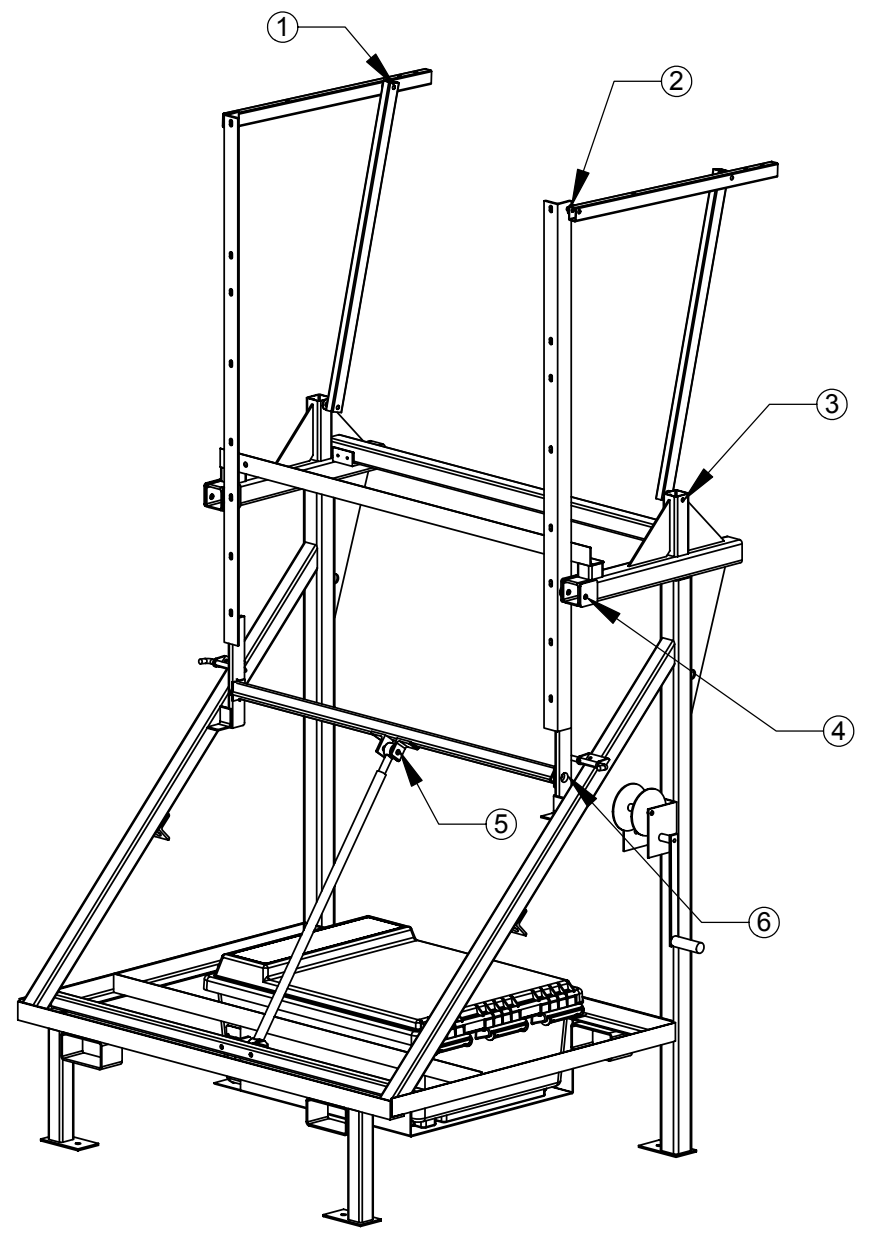
Battery Box Assembly (AT-3000, MT-3000, or MT-3001)  
210-005-130 Contains:  
110-025-141 Box (1ea.)  
110-025-151 Lid (1ea.)  
110-025-161 Divider Plate (1ea.)  
461-120-205 Push Rivet (2ea.)

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

# **SILENT MESSENGER**

**PORTABLE CHANGEABLE MESSAGE SIGNS**

**Parts Diagrams:**

**Silent Messenger Sign Case Assemblies**

**MB-24-318**

**MB-22-448**

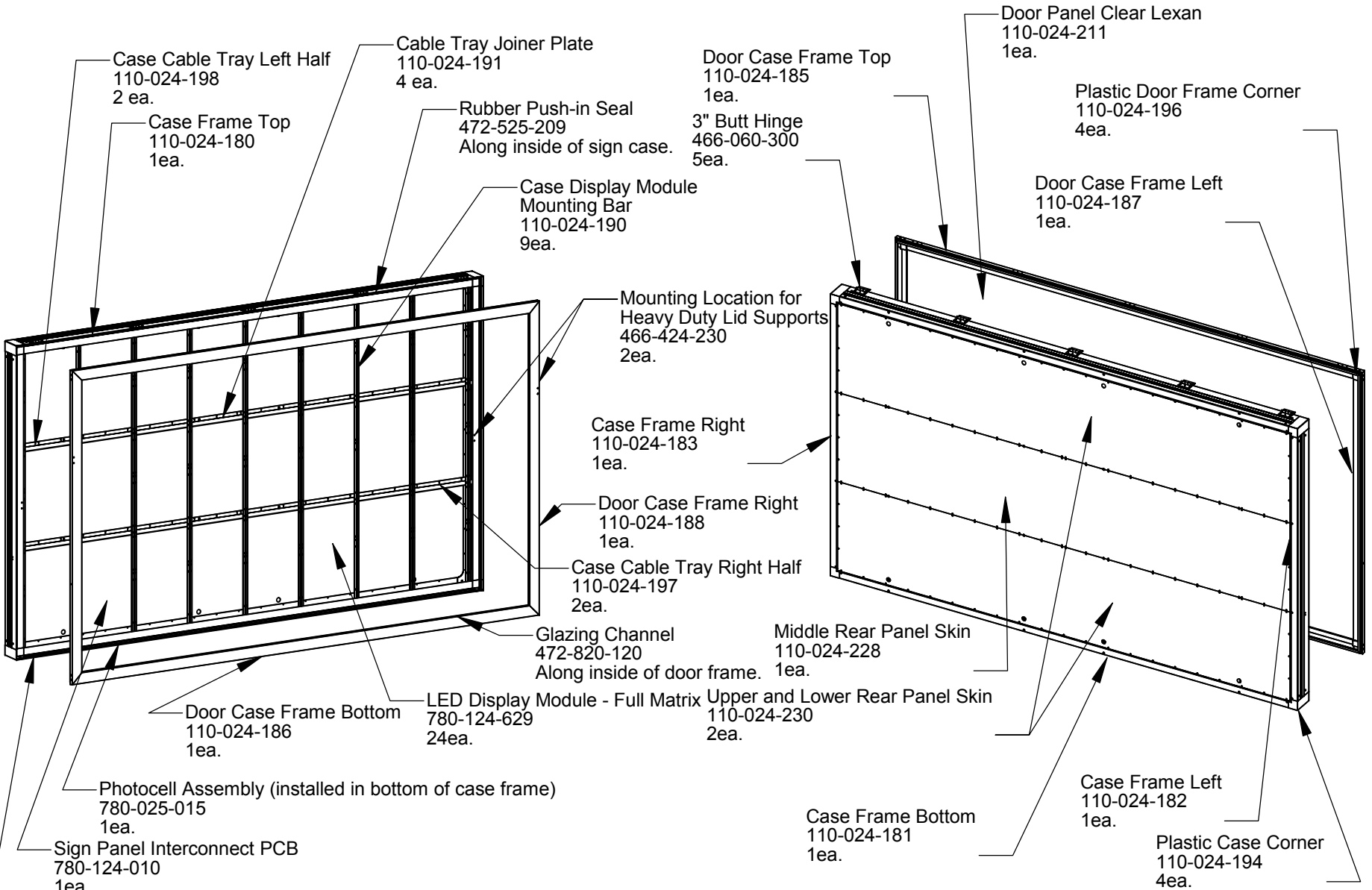
**MB-23-448**



8 7 6 5 4 3 2 1

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D  
C  
B  
A



Case Cable Tray Left Half  
110-024-198  
2 ea.

Case Frame Top  
110-024-180  
1ea.

Cable Tray Joiner Plate  
110-024-191  
4 ea.

Rubber Push-in Seal  
472-525-209  
Along inside of sign case.

Case Display Module  
Mounting Bar  
110-024-190  
9ea.

Mounting Location for  
Heavy Duty Lid Supports  
466-424-230  
2ea.

Case Frame Right  
110-024-183  
1ea.

Door Case Frame Right  
110-024-188  
1ea.

Case Cable Tray Right Half  
110-024-197  
2ea.

Glazing Channel  
472-820-120  
Along inside of door frame.

Door Case Frame Bottom  
110-024-186  
1ea.

LED Display Module - Full Matrix  
780-124-629  
24ea.

Photocell Assembly (installed in bottom of case frame)  
780-025-015  
1ea.

Sign Panel Interconnect PCB  
780-124-010  
1ea.  
Mounted on Rear Panel Skin

Case-Door Latch (466-525-230)  
and Latch Keeper (466-525-250)  
5ea.

Door Case Frame Top  
110-024-185  
1ea.

3" Butt Hinge  
466-060-300  
5ea.

Door Panel Clear Lexan  
110-024-211  
1ea.

Plastic Door Frame Corner  
110-024-196  
4ea.

Door Case Frame Left  
110-024-187  
1ea.

Middle Rear Panel Skin  
110-024-228  
1ea.

Upper and Lower Rear Panel Skin  
110-024-230  
2ea.

Case Frame Bottom  
110-024-181  
1ea.

Case Frame Left  
110-024-182  
1ea.

Plastic Case Corner  
110-024-194  
4ea.

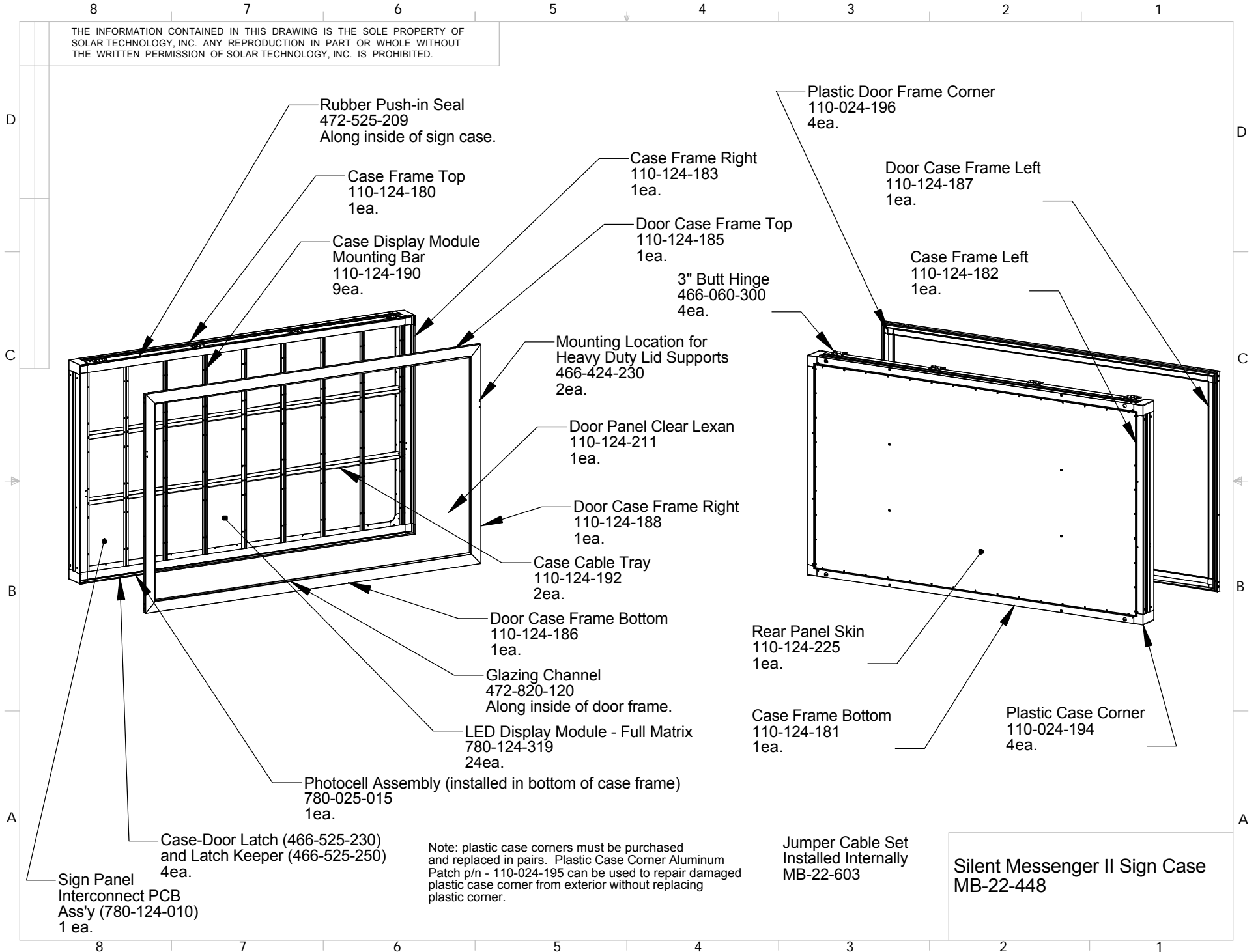
Note: plastic case corners must be purchased and replaced in pairs. Exterior aluminum patch p/n - 110-024-195 may be purchased and installed to repair plastic corners that are broken without removal of broken corner.

Silent Messenger Sign  
Display Case Assembly  
MB-24-318

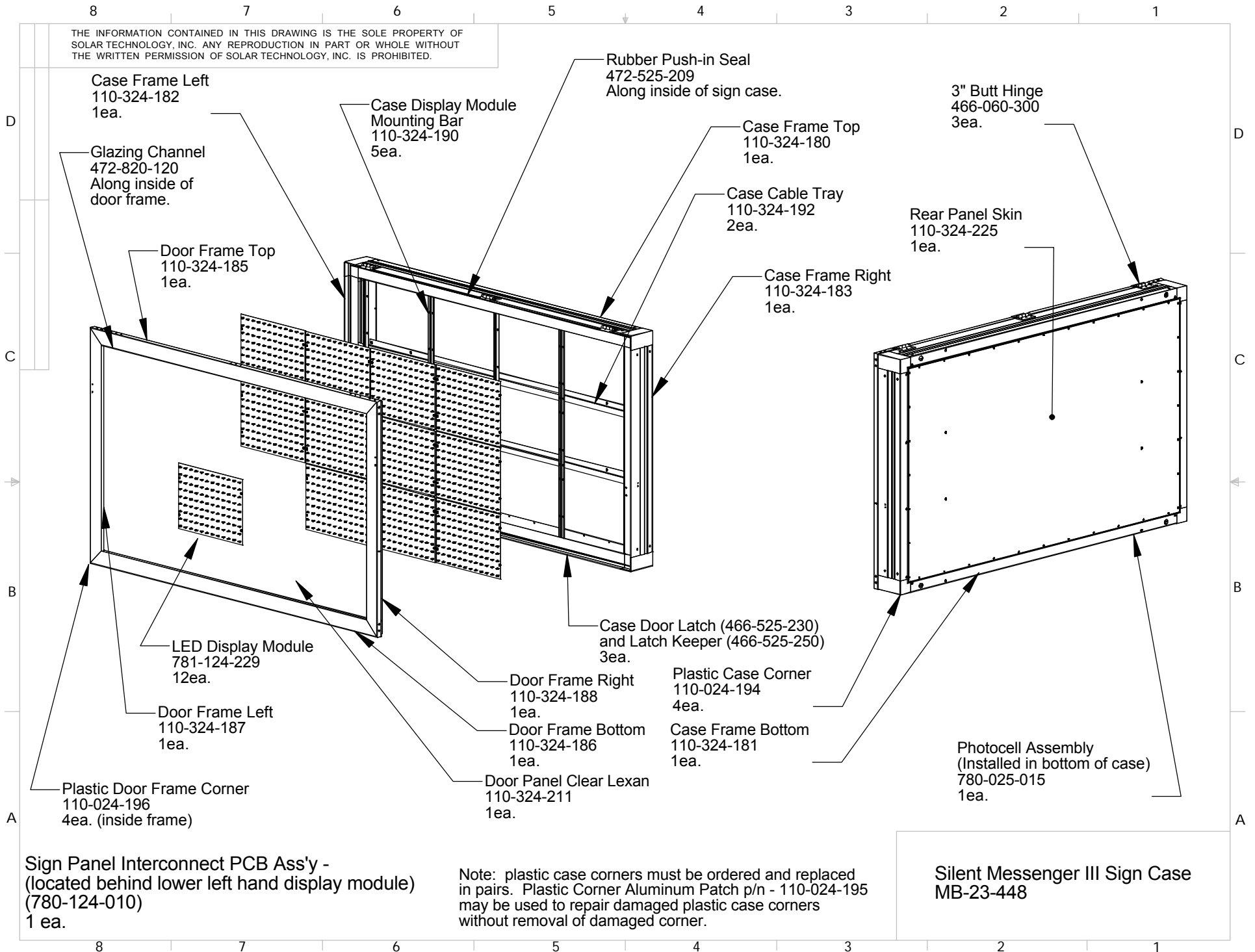
8 7 6 5 4 3 2 1



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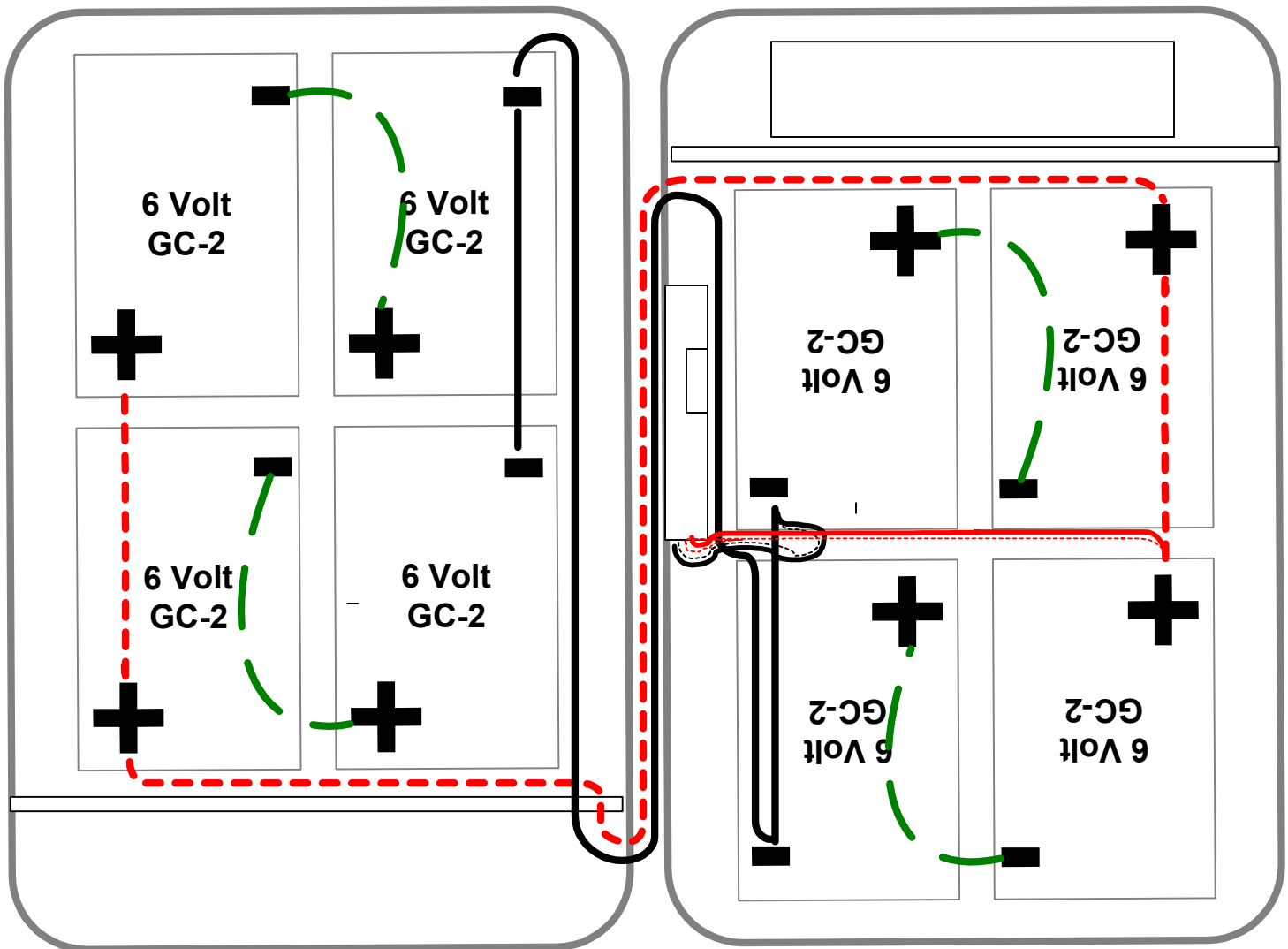
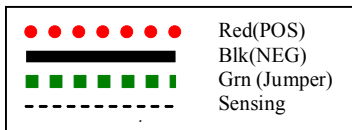
# **SILENT MESSENGER**

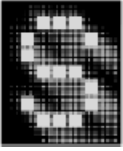
**PORTABLE CHANGEABLE MESSAGE SIGNS**

**Wiring Diagrams**



## Battery Wiring Diagram - Small Trailer 4 or 8 Batteries

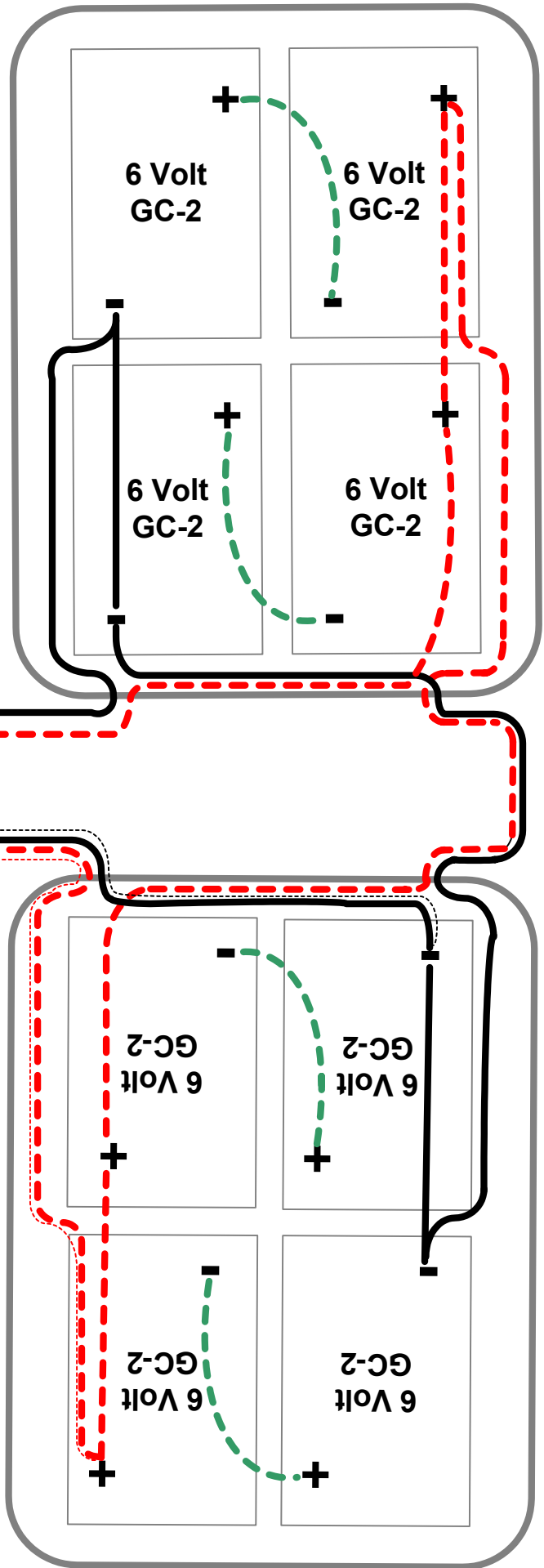
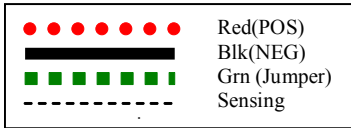




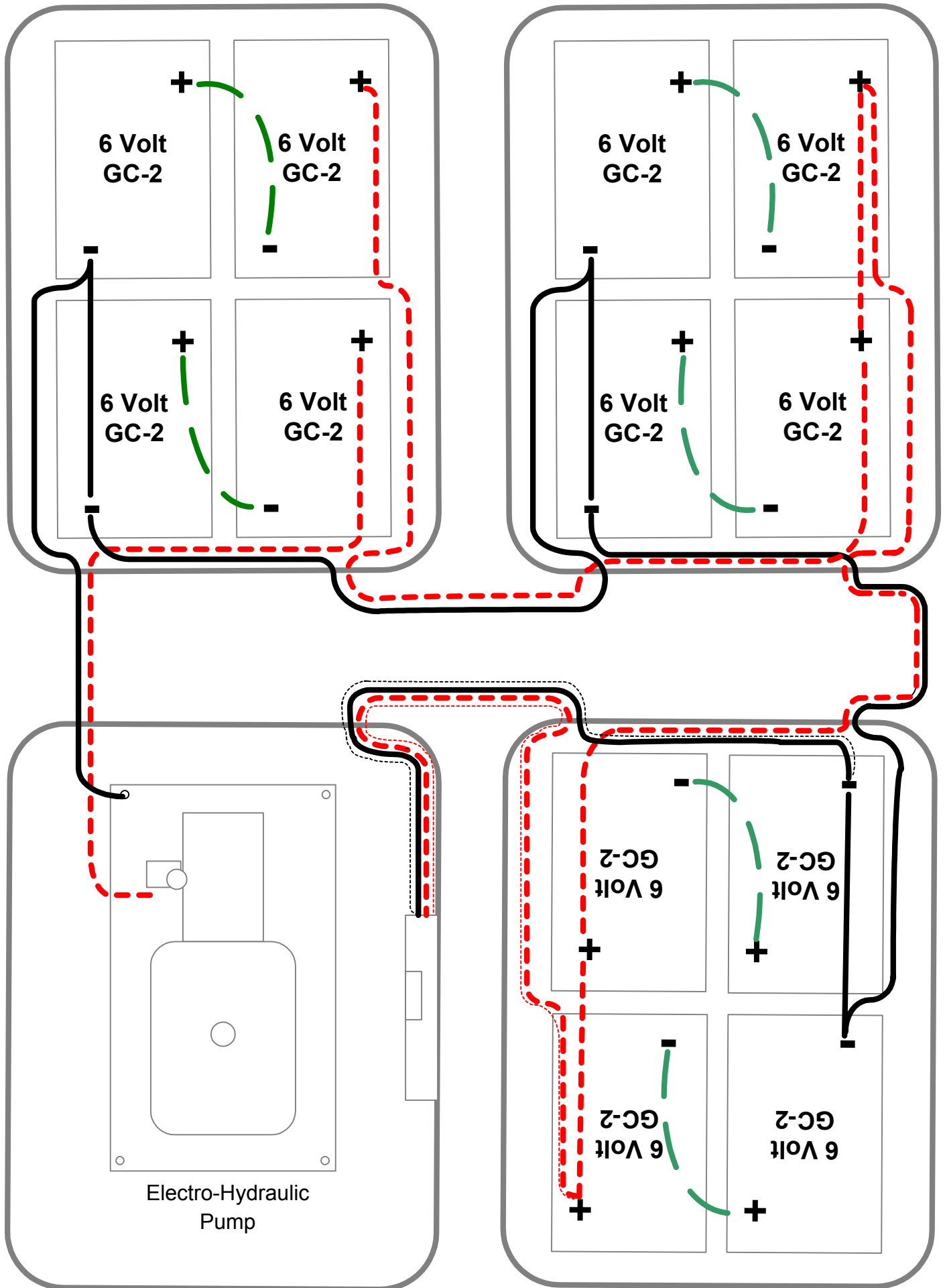
# SOLARTECH

## Message Board Battery Wiring Diagram

Message Board Battery  
Wiring - Large Trailer  
8 Batteries



Message Board Battery Wiring - Large Trailer - 12 Batteries



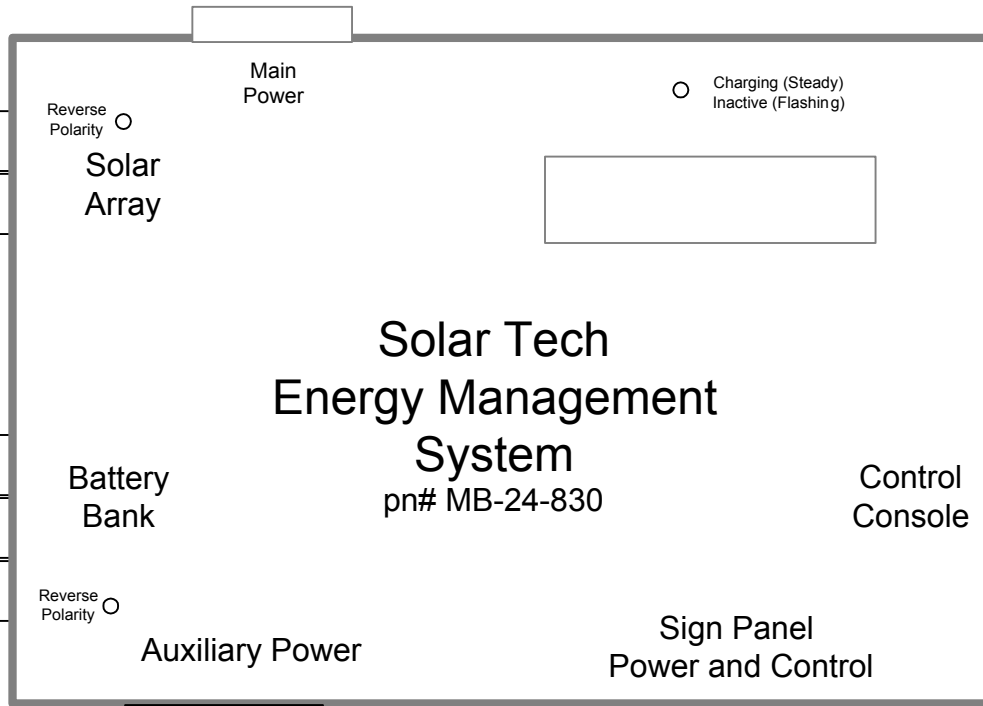


# Energy Management System

13-6

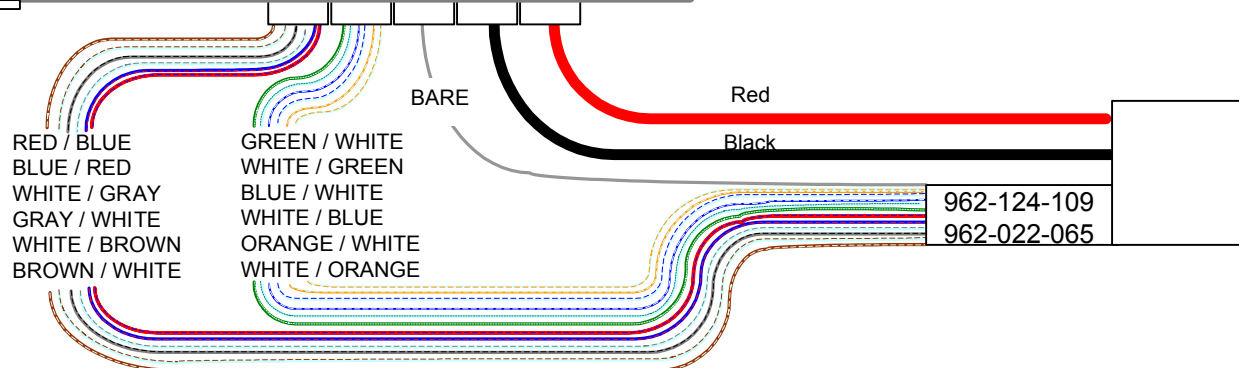
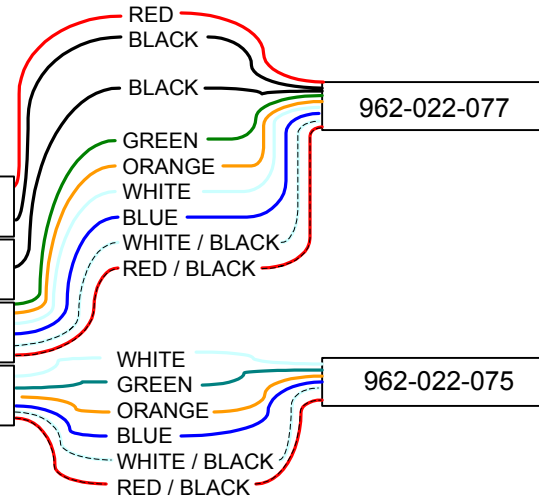
To Solar Panels  
( PV+ PV - )

Red Black



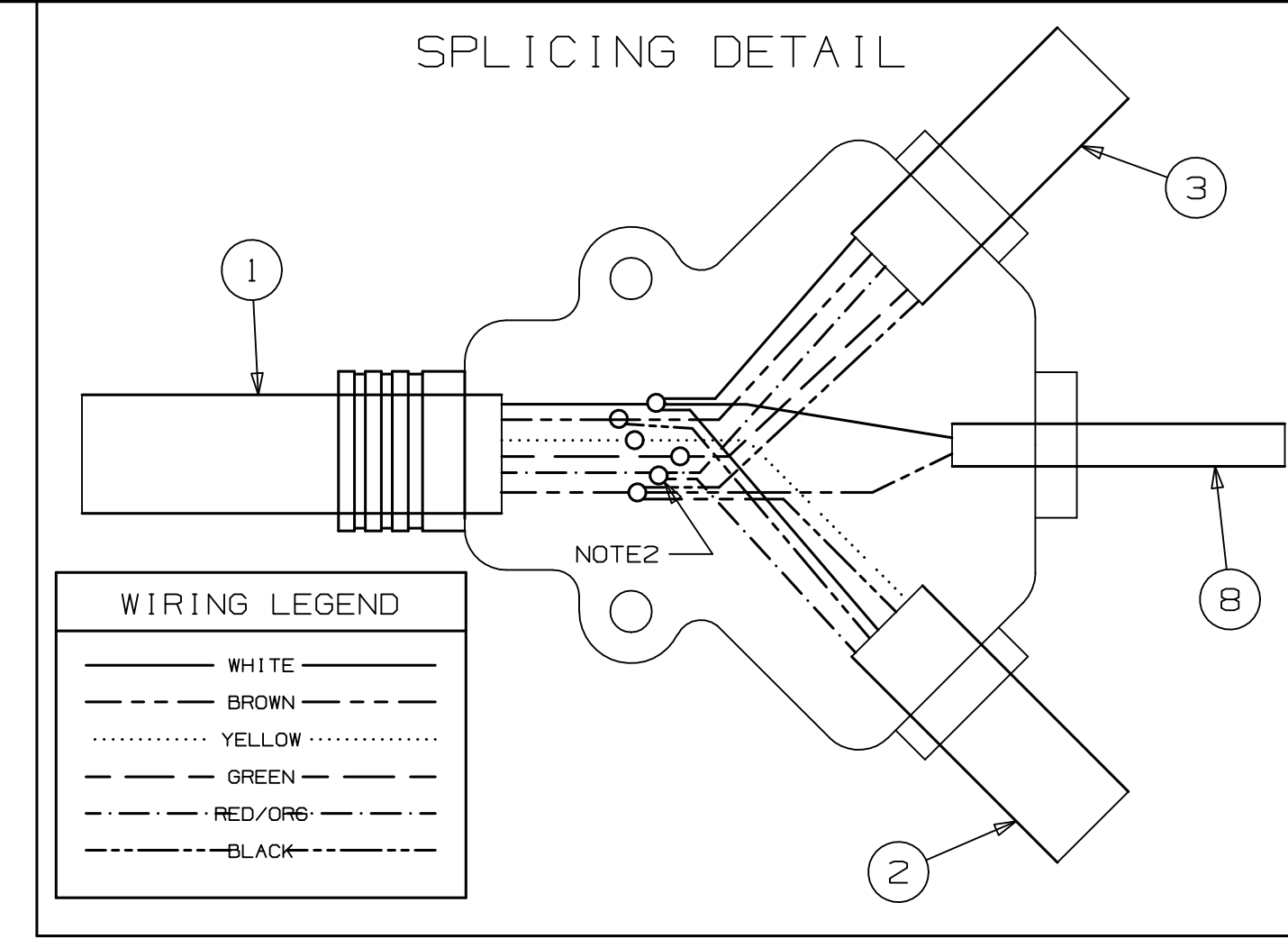
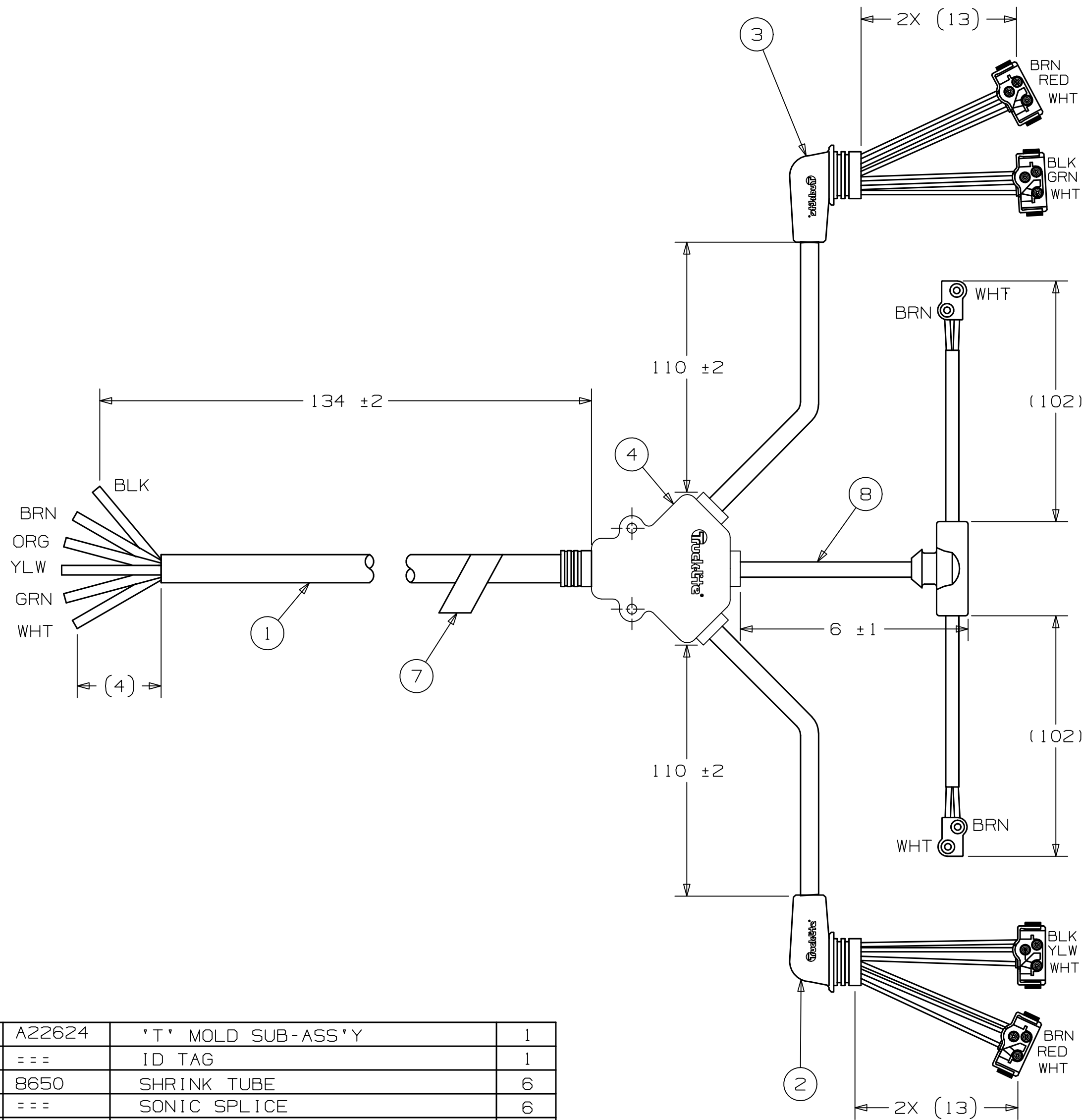
To Battery Bank  
( BAT- BAT + )

Black Red



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

### Trailer Lighting Wire Harness - Large Trailer



ITEM	PART NO.	DESCRIPTION	REQ.
8	A22624	'T' MOLD SUB-ASS'Y	1
7	===	ID TAG	1
6	8650	SHRINK TUBE	6
5	===	SONIC SPLICE	6
4	2956	DOLLY 'Y' MOLD #2093	.40644
3	A22628	RH ST/T SUB-ASS'Y	1
2	A22627	LH ST/T SUB-ASS'Y	1
1	A22625	6 COND SUB-ASS'Y	1
13-			

8-7

REV	DATE	DESCRIPTION	ECN	DWN	APVD
0	04-17-01	RELEASE	16568A	CDG	-
A	2-28-01	PRELIMINARY F/HDHR6598-01	16569	CDG	-

REVISION HISTORY			
REFERENCE DRW. NO.	THIRD ANGLE PROJECTION	DIMENSIONS ARE IN INCHES	
-		WIRE STRIP LENGTH TOL: ±1/2	
CUST./SUPPLIER PART NO.	CAD DATA SOURCE	CABLE JACKET STRIP LENGTH:	
-	UNIGRAPHICS	0 to less than 2: ±1/8	
		2 to ...: ±1/2	
		CABLE CUT LENGTH:	
		0 to less than 250: ±1/2	TOL. 'A': ±1/2
		250 to less than 500: ±2	TOL. 'B': ±1/2
		500 to ...: ±2 1/2	±1 1/2

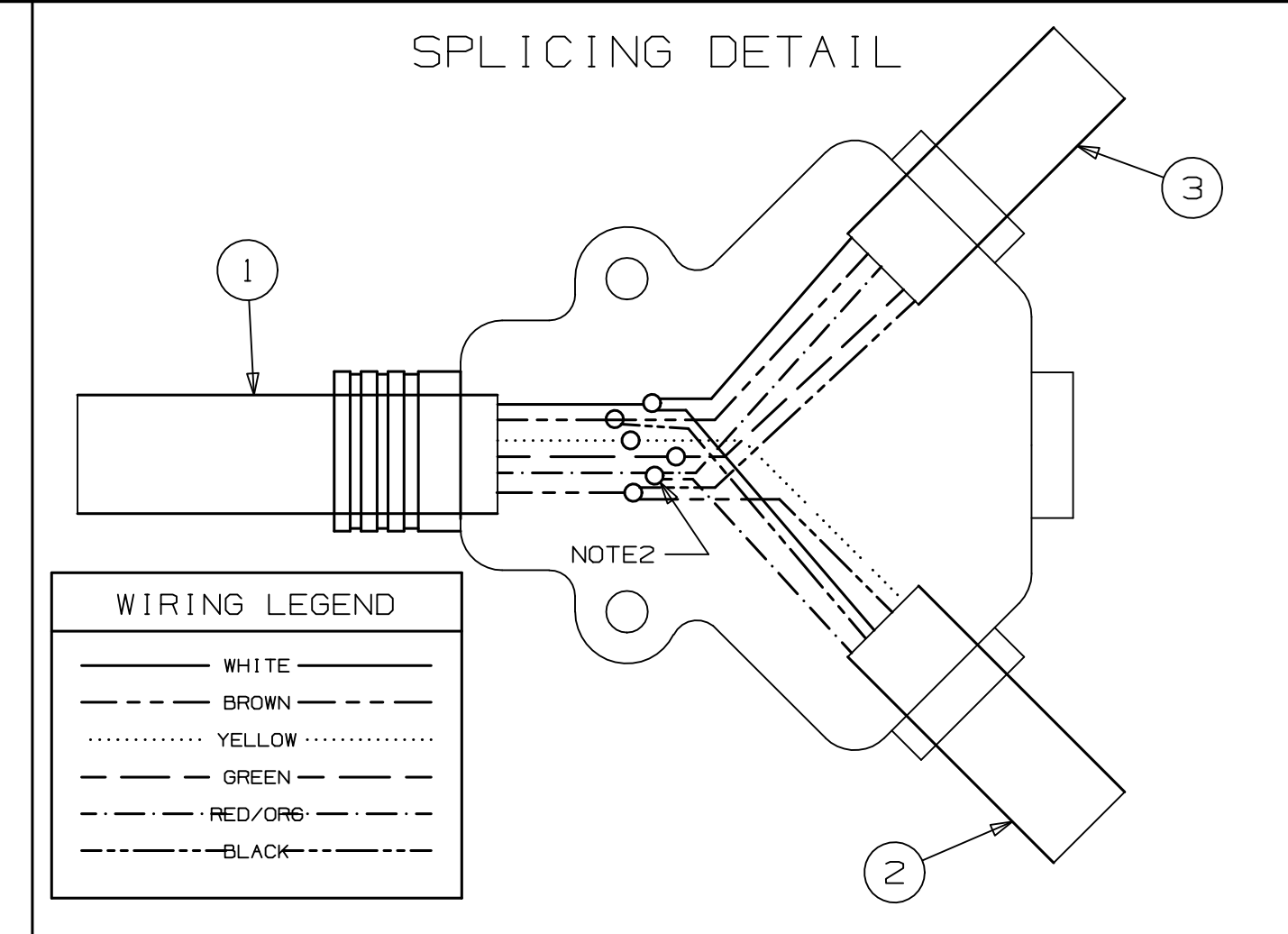
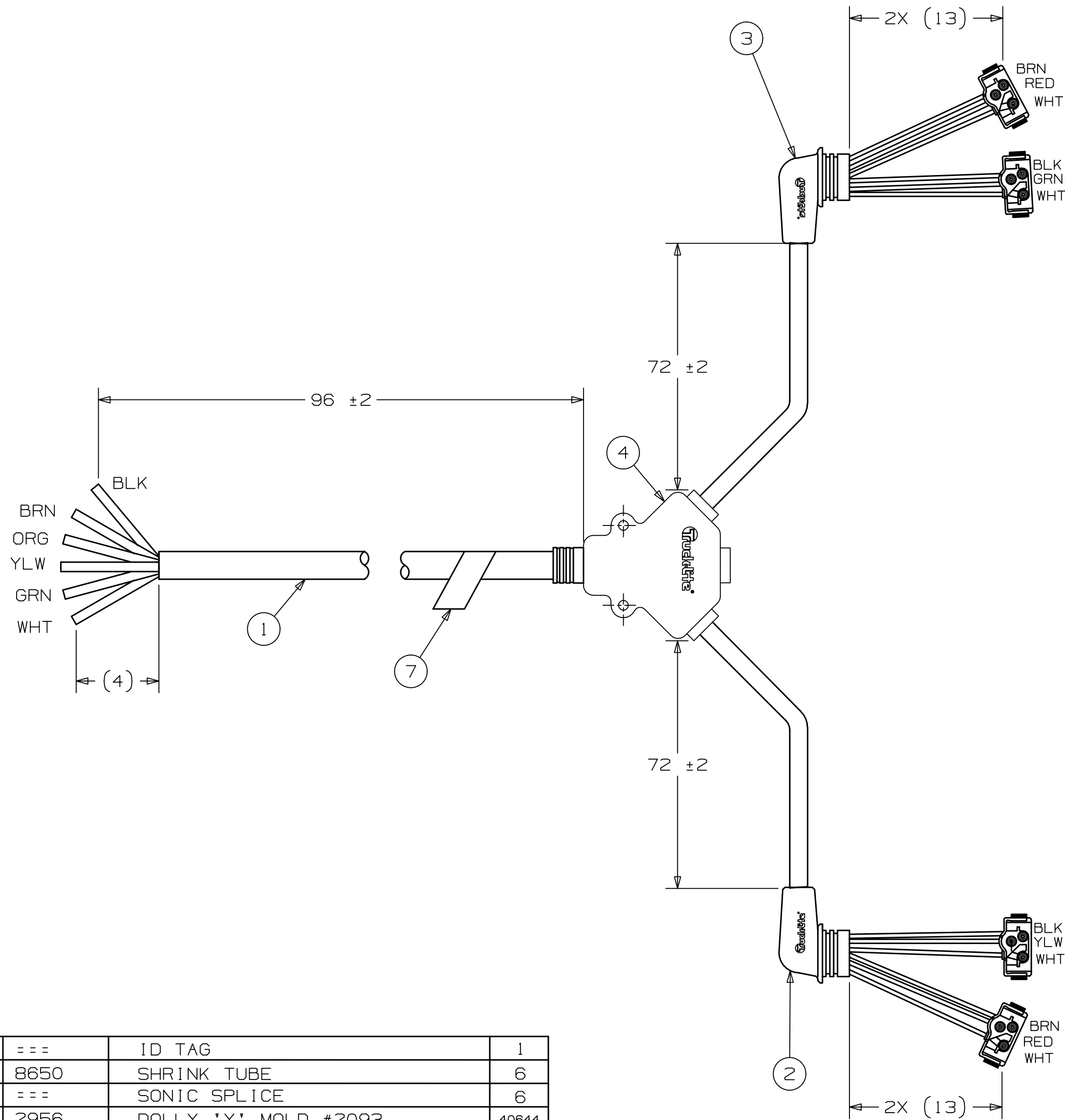
TRUCK-LITE CO., INC.  
FALCONER, NEW YORK USA

HARN-SS DOLLY S/T/T &M/C

SCALE:	MOLD/TOOL NO.:	PART NO.:	DRW. NO.:
NTS	-	51503	28391C0

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

## Trailer Lighting Wire Harness - Small Trailer



ITEM	PART NO.	DESCRIPTION	REQ.
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
			13-

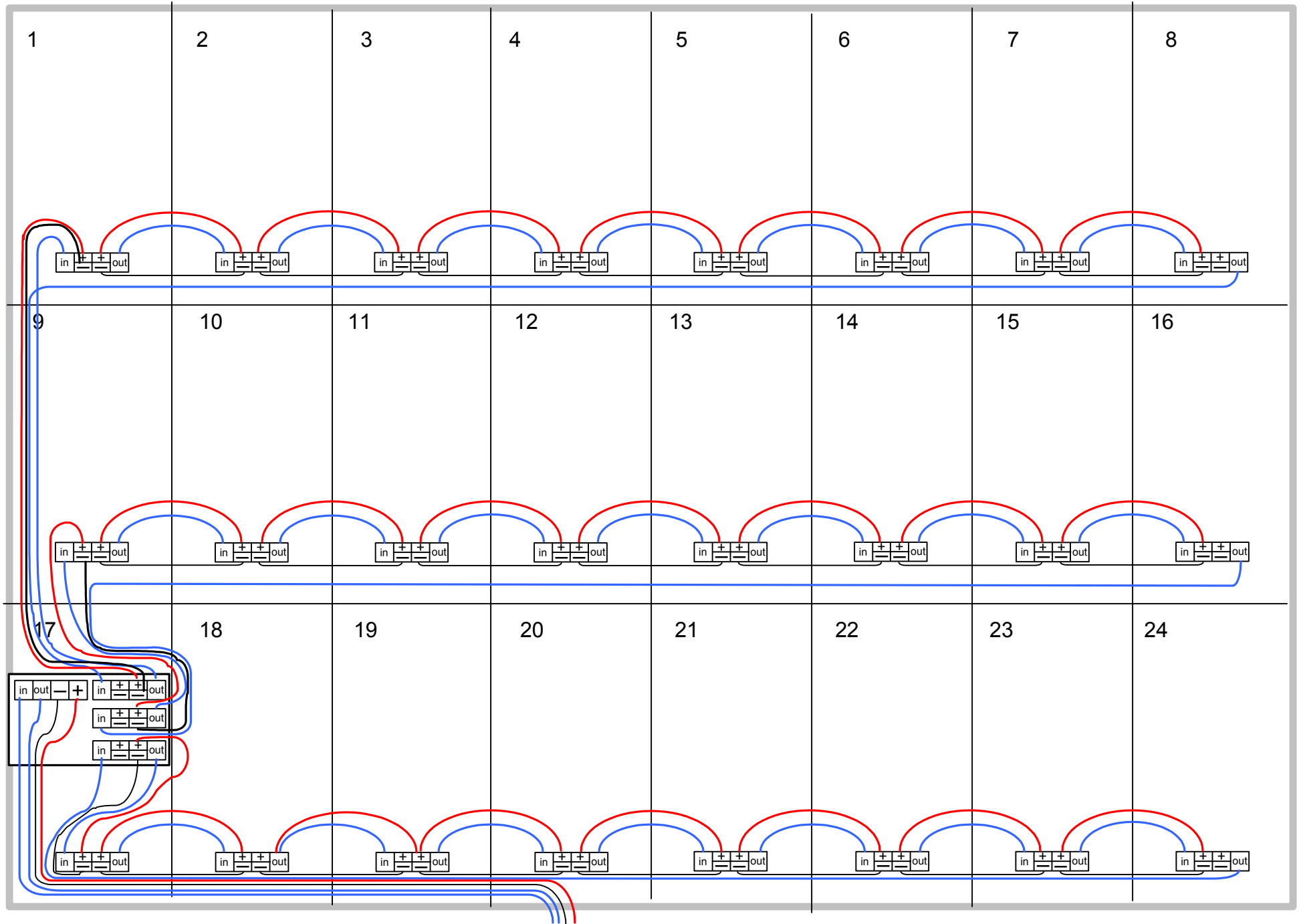
REV	DATE	DESCRIPTION	ECN	DWN	APVD
0	04-17-01	RELEASE	16568A	CDG	-
A	2-28-01	PRELIMINARY F/HDHR6597-01	16568	CDG	-

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': ± 1/2
		250 to less than 500 ± 2	TOL. 'B': ± 1
		500 to ... ± 2 1/2	± 1 1/2

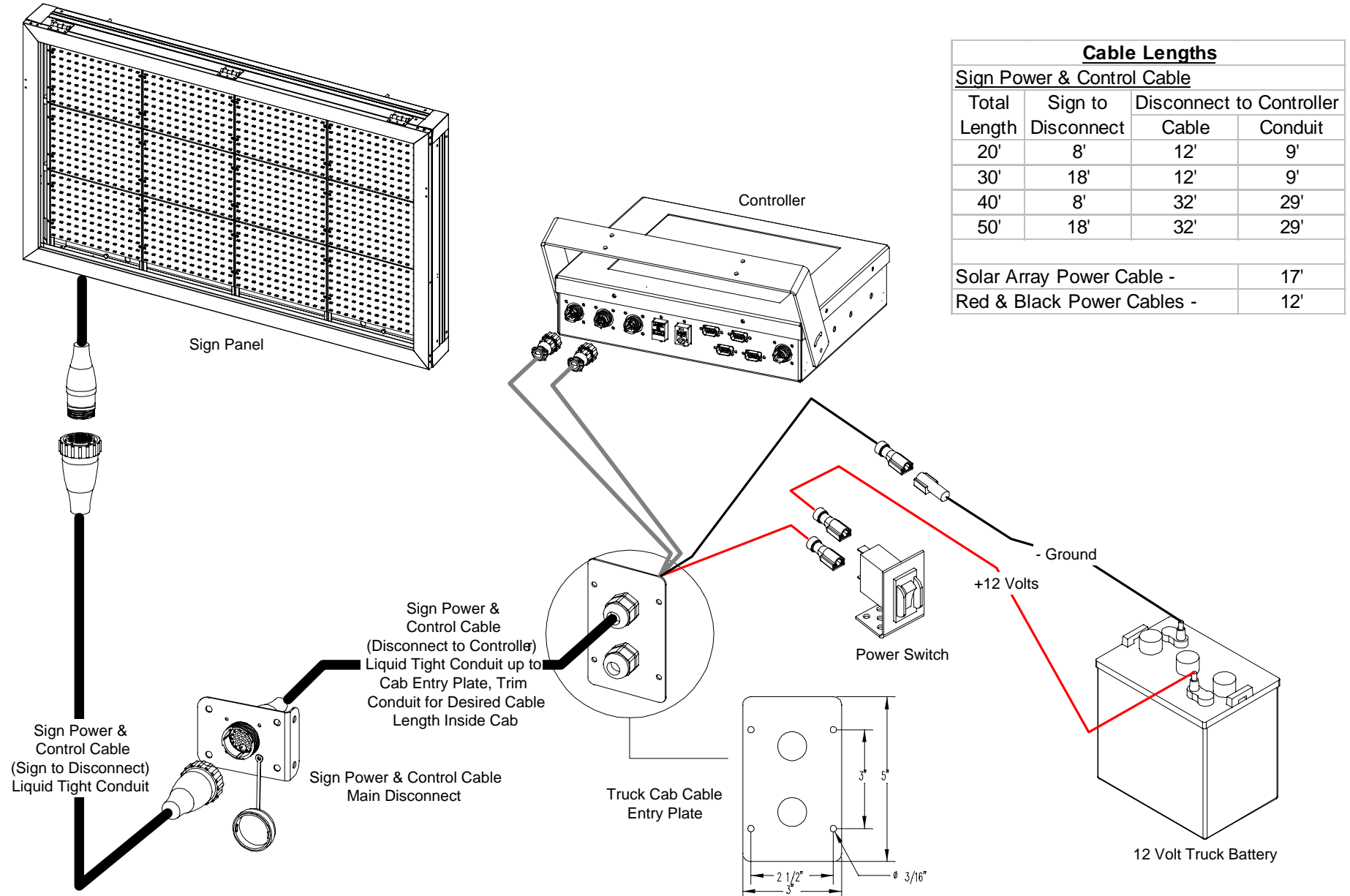
**TruckLite** TRUCK-LITE CO., INC.  
 FALCONER, NEW YORK USA

HARN-SS DOLLY S/T/T

SCALE:	MOLD/TOOL NO.:	PART NO.:	DRW. NO.:
NTS	-	51504	28392C0



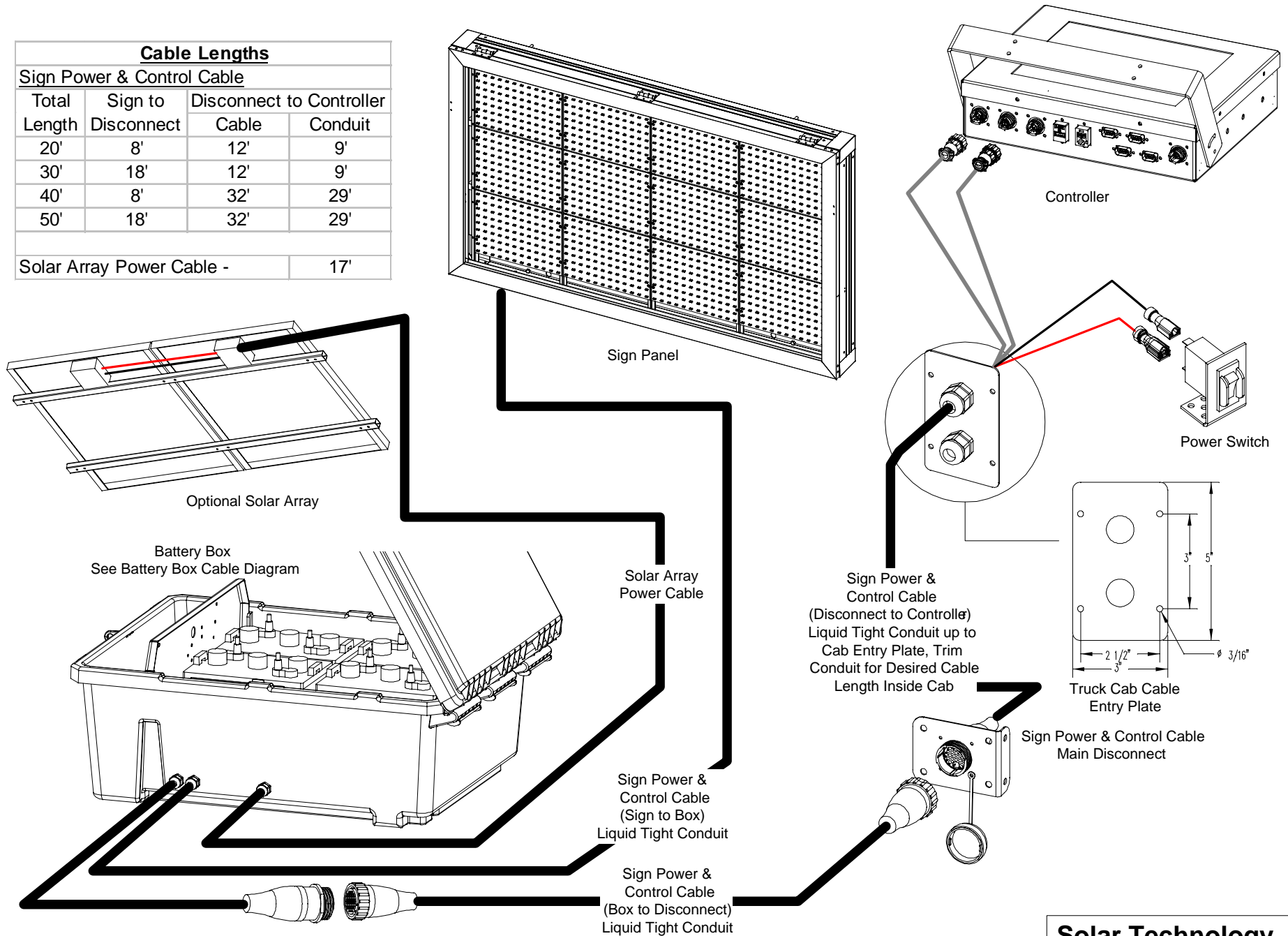
## Cable Diagram: Vehicle Mount Message Board, In Cab Mount without Battery Pack



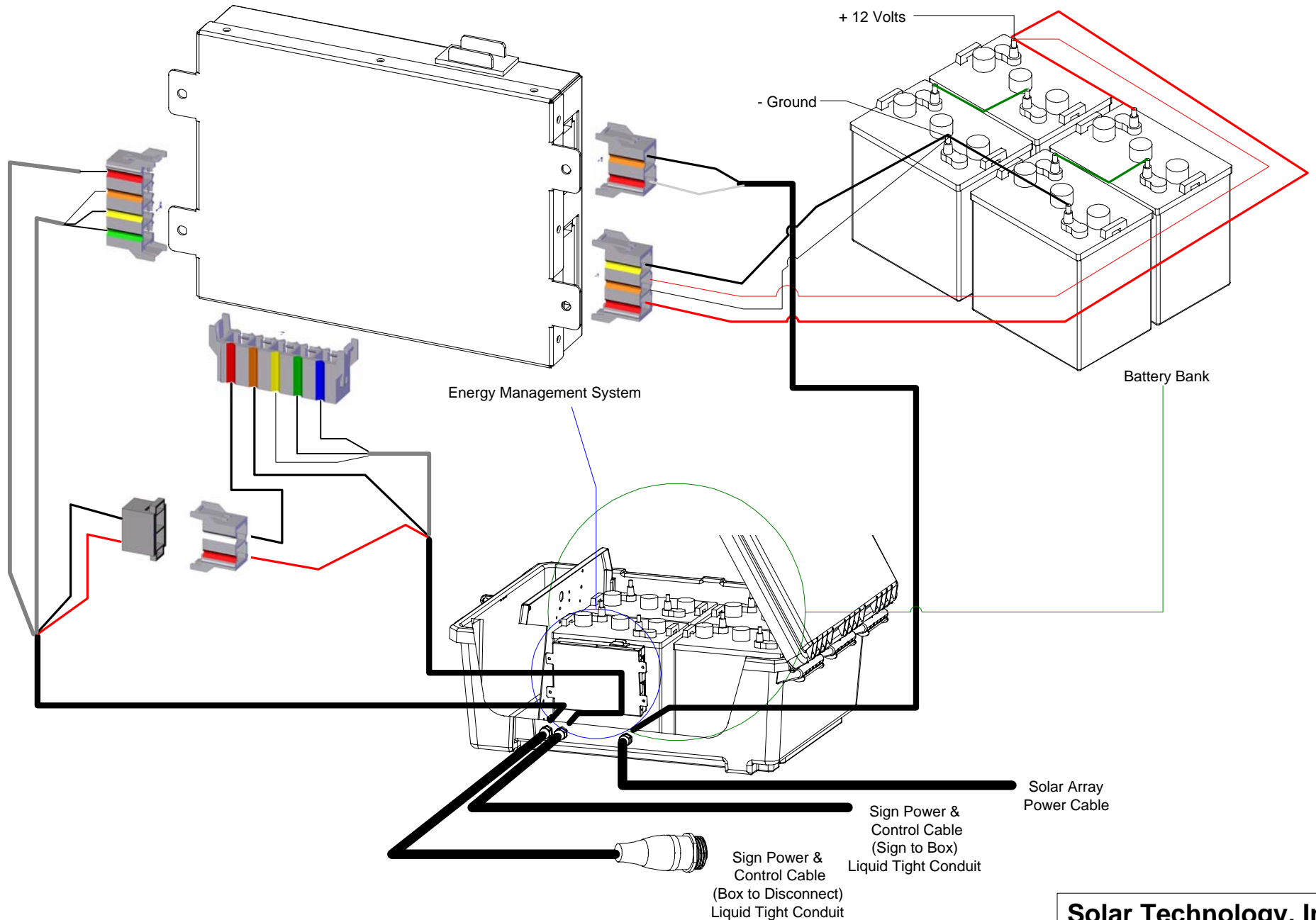
<b>Cable Lengths</b>			
<b>Sign Power &amp; Control Cable</b>			
Total Length	Sign to Disconnect	Disconnect to Controller	
		Cable	Conduit
20'	8'	12'	9'
30'	18'	12'	9'
40'	8'	32'	29'
50'	18'	32'	29'
Solar Array Power Cable -			17'
Red & Black Power Cables -			12'

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

Cable Lengths			
Sign Power & Control Cable			
Total Length	Sign to Disconnect	Disconnect to Controller	
		Cable	Conduit
20'	8'	12'	9'
30'	18'	12'	9'
40'	8'	32'	29'
50'	18'	32'	29'
Solar Array Power Cable -			17'



### Cable Diagram: Battery Box - Vehicle Mount Message Board In Cab Mount With Battery Pack



## Cable Diagram: Vehicle Mount Power Lift

