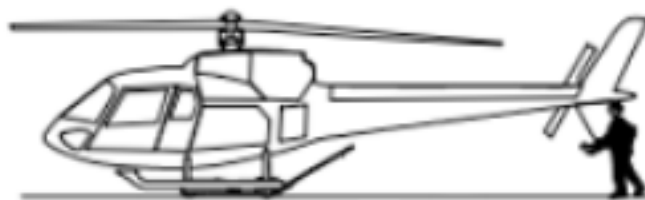


Chopper Spotter

Helicopter Ground Handling
OWNER'S AND OPERATOR'S MANUAL
1989-2019

Simply ... a better idea!



Chopper Spotter, Inc.
15124 Business Parkway
Rosemount, MN 55068

info@ChopperSpotter.com
www.ChopperSpotter.com

Phone: +1 608-537-2049
Fax: +1 608-537-2043

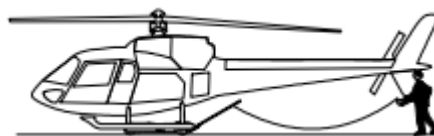
Chopper Spotter®... setting the world standard since 1989!

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Chopper Spotter Helicopter Ground Handling



UNPACKING AND ASSEMBLY

The Chopper Spotter is packaged on a pallet that is suitable for handling with a forklift. A drill or an electric screwdriver with a #2 Phillips bit are recommended for use when unpacking the Chopper Spotter.

Once the cardboard is removed, the bracing and hold-downs should be removed with the drill or electric screwdriver. Attach the handle, and remove the pin holding the spring-loaded rod. Save the pin in the last hole, so that the handle height can be adjusted if needed. Drape the cable over the handle.

The following parts are included with the Chopper Spotter:

1. Transverse tube (square tube, approximately 53 inches long)

Insert the transverse tube into the lifting arm (the hole in the center should be in the UP position). Center the tube, and insert the pin (small bolt) to hold it in the center.

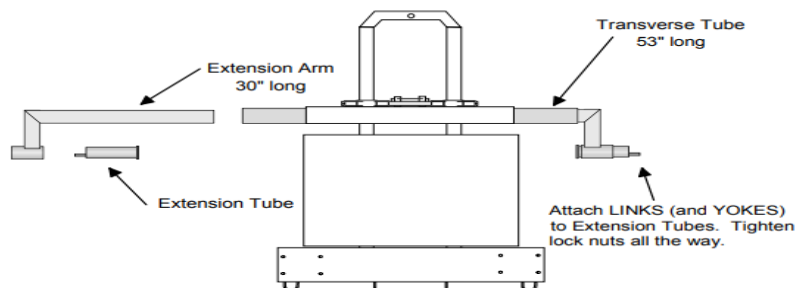
2. Two extension arms (square tube, "L" shaped , with extension tubes inserted)

Insert the extension arms in the transverse tube, with arms to the rear.

3. Right-hand and left-hand skid attachment yokes (along with any necessary links)

Attach the links (which are already fastened to the yokes) to the extension tubes.

Completely tighten the provided lock nuts. The links are provided to make the yokes easier to fasten to the skids.



CHARGING AND ACTIVATING LEAD ACID BATTERIES

Take precautions when working around batteries. Thoroughly review “Electrical Safety Precautions” section in this manual.

When charging with the on-board charger, the MASTER SWITCH must be ON.

Plug in the charger to begin charging. The charger will shut off automatically when the batteries are charged. After charging, check the acid level, then add pure clean WATER to bring the level to the rings if necessary. Using distilled water is preferred. The “BATTERY POWER” gauge may read above 100%, which is normal just after charging. The batteries will not achieve their full capacity until they have gone through a few charging cycles. **See below for more information.

The on-board charger is equipped with an electronic timer. After a predetermined voltage has been reached, the timer will activate. Run the charger at a higher voltage for two hours, then shut off. During the timed operation, the battery cells will gas, and are then equalizing to assure fully charged batteries.

+++++
If the AC supply cord is unplugged, then plugged back in, the charge cycle will repeat itself. It is important to avoid this situation, because the batteries will overcharge.
+++++

The green LED will light up while current is flowing to the batteries, and the light is visible from the rear of the Chopper Spotter. When the charging cycle is complete, the light extinguishes.

**After charging the batteries for the first time, use the Chopper Spotter until the batteries are discharged to about 30-50%. If the battery is COMPLETELY discharged, the on-board charger may not sense enough voltage to start the charging cycle. If this happens, temporarily connect another charger to each battery to allow each to charge. Repeat this cycle TWICE to properly break-in the battery. This procedure is necessary for all lead acid deep cycle batteries, as lead acid batteries do not have a charging memory like NiCd batteries.

**Never leave the batteries completely discharged. Fully charged batteries have a long life, whereas discharged batteries have a short 2-3 week life.

OPTIMA AGM REDTOP BATTERY #78- CHARGING INFORMATION

The following charging methods are recommended to insure long battery life. The batteries are designed for engine starting applications, and are not recommended or warranted for use in deep cycle applications.

Always use a voltage regulated charger, with voltage limits set as follows:

Alternator:

*13.3 to 15.0 volts, no amperage limit

Battery Charger:

*13.8 to 15.0 volts, 10 amps maximum, approximately 6-12 hours

Rapid Recharge:

*Maximum voltage 15.6 volts (regulated), with no current limits, as long as battery temperature remains below 125°F (51.7°C). Charge until the current drops below 1 amp.

Float Charge:

*13.2 to 13.8 volts, 1 amp maximum current, time is indefinite at lower voltage

All limits must be strictly adhered to, and safety information followed:

*Always wear safety glasses when working with batteries.

*Always use a voltage regulated battery charger with limits set to the above ratings.

Overcharging can cause the safety valves to open, and battery gases to escape, resulting in premature failure. **These gases are highly flammable!** You cannot replace water in sealed batteries that have been overcharged. Any battery that becomes very hot or makes a hissing sound while charging, should be disconnected IMMEDIATELY.

*Failure to fully charge a battery can result in diminished performance, and a reduction in capacity.

BATTERY CHARGER ISSUES

It is virtually impossible that all four batteries are inoperable. Hundreds of batteries have been shipped with no issues. If the batteries are discharged completely, the charger will not initiate charging when the battery is below approximately 9 volts.

The modern “smart” battery charger, as is used on the Chopper Spotter, will not charge a completely discharged battery. The smart charger will need to be used after a constant current “dumb” charger begins the charging process. If a constant current charger is not available, a charged battery should be hooked up to the discharged battery parallel “plus to plus” “negative to negative” such as when starting a car. Then, the discharged battery will take a charge from the charged battery.

The “smart” charger can then be connected to both batteries, so that the discharged battery will charge. This is used so that the batteries recharge individually. Care must be taken to not let the batteries discharge completely.

One way to insure that your 12 volt battery charger is working properly, is to hook it up to an individual battery, then compare voltage when the charger is ON, versus when the charger is OFF. If there is no increase in the voltage when the charger is ON, it is not working correctly, for those reasons expressed above.

IMPORTANT: DO NOT ALLOW THE BATTERIES TO DISCHARGE COMPLETELY. IF THE BATTERIES DISCHARGE COMPLETELY, FOLLOW INSTRUCTIONS ABOVE FOR RESOLUTION OF BATTERY ISSUES.

OPTIMA AGM REDTOP #78 BATTERY

- 1. DO NOT FILL WITH ACID OR WATER.**
- 2. Batteries are charged before shipping, but it is recommended that the batteries be charged overnight upon receipt of the unit.**
- 3. Battery information is included in the Chopper Spotter Owner's Manual, and online at:**

www.optimabatteries.com

Optima batteries are available in most countries. If you are not able to purchase these particular batteries in your country, Chopper Spotter, Inc. has them in stock for purchase.

Please contact Chopper Spotter, Inc. for current battery pricing and shipping costs.

+1 608-537-2049
info@chopperspotter.com

BATTERY GAUGE

The Chopper Spotter is equipped with a battery energy gauge which has been designed to measure the exact amount of electrical energy stored in the batteries. It provides a percentage reading of the maximum charge, informing the operator when to charge the batteries, and for how long.

The gauge is a very sensitive and accurate voltage meter. It does not measure the amount of liquid in the batteries. Low liquid will affect the performance of the batteries, and will also affect the accuracy of the BATTERY ENERGY GAUGE. Batteries must be properly maintained if they are to perform properly. Keep the batteries fully charged (80% or more) when not in use.

To Obtain an Accurate Reading:

Shut off all loads to the batteries. The switch on the hand held controller should be **OFF**. MASTER SWITCH MUST BE **ON**.

If the batteries have just been charged, operate the Chopper Spotter for 2 to 4 minutes to remove the "surface charge" of the batteries. The gauge will read more than 100% if there is a surface charge. **Surface charge will dissipate if the batteries are allowed to stand for 10 hours or more.** After using the Chopper Spotter, allow the charge to normalize for at least 60 seconds before checking.

Recharging:

Do not overcharge the batteries. See section regarding the batteries. The BATTERY ENERGY GAUGE can be used to determine when recharging is necessary, and how much is needed. Refer to the following chart:

Percent Charge	Charging Time
75%	5 Hours
50%	10 Hours
25%	15 Hours
0%	25 Hours

If the electrolyte (battery acid) temperature is under 70°F (20°C), increase charging time 10% for each 10° (5°C) below 70°. As the battery ages, its capacity decreases. The BATTERY ENERGY GAUGE may still show the battery as "full", but now you are effectively measuring a smaller tank. You will see this as a reduced amount of running time on an older battery. When you experience about half of the original running time, the battery should be replaced. Contact Chopper Spotter for replacement batteries.

NOTE: Excessive charging of batteries can cause permanent damage. Always check liquid level and add water as needed. Never add acid to batteries, as this will destroy the chemical balance of the battery, and will also cause loss of storage capacity and battery life.

AUXILIARY POWER UNIT (APU) **(Optional for Model E)**

Your Chopper Spotter may be equipped with an auxiliary power receptacle. This feature includes heavy wiring, and provides a relatively high amperage for 24 volts (nominally 28 volts) auxiliary power uses. It is extremely important to maintain the system to provide the proper voltage. Many factors such as dirty terminals or connections, improperly charged batteries, and loose connections, contribute to lowering the system voltage. When the voltage of a system decreases, the necessary power can only be provided by increasing the current. High current (amperage) can ruin motors, to include starter motors on aircraft.

Always use the auxiliary power feature with caution!

The Master Switch must be **ON**

Heat in the wires or connections indicates excessive current. Discontinue use if heat is detected.

Observe the following precautions:

- * Use the shortest cable as possible, with the proper gauge. Long cables or small gauge cables will decrease voltage. Customer will supply the cable for the aircraft, or a 5m, 16ft cable is available from Chopper Spotter Inc.

- *Keep the battery terminals clean.

Dirty battery terminals decrease the voltage of the system.

Lower system voltages cause unusually high currents, which can damage the systems of the Chopper Spotter and the aircraft.

- *The circuit is not fused. Insure that the circuit in the aircraft is fused. Avoid very high current situations, and observe all safety precautions.

- *Keep batteries charged, and the connections tight. **Do not use the Auxiliary Power Unit if the battery power is under 50%.**

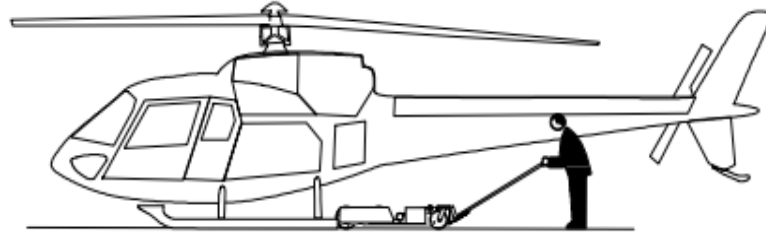
- *Check electrical connections for heat. A *hot* connection is a *dirty* or *loose* connection, and should be cleaned and/or tightened. If the APU is hot while in use, it is not making a good connection.

Third Terminal Connection

The third terminal, a small prong adjacent to the + (positive) terminal is not connected. Most systems require this terminal to be battery + positive to activate a relay on the aircraft to disconnect the aircraft battery when the APU is utilized. If you purchased a power cable with the Chopper Spotter, the battery + connection is made internally to the third terminal, thus your aircraft will receive battery + on this terminal.

CHOPPER SPOTTER GROUND HANDLING OPERATIONS

The Chopper Spotter is a unique, patented machine to safely handle helicopters on pavement.



The Chopper Spotter allows one person to quickly load and move a helicopter with ease and unmatched safety for the helicopter and operator.

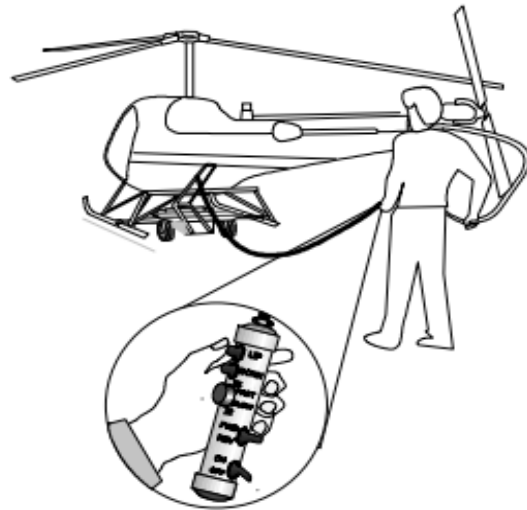
The Chopper Spotter easily loads from the rear. Simply roll it under the ship, and attach the two “yokes” to the wheel attachment points.

1. Take the remote control in hand.
2. Step back to the tail.
3. Press *UP*.

The helicopter balances as if it were on its regular wheels, and in some cases, much better.

Press *FWD* or *REV* on the hand held controller, and the “*soft start*” electronic speed control gently moves the helicopter at any selected speed, up to 3 feet per second.

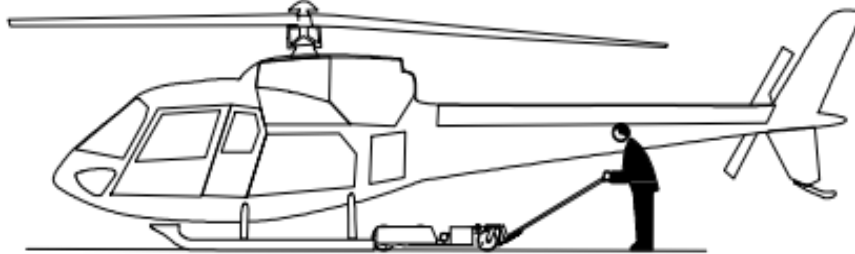
The hand held control regulates the speed and direction. It also raises and lowers the helicopter.



-NOTE-

If you damage the hand held controller, a new one can purchased and easily plugged into your existing Chopper Spotter unit.

OPERATING THE CHOPPER SPOTTER MODELS E and M **IMPORTANT!**



Easy to align from the left side. The handle can be lowered to prevent interference.

1. **Insure that ALL operators have read this material before operating the Chopper Spotter.**
2. **MASTER SWITCH** should be **ON** unless performing maintenance. Load the Chopper Spotter from the left rear of the helicopter. Practice aligning the “nose” of the Chopper Spotter directly under the longitudinal center of the ship. Once it is centered, the casters allow easy alignment of the rear of the Chopper Spotter. The Chopper Spotter handle can be adjusted to avoid touching the fuselage, antennas, or other equipment.
3. Attach the yokes to the ground-handling wheel attachment points. Always insure that both lift points are properly engaged before lifting the helicopter. Each yoke has a pin or other fastening device to secure the yoke. For example, note that the lock pins for the AS350 attach on the inside of the skid. The lock pin should hold the yoke in position while loading the opposite side.



Example: Yokes for AS350/355 and EC 120



4. Unwind enough cable to step back to the tail boom. Grab the stinger or other suitable handle to stabilize pitch, while you lift the ship high enough to prevent the skids from touching. **An inch or two is enough height.** There is usually no reason to lift any higher than this. If the Chopper Spotter is not properly centered or balanced, it should be realigned. When properly loaded and level, the helicopter should be balanced when lifted.

OPERATING THE CHOPPER SPOTTER MODELS E and M

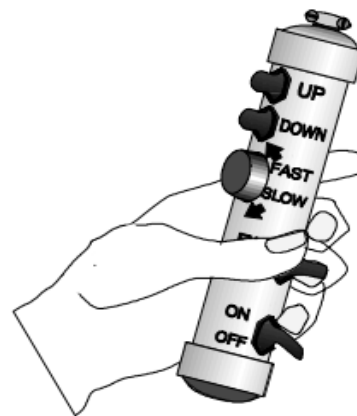
IMPORTANT!

(Continued)

5. Never raise the lifting arm more than 12 inches. Damage will be done to the lifting arm if the lift continues to operate past this point. There is no reason to lift the helicopter more than one or two inches off the ground.
6. Start ***SLOWLY!*** Pressing ***FWD*** or ***REV*** (Forward or Reverse) starts the acceleration cycle. Listen for the solenoid “click”, and the Chopper Spotter will start to gradually pick up speed. Letting off of the switch starts the acceleration cycle over again. The speed can easily be changed while in motion. Like any vehicle without power steering, the Chopper Spotter is easiest to steer when there is some motion. Once the casters are all aligned, however, it is easy to pivot on the drive wheel. **NEVER PUT UNDUE STRESS ON THE TAIL BOOM.** If the casters are pointed in the wrong direction, ***push FWD*** or ***REV*** to allow some motion, and allow the casters to swivel easily.
7. **Caution!** *Never* leave a helicopter in the raised position while unattended.
8. Always turn the switch ***OFF*** after using, to prevent inadvertent operation. The MASTER SWITCH can remain ON.
9. **Braking can be accomplished by switching directional control to the *opposite* direction. (See section “Adjusting Electronic Controller”)**
10. Use caution when transitioning down inclines. Proceed slowly, and keep the skids close to the ground so that the helicopter can easily be lowered if abrupt stopping is needed. The electronic controller can be adjusted to allow neutral braking capability for going down inclines.

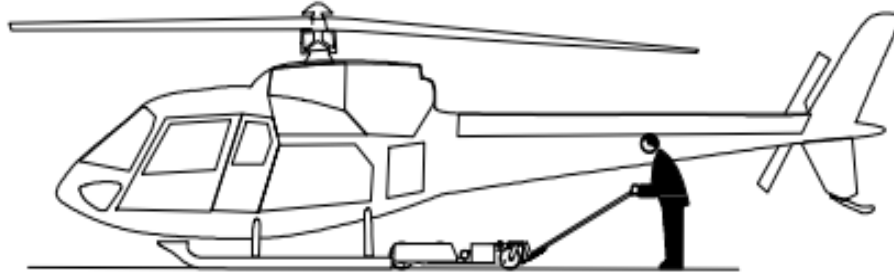
As a safety feature, the handheld speed selector control must be turned to ***SLOW*** before the Chopper Spotter will accelerate to ***FAST***. Turn the speed selector to maximum ***SLOW***, then select any speed.

When the Chopper Spotter is turned on, with the speed selector at any setting ***EXCEPT SLOW***, the controller will show a six flash error code. Turning the selector all the way to ***SLOW*** cancels the error message, and the Chopper Spotter will operate normally.



OPERATING THE CHOPPER SPOTTER MODEL 4

IMPORTANT!



Easy to align from the left side. The handle can be lowered to prevent interference.

1. **Insure that ALL operators have read this material before operating the Chopper Spotter.**
2. **MASTER SWITCH** should be **ON** unless performing maintenance. Load the Chopper Spotter from the left rear of the helicopter. Practice aligning the “nose” of the Chopper Spotter directly under the longitudinal center of the ship. Once it is centered, the casters allow easy alignment of the rear of the Chopper Spotter. The Chopper Spotter handle can be adjusted to avoid touching the fuselage, antennas, or other equipment.
3. Pull out the telescoping tubes, and attach the aft yokes *just behind* the ground handling wheel attachment points. This should be just behind the aircraft center of gravity, and should carry 80-90% of the total weight of the helicopter. The WING NUTS should be adjusted so that the yokes cradle the skids. The yokes do not need to “clamp” onto the skids. The forward yokes should then be attached to stabilize the pitch of the helicopter.



4. Unwind enough cable to step back to the tail boom. Grab the stinger or other suitable handle to stabilize pitch, while you lift the ship high enough to prevent the skids from touching. **An inch or two is enough height.** There is usually no reason to lift higher than this. If the Chopper Spotter is not properly centered or balanced, it should be realigned. When properly loaded and level, the helicopter should be balanced when lifted.

OPERATING THE CHOPPER SPOTTER MODEL 4 (Continued)

IMPORTANT!

5. Never raise the lifting arm more than 12 inches. Damage will be done to the lifting arm if the lift continues to operate past this point. There is no reason to lift the ship more than one or two inches off the ground.
6. Start ***SLOWLY!*** Pressing ***FWD*** or ***REV*** (Forward or Reverse) starts the acceleration cycle. Listen for the solenoid “click”, and the Chopper Spotter will start to gradually pick up speed. Letting off of the switch starts the acceleration cycle over again. The speed can easily be changed while in motion. Like any vehicle without power steering, the Chopper Spotter is easiest to steer when there is some motion. Once the casters are all aligned, however, it is easy to pivot on the drive wheel. **NEVER PUT UNDUE STRESS ON THE TAIL BOOM.** If the casters are pointed in the wrong direction, ***push FWD*** or ***REV*** to allow some motion, and allow the casters to swivel easily.
7. **Caution!** Never leave a helicopter in the raised position while unattended. The Model 4 Chopper Spotter permits the helicopter to PIVOT on the single drive wheel when raised. In windy conditions, the helicopter can “weather vane”, turning into the wind if not well secured. ALWAYS lower the helicopter after maneuvering and movement is completed.
8. Always turn the switch to ***OFF*** after using, to prevent inadvertent operation. The MASTER SWITCH can remain ON.
9. **Braking can be accomplished by switching directional control to the opposite direction. (See section “Adjusting Electronic Controller”)**
10. Use caution when transitioning down inclines. Proceed slowly, and keep the skids close to the ground so that the helicopter can easily be lowered if abrupt stopping is needed. The electronic controller can be adjusted to allow neutral braking capability for going down inclines.

As a safety feature, the handheld speed selector control must be turned to ***SLOW*** before the Chopper Spotter will accelerate to ***FAST***. Turn the speed selector to maximum ***SLOW***, then select any speed.

When the Chopper Spotter is turned on, with the speed selector at any setting ***EXCEPT SLOW***, the controller will show a six flash error code. Turning the selector all the way to ***SLOW*** cancels the error message, and the Chopper Spotter will operate normally.



TOWING THE CHOPPER SPOTTER

The Chopper Spotter can be towed with another vehicle, using the towing fixtures on the front and back of the unit. An operator must stabilize the pitch of the aircraft from the regular operating position at the end of the tail boom.

IMPORTANT!

Never tow the Chopper Spotter faster than 1.70 mph (2.74 km/h). If it is necessary to tow faster, the roller chain must be disengaged to prevent damage to the motor. Over-speeding the motor will destroy the armature.

CAUTION!

Serious damage will be done to the motor if the Chopper Spotter is towed faster than 1.70 mph (2.74 km/h). This is a walking speed. Remove the drive chain if faster speeds are desired.

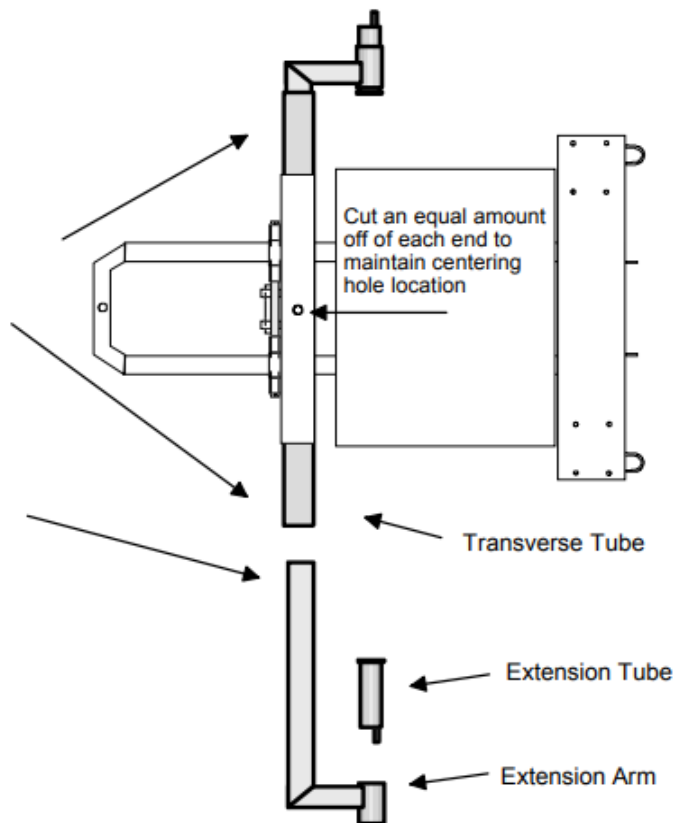
CUSTOMIZING THE LIFTING ARM ASSEMBLY

The lifting arm assembly as shipped with the Chopper Spotter is suitable for helicopters with up to 100 inches (2.54 m) between skids. If you do not need this much width, **you may want to narrow the lifting arms for easier loading capability.**

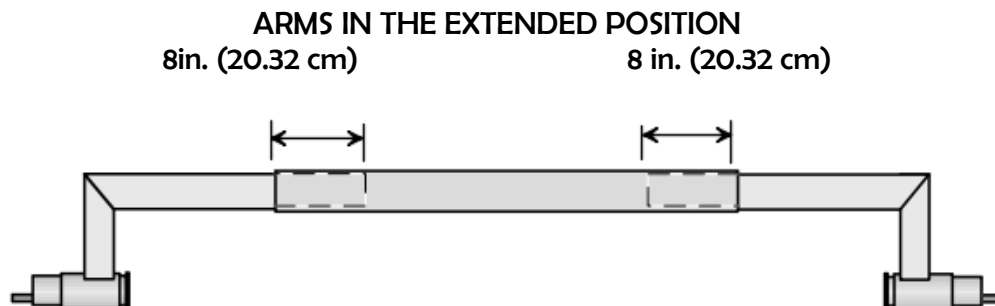
The transverse tube can be cut on both ends to maintain the hole in a center position.

Cut an equal amount off of each end to maintain centering hole location.

Each extension arm can be cut the same amount as the transverse tube. Cut both tubes.



Maintain a minimum of 8 inches (20.32 cm) overlap when arms are in the extended position.



MAINTENANCE

Daily

*Keep twists out of control cable. Do not routinely wind cable onto the handle. Simply drape it over the helicopter or over the Chopper Spotter to avoid excessive flexing.

*Maintain a battery charge of at least 80%. **The most important maintenance on the Chopper Spotter is vigilant battery care.** The batteries will last for several years if taken care of appropriately. Do not overcharge the batteries by recharging, even when the gauge shows a good charge. In most situations, only recharge when the reading is less than 50%.

*Insure that the battery terminals are always clean.

*Check for leaks in the hydraulic system, and check for drips on the floor. Tighten or repair as needed.

*If the lifting arm does not lift high enough, check hydraulic fluid level. Oil in the reservoir should be within ½ inch of the top (fill hole) when the lifting arm is down. Use SAE 10 (light)hydraulic oil in all temperature conditions. A non-detergent SAE 10 motor oil may also be used.

Monthly

*Carefully inspect all lifting components to insure that fasteners are tight.

*Visually check battery acid level, and add clean water if needed. Do not add acid.

*Check chain tension, and adjust as necessary. The chains need not be very tight. They can “sag” slightly, leaving about ½ inch of play. If adjustment is necessary, adjust the jack shaft to the wheel first, then adjust the motor chain by moving the motor.

Every Six Months

*Make sure electrical connections are tight. *Observe important electrical safety precautions.*

*Check EACH battery cell with a specific gravity tester. An imbalance indicates a potential battery problem. A battery that shows variation between cells should be slowly charged separately, and analyzed by a service technician familiar with battery maintenance.

*Use a quality bearing grease on the following components:

-Swivel casters, wheels, and drive wheel

-Lifting arm

The jack shaft bearings are sealed, and will not need grease.

*Lightly oil the ends of the hydraulic cylinder, and make sure pins are loose.

*Clean and lightly oil the chains, and wipe off the excess oil. Use a SAE 20 non-detergent oil, or a lubricant designed for chain lubrication. The motor and hydraulic pump are permanently lubricated, and need no maintenance.

HYDRAULIC SYSTEM

The hydraulic system consists of a 24 volt hydraulic pump, hoses, fitting, and a 3"x 8" hydraulic cylinder. Engaging the UP switch activates a 24 volt solenoid that turns the pump on. Engaging the DOWN switch activates the down solenoid, permitting gravity and springs to lower the lifting arm. The DOWN valve is pressure compensated to lower any weight slowly.

The model M5 and model 4 are equipped with a MANUAL DOWN valve located on the hydraulic pump body. In the rare event of electrical or valve failure, the system pressure can be released by pushing in on the manual valve and turning counter clockwise. The valve will pop out a few millimeters and release. To close the valve, push in and turn clockwise. The valve turns very easily. **DO NOT FORCE THE VALVE.**

Hydraulic System Maintenance

The Chopper Spotter requires very little maintenance. The hydraulic cylinder may expel the collected oil in the cylinder. This is a natural occurrence, and will appear as a leak. Place cardboard or a tarp under the cylinder. Raise the Chopper Spotter all the way up **(without helicopter attached)** for 1-2 seconds, then let the machine down. This process will expel all collected oil in the cylinder. It is recommended that this process be done once a quarter (four times/year). If the Chopper Spotter continues to leak oil after this maintenance procedure, a new cylinder will be required.

If the lifting arm does not lift high enough, the hydraulic fluid is probably low. Add as needed. **FILL RESERVOIR ONLY WHEN THE ARM IS DOWN.**

*Use VERY CLEAN SAE 10 (light weight ISO 32) non-foaming hydraulic fluid in all temperature conditions. Non Detergent SAE 10 motor oil can be used if the preferred fluid is unavailable.

Most hydraulic pump failures and valve malfunctions can be attributed directly or indirectly to dirt or other foreign material getting into the system. When filling, use a funnel with a very fine mesh screen. Do not use a cloth strainer, as lint may be introduced into the system. The moving parts on the cylinder and lifting arm require a few drops of SAE 20 every six months, or more often in dusty conditions. Inject grease into the grease fittings on the moving parts.

The inlet is fitted with a filter screen. To gain access to the filter screen, drain the reservoir of oil, and remove the screws which attach the reservoir to the motor adapter. Carefully remove the inlet assembly, and flush with solvent.

If the system does not lower, the electrical pressure release valve may be "hanging up". First, insure that the solenoid is magnetized when the down switch is engaged. If it is, remove the valve and clean it out with solvent and compressed air. Operate it outside of the pump housing to see if the plunger is moving.

IMPORTANT NOTE: The solenoids that control the hydraulic system are 24 volt switches. Be cautious when working on the system, as the volt short can produce dangerous sparks and cause serious burns.

ELECTRICAL SAFETY PRECAUTIONS

1. **WARNING!** Working with or near lead acid batteries is dangerous. Batteries contain sulfuric acid, and produce explosive gasses. A battery explosion could result in loss of eyesight or serious burns. ALWAYS wear eye and body protection when working with or near lead acid batteries.

Do not smoke, or allow spark or flame near batteries. Charge in areas that are clean, dry, and well ventilated. Do not lay tools or anything metallic near the batteries. In addition, when working around batteries, remove personal items—rings, bracelets, necklaces, and watches. A battery can produce a current high enough to weld jewelry to metal, thus causing severe burns.

2. Before any disassembly of the electrical system, **TURN OFF THE MASTER SWITCH.**
3. The battery charger should be plugged into a properly grounded receptacle.
4. Always turn handheld controller switch to **OFF** when not in use. Never leave the Chopper Spotter unattended while the drive system is activated. Note that the AMBER light is **ON** when the drive system is activated.
5. Do not operate the Chopper Spotter while the battery charger is plugged in. This may result in drawing too much current from the charger, and will cause the battery charger fuse to blow.
6. If the circuit breaker cycles on and off, turn off the machine, and the master switch immediately. “Cycling” of the circuit breaker indicates a short circuit. Identify the problem, and repair it before reconnecting the batteries. If a circuit breaker trips during normal operating conditions, this indicates a bad, and possibly corroded connection at the batteries.
7. NEVER short across a circuit to test it. Use a voltage indicator or multi-tester. If you need to bypass a relay (solenoid) to test it, disconnect the electronic controller first.
8. The electronic controller is highly sensitive to stray voltages! Check, and double check connections to prevent incorrect connections. Service should be performed only by a qualified service technician.

THE FRAME OF THE CHOPPER SPOTTER IS ELECTRICALLY NEUTRAL. INSURE THAT NO ELECTRICAL TERMINALS OR BARE WIRES CONTACT THE FRAME OR OTHER METAL PARTS, IN ORDER TO MAINTAIN ELECTRICAL NEUTRALITY. CHECK WIRES FOR CHAFING, AND WRAP WITH ELECTRICAL TAPE IF NECESSARY.

ELECTRONIC CONTROLLER DIAGNOSTICS

On power up, a **red** light on the top panel next to the master switch will glow. The electronic controller checks the circuits, and turns on the **amber** light when all systems are "GO". If the amber light does not go on, you must check the **green** LED on the controller itself.

The electronic controller, "Micromos" is equipped with a diagnostic system using a green LED visible on its cover. The green LED is visible underneath the cover on the left side, forward of the hydraulic pump. On power up, the LED will be illuminated if the system is functioning correctly.

If there is a problem in the system, the LED will not light. This can be the result of a blown fuse, a faulty controller, lack of power to the controller, or another problem external to the controller.

The controller will give a fault code by flashing a number of times on power up, or while running.

List of Fault Codes

2 flashes	-Incorrect start procedure fault-FWD or REV may be engaged
3 flashes	-Recycle through neutral to clear-short circuit across drive mosfets
4 flashes	-Direction contactor welded
5 flashes	-Faulty solenoid, solenoid circuit, or open-circuit motor
6 flashes	-Accelerator depressed at power up (speed control set to FAST)
7 flashes	-Battery voltage dipped below 12volts, or voltage exceeds 45 volts
8 flashes	-Thermal cutback

In some error conditions, the LED will flash the fault code, then reset to steady glow. This means that you should always be watching the LED while attempting the operation, so that you will see the flashes.

IMPORTANT

As a safety feature, the handheld speed selector control must be turned to **SLOW** before the Chopper Spotter will accelerate to **FAST**. Turn the speed controller to maximum **SLOW**, then select any speed.

When the Chopper Spotter is turned on with the speed selector at any setting **except SLOW**, the controller will give a 6 flash error code. Turning the selector all the way to **SLOW** cancels the error message, and the Chopper Spotter will operate normally.

ADJUSTING THE ELECTRONIC CONTROLLER

The electronic controller has 5 adjustable parameters. The controller must be removed from the Chopper Spotter to access the DIP switches under the cover.

Instructions on How to Remove the Electronic Controller

1. Remove cover to access the controller.
2. Disconnect the batteries at the batteries, or shut off the Master Switch.
3. Remove the wires attached to the controller, making sure to mark them so that they can be reassembled properly. Generally, RED=positive, BLACK=negative.
4. Remove the bolts holding the controller, and carefully lift out. The DIP switches can be found by removing the cover.

SW1	SW2	Neutral Braking	SW3	SW4	Braking	SW5	SW6	Accel. Delay	SW7	Current Limit	SW8	Acceleration Input
OFF	OFF	60%	OFF	OFF	100%	OFF	OFF	0.5s	OFF	100%	OFF	0-5v I/P
ON	OFF	40%	ON	OFF	75%	ON	OFF	1.0s	ON	50%	ON	500R-10K pot. or 0-10v I/P
OFF	ON	20%	OFF	ON	50%	OFF	ON	1.5s				
ON	ON	NONE	ON	ON	25%	ON	ON	2.5s				

Shaded areas denote factory defaults.

*Switch *UP* toward the printed circuit board (PCB) is the “ON” position.

*Switch *AWAY* from the PCB is the “OFF” position.

Adjusting the switches can make a significant difference in the performance and action of the Chopper Spotter. The switches are factory adjusted for moving helicopters on level surfaces. If slopes, ramps, or very confined areas are encountered, the braking parameters may be adjusted to give more braking, thus enhancing the control of the aircraft. **Neutral braking** is helpful in controlling the aircraft while going down slopes. This prevents “coasting”.

Quick braking is accomplished by switching the FWD/REV switch to the opposite direction to quickly and smoothly stop. For example, if you are going forward, you can quickly switch to reverse. A microprocessor in the controller actually controls the reversing action, braking the Chopper Spotter to a complete stop before actually changing direction, so that no damage will be done to the electronics. Experimentation will determine the best setting for each situation.

Settings are a percentage of the maximum range. For example, with switch 3 on, and switch 4 off, the braking effort will be 75% of the available range, proportional to the speed controller position. Neutral braking is not affected by the speed controller position, and acceleration delay settings are measured in seconds. For example, with the factory setting, 100% speed will be reached 2.5 seconds after a valid direction has been selected.

CONTROLLER INFORMATION

IMPORTANT!

If the Chopper Spotter is turned ON while the speed control dial is set to "**FAST**", it will appear to lack power. The electronic controller will need to be reset by turning the speed dial all the way to **SLOW**. The Chopper Spotter will function normally when this is done.

NOTE

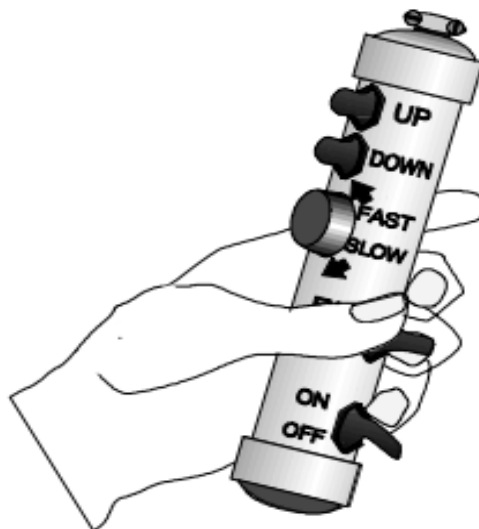
*As a safety feature, the handheld speed selector must be turned to **SLOW** before the Chopper Spotter will accelerate.

Turn the speed controller to maximum **SLOW**, then select any speed.

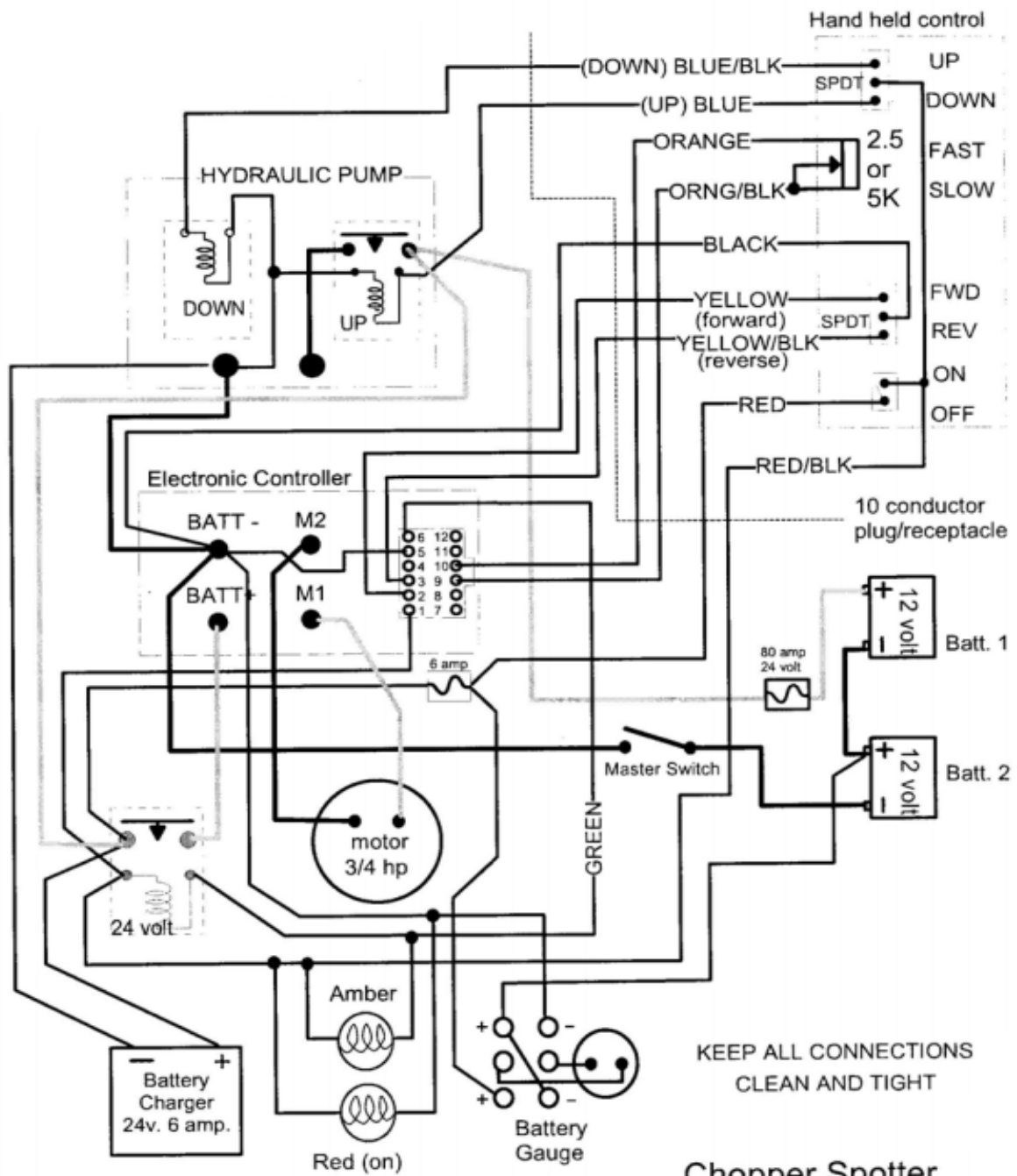
*When the Chopper Spotter is turned on with the speed selector at any setting *except* **SLOW**, the controller will give a 6 flash error code.

Turning the selector all the way to **SLOW**, cancels the error message, and the Chopper Spotter will operate normally.

-SPEED CONTROL-
Turn to **SLOW** to reset



CHOPPER SPOTTER MODEL E CONTROLLER



Chopper Spotter Hydraulic

1 Black	BATT -
2 Red	BATT +
3 Blue	UP
4 Orange	5k Pot
5 Yellow	FWD Input
6 Brown	Unused
7 Red/Black	ON
8 Blue/Black	DOWN
9 Orange/Black	10.5v
10 Yellow/Blk	REV input

CHOPPER SPOTTER MODELS M3 and 4 CONTROLLER WITH OPTIONAL FWD/REV WARNING HORN

