User Guide

AndyMark, Inc. Drive System Components for 2011 *FIRST* Robotics Competition

8" FIRST Wheels

Aluminum Sprockets

#35 Series Roller Chain

Version 1.1

Dec. 29, 2010

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Overview

The 2011 AndyMark Drive Systems is designed for use in the 2011 *FIRST* Robotics Competition (*FRC*).

This Drive System includes standard AndyMark products:

2011 C-Base Drive Chassis (am-0735)

CIMple Box gearbox (am-0734)

8" *FIRST* Wheels, rubber treaded (am-0420)

3/8" bore wheel bearings (am-0209)

#35 ANSI Roller Chain (am-0367) and masterlinks (am-0368)

26-tooth Sprocket (am-0737) and mounting screws (am-1123)

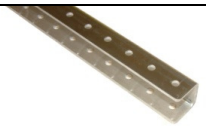
12-tooth Double Sprocket (am-0736) w/ spacers (am-0763, am-1181)

Battery Plugs (am-0122)

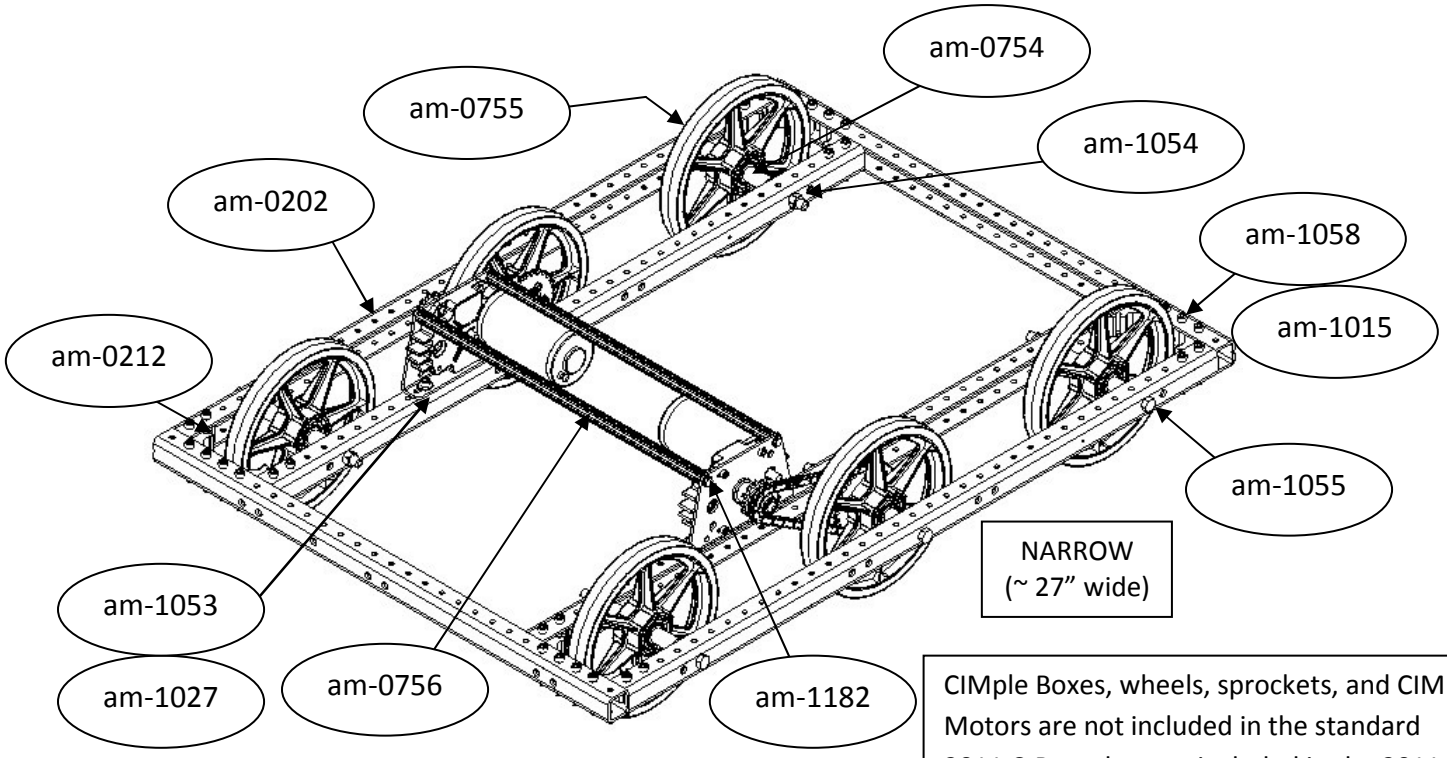
Each registered *FRC* team will receive parts for one 2011 C-base, two CIMple Boxes, six rubber treaded 8" wheels, bearings, chain and sprockets.

All of these parts are provided in kit form, with assembly required. Assembly instructions can be found in this manual, and online. CAD files and more detailed layout drawings can be found at www.andymark.com.

2011 C-Base (am-0735) Bill of Material and Part Photos

Component	Qty	Part Number	Part Photo
C-Channel	6	am-0202	
Corner Connect	8	am-0212	
2550x375 Spacer	6	am-0754	
1940x375 Spacer	6	am-0755	
500 Cross Hex Tube	2	am-0756	
¼ - 20 Nylock Nut	36	am-1015	
¼ id Washer	4	am-1027	
¼-20 x 5/8 SHCS	4	am-1053	
3/8-16 Nylock Nut	6	am-1054	
3/8-16x7 inch Hex Head Screw	6	am-1055	
1/4-20x1.75 SHCS	32	am-1058	
1/4-20x1 Thread Rolling Screw	4	am-1182	

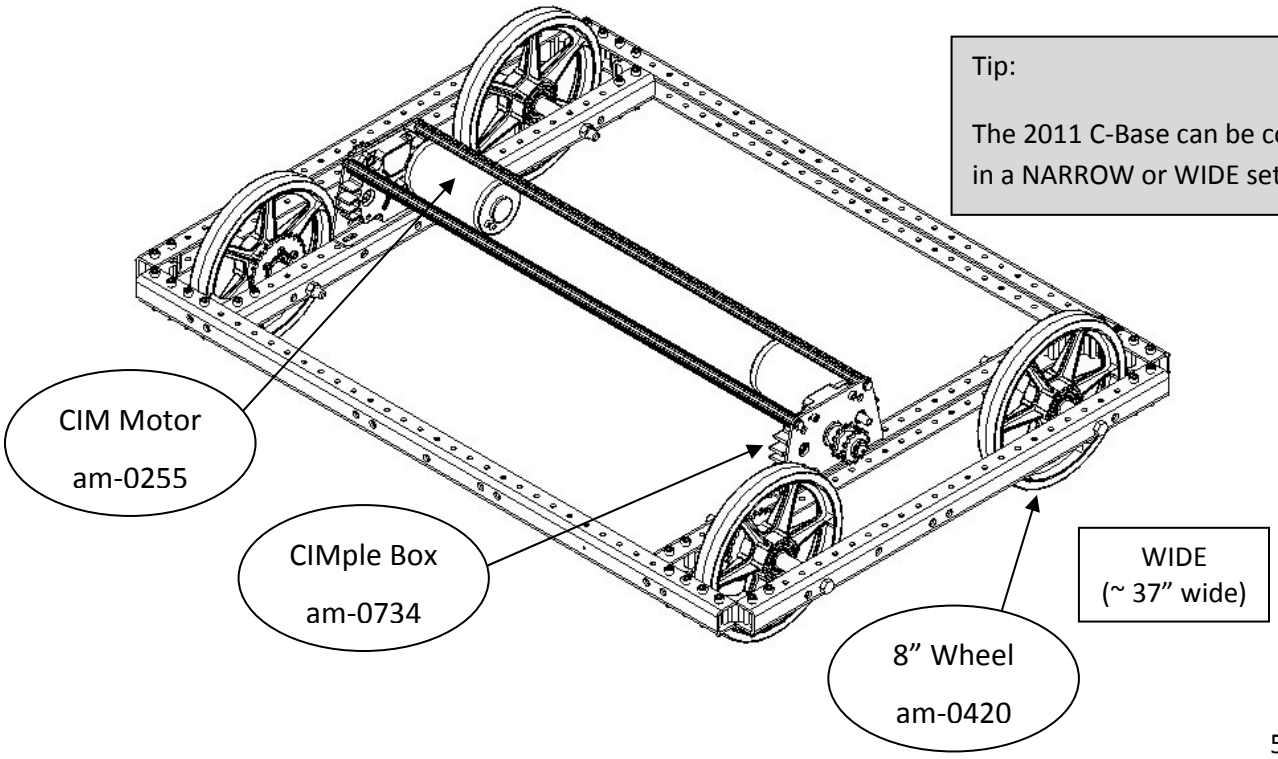
2011 AndyMark Drive System Layout Drawing



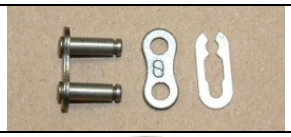
CIMple Boxes, wheels, sprockets, and CIM Motors are not included in the standard 2011 C-Base, but are included in the 2011 AndyMark Drive System Kit of Parts.

Tip:

The 2011 C-Base can be configured in a NARROW or WIDE setup.



Sprocket and Wheel Bill of Materials

Component	Qty	Part Number	Part Photo
3/8” Bore Ball Bearing 1614ZZ	12	am-0209	
#35 ANSI Roller Chain	10ft.	am-0367	
#35 Masterlink	2	am-0368	
8” FIRST Wheel, Rubber Tread	6	am-0420	
S35-12DHE Sprocket	2	am-0736	
S35-26LE Sprocket	2	am-0737	
595x500 Spacer	2	am-0763	
Self-tapping #10-24 x 3/4 screw	12	am-1123	
3/16 thick Nylon Spacer	2	am-1181	

CIMple Box Overview and Specifications

The AndyMark CIMple Box gearbox (am-0734) is a single stage, spur gearbox. Each *FRC* team will receive two (2) CIMple Boxes in their Kit of Parts.

The CIMple Box is provided in kit form, unassembled. Full assembly instructions are included in this manual, and on the www.andymark.com website. Each CIMple Box includes all parts to mount two 2.5" CIM Motors (provided in the Kit of Part) as input devices. The US Digital encoder provided in the Kit of Parts fits onto the CIMple Box in between the two motor mount locations.

Gears:

AGMA 6

20 dp, 14.5 deg. pressure angle

Material: cold-formed 4140 steel

Gear Sizes:

CIM Gear: 12 tooth (0.314" inside diameter with 2mm keyway)

Large Output Gear: 56 tooth (1/2" hex bore)

Gear Ratio:

4.67:1 (56/12)

Output Shaft:

½" diameter 4140 steel shaft, with 1/8" wide keyway

¼-20 x ½" deep threaded hole at end

1 machine key, washer and ¼-20 screw are provided

Housing Material: Nylon 6/6 with Long Fiberglass Fill

Shaft Plate Material: 5052 aluminum

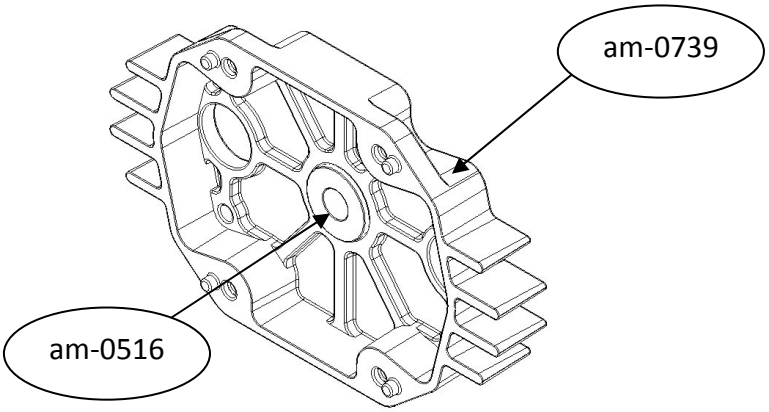
CIMple Box (am-0734) Bill of Material and Part Photos

Component	Qty	Part Number	Part Photo
1/2" id flanged, shielded ball bearing (FR8ZZ)	1	am-0030	
Retainer clip, 8mm id	2	am-0033	
Grease Packet, 2 gram	1	am-0448	
3/8" id bearing, shielded (R6ZZ)	1	am-0516	
CIMple Box Shaft Plate	1	am-0738	
CIMple Box Housing	1	am-0739	
CIMple Box Output Shaft	1	am-0740	
12x520 CIM Gear	2	am-0741	
56 Tooth Output Gear	1	am-0742	

¼ id Washer	1	am-1027	
1/4-20 x 1/2 BHCS	1	am-1039	
10-32 Nylock Nut	4	am-1042	
1/8 x 1/8 x 0.7 machine key	1	am-1043	
10-32 x 5/8 SHCS w/ nylon thread lock patch	8	am-1120	
2x2x10mm machine key	2	am-1121	

CIMple Box Assembly Instructions

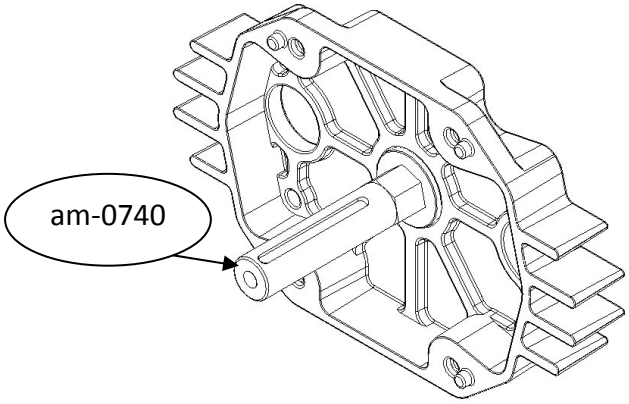
Step 1: Press R6ZZ bearing into CIMple Box Housing.



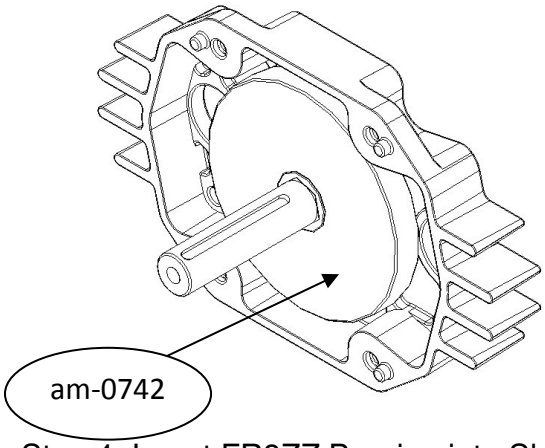
Tip:

Use an arbor press, or tap lightly with a wood block (to avoid damage to the bearing).

Step 2: Insert Output Shaft into bearing.



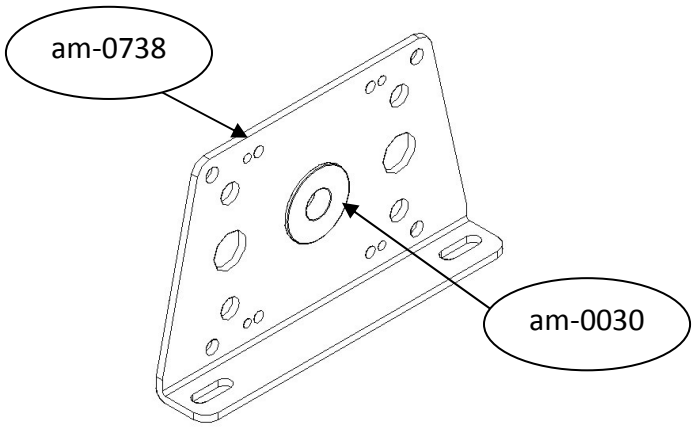
Step 3: Insert 56 Tooth Output Gear onto Output Shaft.



Tip:

The ½" hex hole in the gear should slip over the ½" hex portion of the Output Shaft.

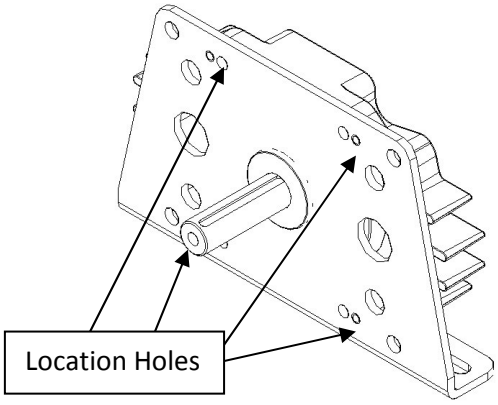
Step 4: Insert FR8ZZ Bearing into Shaft Plate.



Tip:

Use an arbor press, or tap lightly with a wood block (to avoid damage to the bearing).

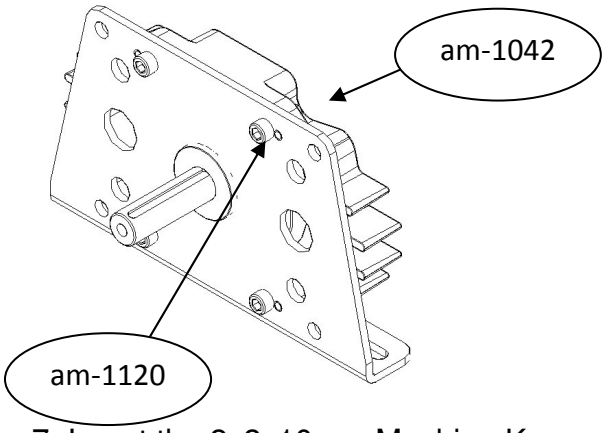
Step 5: Slide the Shaft Plate and FR8ZZ Bearing onto the Output Shaft. This will be a tight slip fit. The four locating nubs on the Housing will line up with the four location holes on the Shaft Plate.



Tip:

Be sure that the FR8ZZ flange is inside of the housing. If it is on the outside of the plate, this bearing will eventually fall out.

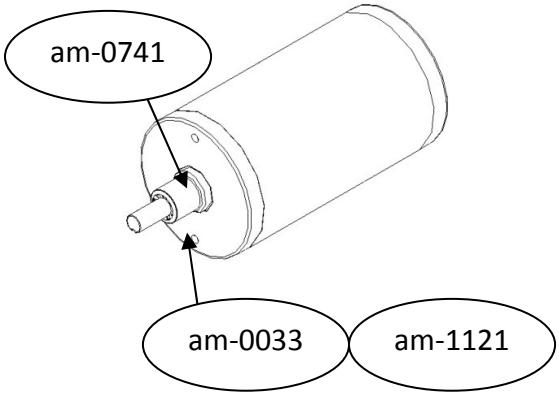
Step 6: One at a time, install 4 Nylock Nuts in the hex pockets on the back side of the Housing. Screw a 10-32 x 5/8" screw into each nut.



Tip:

You won't need a wrench to hold the nut. Just hold it into the pocket with your finger as you are driving the screw with a 5/32" allen driver.

Step 7: Insert the 2x2x10mm Machine Key onto the CIM Motor keyway. Then, slide on the 12x520 CIM Gear so that it almost touches the motor. Lastly, press on the 5/16" Retaining Ring onto the motor shaft to keep the CIM Gear in place.

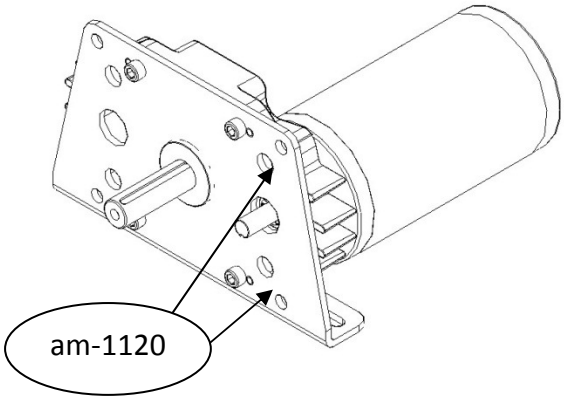


Tips:

The retaining clip has small tongs on its interior. Line up one of these tongs to fit into the keyway, and the machine key won't back out.

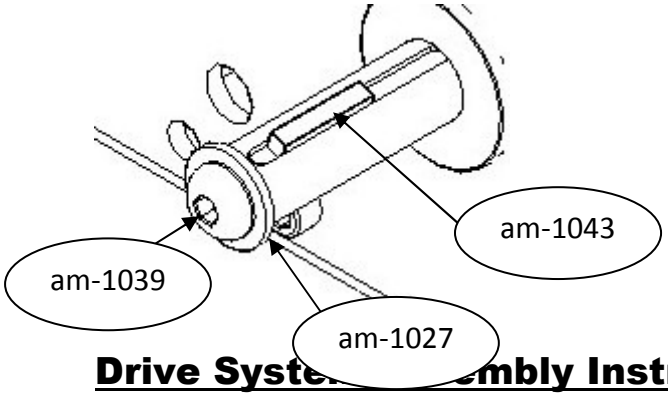
Use a 3/8" socket driver to push the retaining ring into position.

Step 8: Slide the CIM Motor into one of the two motor locations on the back side of the Housing. Use two 10-32x5/8" Screws to fasten the motor in place.



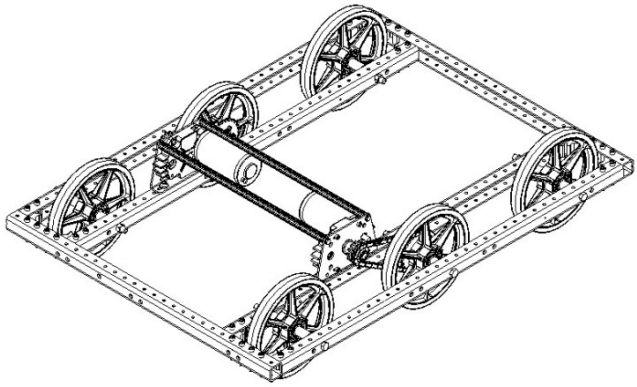
Step 9: Place the 1/8x1/8x0.7" Machine Key into the 1/8" wide keyway on the Output Shaft. Don't keep it there, since you won't really install this machine key until you put

the sprocket on the Output Shaft. Use the ¼" Washer and Button Head Screw to capture the sprocket on this shaft (eventually).

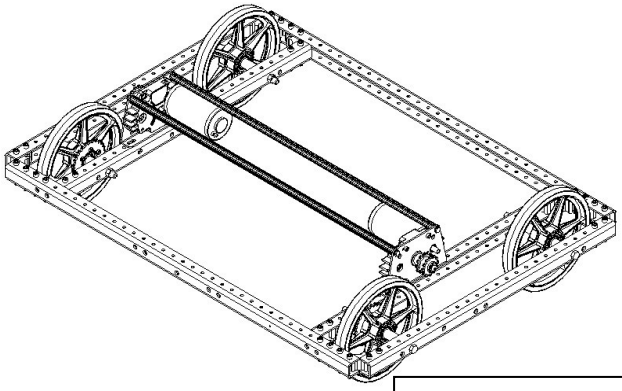


Drive Syste[illegible]embly Instructions

Step 1: Decide whether to use the C-Base in a NARROW or WIDE setup.



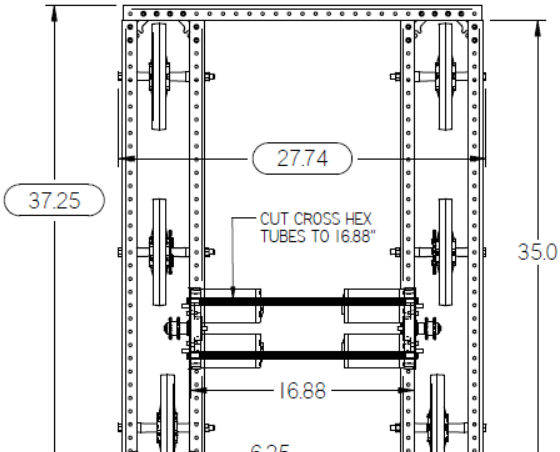
NARROW
(~ 27" wide)

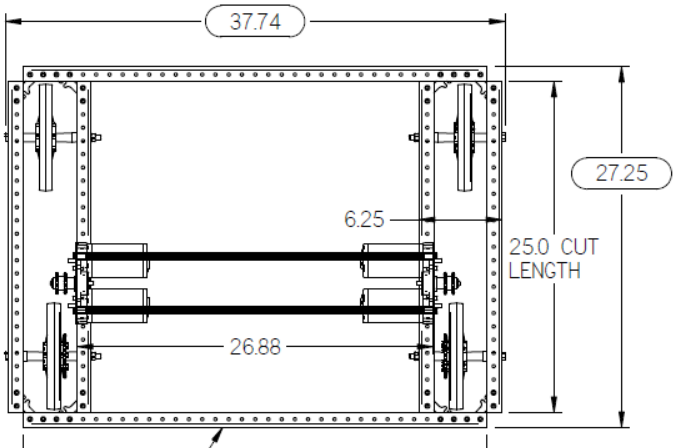


WIDE
(~ 37" wide)

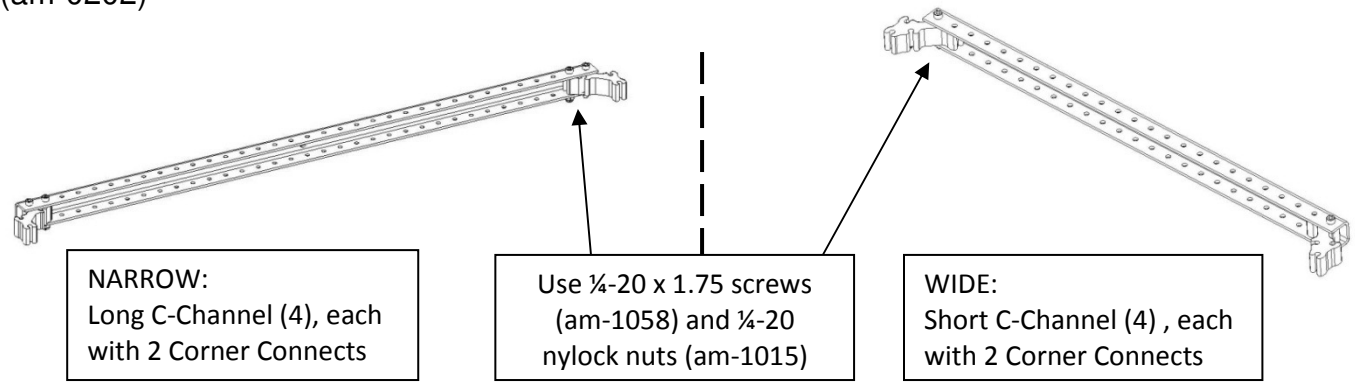
Step 2: Build the C-Base frame, starting by measuring and cutting the correct number of C-Channel pieces to your desired length, as shown in the below layout pictures.

If you are not sure if you wish to go NARROW or WIDE, then build the C-Base as a 37"x37" square chassis. Realize that this will be too wide for the 2010 *FRC* game, but it gives you time to decide to go NARROW or WIDE.



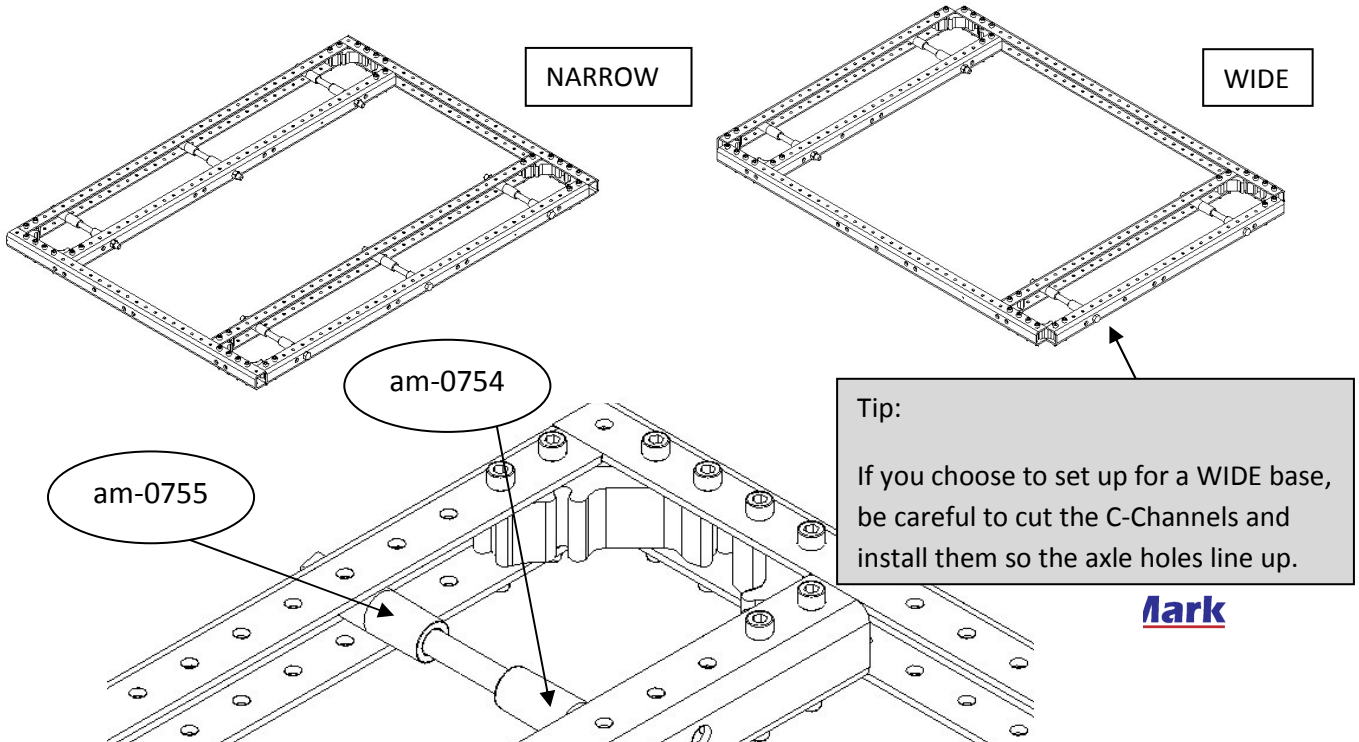


Step 3: Assemble the Corner Connects (am-0212) onto the ends of the C-Channels (am-0202)



Step 4: Assemble the frame, insert the 7" screws (am-1055) and spacers. These screws are used as wheel axles. One long plastic spacer (am-0754) and one short plastic spacer (am-0755) are installed on each axle. These spacers will locate the 8" wheels.

Fasten the 3/8" nut (am-1054) on each 7" screw, lightly. This nut will be removed when the wheels are installed.



Tip:

If you wish to configure your System to drive chain to all of the wheels, these spacers can be installed in reversed positions on other wheels in order to align chain with the double sprocket on the CIMple Box output shaft.

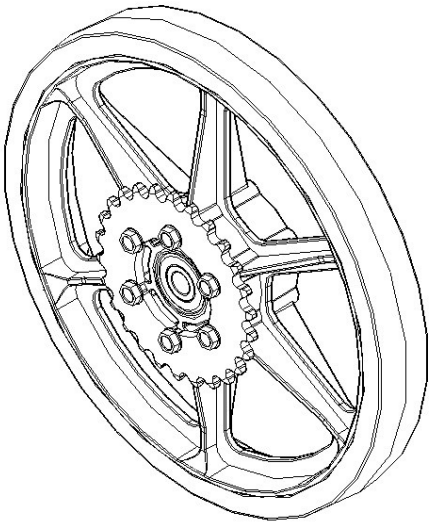
Step 5: Prepare the Wheels.

Press 2 ball bearings (am-0209) into each 8" wheel (am-0420), with one bearing on each side. Using the provided parts in the kit, only 2 wheels per drive system get 26 tooth sprockets (am-0737). More sprockets can be purchased from www.andymark.com if you wish to have more wheels driven by chain.

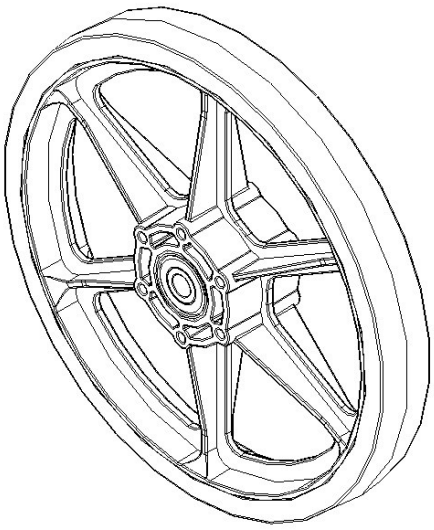
For a 6-wheel drive base (as on the NARROW base), 2 wheels with sprockets and 4 wheels without sprockets will be used.

For a 4-wheel drive base (as on the WIDE base), 2 wheels with sprockets and 2 wheels without sprockets will be used.

12 screws (am-1123) are used to attach the sprocket to the wheel. These are self-threading screws, so no pre-tapping is needed. Use a 5/16" socket or wrench to drive in these screws.



8" wheel with bearings, 26 tooth sprocket, and 6 screws

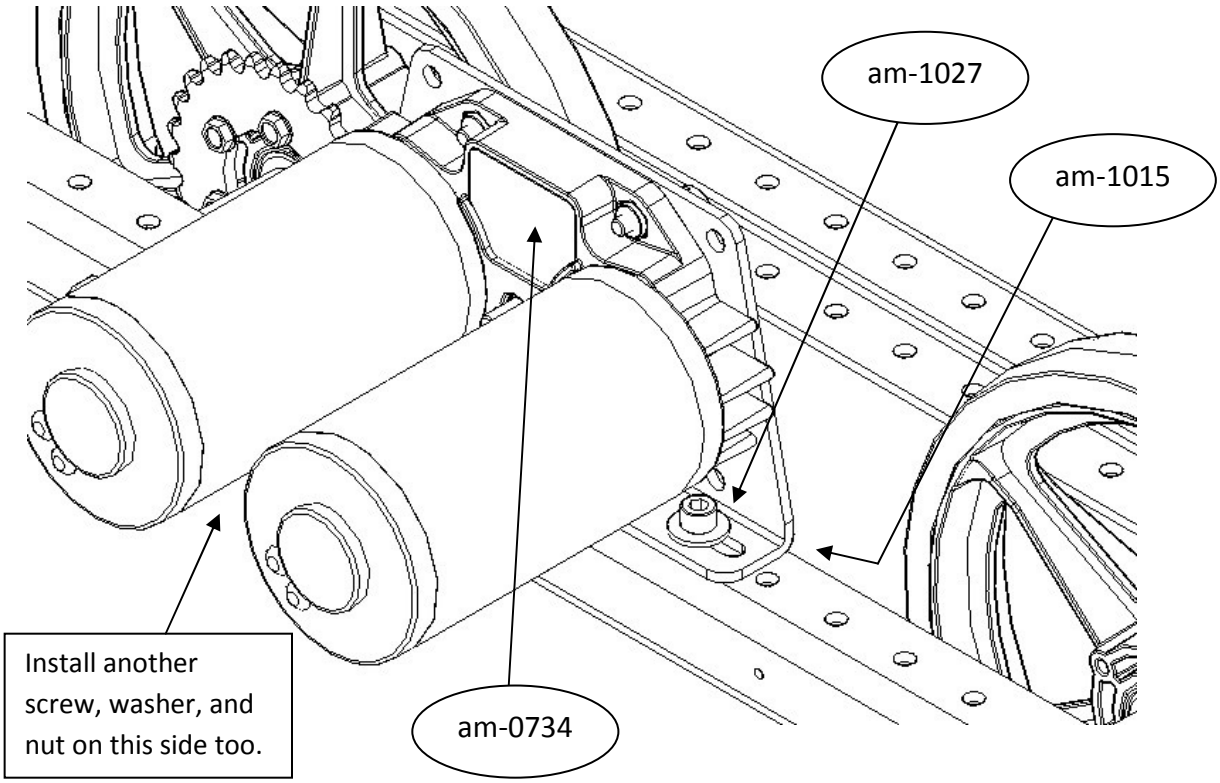


8" wheel with bearings

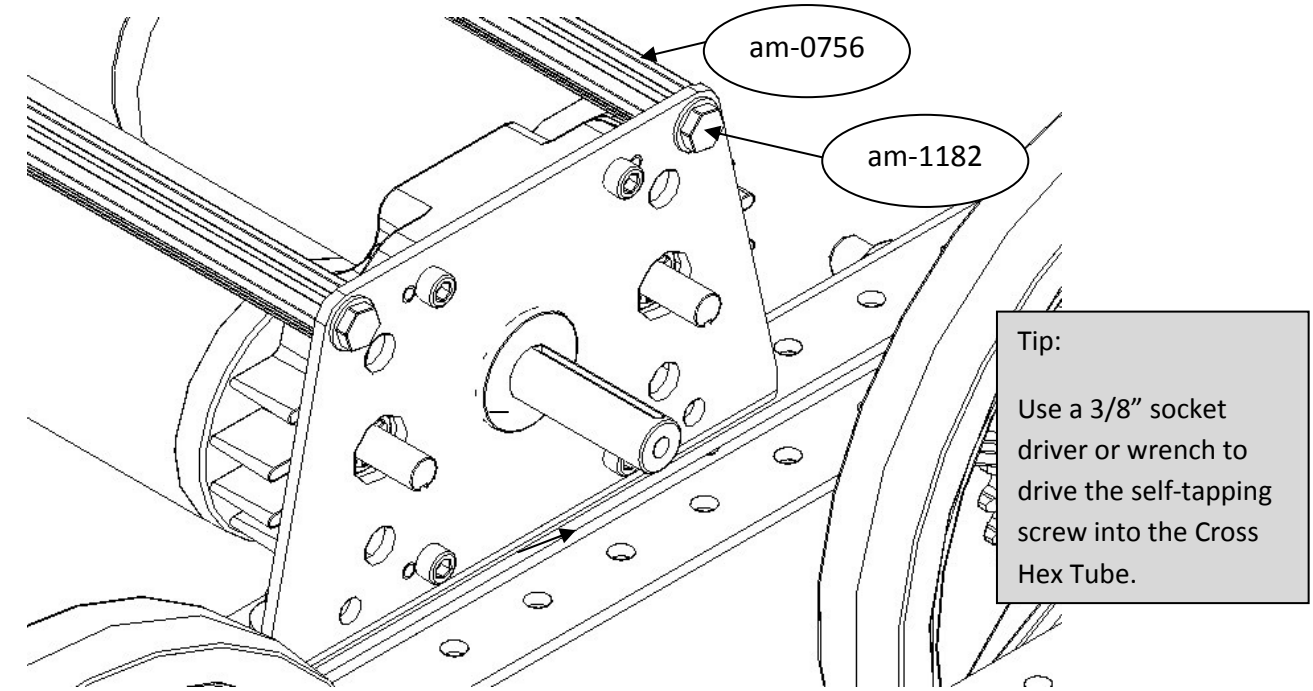
Step 6: Install the wheels where you wish them to be on your C-Base

(see the pictures in Step 1 for possible locations)

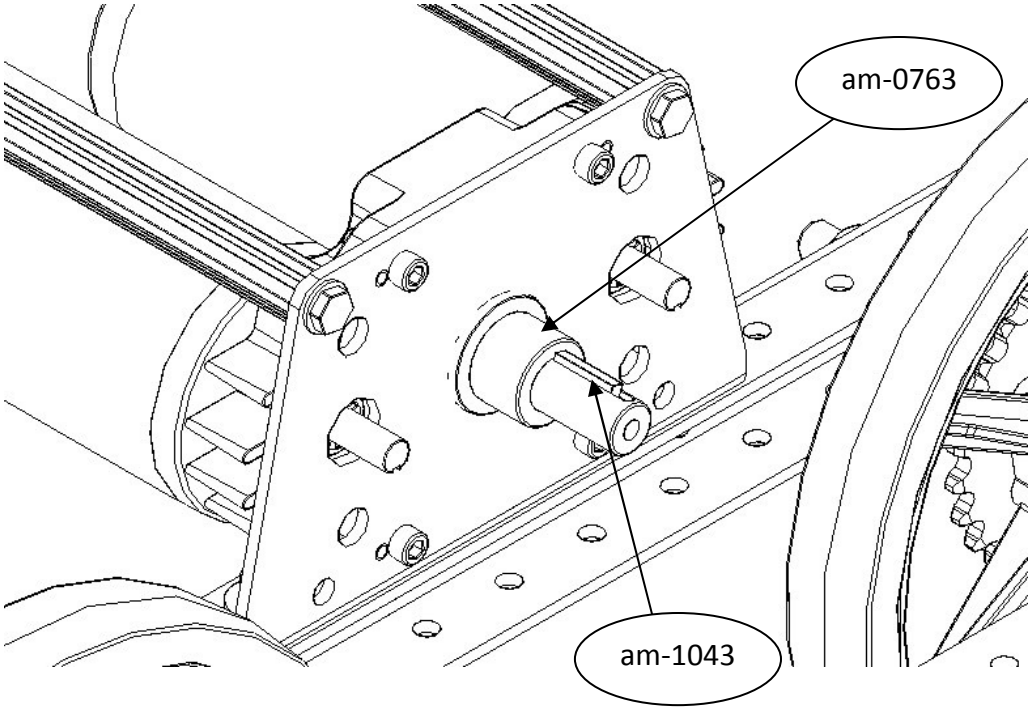
Step 7: Attach CIMple Boxes to C-Base.



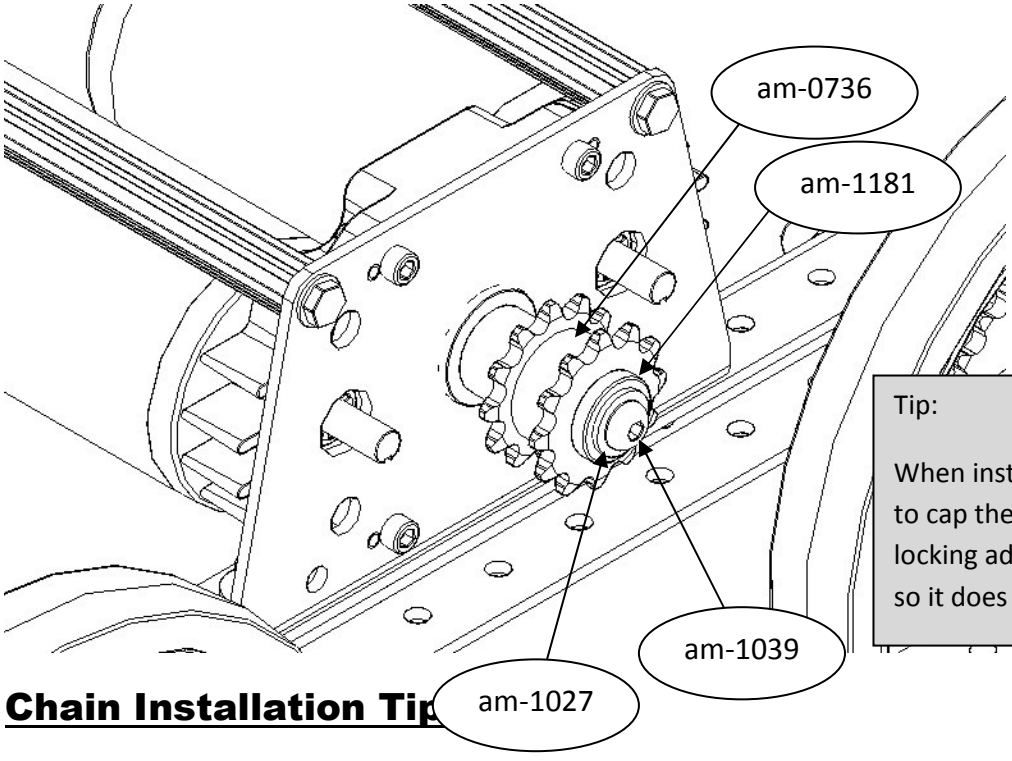
Step 8: Install the Cross Hex tubes, using the ¼-20 x 1" Thread Forming Screws.



Step 9: Install the 595x500 Spacer (am-0763)and CIMple Box Machine Key (am-1043).



Step 10: Install the S35-12DHE Sprocket (am-0743) and 188x500 Spacer (am-1181). Use the ¼" washer (am-1027) and ¼-20 BHCS (am-1039) to hold the sprocket on the shaft.



Tip:

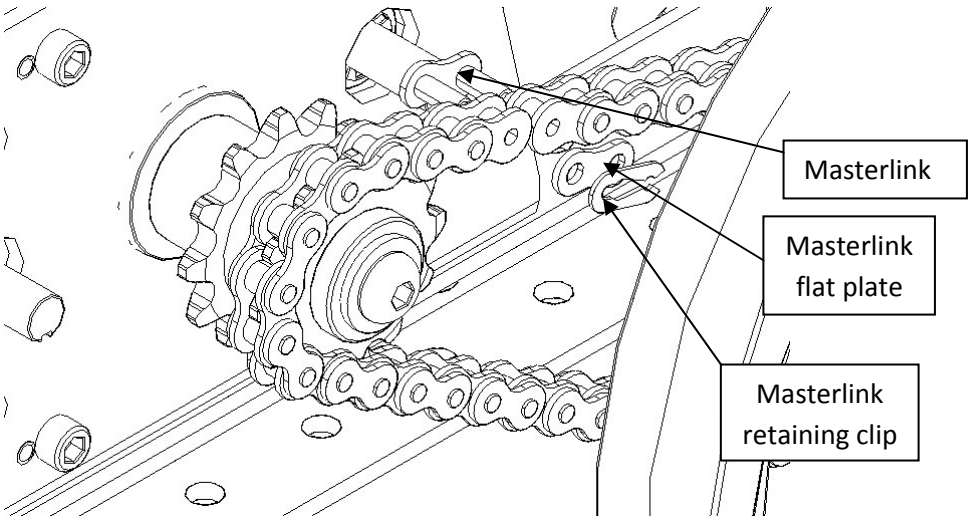
When installing the ¼-20 screw to cap the shaft, use a thread-locking adhesive on the screw so it does not back out.

Chain Installation Tip

These are simple directions to install the #35 series roller chain (am-0367). This chain is different from bike chain, as bike chain has a longer pitch. Due to this longer pitch, bike sprockets do not fit #35 roller chain.

Step 1: Cut the chain to the length needed. Measure out how many links are needed for your chain length (don't forget the masterlink (am-0368) in this estimation). Cut the chain by using a chain breaker, a dremel tool or grinder. Be SAFE when cutting chain.

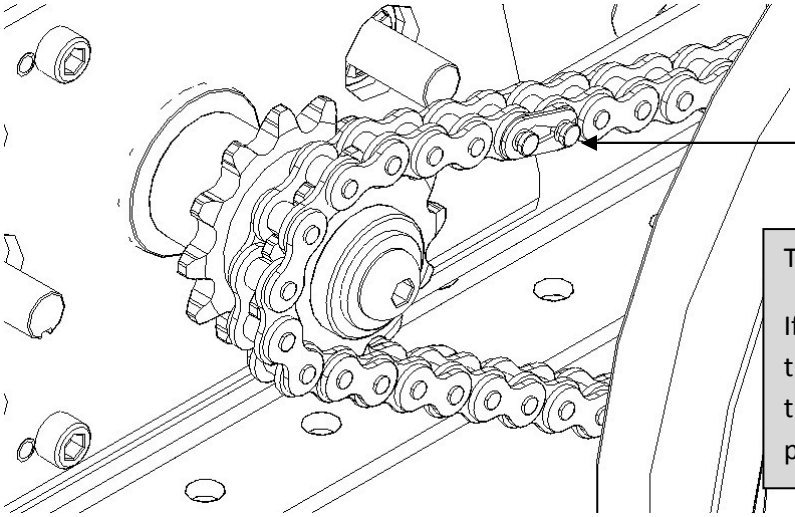
Step 2: Wrap the chain around the two sprockets on your robot. Put the ends of the chain in a location where you can easily insert the masterlink.



Tip:

The chain shown in the picture is 19-7/8" long (not including the masterlink). Your chain may be this length, or a different length, depending on your design.

Step 3: Slide the masterlink into position, place the flat plate and retaining clip into position as shown below. Be sure that the masterlink posts stick out past the retaining clip so that the clip is used properly.



Masterlink posts protrude past retaining clip, and the clip rests in the grooves on the posts.

Tip:

If this is difficult to do on your robot, install the masterlink without the chain being on the robot. Then adjust the CIMple Box position to put the chain back into place.

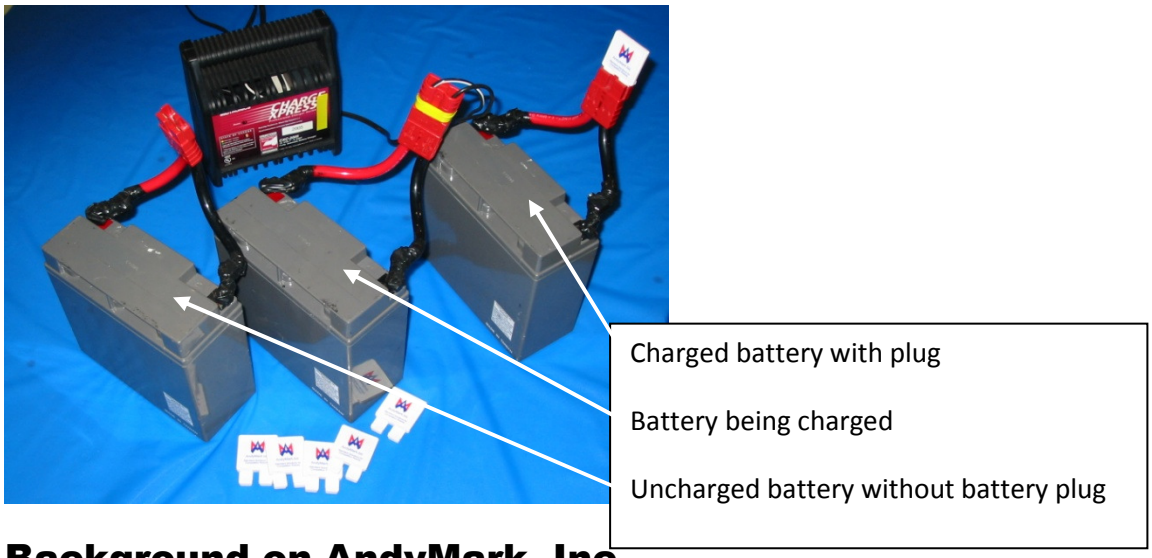
Battery Plug Usage

Four white plastic AndyMark battery plugs (am-0122) are included in the 2011 AndyMark Drive System kit.

These plugs are intended to be flags for charged batteries. While they serve as safety insulators, they are not to be used on uncharged batteries.

Procedure for using these battery plugs:

1. Remove charged battery from charger
2. Insert battery plug into the charged battery's red Anderson connector
3. Place battery on shelf. Battery waits for its chance to power a robot. Anyone who sees that battery with the battery plug will automatically know that battery is charged and ready.
4. Remove battery plug before installing battery on robot
5. Remove uncharged, spent battery from robot, but do not put battery plug back in to uncharged battery, or someone else will think it is charged.



Background on AndyMark, Inc.

We at AndyMark, Inc. provide unique, high quality products for mobility robotics, in a timely fashion. While many of our products are designed with *FIRST* customers in mind, many are used in a wide variety of fields and applications in many countries around the world.

AndyMark was founded in 2004, when Andy Baker and Mark Koors saw a need to design and sell unique mechanical parts for the competition and education robot community. Many designs were being shared and re-created, but finding the correct fabrication resources for these parts was difficult for many competitors, teachers, students, and mentors. As AndyMark grew, so did this same community, and now AndyMark sells parts to all 50 states and to over 30 countries worldwide.

AndyMark is committed to supporting *FIRST*. We are a proud supplier of the FRC program since 2005, and the company owners (Andy Baker and Mark Koors) have been FRC mentors since 1998. We know the demands of a quick build season and the pressures of 2-minute matches during Regionals and the Championships. For the 2011 FRC build season, AndyMark will be working around the clock to meet customers' needs. During the competition season, AndyMark staff will volunteer at many FRC Regional events, and we will have a booth at the St. Louis Championships.

We encourage our customers to seek product information on our website, www.andymark.com, or to send us emails at sales@andymark.biz. We appreciate phone calls (877-868-4770) from any customer, but we also are very busy during the January and February FIRST build season. During this time, we would prefer email instead of a phone call to save time and increase our efficiency. So, please email us with any and all comments and questions. We will be diligent in replying.

We wish all of our customers the best of luck in the 2011 FRC season, and we hope to see you in St. Louis at the Championships.

Version	Change	Page	Date
1.1	All "am-0734" must be changed to "am-0736" All "am-0734" must be changed to "am-0736" Typo on page 9 Added version control	3, 6, 17 3, 6, 15 9 20	Dec. 30, 2010