

## Scoring Guidance – Robotic Grasping and Manipulation Challenge (RGMC)– Manufacturing Track

The following images provide scoring guidance for the RGMC competition. Not every part in the competition is presented but the rules for scoring each type of subtask (insertion, threading, routing etc.) are described. This guidance should be used for similar parts that require the same assembly operations to perform.

### Threaded Fasteners:



Cross threaded screw cannot advance thread by hand (no points)



Threaded – can be advanced by hand (2 points)



Not fully threaded – can insert washer under head (2 points)

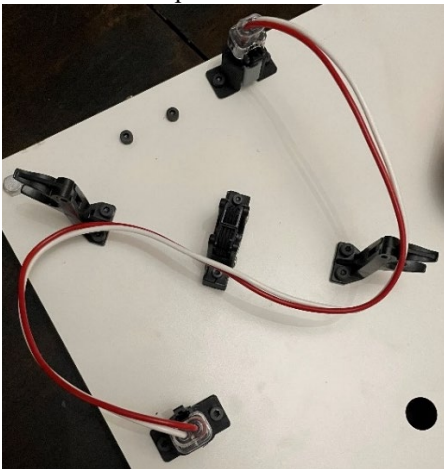


Fully successful fastener operation. Washer cannot be inserted under head. (3 points)

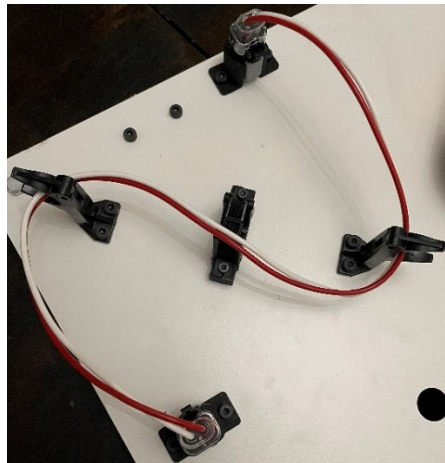
Note: In all four cases above, cross threading and destruction of threads receives no points. Judges check this by screwing/unscrewing fastener with ease.

### Wire routing:

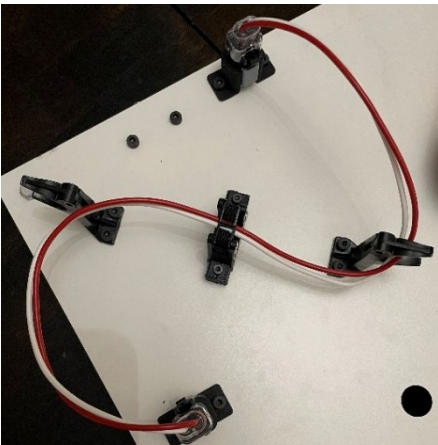
Points accessed per wire.



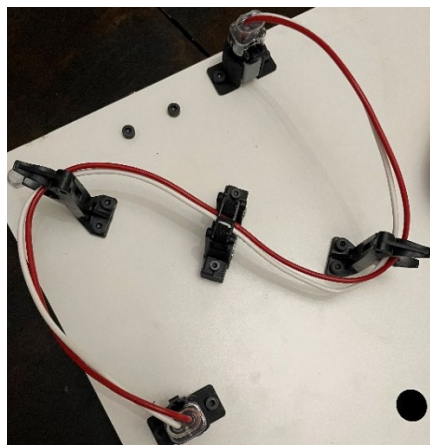
Neither wire routed through any channels. (0 points)



Both wires routed through both corner posts but not through the elastic retainer. (6+6+6+6 = 24 points)



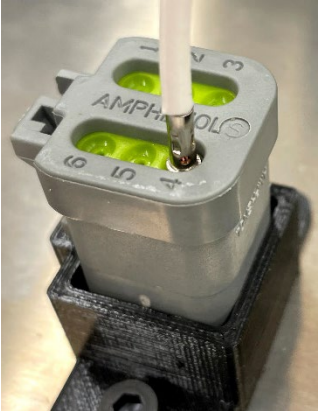
Both wires routed through one corner post and through the elastic retainer. (24 points)



Both wires routed through all posts and retainers. (36 points).

## Pin insertion:

A different connector is used for task board



Wire pin inserted into connector  
(3 points)

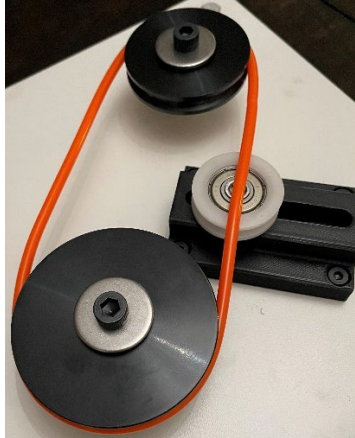


Inserted and fully seated. Cannot be removed with a tug.  
(5 points)

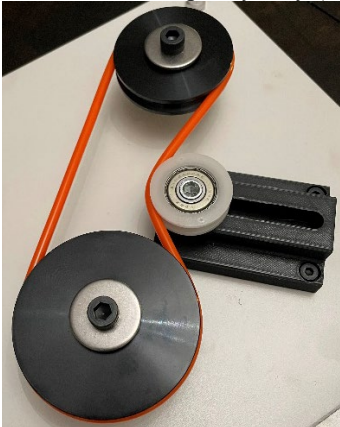
## Belt Threading and Tensioning:



Threaded on one pulley only (14 points)



Fully threaded (28 points)



Fully threaded and tensioned (42 points)

AT-02 Connector:



Insertion into mating counterpart  
but no snap fit of locking mechanism  
(3 points)



Insertion into mating counterpart  
and snap fit of locking mechanism  
(5 points)

Ethernet Connector:



Insertion into mating counterpart  
but no snap fit of locking mechanism  
(3 points)



Insertion into mating counterpart  
and snap fit of locking mechanism  
(5 points)

BNC Connector:



Insertion only  
(3 points)



Insertion only  
(3 points)



Insertion, partial  
(3 points)



Insertion and full lock  
(5 points)

Pegs:



All edges not below task board top surface (0 points)

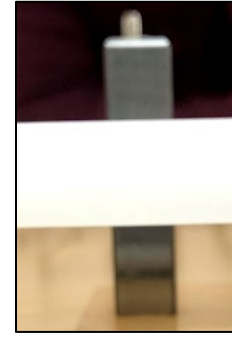


All edges below task board top surface (3 points)



(a)

Full insertion with peg seated on surface that supports the task board (5 points)



(b)



All edges below task board Top surface (3 points)

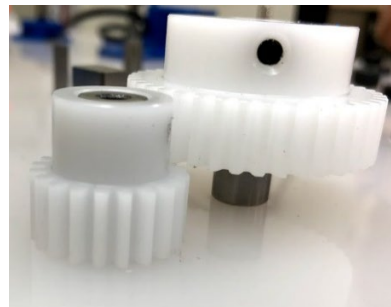


Full insertion with peg seated on surface that supports the task board (5 points)

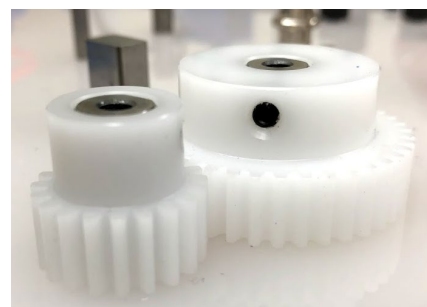
Gears:



Inserted but not Seated on task board (3 points)



Small gear inserted and seated for (5 points). Large gear inserted but not seated (3 points)



Both gears inserted and fully seated (5 points) for each.

**EXAMPLE** Scoring Sheet: Robotic Grasping and Manipulation Competition – Manufacturing Track

## SubTask1: Assembly

Team Name: \_\_\_\_\_

Team Leader: \_\_\_\_\_

\_\_\_\_\_ *Team Leader Signature*

Judge: \_\_\_\_\_

\_\_\_\_\_ *Judge Signature*

<b>Quad 1: Threading</b>						
Start Time: _____				End Time: _____		
Class	Component	Contact board	Threaded (2 points ea.)	Number Seated	SubTotal	Total (/48)
Fastener Screwing	M12 Screws (out of 2)		_____ x 2 = _____	_____ x 1 = _____		
	M8 Screws (out of 2)		_____ x 2 = _____	_____ x 1 = _____		
	M4 Screws (out of 2)		_____ x 2 = _____	_____ x 1 = _____		
Nut Securing	M12 Nuts (out of 2)		_____ x 2 = _____	_____ x 1 = _____		
	M8 Nuts (out of 2)		_____ x 2 = _____	_____ x 1 = _____		
	M4 Nuts (out of 2)		_____ x 2 = _____	_____ x 1 = _____		
<b>Time Bonus:</b>				<b>Final Score:</b>		
Time bonus = INT(total remaining time [min]) x 1 point _____				Total + Time bonus =		

Resets: \_\_\_\_\_

<b>Quad 2: Insertions</b>						
Start Time: _____			End Time: _____			
Class	Component	Contact board	Inserted (3 points ea.)	Seated (2 points ea.)	Total (/48)	
Insertions	Small Gear					
	Large Gear					
	16 mm Round Peg					
	8 mm Round Peg					
	12 mm x 8 mm Peg					
	4 mm Square Peg					
	BNC Connector					
	RJ45 Connector					
<b>Time Bonus:</b>				<b>Final Score:</b>		
Time bonus = INT(total remaining time [min]) x 1 point _____				Total + Time bonus =		

Resets: \_\_\_\_\_



**EXAMPLE Scoring Sheet: Robotic Grasping and Manipulation Competition – Manufacturing Track**

## SubTask2: Disassembly

Team Name: \_\_\_\_\_

Team Leader: \_\_\_\_\_

\_\_\_\_\_  
*Team Leader Signature*

Judge: \_\_\_\_\_

\_\_\_\_\_  
*Judge Signature*

<b>Quad 1: Threading</b>				
Start Time: _____		End Time: _____		
Class	Component	Unthreaded from the board (2 points each)	Placed in Kit Tray (1 point each)	Total ( /36)
Fastener Screwing	M12 Screws (out of 2)	_____ x2 = _____	_____ x1 = _____	
	M8 Screws (out of 2)	_____ x2 = _____	_____ x1 = _____	
	M4 Screws (out of 2)	_____ x2 = _____	_____ x1 = _____	
Nut Securing	M12 Nuts (out of 2)	_____ x2 = _____	_____ x1 = _____	
	M8 Nuts (out of 2)	_____ x2 = _____	_____ x1 = _____	
	M4 Nuts (out of 2)	_____ x2 = _____	_____ x1 = _____	
<b>Time Bonus:</b>			<b>Final Score:</b>	
Time bonus = INT(total remaining time [min]) x 1 point _____			Total + Time bonus =	

Resets: \_\_\_\_\_

<b>Quad 2: Insertions</b>				
Start Time: _____		End Time: _____		
Class	Component	Removed from the board (2 points each)	Placed in Kit Tray (1 point each)	Total ( /24)
Insertions	Small Gear			
	Large Gear			
	16 mm Round Peg			
	8 mm Round Peg			
	12 mm x 8 mm Peg			
	4 mm Square Peg			
	BNC Connector			
	RJ45 Connector			
<b>Time Bonus:</b>			<b>Final Score:</b>	
Time bonus = INT(total remaining time [min]) x 1 point _____			Total + Time bonus =	

Resets: \_\_\_\_\_

Quad 3: Belt Tensioning				
Start Time: _____		End Time: _____		
Class	Component	Removed from the board (2 points)	Placed in Kit Tray (1 point)	Total (/49)
Belt removal	Removed from small pulley		(1 belt)	
	Removed from large pulley			
	Removed from tensioner pulley			
Time Bonus: Time bonus = INT(total remaining time [min]) x 1 point			Final Score: Total + Time bonus =	

Resets: \_\_\_\_\_

Quad 4: Wire Harness				
Start Time: _____		End Time: _____		
Class	Component Contact board	Disconnected from board (2 points each) Sub-total:	Placed in Kit Tray (1 point)	Total (/11)
Cable Routing	Wire removed from post 1		(1 Completed wire harness)	
	Wire removed from post 2			
	Wire removed from post 3			
AT connector removal	Connector removed from housing (out of 2)	_____ x2 = _____		
Time Bonus: Time bonus = INT(total remaining time [min]) x 1 point			Final Score: Total + Time bonus =	

Resets: \_\_\_\_\_

### Total for subtask 1: Disassembly

Quad 1 score:	+	Quad 2 score:	+	Quad 3 score:	+	Quad 4 score:	=	<b>Total</b>

### Total Team Score:

Assembly Score	+	Disassembly Score	=	<b>FINAL TOTAL SCORE</b>

Verify score \_\_\_\_\_

2<sup>nd</sup> Judge's Signature