

No.	Part/Operation Description	Time Factors (seconds)										K	L	M	N	O
		A	B	C	D	E	F	G	H	I	J					
		End-to-End Orientation	Rotational Alignment	Part Size	Part Thickness	Insertion Clearance	Insertion Direction	Insertion Condition	Fastening	Fastening Process	Handling Condition	Time/Each Operation (T _{op})	Number of Repetitions (N _{rep})	Repetition Time (K*L) (T _{rep})	Insert Part (1 = Yes; 0 = No)	Eliminate Part (1=Yes; 0 = No)
1	LED connect to PCB	1.8	0.5	0.4	0.2	0.0	0.6	6.0	2.0	7.0	1.0	19.5	2	39	1	
2	LED mount to gearbox	0.8	1.0	0.4	0.2	1.6	1.4	1.4	0.0	11.0	0.0	17.8	2	36	1	
3	PCB mount to gearbox	1.8	1.0	0.0	0.5	0.0	1.4	1.4	4.0	4.0	0.0	14.1	1	14	1	
4	Pedal connect to crank arm	0.8	1.0	0.0	0.0	1.6	1.4	0.0	5.0	4.0	0.0	13.8	2	28	1	
5	Bearing to shaft	1.3	1.0	0.0	0.0	0.3	1.4	1.5	0.0	4.0	0.0	9.5	4	38	1	
6	Place Gear on shaft	2.3	0.5	0.0	0.2	0.0	1.4	2.3	2.5	1.0	0.0	10.2	3	31	1	
7	Mount shafts to casing	0.8	0.5	0.0	0.0	0.3	1.4	1.5	0.0	1.0	0.0	5.5	4	22	1	
8	Mount motor to casing	1.8	1.0	0.0	0.0	0.9	1.4	1.5	4.0	4.0	0.0	14.6	4	58	1	
9	Connect all walls of gearbox	1.3	1.0	0.0	0.0	0.9	1.7	2.3	4.0	4.0	0.0	15.2	6	91	1	
10	Fasten track adjuster bracket to gearbox	1.8	1.0	0.0	0.0	0.0	1.4	1.4	4.0	4.0	0.0	13.6	2	27	1	
11	Drill pilot holes in bottom of bucket and track	0.8	1.0	0.0	0.2	0.0	2.0	1.4	4.0	4.0	0.0	13.4	3	40	1	
12	Cut holes in buckets (1.75"x3.75")	0.8	1.0	0.0	0.0	0.0	1.4	1.4	6.0	9.0	0.0	19.6	2	39	1	
13	Cut holes in track adjuster bracket	0.8	1.5	0.1	0.2	0.0	1.4	1.4	4.0	4.0	0.0	13.4	2	27	1	
15	Attach plywood to 2"x4" at 45 degree	1.3	1.0	0.0	0.0	0.0	1.4	1.4	4.0	4.0	0.0	13.1	1	13	1	
16	Cut holes in 2"x4" 48" long	0.8	1.5	0.1	0.2	0.0	1.4	1.4	4.0	4.0	0.0	13.4	7	94	1	
17	E-clips to shaft	1.8	1	0.1	0.2	1.6	1.4	1.4	2.5	1	0	11.0	6	66	1	
												51	663	16		
												TOP	TAT	NUP		

Labor Costs and Assembly Time (1 unit)		
Total Assembly Time	11.05	min
Machining Time	1.2	hr
Total Manufacturing Time	1.384	hr
Rate=	20	\$/hr
Labor Price=	27.68	dollars

Summary Statistics		
NUP	16	= number of unique parts (Sum of Column N)
TOP	51	= total number of operations (sum of Column L)
TAT	662.8	= total assembly time (sum of Column M)
NP	51	= number of parts = sumproduct(L,N)
T _{avg}	13.0	= avg time/operation = TAT/TOP
P _{min}	51.0	= min # parts = NP - sumproduct(L,N,O)
AR	0.18	= Assembly rating = 2.35 * NP /TAT
PE	1.00	= Part Efficiency = Pmin/NP
C	540.40	= Assembly complexity = TAT - (2.4*TOP)
OR	5.42	= Operation difficulty rating = TAT/(2.4*TOP)