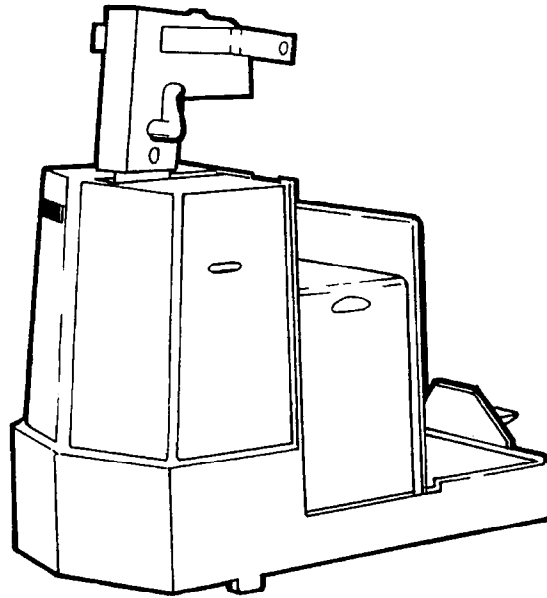


# SM-614 PWC 30, PWT 7 Service Manual



**CLARK** Technical  
Publications  
Lexington, KY  
40508

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# NOTICE

"CLARK Trucks meet all applicable requirements of ASME B56.1 or ASME B56.9 at time of manufacture.

CLARK will not assume any liability for injuries or damages arising from or caused by the removal, disconnection or disengagement of any part from any of its trucks.

CLARK recommends all replacement parts are of OEM (Original Equipment Manufacturer) origin.

Any modifications and/or additions which affect capacity or safe operation of CLARK trucks shall not be performed without CLARK's prior written approval.

A user should consult the Local Authorized Dealer if the user's intended application is outside the designated performance characteristics of the truck.

Dimensions and performance specifications shown may vary due to manufacturing tolerances. Performance is based on an average size truck and is affected by weight, condition of the trucks, battery, optional equipment and operation area.

CLARK products and specifications are subject to change without prior notification."



# **GENERAL INFORMATION (GI)**

## PWT & PWC INTRODUCTION

This manual has been assembled to assist in the training of a service technician to service, maintain and repair if required the units covered.

This manual covers the PWT tow tractor and the PWC center controlled pallet truck manufactured after 1989. Even though these units serve different applications, the power section or tractor section of these units are the same.

We have made every effort to disguise between the models so the authorized technician will be working with the correct service specifications.

You will find that the PWT tractor can have either resistor or PMC for drive motor control, and the PWC is standard with PMC drive motor control.

Also the reverse function is different for these units which will be covered under Basic Electrical Operation (EC Section).

**All schematics and part numbers included in this manual are for standard units. These are subject to change please reference the units specific parts manual for correct information.**

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# GENERAL INFORMATION

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## SPECIFICATIONS FOR PWT

Electrical System                    24V Standard  
PMC Controller (Standard)        Mosfet Transistor  
Resistor (Contactor - Optional)   3 Speed (Electric Timer)

Model	Standard	Standard	Hi-Speed	Hi-Speed	Hi-Torque	Hi-Torque
Motor	39100-009	39100-009	39100-010	39100-010	39100-011	39100-011
HP/Amp	1.0/91			2.5/120		
Gear Ratio	18:1	12:1	21:1	12:1	18:1	15:1
Approx. Speed	Empty 6.3 Loaded 3.3	Empty 7.5 Loaded 5.0	Empty 6.3 Loaded 3.8	Empty 8.5 Loaded 6.5	Empty 6.3 Loaded 3.5	Empty 7.0 Loaded 4.8
Towing Capacity	10,000	7,000	12,000	6,000	15,000	15,000

Tires	A. Drive Tire	Standard	Option #1	Option #2
	10 x 4	Rubber	Non-Marking	83 duro Poly
	Part Number	11905-021	18849-004	13076-030
	B. Rear Wheel	Rubber		
	7 x 4	28000042-000		

### Dimensions

A. Overall Length without Coupler (Hitch)	45.88"	
B. Wide	32.75"	
C. Weight without Battery PWT	950#	
	PWT Hi-Torque	1300#
D. Battery Sizes	30.69" x 12.81" x 23.25" AMP. HR. 450	960#
	30.69" x 12.81" x 23.25" AMP. HR. 510	1000#
	30.69" x 12.94" x 31.00" AMP. HR. 625	1180#
	30.69" x 12.94" x 31.00" AMP. HR. 750	1500#
E. Steering	180° Total (90° to Left or Right)	

Note: All specifications subject to change without prior notification.

**SPECIFICATIONS FOR  
PWC**

Electrical System                      24V Standard  
PMC Controller                         Mosfet High Speed Truck

Capacity	Standard 6000#	Option 8000#
Motor	39100-010	39100-010
HP/Amp	2.5/113	2.5/113
Gear Ratio	18:1	18:1
Approx. Speed	Empty 6.2	Empty 6.2
	Loaded 4.4	Loaded 4.0
	Walking 3.5	Walking 3.5

Hyd. Capacity	Pints
Hyd. Pump Type	Barnes
Hyd. Relief psi Approx.*	@6000# = 1850psi
	@8000# = 2100psi
Hyd. Oil	Valvoline F32U

\*Note: Units are tested to lift its rated load in 4.0 to 4.5 sec. relief valve is adjusted to meet this standard.

Tires	A. Drive Tire	Standard	Option #1	Option #2
	10 x 4	Rubber	Non-Marking	83 duro Poly
	Part Number	11905-021	18849-004	13076-030
	B. Cater Wheel	Poly		
	3.25 x 6	27462-008		
	C. Load Wheel	Poly	Poly 8000# Only	
	3.25 x 6	9988-048	9988-048V	

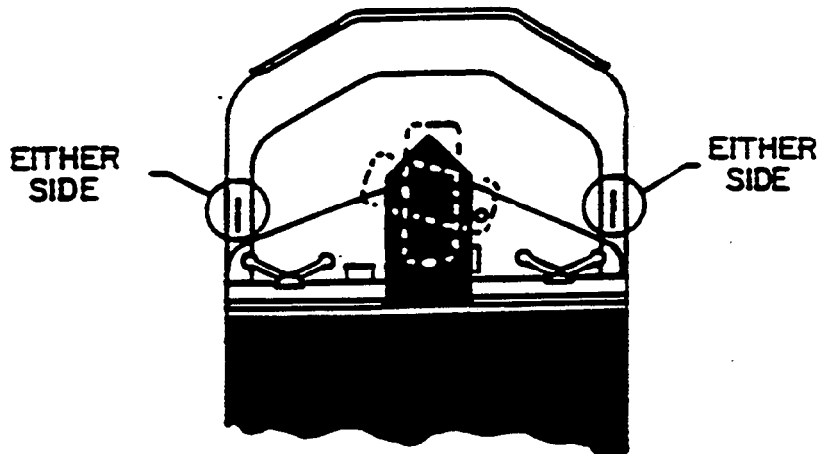
**Dimensions with 96" Forks**

A. Overall Length	151.34"
B. Overall Width	34.90"
C. Weight without Battery	1910#
D. Battery Sizes	30.69" x 12.81" x 23.25" AMP. HR. 450      960#
	30.69" x 12.81" x 23.25" AMP. HR. 510      1000#
	30.69" x 12.94" x 31.00" AMP. HR. 625      1180#
	30.69" x 12.94" x 31.00" AMP. HR. 750      1500#
E. Lift Height to top of Forks	9.25"
E. Steering	180° Total (90° to Left or Right)

Note: All specifications subject to change without prior notification.

SERIAL NUMBER LOCATION  
CURRENT MODELS

PWT & PWC



## RECORD KEEPING

Webster defines maintenance as the art of maintaining, or the upkeep of property or equipment.

There is a constant search for a maintenance program that encompasses all requirements with minimum effort and maximum results.

All maintenance systems have four basic requirements:

1. Capable trained personnel to perform the required maintenance.
2. Delegate adequate authority to the service personnel so that the needed service can and is being done.
3. Keep simple records in order to evaluate the operation of the vehicle and to be certain that the scheduled services are performed.
4. Follow the manufacture's basic maintenance recommendations.

To implement proper product maintenance, we suggest following our basic truck and tractor maintenance schedule in this section.

In order to provide a quick visual check on the daily status of the units requiring maintenance, we have prepared a sample maintenance record board on the next page. The size of this board will be determined by the number of units to be serviced. Sample covers a six month period - actual should cover a twelve month period.

With newer computer based maintenance programs it is much easier to keep track of units performance and cost.

No maintenance schedule can cover all possible types of operations and conditions. Service records will enable you to obtain the highest product efficiency through planned maintenance.

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# **GENERAL INFORMATION**

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## RECORD KEEPING

Model & Serial No. _____	Stock No. _____
Date Placed in Service _____	

## TOOLS REQUIRED TO SERVICE THESE PRODUCTS

Mechanical, electrical, hydraulic, and maintenance service on these products can be performed with standard hand tools.

Various size roll pins are used throughout all our products. The removal and installation can be made by the use of hardened steel punches of various diameters and length.

In some cases, the replacement of hydraulic cylinder packing requires the use of the packing installer tool or guide to ease installation of the packing. Tools can be provided for such use; however, due to the various sizes and continual changes, a standard engine piston ring compressor can be used effectively for this service. All basic electrical services can be performed with standard hand tools, a good VOM (Volt Ohm Meter) and AMP Meter. We have added tool requirements in some of the servicing sections. These tools may include impact tools, lifting straps, hoist, torque wrench and jacks which are readily available locally.

Always use good quality tools to ensure your safety and the safety of others.



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# GENERAL INFORMATION

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## TORQUE CHART

### Feeler Gauges, Micrometers, Calipers

### Wrenches

<u>mm</u>	<u>inches</u>	<u>mm</u>	<u>inches</u>	<u>mm</u>	<u>inches</u>	<u>mm</u>	<u>inches</u>
0.01	0.0004	0.46	0.0181	0.91	0.0358	6	15/64
0.02	0.0008	0.47	0.0185	0.92	0.0362	7	9/32
0.03	0.0012	0.48	0.0189	0.93	0.0366	8	5/16
0.04	0.0016	0.49	0.0193	0.94	0.0370	9*	11/32
0.05	0.0020	0.50	0.0197	0.95	0.0374	10**	13/32
0.06	0.0024	0.51	0.0201	0.96	0.0378	11	7/16
0.07	0.0028	0.52	0.0205	0.97	0.0382	12*	15/32
0.08	0.0031	0.53	0.0209	0.98	0.0386	13	1/2
0.09	0.0035	0.54	0.0213	0.99	0.0390	14	9/16
0.10	0.0039	0.55	0.0216	1.00	0.0394	15*	19/32
0.11	0.0043	0.56	0.0220			16	5/8
0.12	0.0047	0.57	0.0224			17	11/16
0.13	0.0051	0.58	0.0228			19	3/4
0.14	0.0055	0.59	0.0232			21	12/16
0.15	0.0059	0.60	0.0236			22	7/8
0.16	0.0063	0.61	0.0240			24	15/16
0.17	0.0067	0.62	0.0244			26	1"
0.18	0.0071	0.63	0.0248			27	1-1/16
0.19	0.0075	0.64	0.0252			30	1-3/16
0.20	0.0079	0.65	0.0256			32	1-1/4
0.21	0.0083	0.66	0.0260			36	1-7/16
0.22	0.0087	0.67	0.0264			41	1-5/8
0.23	0.0091	0.68	0.0268			46	1-13/16
0.24	0.0094	0.69	0.0272			50	2"
0.25	0.0098	0.70	0.0276			55	2-1/8
0.26	0.0102	0.71	0.0279			60	2-3/8
0.27	0.0106	0.72	0.0283				
0.28	0.0110	0.73	0.0287				
0.29	0.0114	0.74	0.0291				
0.30	0.0118	0.75	0.0295				
0.31	0.0122	0.76	0.0299				
0.32	0.0126	0.77	0.0303				
0.33	0.0130	0.78	0.0307				
0.34	0.0134	0.79	0.0311				
0.35	0.0138	0.80	0.0315				
0.36	0.0142	0.81	0.0319				
0.37	0.0146	0.82	0.0323				
0.38	0.0150	0.83	0.0327				
0.39	0.0154	0.84	0.0331				
0.40	0.0157	0.85	0.0335				
0.41	0.0161	0.86	0.0339				
0.42	0.0165	0.87	0.0342				
0.43	0.0169	0.88	0.0346				
0.44	0.0173	0.89	0.0350				
0.45	0.0177	0.90	0.0354				

**TORQUE CHART****TORQUE WRENCHES****Newton Meters**

<u>lb. in.</u>	<u>N.m.</u>	<u>lb. ft.</u>	<u>N.m.</u>
10	1.13	10	13.56
20	2.26	20	27.12
30	3.39	30	40.68
40	4.52	40	54.24
50	5.65	50	67.80
100	11.30	60	81.36
150	16.95	70	94.92
200	22.60	80	108.48
250	28.25	90	122.04
300	33.90	100	135.60
350	39.55	110	149.16
400	45.20	120	162.72
450	50.85	130	176.18
500	56.50	140	189.84
550	62.15	150	203.40
600	67.80	160	216.96
650	73.45	170	230.52
700	79.10	180	244.08
750	84.75	190	257.64
800	90.40	200	271.20
850	96.05	210	284.76
900	101.70	220	298.32
950	107.32	230	311.88
1000	113.00	240	325.44

1 lb. in.=0.11298 N.m

1 lb. ft.=1.3558 N.m

**Recommended Tightening Torques for Bolt and Screw Joints**

<u>in.</u>	<u>mm</u>	<u>kg</u>	<u>ft. lb</u>
1/4	6	0.5	4
5/16	8	1.5	11
3/8	10	2.0	15
1/2	12	5.0	36
5/8	16	10.0	72
3/4	20	15.0	110
1"	24	35.0	250
1-1/4	30	60.0	430

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**GENERAL INFORMATION**

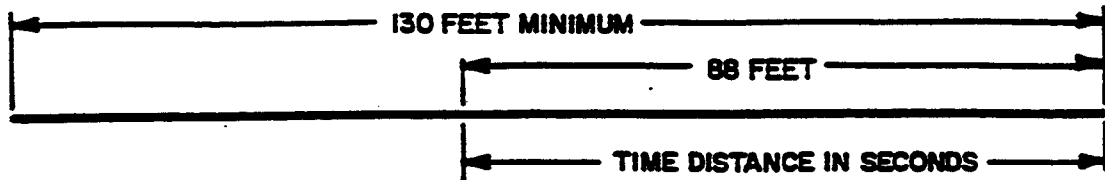
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**CONVERSION FACTORS**

<b>To Convert From</b>	<b>To</b>	<b>Multiply By</b>
bar	psig	14.5
C°	F°	(C° x 1.8) - 32
gal/h	oz/h	128
g/h	oz/h	.03527
g/kWh	oz/BHP <sub>h</sub>	.0263
g/m	U.S. gal/1000 cu. ft.	.0091
J/l	BHP/100 cfm	.0683
kg	lb.	2.205
kgm	lb/ ft	23.730
kg/h	U.S. gal/h	.32
kW	Bhp	1.341
l	gal (U.S.)	.2642
l/s	cfm	2.119
l/s	U.S. gal/min	15.85
m	ft/	3.281
m K/w	btu/h/F°/ft	5.678
m	ft	35.315
mg/m	oz/cu. ft.	1 x 10
mm.	in.	.0394
Nm	lb. ft.	.738

## STANDARD SPEED AND SCR POTENTIOMETER ADJUSTMENTS

### Speed Test Track



60 divided by Time - mph

Example:

60 divided by 10 seconds = 6 mph  
60 divided by 18 seconds = 3.3 mph

### Lift Speed Test

$\frac{\text{Mast Height (inches)}}{12} = \text{Distance}$

$\frac{\text{Lift Speed Time (seconds)}}{60} = \text{Time}$

$\frac{D}{T} = \text{Feet/min.}$

Example:

12 divided by 270 = .04  
60 divided by 14 sec. = 4.2  
4.2 divided by .04 = 105 ft./min.



**WARNING:** All tests should be carried out in a safe area away from normal operational traffic. Follow all plant safety regulations when performing tests.

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# GENERAL INFORMATION

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## GENERAL SERVICE GUIDE

Symptom	Possible Cause	Remarks
Sluggish performance, erratic switching, slow lift	Battery discharged or defective Loose connection (power wiring) Motor brushes are worn Brake is dragging	Charge and inspect battery Tighten connections Replace the brushes See brake adjustments in Maintenance Section
Improper creep speed - improper acceleration in SCR range improper time delay on SCR bypass or inadequate power	Load Wheels are binding Defective SCR control SCR System is misadjusted	Check for clearance Refer to SCR manual and schematic See SCR manual and schematic
Fuses open	Short circuit Overload Defective fuse	Inspect circuits Study duty cycle, reduce load Replace fuse
No lift (motor runs) Direction control O.K.	Excessive load Air lock  Low oil supply Plugged suction screen  Valve is not operating	Check the load Bleed the hydraulic cylinder Check oil pressure - repair or replace if necessary Add oil Clean screen, flush and refill the reservoir Check the valve
No lift (motor does not run)	Control wiring is open (pump contactor does not energize) Power wiring is open (pump contactor does energize)	Refer to SCR manual and schematic Refer to SCR manual and schematic
Slow lift	Battery is discharged Excess Load Leaks in lift cylinder	Charge the battery Check the load Tighten or replace cylinder packing

**GENERAL  
SERVICE GUIDE**

<b>Symptom</b>	<b>Possible Cause</b>	<b>Remarks</b>
No lower	Suction screen plugged	Clean the screen, flush and refill the reservoir
	Worn pump/motor unit(s)	Check oil pressure (rebuild or replace)
Lowers excessively slow	One pump/motor unit inoperative (only dual systems)	Inspect and/or repair
	Control valve sticking	Inspect and repair
Hydraulic systems leaks oil	Mechanical binding	Inspect Mast
	Flow valve is defective	Replace
	Electric circuit	See Schematic
Reservoir overflows	Flow valve is defective	Clean or replace valve
	Fast speed circuit defective	Check switches, valves, etc.
Lift cylinder leaking	Defective hose	Replace the hose
	Loose fittings	Tighten
Insufficient lift	Overfilled	Drain proper oil level
	Air entering system	Return tube in reservoir defective - Inspect and replace
Inner column sticks	Seals or wiper damaged	Replace
	Rod is damaged	Inspect and replace
Forks will not drop to lowered height	Low oil supply	Check oil level - fill to proper level
No operation	Binding in column	Clean bearing surfaces on rollers and columns
	Defective roller(s)	Replace roller(s)
	Mechanical Binding	Check for sprung frame Check for bending or corrosion
	Battery disconnected or discharged	Connect and/or charge battery
	Control fuses blown	Replace fuses
	Power fuse blown	Refer to SCR manual and schematic
	Open circuit or PMT trips	

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# **GENERAL INFORMATION**

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## **PWT MAINTENANCE SCHEDULE**

<b>Period</b>	<b>Time</b>	<b>Function</b>
<b>Daily</b>		
-	-	Check water level in battery.
-	-	Check oil level transmission.
-	-	Check all wheels and tires. Remove any and all tape, plastic and material.
-	-	Check operation of truck steering and speed change including all warning and safety devices (if equipped), horn, speed limit switches and lights.
-	-	Check brake operation and stopping distance (approx. twice the length of the truck, unloaded).
<b>Weekly</b>	<b>100 Hours</b>	
-	-	Check speed of truck and plugging distance (PMC/SCR only).
*	*	Check brake linkage, adjust as necessary. Lubricate pivot points, see lubrication chart (located in Service Information Section).
-	-	Check entire truck for loose items, power and control wiring, linkage, nuts and bolts.
-	-	Clean battery terminals of corrosion. Check electrolyte level. Inspect plug and battery cables.
-	-	Clean and inspect motor brushes. Use only low pressure air or vacuum.
-	-	Inspect contact tips.
-	-	Clean any and all dirt or corrosion from terminal area of PMC Controller units.
<b>30 Days</b>	<b>200 Hours</b>	
-	-	Check steerhead bearing for wear.
*	*	Lubricate entire truck see lubrication chart (located in Service Information Section, for type and points).
-	-	Check safety devices, horn, alarms (if equipped) and slow speed adjustment. Repair or adjust before truck goes back into operation.

**PWT MAINTENANCE SCHEDULE**

<b>Period</b>	<b>Time</b>	<b>Function</b>
<b>60 Days</b> NOTE	<b>300 Hours</b> NOTE	Check current limit on only EV-1 and EV-100 SCR trucks, adjust as needed.
-	-	Check entire truck frame and pivoting points for cracks or worn bearings, repair or replace as needed.
-	-	Inspect brake drum and shoe lining and brake drum.
-	-	Check drive tire and torque bolts to 200 ft. lbs.
-	-	Clean drive motor and inspect commutator. Use only low pressure air or vacuum.
<b>Yearly</b>	<b>1000 Hours</b>	
-	-	Change transmission fluid (requires 3-3/4 pints refill).
-	-	Check amp draw readings of drive motors.

Repair or replace as necessary when inspection finds this part worn or damaged:

1. Drive motor brushes.  
Springs should be replaced along with brushes.
2. Brake shoe lining.  
Replace as an assembly.
3. Contact tips.
4. Load wheel.

- Always repack bearing whenever a wheel is changed. Remember the largest cause of load wheel failure is material getting caught in wheel.

NOTE: Current limit should be checked whenever 200 amp fuse has failed, any EV-1 and EV-100 SCR panel part has been replaced or drive motor has been repaired or replaced.

\* Trucks operating in freezer, wet or brine conditions must be serviced twice in the standard maintenance period and special types of lubricants should be used.