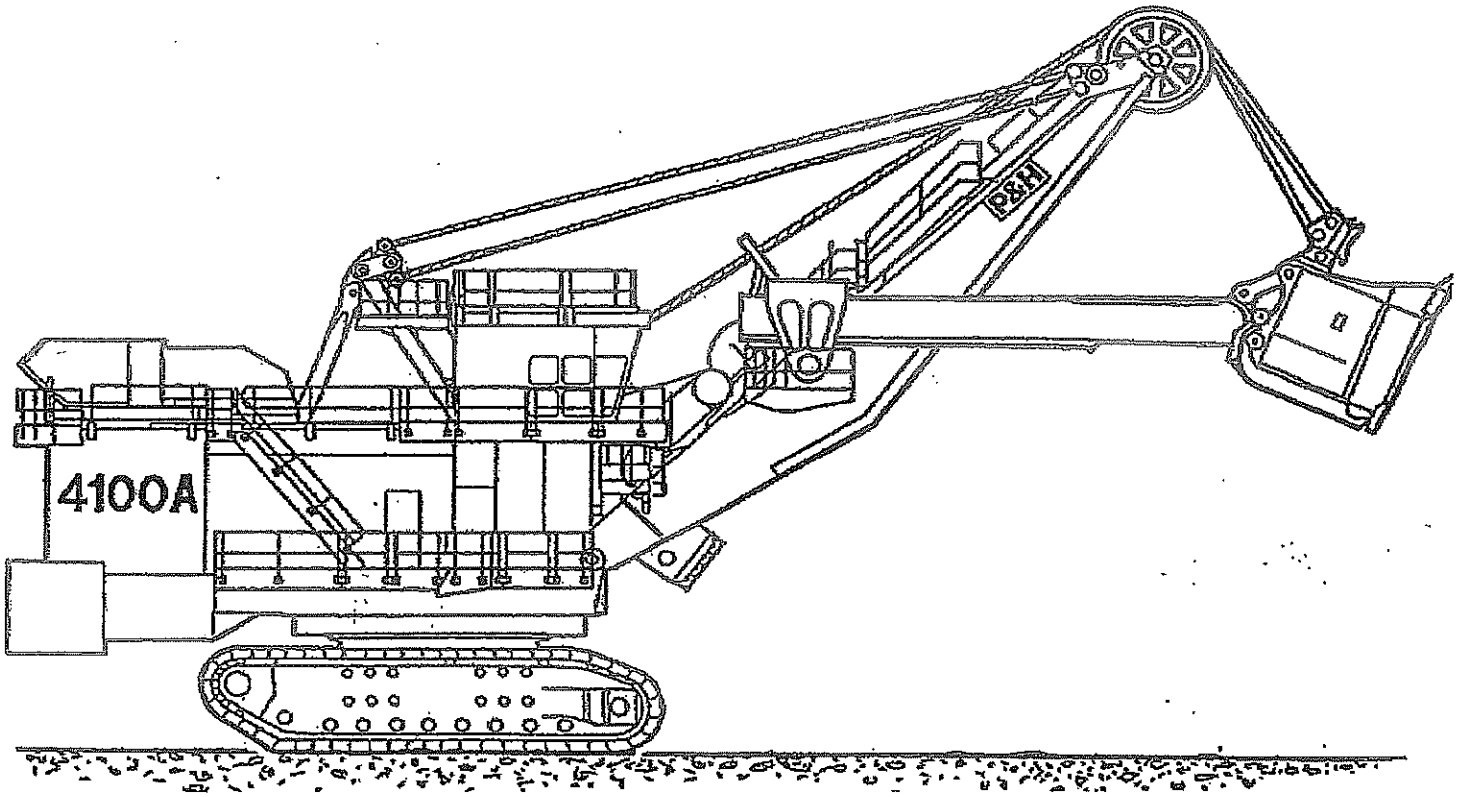
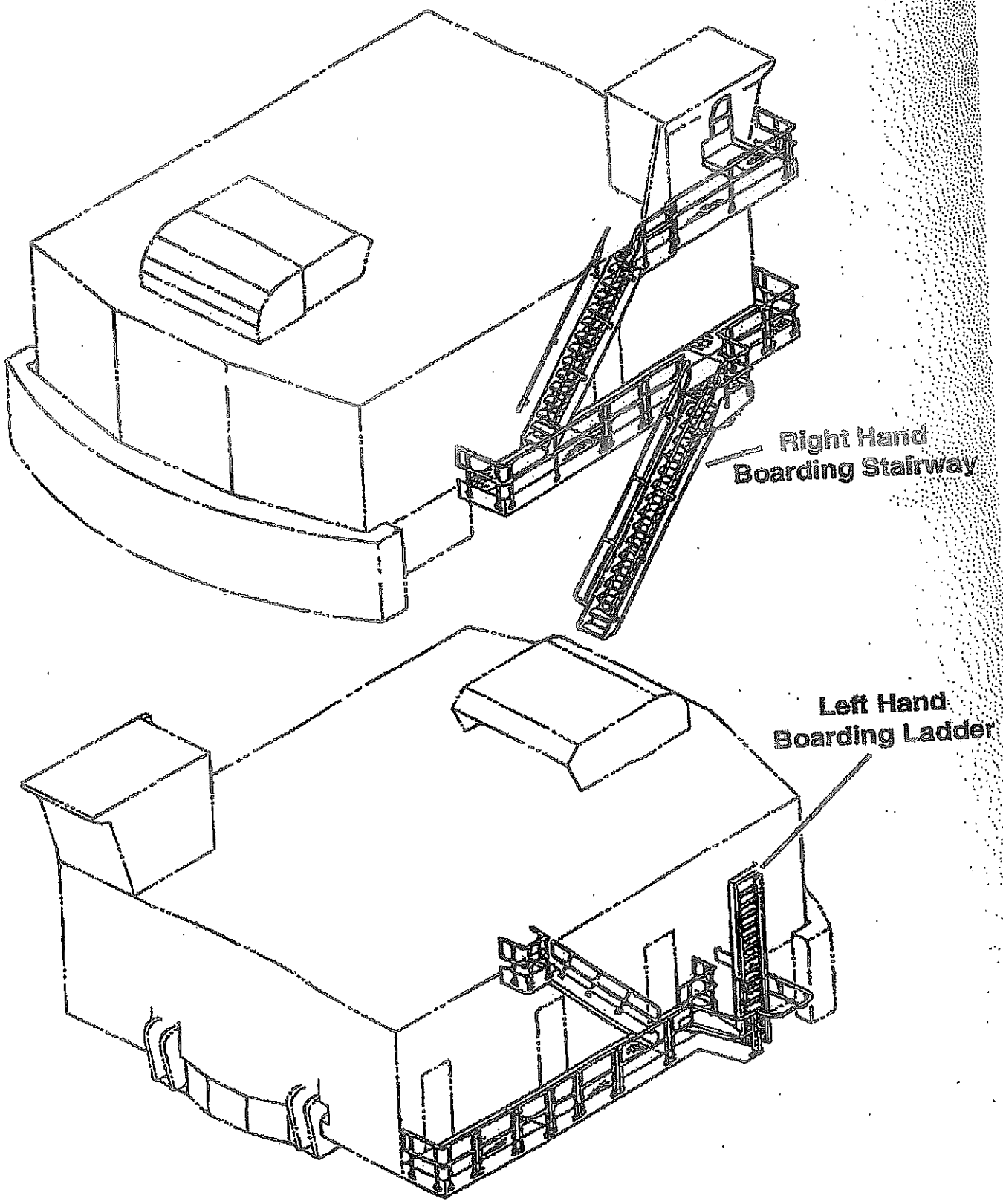
P & H 4100A ELECTRIC SHOVEL

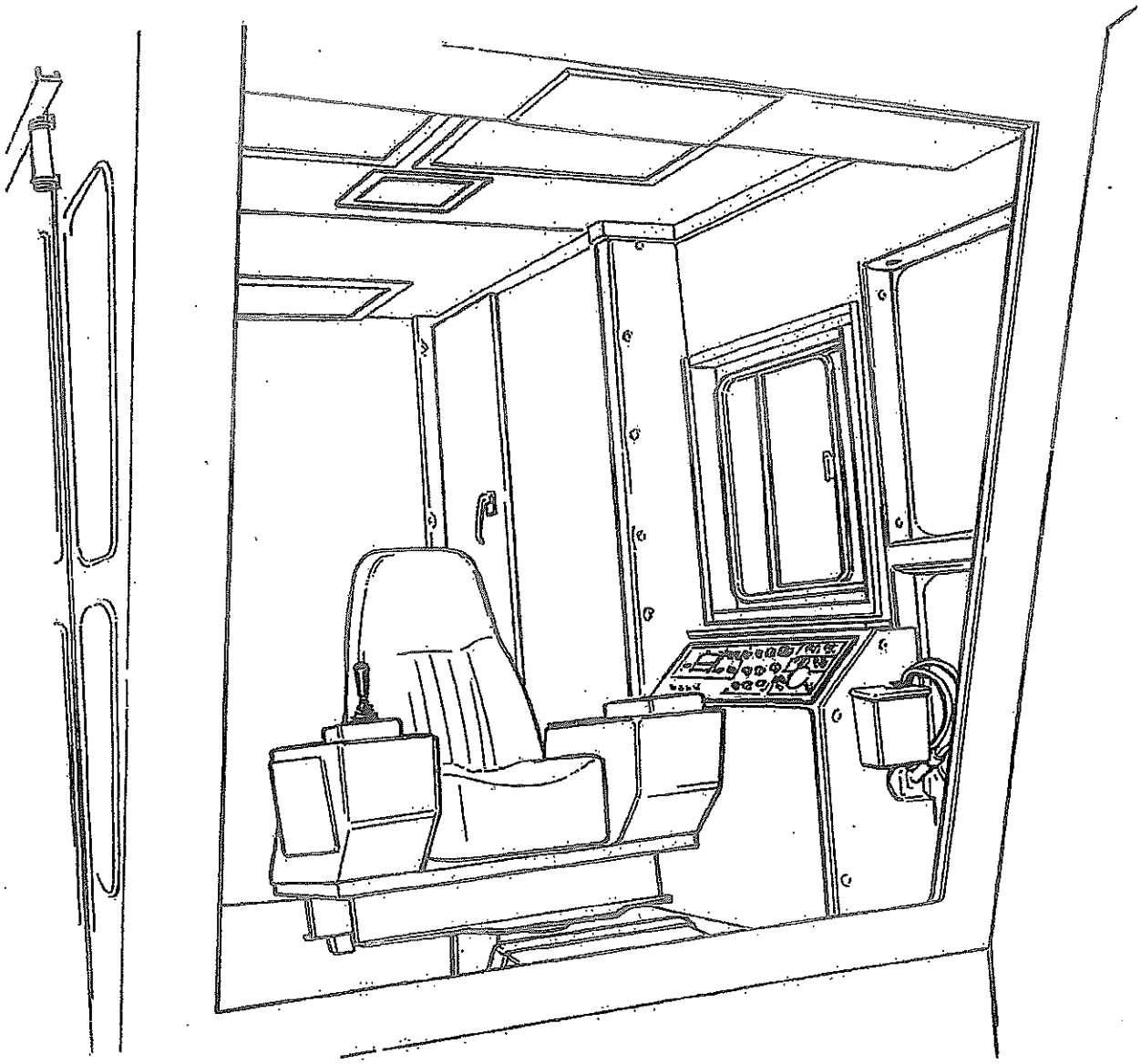
This handout is intended to familiarize Maintenance and Operating Personnel with basis component orientation and description of Electric Shovel machinery



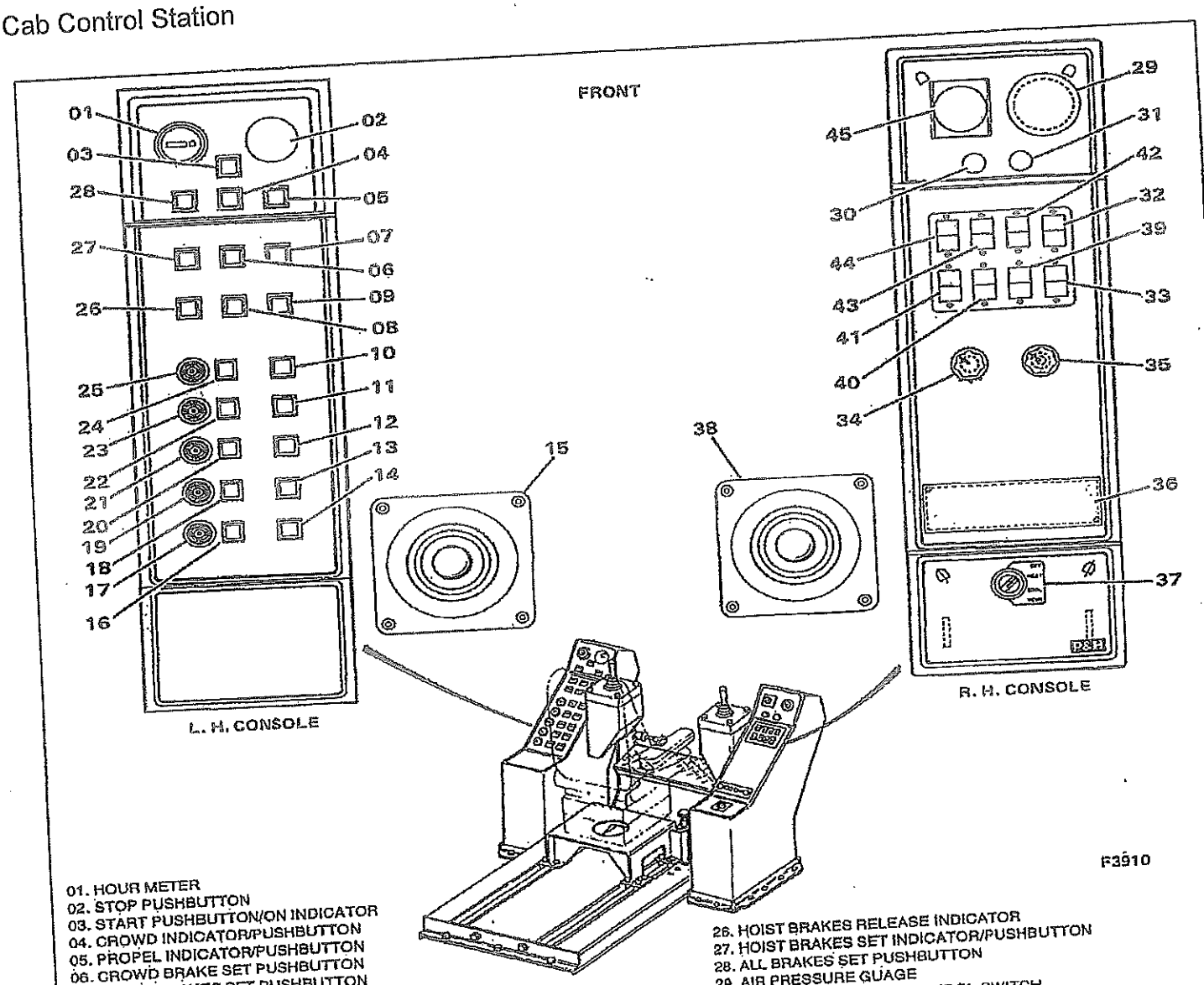
Shovel Access Boarding Ladders



Shovel Cab (View looking in from front window)

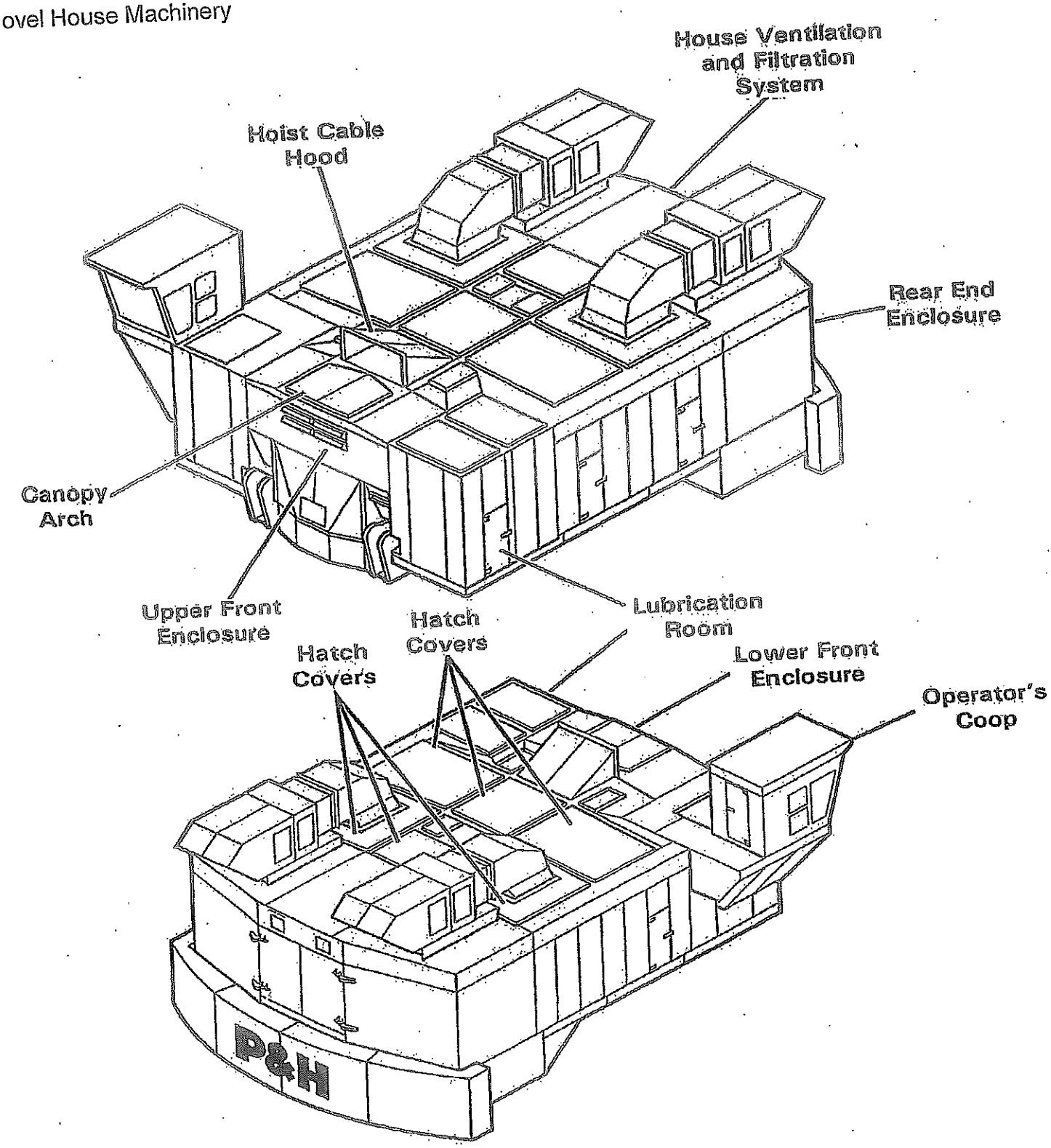


Cab Control Station

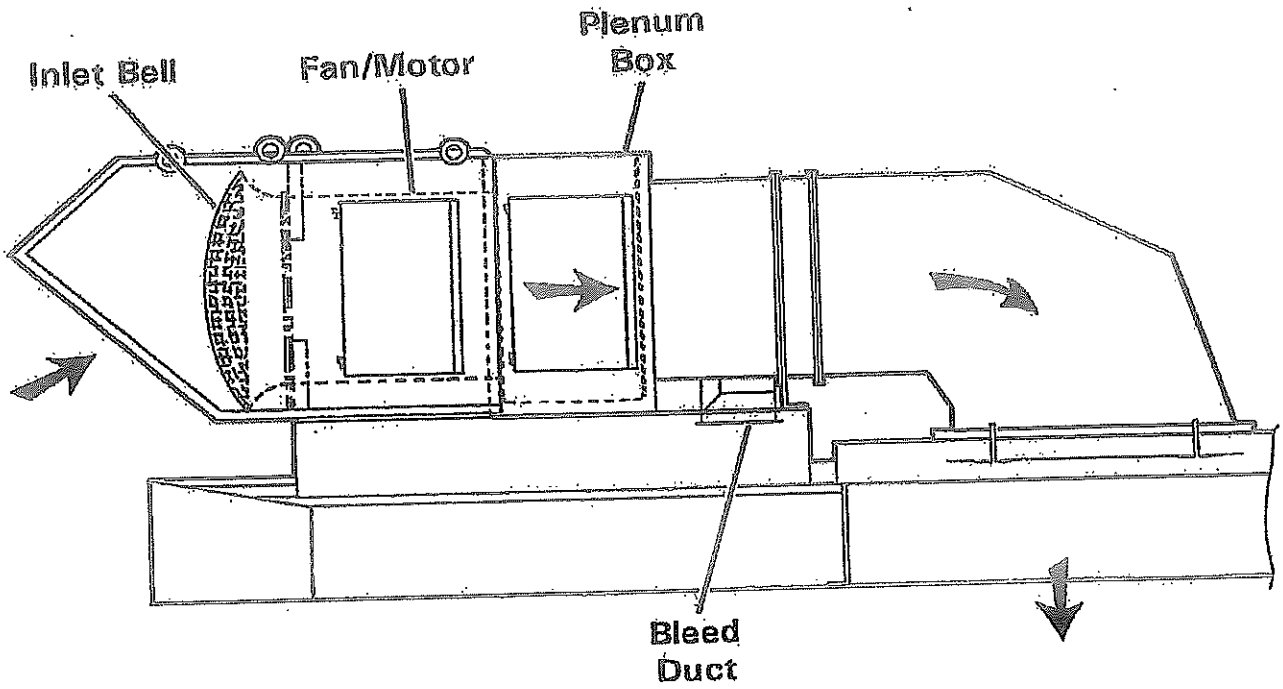


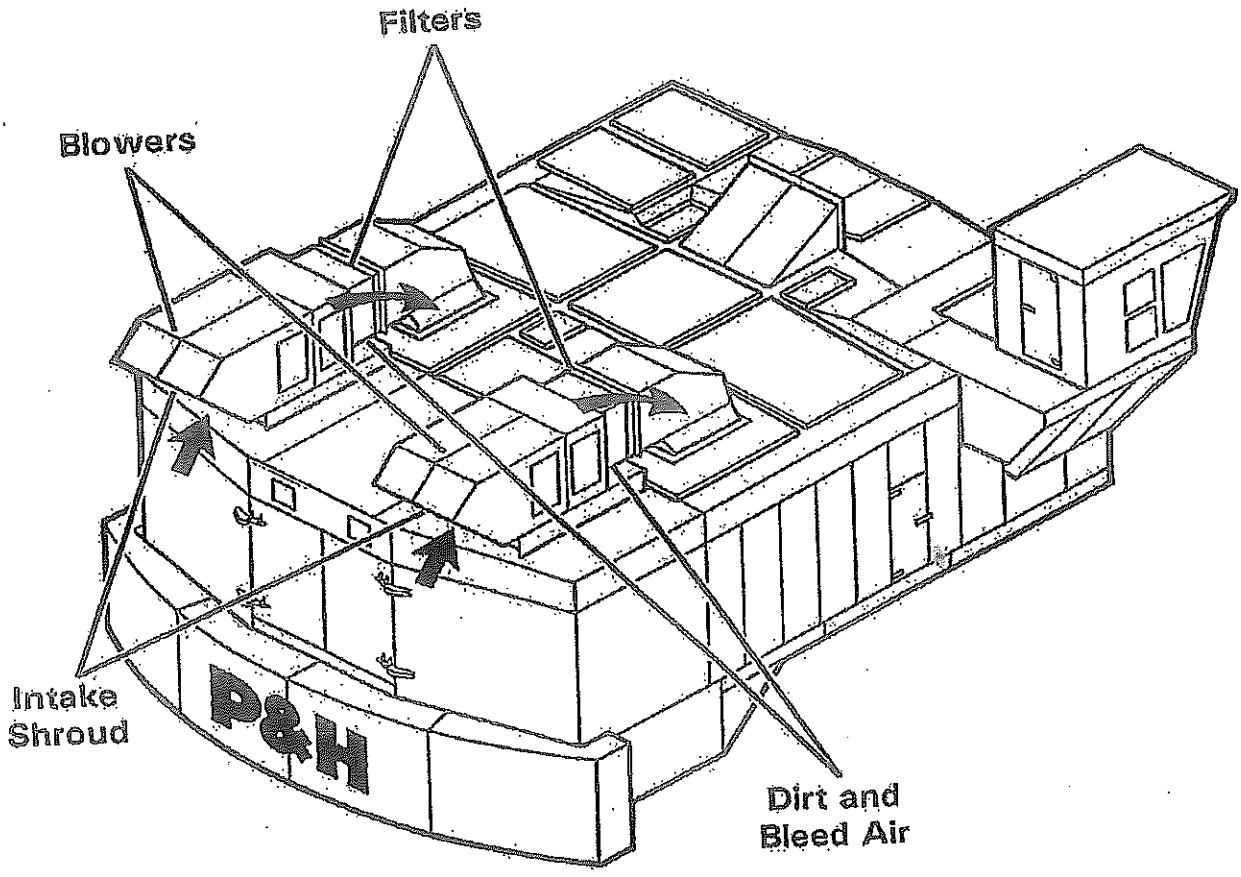
01. HOUR METER
02. STOP PUSHBUTTON
03. START PUSHBUTTON/ON INDICATOR
04. CROWD INDICATOR/PUSHBUTTON
05. PROPEL INDICATOR/PUSHBUTTON
06. CROWD BRAKE SET PUSHBUTTON
07. SWING BRAKES SET PUSHBUTTON
08. CROWD BRAKE RELEASE INDICATOR/PUSHBUTTON
09. SWING BRAKES RELEASE INDICATOR/PUSHBUTTON
10. OPEN GEAR LUBE INDICATOR/PUSHBUTTON
11. UPPER LUBE INDICATOR/PUSHBUTTON
12. LOWER LUBE PUSHBUTTON/INDICATOR
13. RESET PUSHBUTTON, CONTROL FAULT INDICATOR
14. RESET PUSHBUTTON, GROUND FAULT INDICATOR
15. LEFT CONTROLLER
16. CROWD/RETRACT LIMIT INDICATOR/PUSHBUTTON
17. AUDIBLE ALARM, CROWD/RETRACT LIMIT
18. LUBE SYSTEM FAULT INDICATOR/PUSHBUTTON
19. AUDIBLE ALARM, LUBE SYSTEM FAULT
20. BOARD SIGNAL INDICATOR/PUSHBUTTON
21. AUDIBLE ALARM, BOARD SIGNAL
22. DC MOTOR OVERLOAD INDICATOR/PUSHBUTTON
23. AUDIBLE ALARM, DC MOTOR OVERLOAD
24. DELAY SHUTDOWN INDICATOR/PUSHBUTTON
25. AUDIBLE ALARM, DELAYED SHUTDOWN
26. HOIST BRAKES RELEASE INDICATOR
27. HOIST BRAKES SET INDICATOR/PUSHBUTTON
28. ALL BRAKES SET PUSHBUTTON
29. AIR PRESSURE GUAGE
30. WINDSHIELD WIPER CONTROL SWITCH
31. WINDSHIED WASHER PUSHBUTTON
32. BLANK
33. BLANK
34. DIMMER SWITCH - CONSOLE LIGHTING
35. DIMMER SWITCH - OPERATOR'S CAB LIGHTING
36. COVER PLATE, RADIO
37. HEATER/AIR CONDITIONER CONTROL
38. RIGHT CONTROLLER
39. SWITCH, CAB LIGHTS
40. SWITCH, CONSOLE LIGHTS
41. SWITCH, FLOOD LIGHTS
42. SWITCH, WINDOW DEFROST CONTROL
43. SWITCH, MACHINERY HOUSE HEATERS
44. SWITCH, MOTOR HEATERS
45. EMERGENCY STOP PUSHBUTTON

Shovel House Machinery

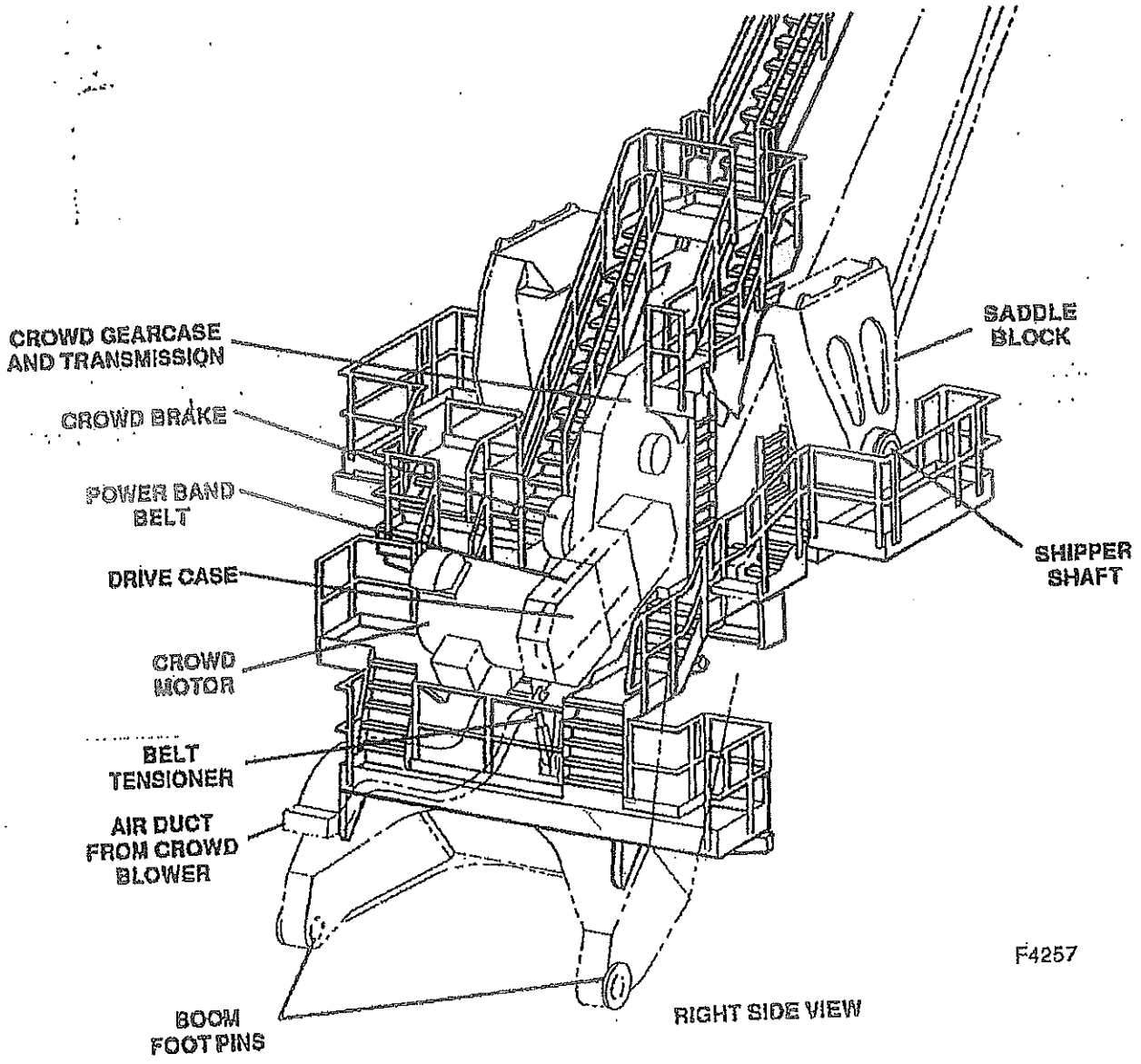


Shovel House Ventilation System

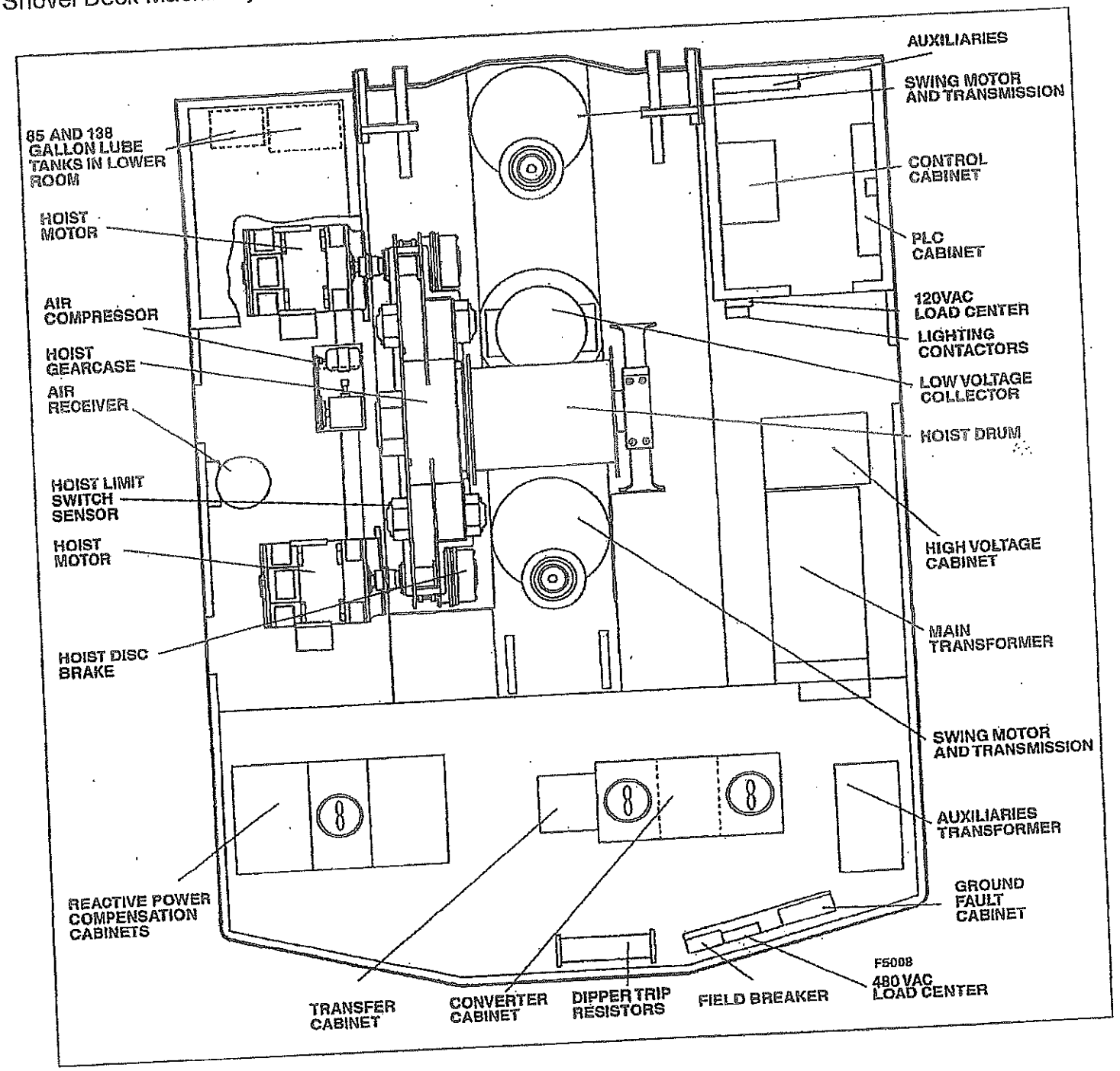




Shovel House Exterior Layout and Component Description



Shovel Deck Machinery and Electrical Cabinet Layout Description (View looking down)



Shovel Operating System Function

Crowd System

A DC motor drives the crowd system. It is mounted on the boom with crowd machinery. The crowd machinery is securely housed on and in the crowd gear case, which is an integral part of the boom. A power band belt drive system couples the crowd motor to the crowd transmission. This belt drive system provides shock protection while the crowd machinery supplies the mining shovel with crowd motion.

Swing System

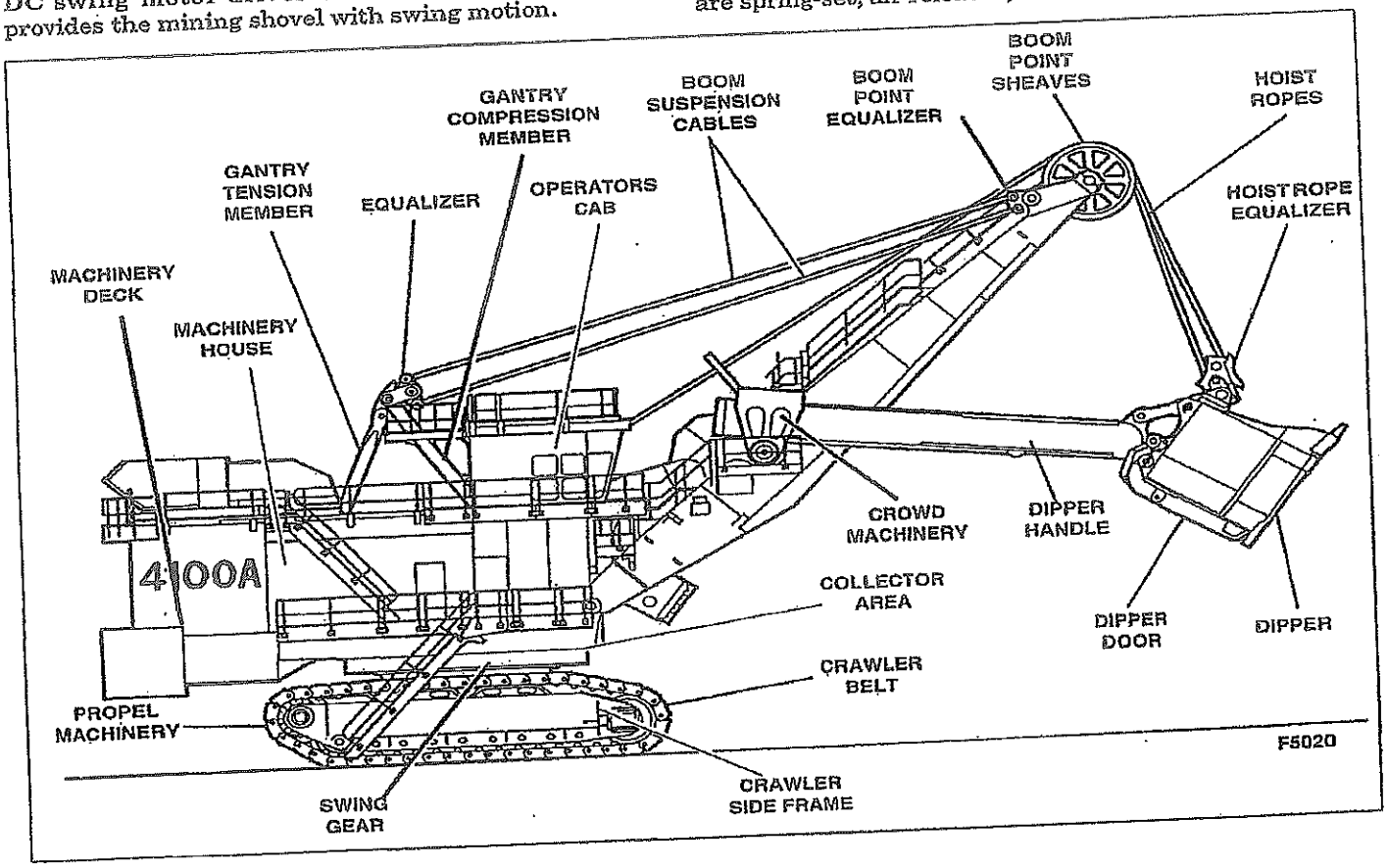
The swing system of this machine uses two swing transmissions, located at the front and rear of the revolving frame. A vertically- mounted fast-response DC swing motor drives each transmission, which provides the mining shovel with swing motion.

Propel System

To achieve forward and reverse propel motions and smooth differential steering, the propel system uses two independent drive trains. Each drive train consists of a DC propel motor, a planetary propel transmission, a propel brake assembly, a tumbler drive shaft, and a crawler side frame and crawler belt assembly. The propel motors mount on a base attached to the mining shovel's carbody. The propel transmissions are secured to the crawler side frames.

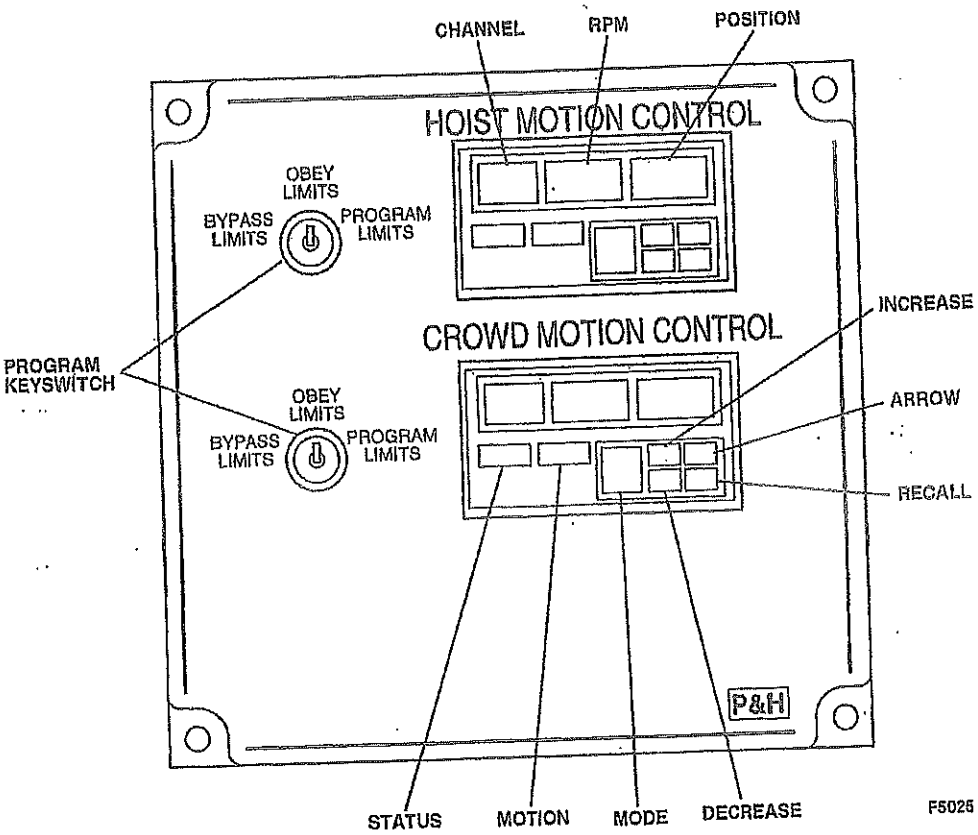
Brake Systems

The four major systems of this machine (hoist, crowd, swing and propel) have braking systems. All of the brake systems provide a "holding" function and should not be used to provide a "stopping" function. All brakes are spring-set, air-released, disc type brakes.

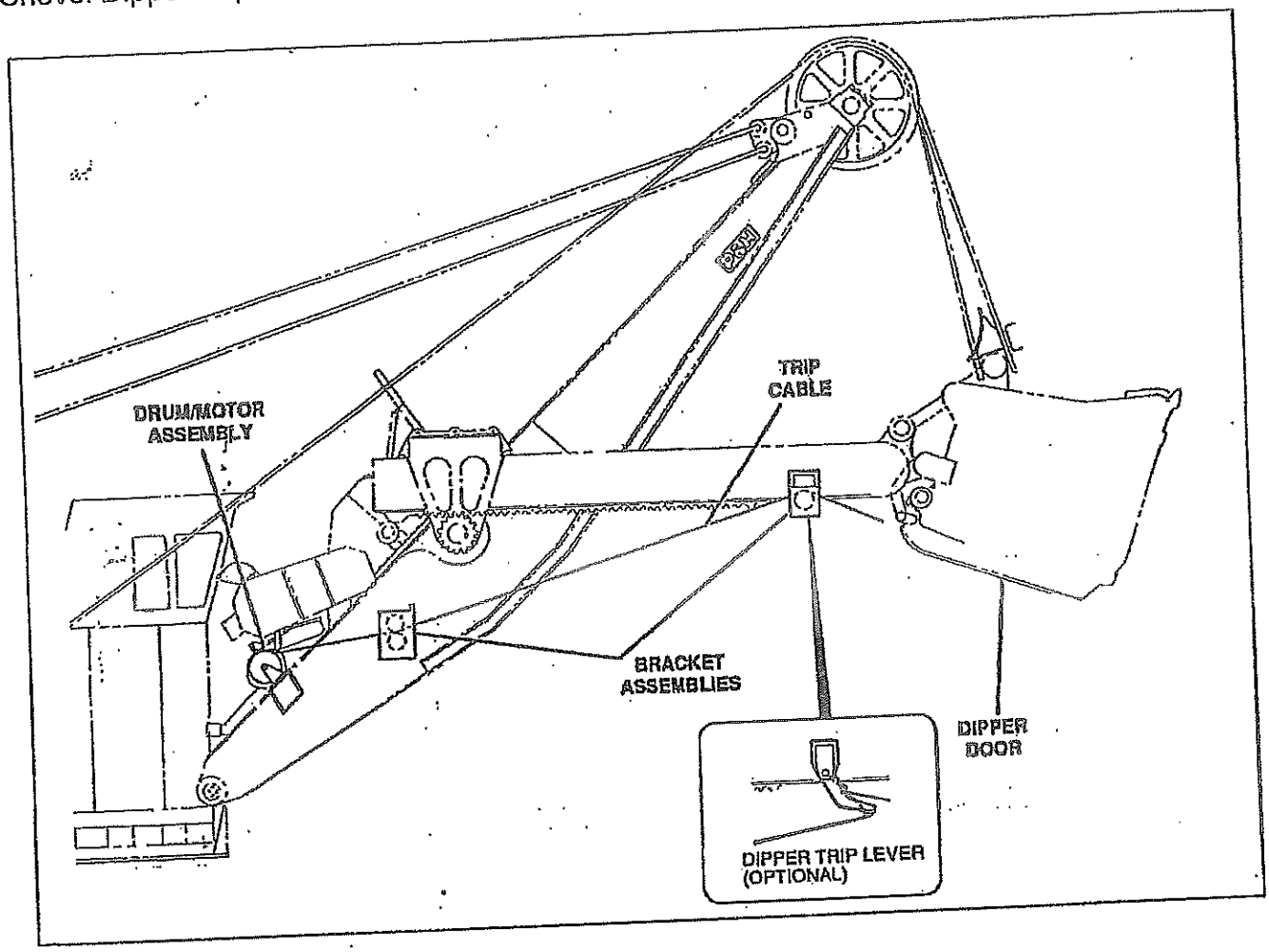


(Additional Shovel Layout and Description)

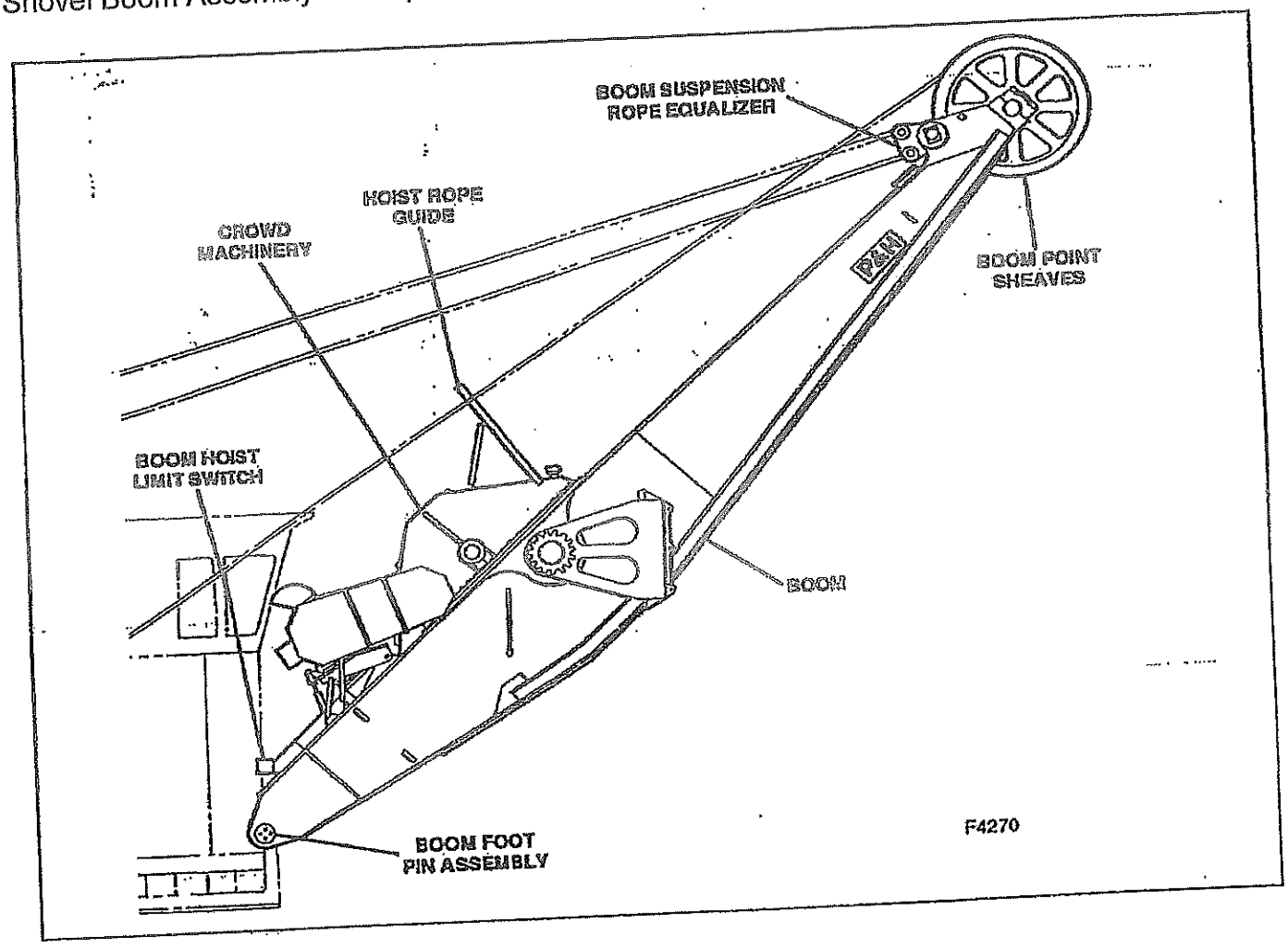
Shovel Hoist and Crowd Motion Controls



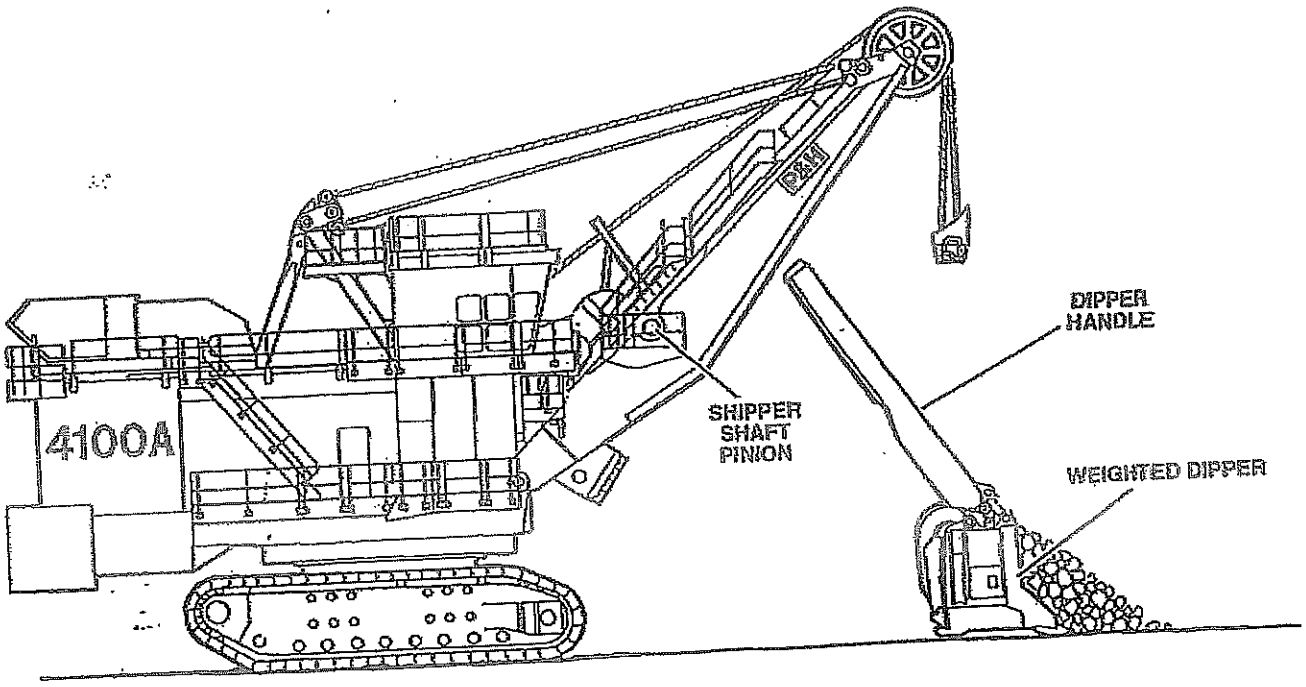
Shovel Dipper Trip Mechanism



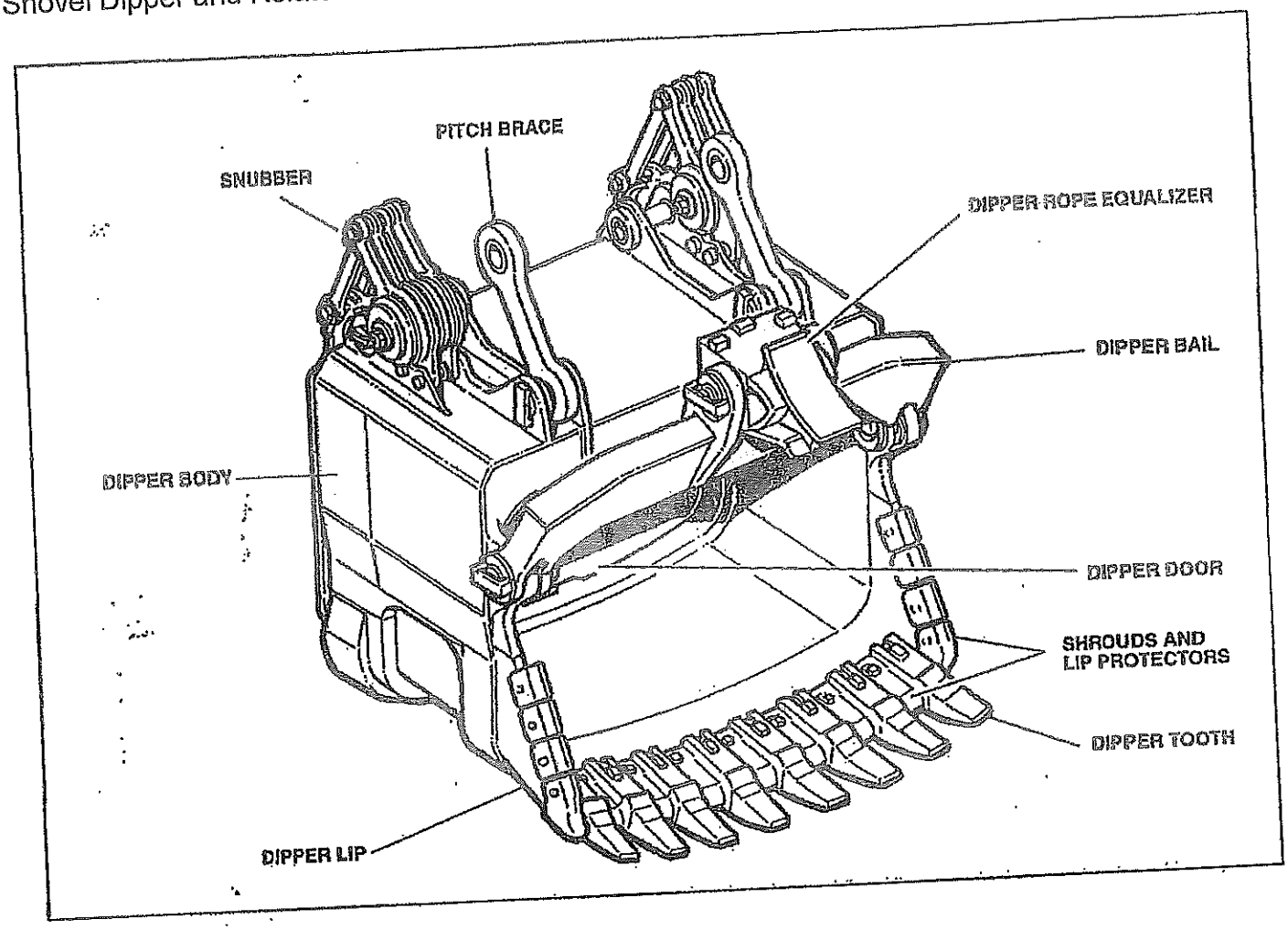
Shovel Boom Assembly Description



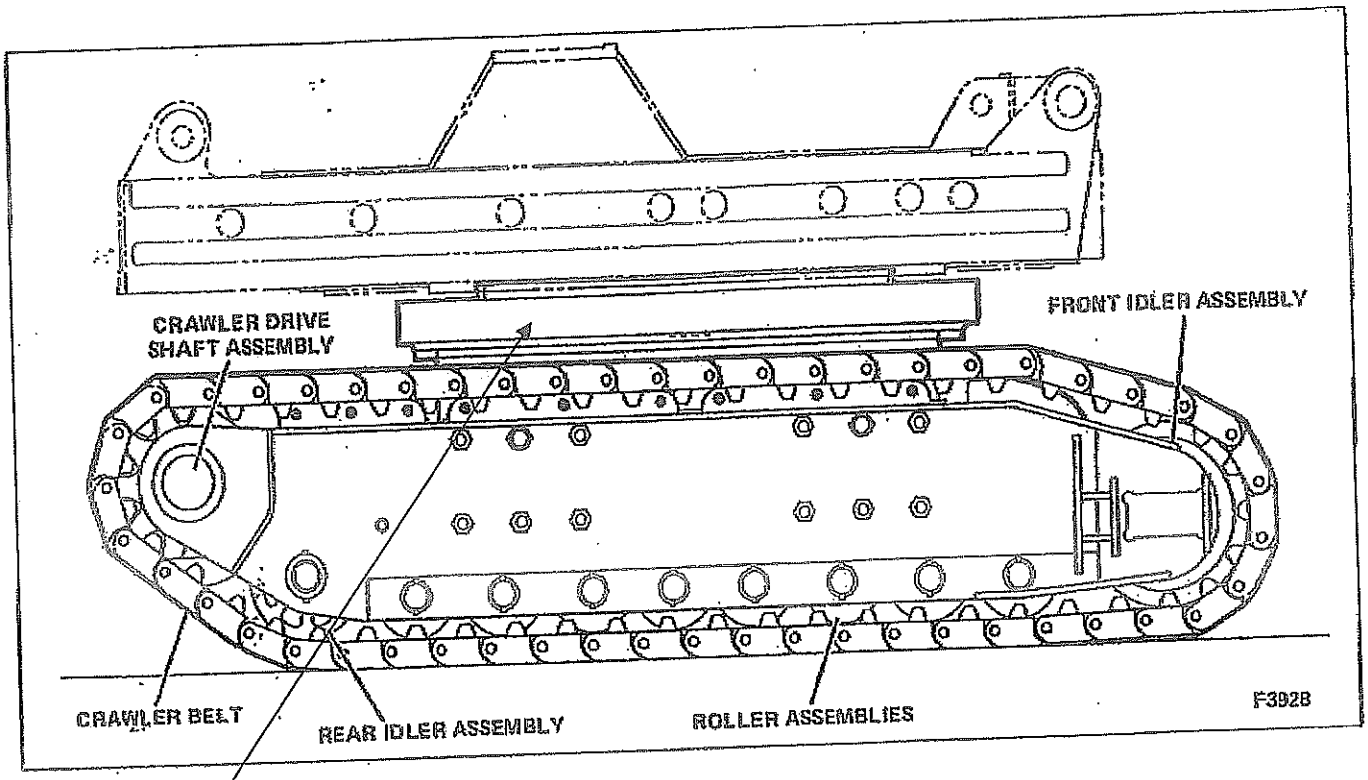
Shovel Dipper and Component Description



Shovel Dipper and Related Attachment Components

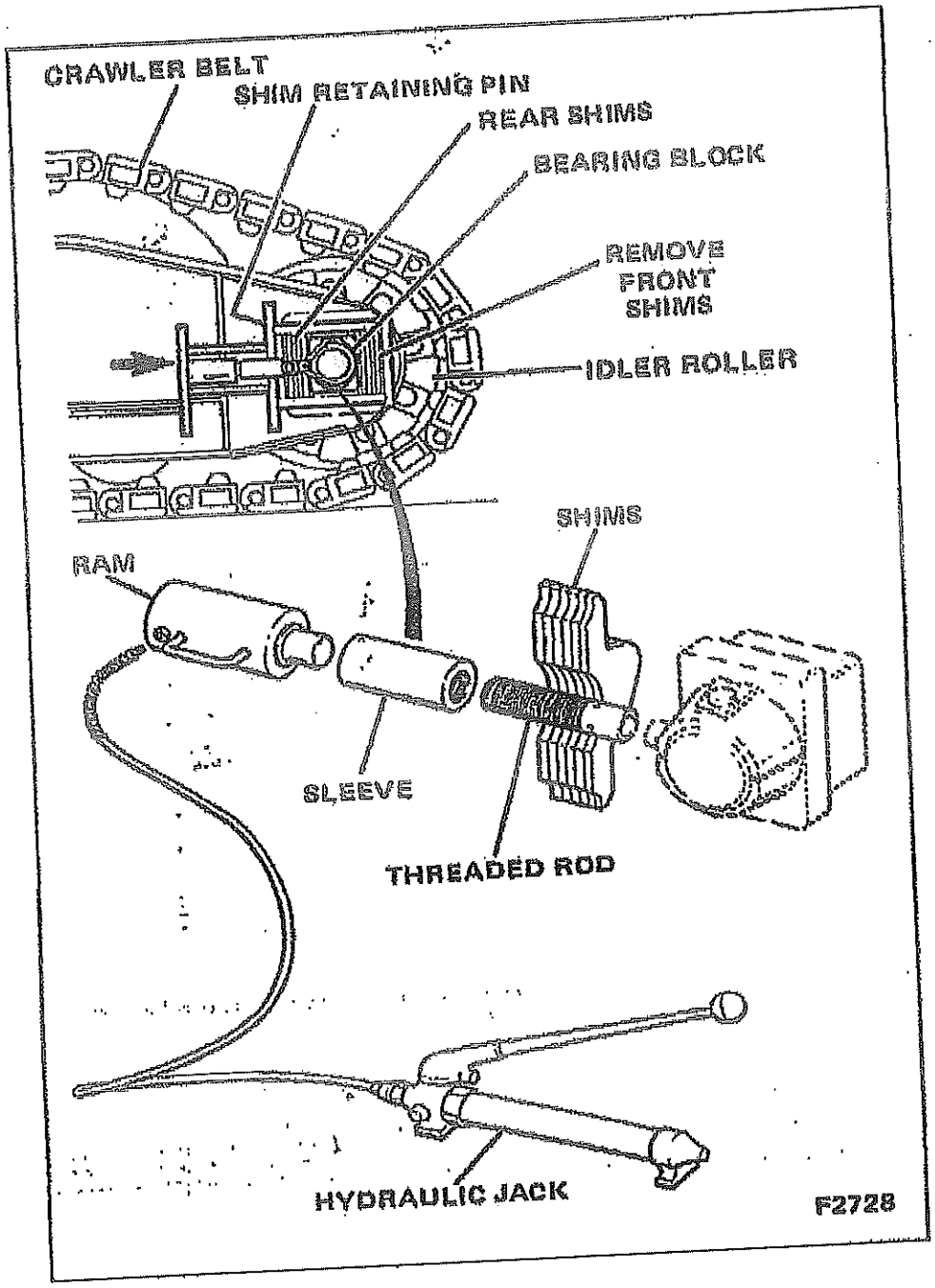


Shovel Track and Roller Assembly Description (Illustration for component location)

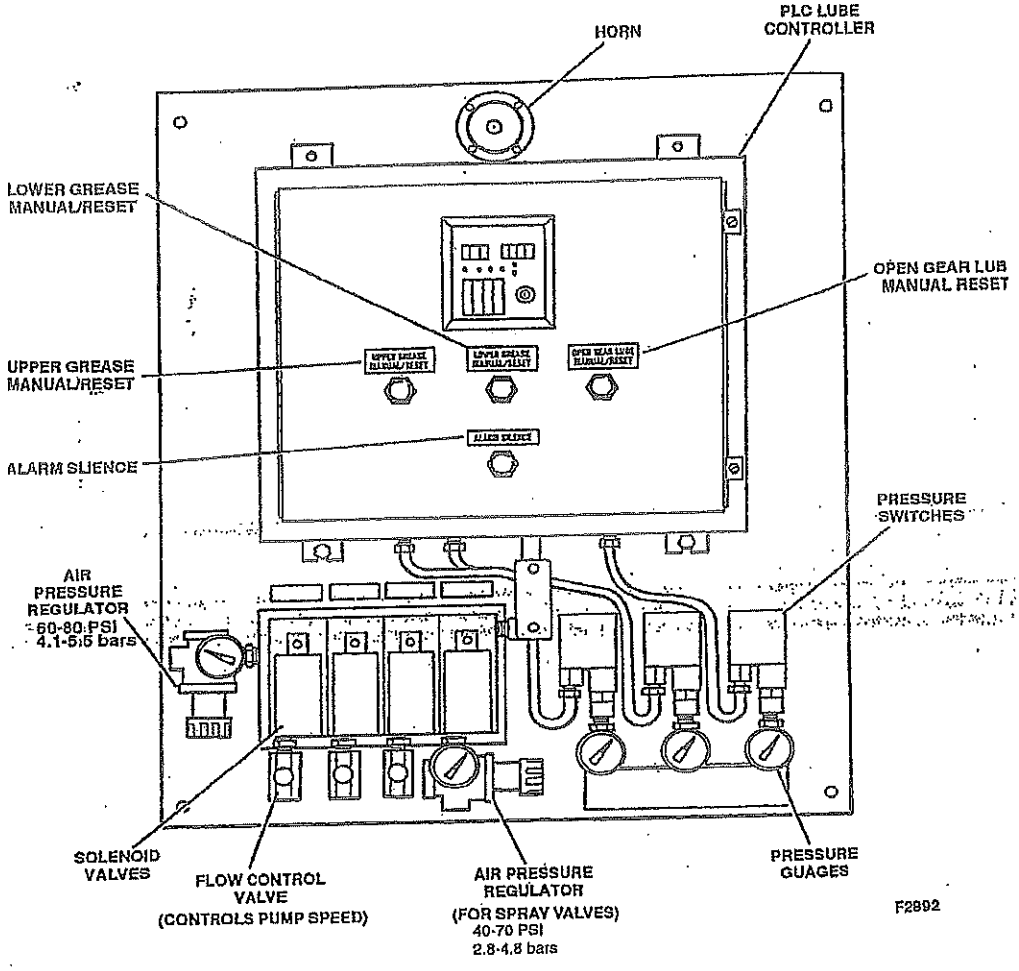


Shovel Circle Roller Path

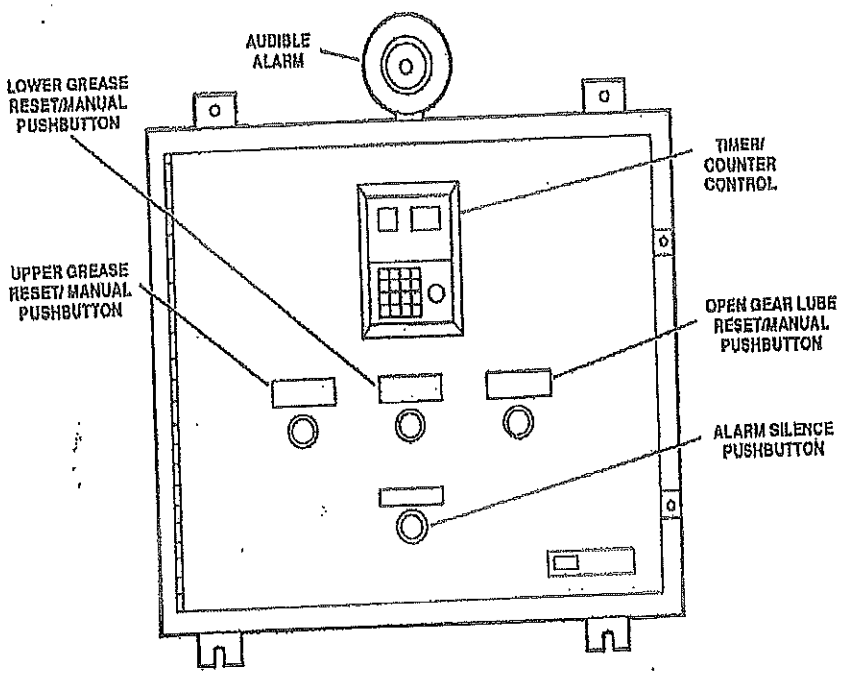
Shovel Track Adjustment (Illustration shown for component location only)

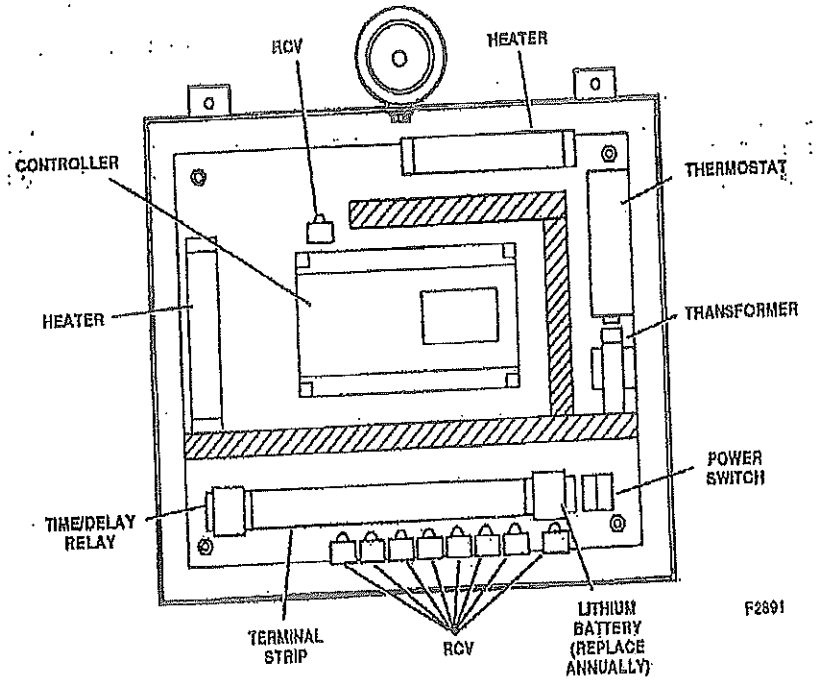


Shovel Lube Controls

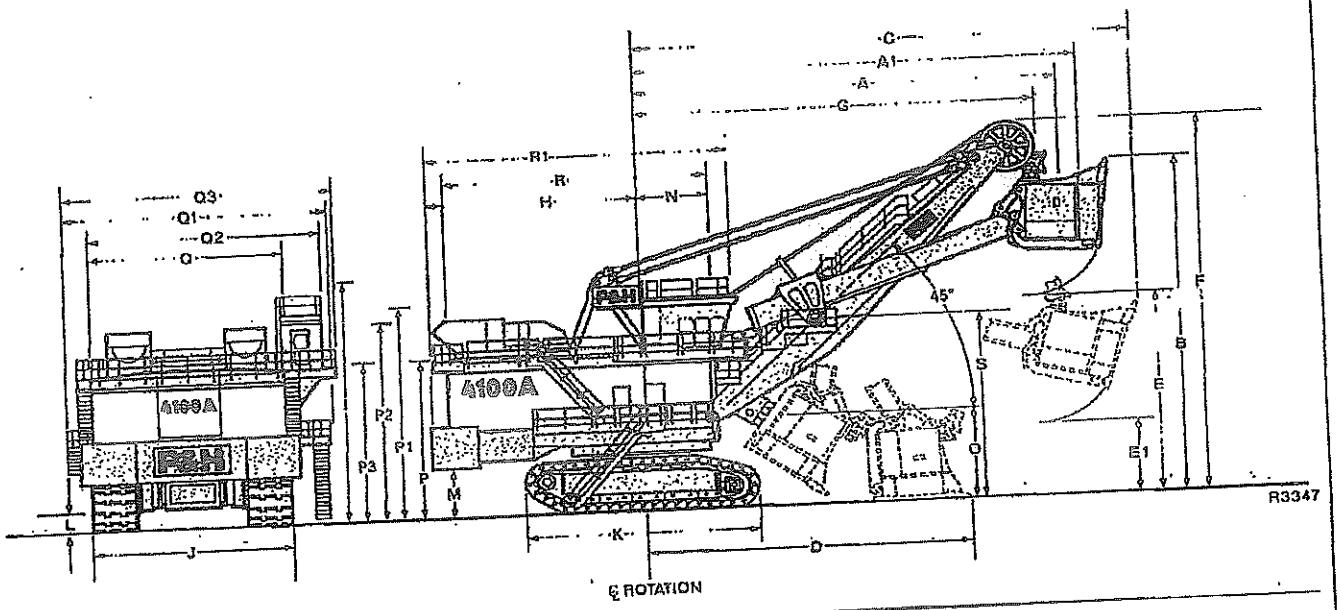


Shovel Lube Controls





Shovel Dimensions and Specifications



WORKING RANGES

	Boom Angle	45°	45°
	Dipper Capacity (Nominal)	56 yd³	42.8 m³
	Dipper Capacity (Range)	40-80 yd³	30.6-61.2 m³
	Boom Length	64 ft. 0 in.	19.51 m
	Effective Dipper Handle Length	35 ft. 0 in.	10.67 m
A	Dumping Radius at Max. Lift	67 ft. 3 in.	20.50 m
A1	Dumping Radius (Max.)	70 ft. 8 in.	21.54 m
B	Height of Cut (Max.)	56 ft. 10 in.	17.32 m
C	Digging Radius (Max.)	80 ft. 2 in.	24.43 m
D	Floor Level Radius	51 ft. 4 in.	15.65 m
E	Dumping Height (Max.)—Door Open	32 ft. 10 in.	10.01 m
E1	Dumping Height at Max. Radius—Door Open	16 ft. 4 in.	4.98 m
F	Clearance Height of Boom Point Sheave	64 ft. 3 in.	19.58 m
G	Clearance Radius of Boom Point Sheave	62 ft. 4 in.	19.00 m

Working ranges A through E' may vary based on dipper selection. Since each application varies, please consult Milwaukee for correct choice of dipper capacity

GENERAL DIMENSIONS

H	Radius of Rear End	33 ft. 0 in.	10.06 m
I	Max. Height Over Gantry	41 ft. 5 in.	12.62 m
J	Overall Width of Crawlers (72"/1828 mm Shoes)	32 ft. 0 in.	9.75 m
K	Overall Length of Crawlers	36 ft. 10 in.	11.23 m
L	Ground Clearance	3 ft. 6 in.	1.07 m
M	Height—Ground to Bottom of Counterweight	8 ft. 9 in.	2.67 m
N	Center of Rotation to Boom Foot Pin	11 ft. 6 in.	3.51 m
O	Height—Ground to Boom Foot Pin	16 ft. 3 in.	4.95 m
P	Height—Ground to Top of Rear Roof Section	27 ft. 7 in.	8.41 m
P1	Height—Ground to Top of Operator Compartment	36 ft. 4 in.	11.07 m
P2	Height—Ground to Top of House Pressurization System	34 ft. 5 in.	10.49 m
P3	Height—Ground to Top of House	27 ft. 6 in.	8.38 m
Q	Width of House	30 ft. 10 in.	9.40 m
Q1	Width of House and Stair Platform	42 ft. 2 in.	12.85 m
Q2	Width of House and Operator Compartment	36 ft. 8 in.	11.18 m
Q3	Width of LH Catwalk and Operator Compartment Catwalk	43 ft. 2 in.	13.16 m
R	Overall Length of House	41 ft. 8 in.	12.70 m
R1	Overall Length of House, Pressurization System and Operator Compartment	48 ft. 3 in.	14.71 m
S	Height—Ground to Operator Eye Level	32 ft. 0 in.	9.75 m

Specifications (continued)

Multiply	by	to get equivalent number of:
LENGTH		
Inch	25.4	millimetres (mm)
Foot	0.3048	metres (m)
Yard	0.9144	metres
Mile (Statute)	1.609	kilometres (km)
AREA		
Inch²	645.2	millimetres² (mm²)
	6.45	centimetres² (cm²)
Foot²	0.0929	metres² (m²)
Yard²	0.8361	metres²
VOLUME		
Inch³	16 387.	mm³
	16.387	cm³
	0.0164	litres (l)
Quart	0.9464	litres
Gallon	3.7854	litres
Yard³	0.7646	metres³ (m³)
MASS		
Pound	0.4536	kilograms (kg)
Ton (Short)	907.18	kilograms
Ton (Short)	0.907	tonne (t)
FORCE		
Kilogram	9.807	newtons (N)
Ounce	0.278	newtons
Pound	4.448	newtons

Multiply	by	to get equivalent number of:
TORQUE		
in-lbs	0.11298	newton-metres (N.m)
ft-lbs	1.3558	newton-metres
ft-lbs	0.1383	kg-m
POWER		
Horsepower	0.746	kilowatts (kW)
PRESSURE OR STRESS		
Inches of mercury	3.377	kilopascals (kPa)
Inches of water	0.2491	kilopascals
Pounds/sq. in. (psi)	6.895	kilopascals
Pounds/sq. in. (psi)	0.069	bars
ENERGY OR WORK		
BTU	1 055.	joules (J)
Foot-pound	1.3558	joules
Kilowatt-hour	3.6 x 10^6 or 3600000	joules (J = one W.s)
VELOCITY		
Miles/hour	1.6093	kilometres/hr (km/h)

TEMPERATURE

$°F = \frac{9}{5}\ °C + 32$

$°C = \frac{5}{9}\ (°F - 32)$

CONVERSION CHART