



**AGGREGATE
BATCH PLANT
4
Operator's & Parts
Manual**



Ideal Manufacturing, Inc. • 2011 Harnish Blvd. • Billings, MT 59101
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USD Funds \$15.00

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2011 Harnish Blvd.
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FAST-WAY LIMITED WARRANTY POLICY

Ideal Manufacturing, Inc., hereinafter referred to as "Manufacturer" warrants FAST-WAY equipment to be free from defect in material and workmanship, under normal use and service, for a period of one (1) year from the date of original purchase. Manufacturer will, at its option, replace or repair at factory in Billings, MT, any part or parts which shall appear, to the satisfaction of the Manufacturer, upon inspection at its factory, to have been defective in material or workmanship. This warranty does not obligate the Manufacturer to bear any transportation charges in connection with replacement or repair of defective parts. This warranty excludes electrical components and damage due to Acts of God, unauthorized modifications, misuse, abuse or negligence to this product.

In order to proceed with a warranty claim, Ideal Manufacturing must be notified of the problem. A new part will be shipped out prepaid (Ground UPS). If the customer requests that the part be expedited that shipping charge will be charged to the owner.

The part that is being warranted must be returned to Ideal Manufacturing postage prepaid. When the new part is shipped out, it will go out with an invoice and a warranty part return number. The defective part must be returned to Ideal Manufacturing, Inc freight prepaid, with the warranty part return number. At that time the invoice will be considered paid in full.

This warranty is exclusive and in lieu of all other obligation, liabilities or warranties. In no event shall Ideal Manufacturing be liable or responsible for incidental or consequential damage or for any other direct or indirect damage loss, cost, expense or fee.

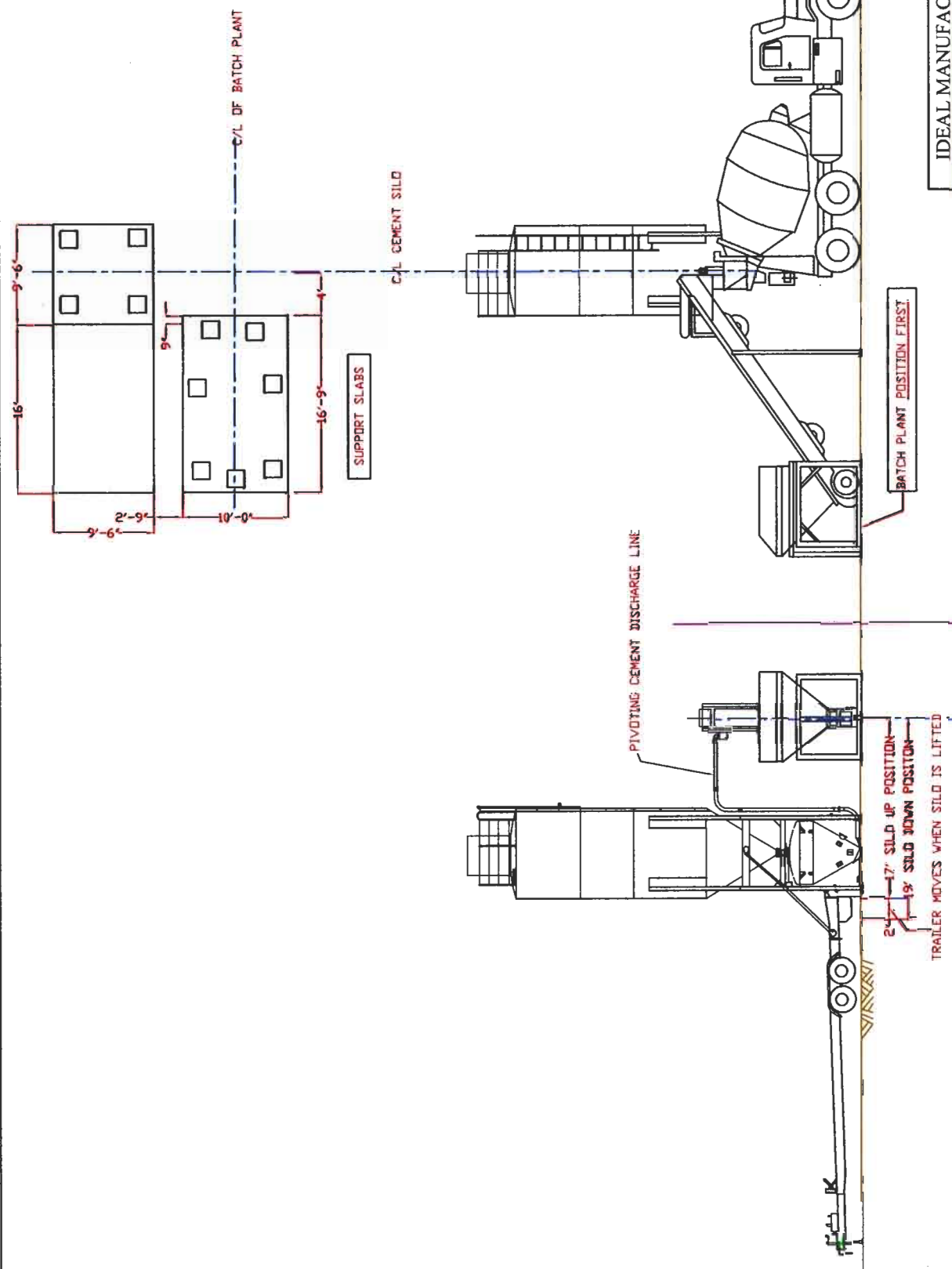
This warranty shall not apply to any products or parts that have been altered or repaired without written consent of Ideal Manufacturing.

Labor to remove and reinstall defective product or parts will be paid from a labor rate and schedule only. Consult Ideal Manufacturing for that rate and schedule.

For further information on returning your product or questions concerning Ideal Manufacturing warranty, please contact Ideal Manufacturing.

SAFETY RULES

1. Follow instructions, don't take chances. If you don't know, ask. When setting up, lowering or putting equipment into traveling position, follow all instructions in operator's manual.
2. Correct or report unsafe conditions. If not sure of how to correct a hazard, report it and get help.
3. Keep everything clean and orderly. Trips or falls can cause serious injuries.
4. Use the right tools and equipment for the job. Use them safely. Replace all machine guards after repair.
5. Report all injuries and get first aid or medical treatment promptly.
6. Use prescribed protective equipment. Keep it in good condition. Wear your hardhat, safety climbing devices or belt. Wear safe clothing to protect you from material being handled cold or hot. Wear a dust mask when conditions require them. When conditions require them, use gloves, eye protection/safety glasses, and earplugs for noise.
7. Use, adjust, and repair equipment only when authorized.
8. Remember, all petroleum fumes, gasoline, L.P. gasses are highly explosive.
9. Don't horseplay: avoid distracting others.
10. When lifting, bend your knees and get help for heavy loads.
11. Report all injuries and get first aid or medical treatment promptly.
12. Don't repair or adjust equipment while in motion. Shut off power source, gasoline engines or electric motors.
13. Comply with safety rules and signs.
14. Gasoline, L.P. gases fumes are highly explosive.



IDEAL MANUFACTURING INC.
 PHONE (406)-656-4380 FAX (406)-656-4363
 CEMENT SILO #3 & BATCH PLANT #4
 COMPLETE PLANT INSTALLATION
 BATCH PLANT #4 DWG # BP-4000-4
 DATE: 12-26-2004 ACAD-PAC

START UP PROCEDURE

1. Rubber skirting at hopper discharge must not contact belt conveyor flights. If too close, loosen holding bolts and adjust.
2. Check oil level in speed reducer.
3. Check tension in drive belts.
4. Check fuel and oil level in engine. Gas tank has shut off valve at outlet. Engine controls are located at left side of conveyor, (See REF # 24).
5. Start conveyor and check belt tension. If belt strikes against return belt enclosure, additional tension is required.
6. If conveyor belt is out of train, adjust drive pulley bearings and/or take up bearings.

SPECIAL INSTRUCTIONS

A pintle hook hitch must be installed on tow vehicle rearward to clear bumper, box, etc., so the tongue can stand vertical from the hitch during set up.

Hitch must have a minimum 2" opening and installed on vehicle so that with 1000 pound load a ground clearance of 24 inches will be maintained.

Recommended is a "Holland Hitch" pintle hook model T-60-AOL-8, Ordinance No. C 8380198 or equal.

SET UP PROCEDURES
DRAWING BP-4001-4 ON PAGE 6

1. Select a firm level site and align plant and tow vehicle in a straight line.
2. Remove wheel chocks from pockets on frame, (See REF #3) and place directly behind tires.
3. Remove locking bolts from conveyor to main frame, (See REF #4). Remove locking bolts from tongue to discharge hopper, (See REF 35).
4. Back vehicle straight against wheel chocks. This will raise the conveyor. Continue backing until tongue has reached a vertical position.
CAUTION: DO NOT EXCEED VERTICAL POSITION AS DAMAGE MAY OCCUR.
The conveyor should be at a 45° angle from ground level.
SET VEHICLE BRAKES
5. Secure frame to conveyor hanger links, (See REF #7) into slotted plates under conveyor frame.
6. Secure frame to conveyor safety chain, (See REF #8) under conveyor and up to hooks on frame.
7. Drive vehicle forward to unlatch hitch.
8. Remove locking bolt from pivoting support to tongue, (See REF #6) and lower to ground.
9. Lock pivoting support to tongue at, (See REF #9). Use bolt removed from, (See REF #6).
10. Remove hopper to frame holding plates, (See REF #10).
11. Place digital support bracket at location for best viewing, (See REF #13). Loosen jam nuts, (See REF #11) and pivot support around. Retighten jam nuts.
12. Raise hopper fold down panels and bolt in place.
13. If hopper extension units, (See REF #28, 29, & 30) are installed, bolt in place.
14. Calibrate Scale, (See REF #12).
15. Remove plug at water meter, (See REF #17) and connect water line.
(See section for meter installation and operation.)

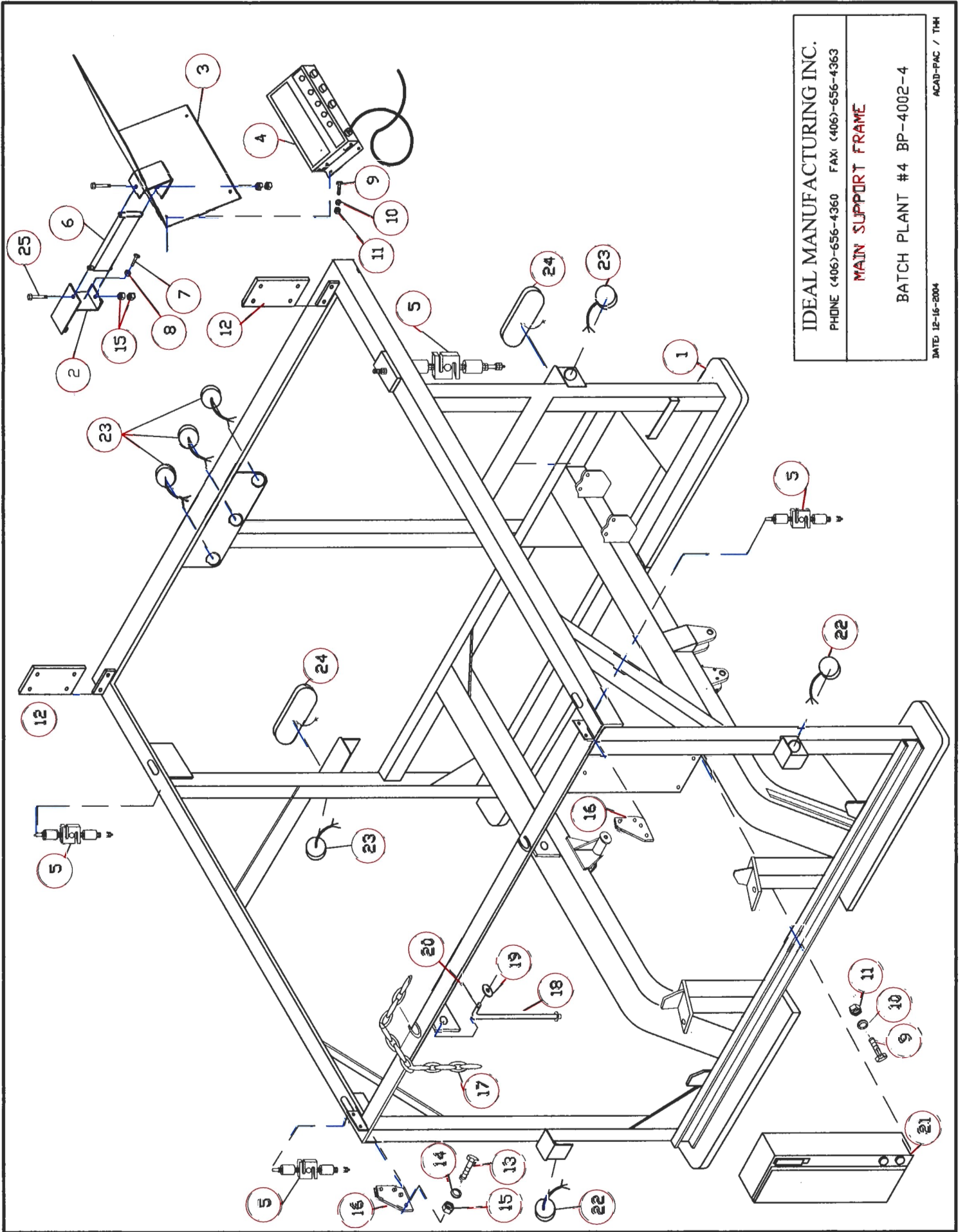
GENERAL ARRANGEMENT
DRAWING BP-4001-4 ON PAGE 6

1. Towing tongue designed for towing vehicle with pintle hook hitch, and top wind jack.
2. Electrical plug for signal, stop and clearance lights. Also electrical brakes, if installed.
3. Removable wheel chock for plant erection.
4. Conveyor to main frame locking bolts – in travel position.
5. Tongue to discharge hopper locking bolts – in travel position.
6. Pivoting support to tongue locking bolt – in travel position.
7. Frame to conveyor hanger links for erected position.
8. Frame to conveyor safety chain for erected position.
9. Pivoting support to tongue locking bolt for erected position.
10. Hopper to frame holding, plates for travel position.
11. Digital Weight Indicator, pivoting support bracket
12. Digital Indicator.
13. Digital Indicator mounting plate.
14. Water meter with register.
15. Water meter auto-stop valve.
16. Hose bib for wash down.
17. Water inlet plug for travel.
18. Electrical cord from power source for electrical motor driven conveyor.
19. Electrical control enclosure for electrical motor driven conveyor.
20. Control panel for engine driven conveyor.
21. Flexible discharge boot.
22. Front hopper fold down panel.
23. Side hopper fold down panels.
24. Rear hopper side extension panels.
25. Rear hopper extension panel.
26. Additional hopper front and side extensions.
27. Hopper discharge gate control lever.

**FAST-WAY BATCH PLANT #4
MAIN SUPPORT FRAME ATTACHMENTS**

DRAWING BP-4002-4

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	BPO101	Main Support Frame	1
2	BPO183	Moveable Scale Support	1
3	BPO184	Scale Bracket	1
4	POO718	Digital Weigh Indicator	1
5	POO717	Load Cell Kit (Set of 4)	1
6	BPO185	Scale Pivot	1
7	N/A	3/8-16 x 1 1/2" Hex Head Bolt	2
8	N/A	3/8-16 Hex nut	2
9	N/A	5/16-18 x 1" Hex Head Bolt	7
10	N/A	5/16 Lockwasher	7
11	N/A	5/16-18 Hex Nut	7
12	BPO106	Hopper Holding Plate "Rear"	2
13	N/A	1/2-13 x 1" Hex Head Bolt	16
14	N/A	1/2 Lockwasher	16
15	N/A	1/2-13 Hex Nut	16
16	BPO105	Hopper Holding Plate "Front"	2
17	POO200	Conveyor Safety Chain	1
18	BP0107	Conveyor Hanger Link	2
19	N/A	3/4 SAE Flat Washer	2
20	N/A	3/16" x 1 1/2" SS Cotter Pin	2
21	N/A	Electrical Enclosure (See Drawings - BP2000E-3, BP2000E-2, BP2000-1)	1
22	POO650	Clearance Light - Amber	2
23	POO651	Clearance Light - Red	5
24	POO667	Signal Stop Light	2
25	N/A	1/2-13 x 6 Hex Head Bolt	2
26	POO652	Rubber Grommet Kit For Lights	7



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MAIN SUPPORT FRAME

BATCH PLANT #4 BP-4002-4

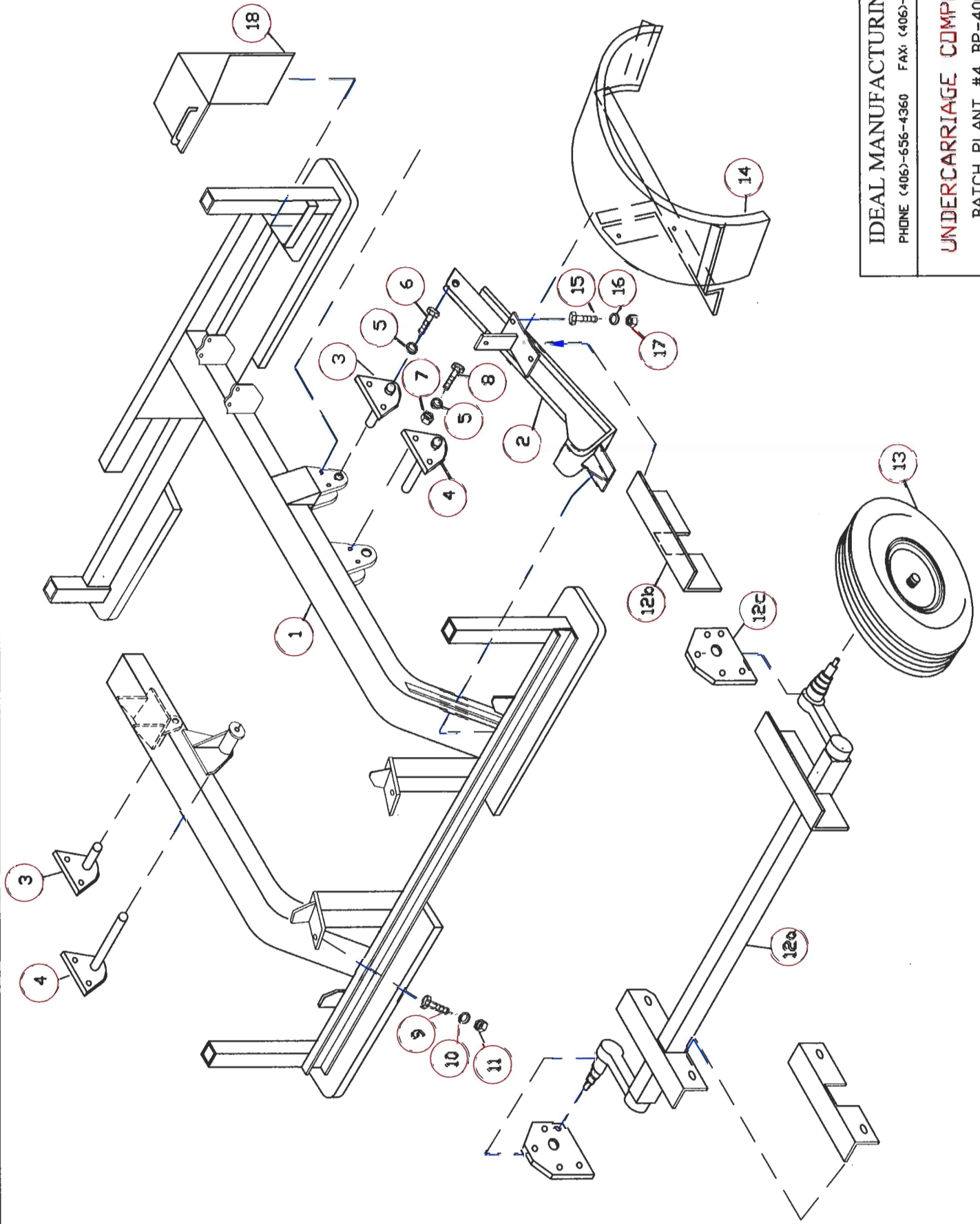
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**FAST-WAY BATCH PLANT #4
UNDERCARRIAGE COMPONENTS**

DRAWING BP-4003A-4

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	Main Support Frame (See Drawing BP-4002-4)	
2	BP0108LH	Left Hand Carriage Beam	1
	BP0108RH	Right Hand Carriage Beam	1
3	BP0109	Carriage Pivot Pin	2
4	BP0110	Conveyor Pivot Pin	2
5	N/A	3/8" Lock washer	8
6	N/A	3/8-16 x 7/8 Hex Head Bolt	4
7	N/A	3/8-16 Hex Nut	4
8	N/A	3/8-16 x 1 1/4 Hex Head Bolt	4
9	N/A	3/4-10 x 2" Hex Head Bolt	2
10	N/A	3/4 Lock washer	2
11	N/A	3/4-10 Hex Nut	2
12A	POO848	Axle Assembly.	1
12B	N/A	Axle Mount Angle (Welded to Carriage Beam)	
12C	N/A	Brake Assembly Mount Plate (Welded to Axle Spindle)	
13	N/A	Wheel Assembly (See Drawing BP-4015 A-4)	
14	BP0111LH	Left Hand Fender Assembly	1
	BP0111RH	Right Hand Fender Assembly	1
15	N/A	1/2-13 x 1 Hex Head Bolt	6
16	N/A	1/2 Lock washer	6
17	N/A	1/2-13 Hex Nut	6
18	BP0112	Wheel Clock	2



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UNDERCARRIAGE COMPONENTS

BATCH PLANT #4 BP-4003A-4

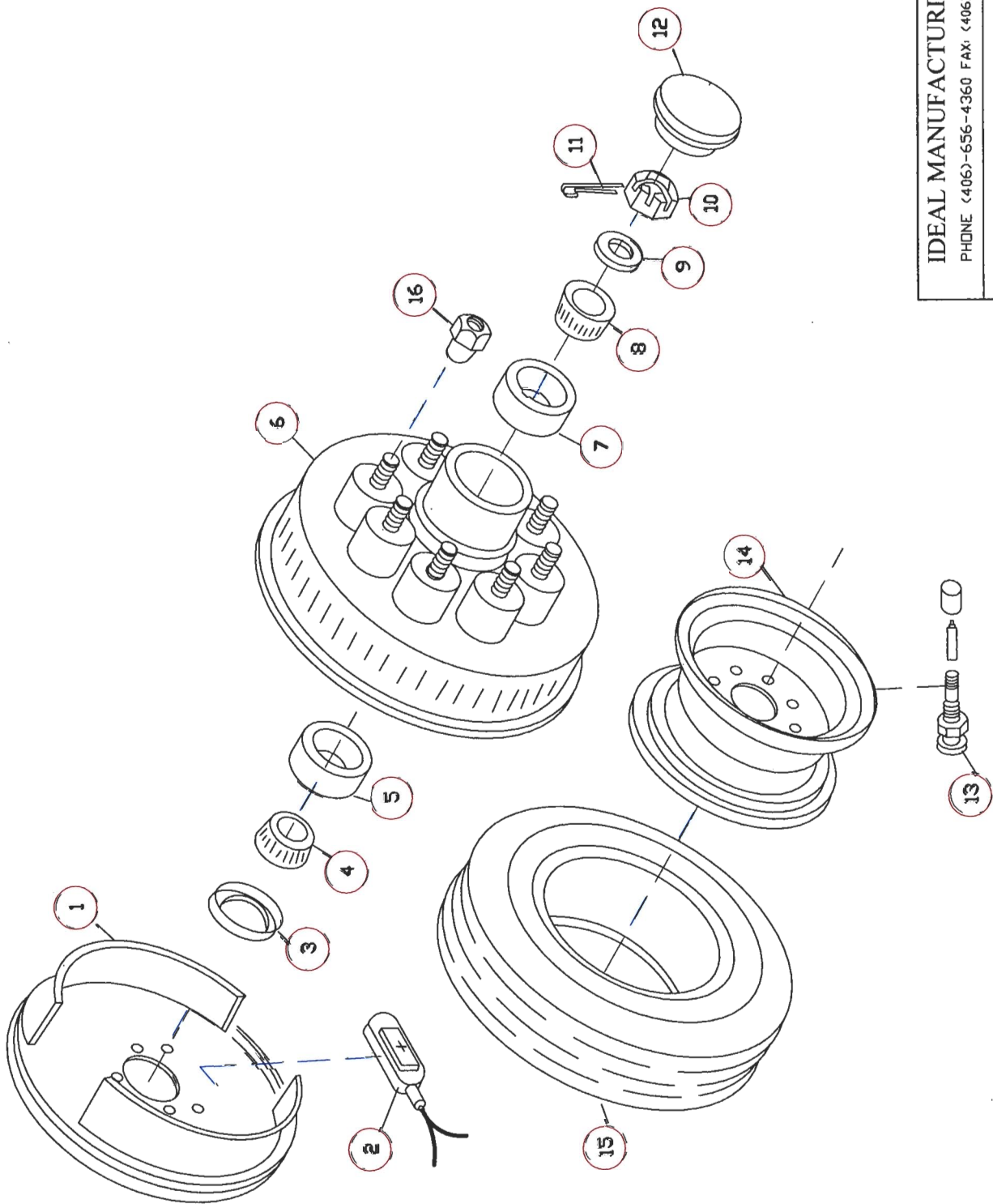
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**FAST-WAY BATCH PLANT #4
 UNDERCARRIAGE WHEEL COMPONENTS
 2 ASSEMBLIES INCLUDED**

DRAWING BP-4015 A-4

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	POO831	Right Brake Assembly.	1
	POO832	Left Brake Assembly.	1
2	POO833	Actuator Magnet Kit	2
3	POO834	Inner Grease Seal	2
4	POO835	Inner Bearing	2
5	POO836	Inner Bearing Race	2
6	POO837	Hub and Brake Drum	2
7	POO838	Outer Bearing Race	2
8	POO839	Outer Bearing	2
9	POO840	Spindle Washer	2
10	POO841	Spindle Nut	2
11	N/A	5/32" x 1 1/2" Cotter Pin	2
12	POO842	Dust Cap	2
13	POO843	Valve Stem Assembly	2
14	POO844	Tire Rim	2
15	POO845	Tire	2
16	POO846	Lug Nut	16



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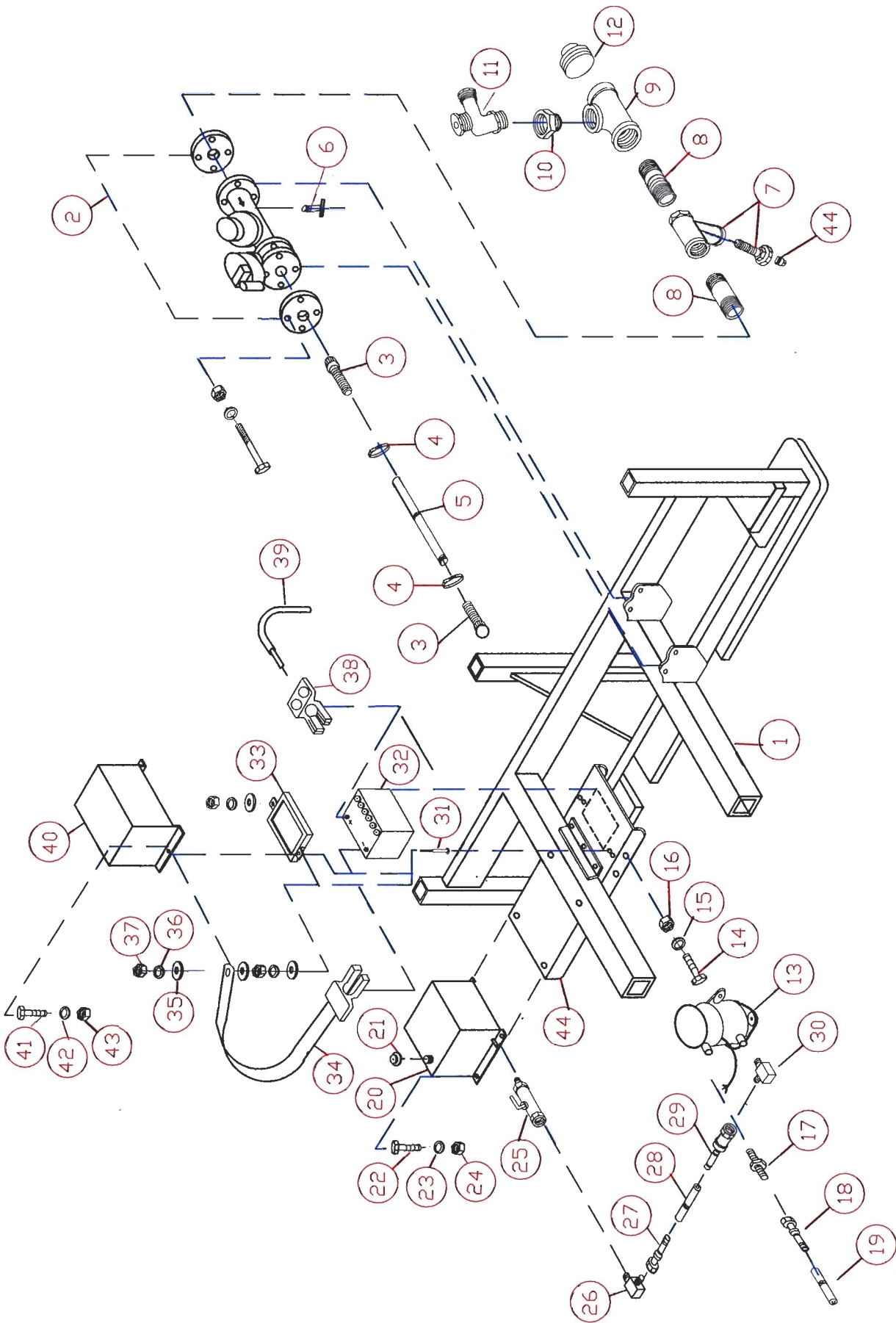
WHEEL COMPONENTS
 BATCH PLANT #4 BP-4015 A-4

DATE: 12-17-2004 ACAD-PAC

**FAST-WAY BATCH PLANT #4
STANDARD WATER METER GAS ENGINE ACCESSORIES**

DRAWING BP-4004-4

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	Main Support Frame (See Drawing BP-4002-4)	1
2	POO760	Water Meter	1
	POO761	Flange Set	1
3	POO704	Hose Nipple	2
4	POO189	Hose Clamp	2
5	POO756	Water Line	1
6	POO750	Drain Valve	1
7	POO751	Water Strainer	1
8	POO702	Nipple	2
9	POO703	Tee	1
10	POO754	Reducer Bushing	1
11	POO420	Water Hose Bib	1
12	POO755	Travel Plug	1
13	POO182	Fuel Pump	1
14	N/A	1/4-20 x 1 Hex Head Bolt	2
15	N/A	1/4 Lock washer	2
16	N/A	1/4-20 Hex Nut	2
17	POO508	Nipple	1
18	POO552	Fuel Line End Connector	1
19	POO553	Fuel Line to Engine	1
20	BP0113	Fuel Tank	1
21	POO423	Fuel Tank Vent Cap	1
22	N/A	1/2-13 x 1 Hex Head Bolt	4
23	N/A	1/2 Lock washer	4
24	N/A	1/2-13 Hex Nut	4
25	POO499	Fuel Valve	1
26	POO504	Fuel Line, 90° Fitting	1
27	POO552	Fuel Line End Connector	1
28	POO555	Fuel Line	1
29	POO552	Fuel Line End Connector	1
30	POO504	Fuel Line, 90° Fitting	1
31	POO476	Battery Hold Down Bolt	2
32	POO374	Battery	1
33	POO475	Battery Hold Down Frame	1
34	POO268	Battery Ground Strap	1
35	N/A	5/16 SAE Flat Washer	4
36	N/A	5/16 Lock washer	3
37	N/A	5/16-18 Hex Nut	3
38	POO269	Battery Terminal	1
39	POO556	Battery Cable to Control Panel	1
40	BP0114	Battery Cover	1
41	N/A	3/8-16 x 1 Hex Head Bolt	2
42	N/A	3/8 Lock washer	2
43	N/A	3/8-16 Hex Nut	2
44	POO355	3/4" Square Head Plug	1



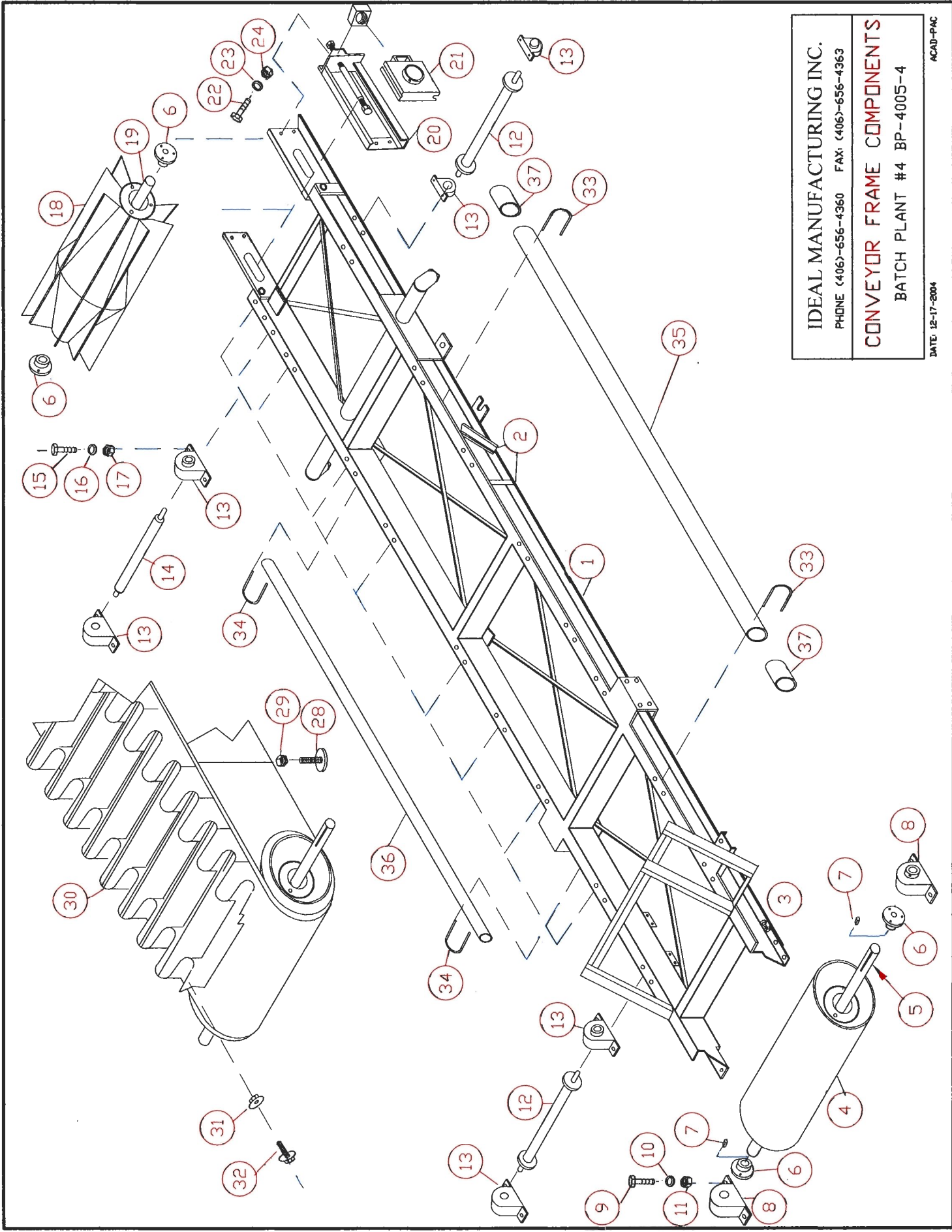
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WATER METER & ENGINE ACCESSORIES
 BATCH PLANT #4 BP-4004-4
 DATE: 12-17-2004 ACAD-PAC

**FAST-WAY BATCH PLANT #4
CONVEYOR FRAME COMPONENTS**

DRAWING BP-4005-4

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	BP0116	Conveyor Frame	1
2	N/A	Engine Control Mount Locations	
3	N/A	5/8 x 2 Hex Head Bolt Bearing Adjuster	2
4	POO198	Drive Pulley	1
5	BP0117	Drive Pulley Shaft	1
6	POO198A	Pulley Bushings	4
7	BP0118	Shaft Key	1
8	POO227	Drive Pulley Bearing	2
9	N/A	1/2-13 x 3/4 Hex Head Bolt	4
10	N/A	1/2 Lock washer	4
11	N/A	1/2-13 Hex Nut	4
12	BP0119	Guide Carrier Roll	2
13	POO226	Carrier Roll Bearing	22
14	BP0120	Carrier Roll	9
15	N/A	3/8-16 x 1 1/4 Hex Head Bolt	44
16	N/A	3/8 Lock washer	44
17	N/A	3/8-16 Hex Nut	44
18	POO199	Take-Up Pulley	1
19	BP0121	Take-Up Pulley Shaft	1
20	POO225LH	Left Hand Take-up Frame	1
	POO225RH	Right Hand Take-up Frame	1
21	POO228	Take-up Bearing	2
22	N/A	1/2-13 x 1 Hex Head Bolt	8
23	N/A	1/2 Lock washer	8
24	N/A	1/2-13 Hex Nut	8
26	NA	Belt Lacing Kit, Furnished on Conveyor Belt	
28	POO312	Elevator Bolt	4
29	N/A	5/16-18 Hex Nut	4
30	POO305A	Conveyor Belt (All Rubber)	1
31	N/A	5/16 Flange Lock Nut	4
32	N/A	5/16 Flange Bolt	4
33	POO764	5/16-18 x 2 1/2 x 3 3/16 U Bolt	2
34	POO763	5/16-18 x 1 3/4 x 2 11/16 U Bolt	2
35	BPO174	Pipe 2 SCH.40	1
36	BPO175	Pipe 1 1/4 SCH. 40	1
37	POO762	2" Coupler	2

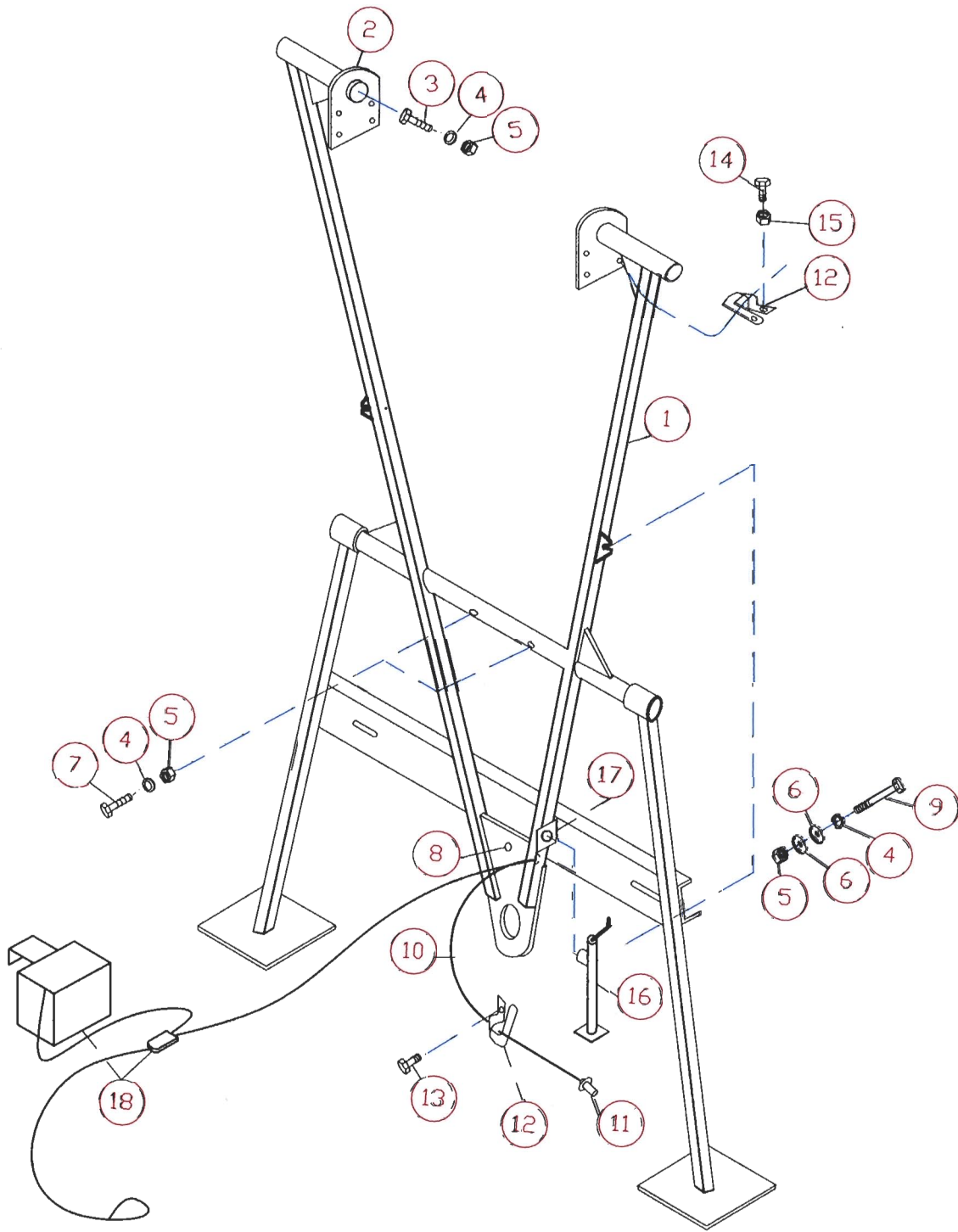
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CONVEYOR FRAME COMPONENTS
 BATCH PLANT #4 BP-4005-4
 DATE: 12-17-2004
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**FAST-WAY BATCH PLANT #4
TOWING TONGUE AND FORWARD CONVEYOR
SUPPORT**

DRAWING BP-4006-3

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	BP0123	Frame Unit	1
2	N/A	Pivot Plate Connected to Conveyor Frame	
3	N/A	1/2-13 x 1 1/4 Hex Head Bolt	8
4	N/A	1/2 Lock washer	12
5	N/A	1/2-13 Hex Nut	12
6	N/A	1/2 USS Flat Washer	4
7	N/A	1/2-13 x 3 1/2 Hex Head Bolt	2
8	N/A	Holes for 1-Bolt (See REF #9) at Plant Erection (DrawingBP-4001-4)	2
9	N/A	1/2-13 x 4 1/4 Hex Head Bolt	2
10	N/A	Electrical Wiring for Signal, Stop and Clearance Lamps, Also Brakes, If Installed	4
11	POO786	7-Pole Electrical Plug	1
	POO785	7-Pole Electrical Socket for Vehicle (Not shown)	
12	POO325	Cable Clip	As Req'd
13	N/A	1/4-20 x 1/2 Hex Head Bolt	1
14	N/A	1/4-20 x 3/4 Hex Head Bolt on Conveyor Frame	As Req'd
15	N/A	1/4-20 Hex Nut	As Req'd
16	POO788	Top Wind Jack	1
17	POO789	Weld on Bracket for Jack	1
18	POO654	Safety Breakaway System	1



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**TOWING TONGUE &
FORWARD CONVEYOR SUPPORT**

BATCH PLANT #4 BP-4006-4

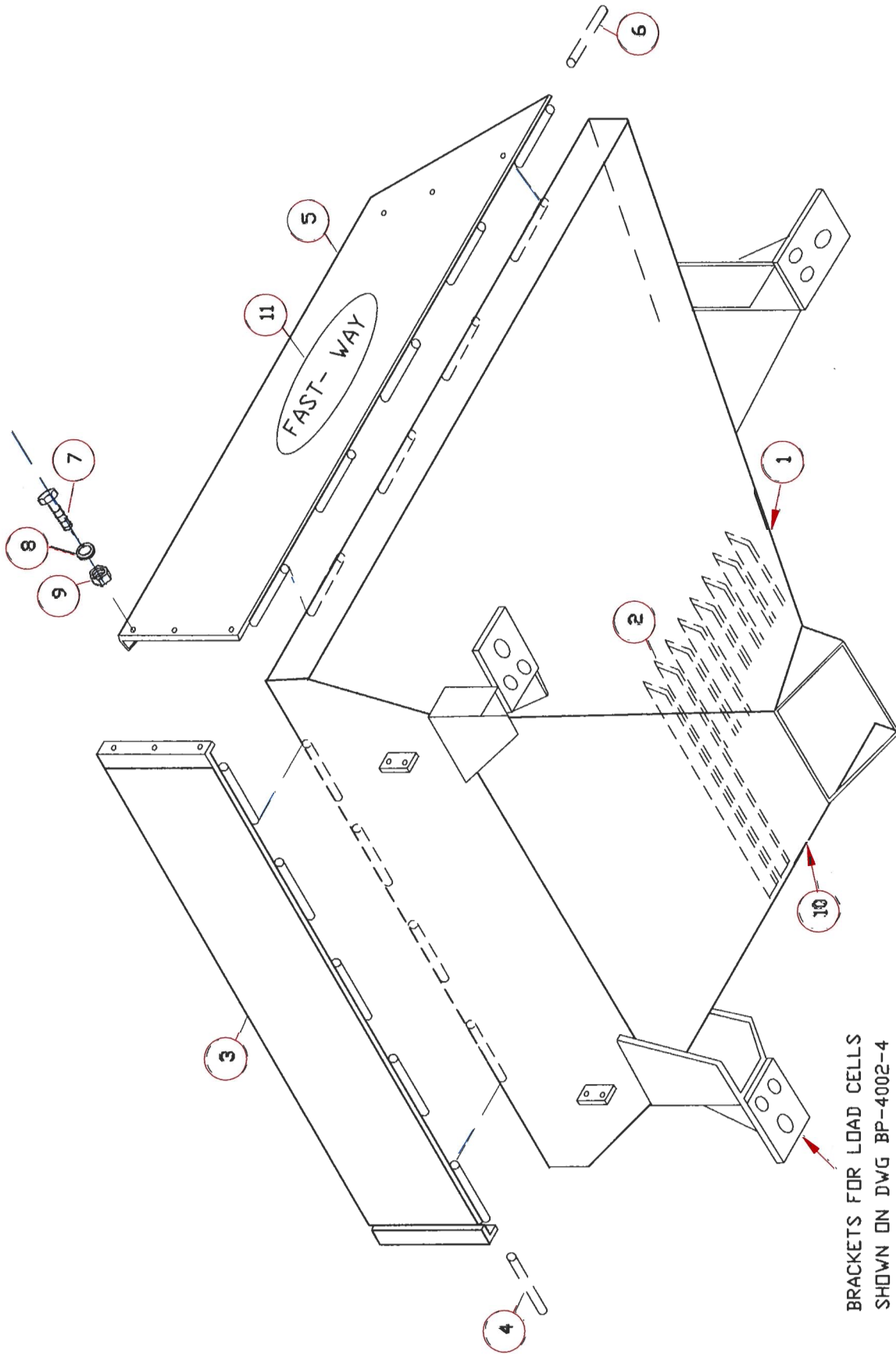
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**FAST-WAY BATCH PLANT #4
AGGREGATE HOPPER**

DRAWING BP-4007-4

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	BP0124	Aggregate Hopper	1
2	BP0125	Bar Grating	1
3	BP0126	Front Fold-down Section	1
4	BP0127	Front Hinge Rod	1
5	BP0128RH	Right Side Fold-down Section	1
	BP0128LH	Left Side Fold-down Section	1
6	BP0129	Side Hinge Rod	2
7	N/A	1/2-13 x 1 Hex Head Bolt	6
8	N/A	1/2 Lock washer	6
9	N/A	1/2-13 Hex Nut	6
10	N/A	Hopper Discharge Gate Location (See Drawing BP-4009-4)	
11	POO377	FAST-WAY Decal	2



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AGGREGATE HOPPER

BATCH PLANT #4 BP-4007-4

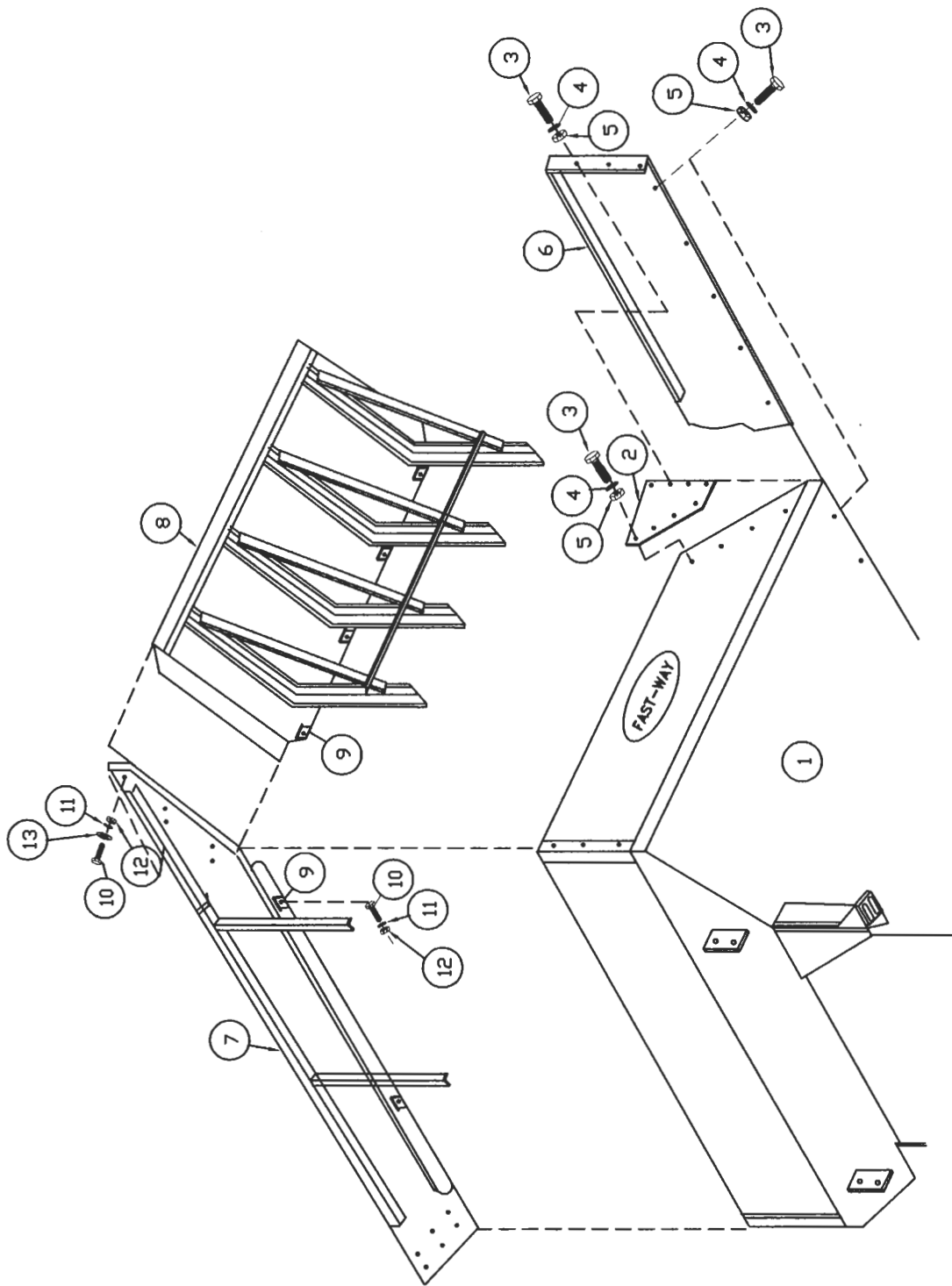
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**FAST-WAY BATCH PLANT #4
AGGREGATE HOPPER EXTENSIONS
11 YARD**

DRAWING BP-4008-4

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	Aggregate Hopper (See Drawing BP-4007-4)	
2	BP0130	Side Enclosure	2
3	N/A	3/8-16 x 3/4 Hex Head Bolt (Front Fold-down Section)	26
4	N/A	3/8 Lock washer	26
5	N/A	3/8-16 Hex Nut	26
6	BP0131	Rear Enclosure	1
7	BP0132	Front Extension	1
8	BP0133RH	Right Side Extension	1
	BP0133LH	Left Side Extension	1
9	BP0134	Hold-down Clip	10
10	N/A	1/2-13 x 1 Hex Head Bolt	24
11	N/A	1/2 Lock washer	24
12	N/A	1/2-13 Hex Nut	24
13	N/A	1/2 USS Flat Washer	8



IDEAL MANUFACTURING INC.
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 BATCH PLANT # 4
HOPPER EXTENSIONS FOR 11 YD
 12-20-2004
 BP-4008-4

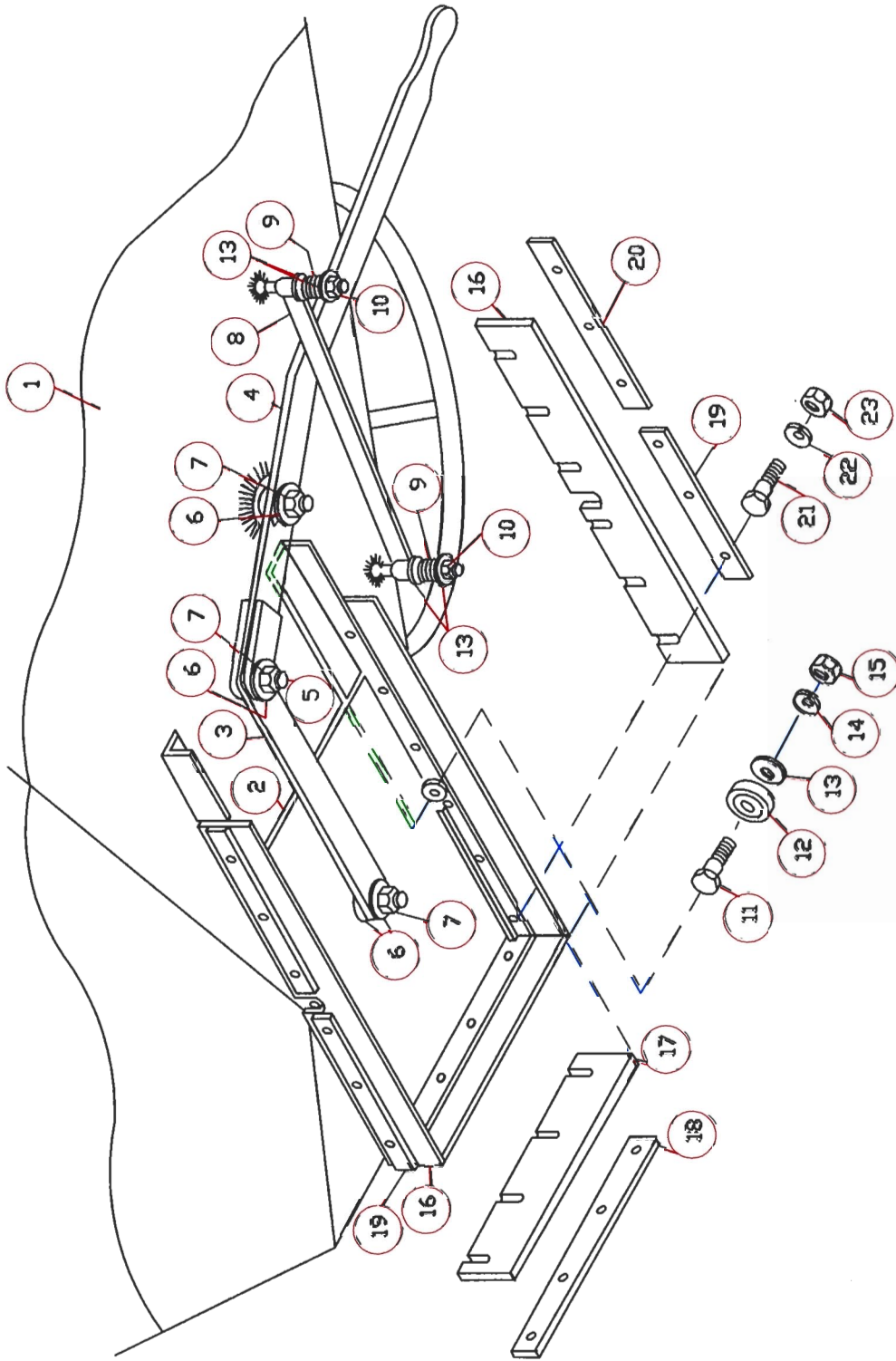
INSTALLATION INSTRUCTIONS FOR 11 CU. YD. HOPPER KIT

1. Remove all angle iron clips (REF #9, Drawing BP-4008-4 & BP-4008A-4).
2. Set front section into place and anchor with angle iron clips (REF #9). Install as per Drawing BP-4008A-4.
3. Set a sideboard into place and install four (4) ½" bolts attaching both front and side together. Install angle iron clips as shown. Install other sideboard and tighten all bolts securely.

**FAST-WAY BATCH PLANT #4
AGGREGATE HOPPER DISCHARGE GATE**

DRAWING BP-4009-4

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	Aggregate Hopper (See Drawing BP-4007-4)	
2	BP0135	Slide Plate	1
3	BP0136	Slide Plate Linkage	1
4	BP0137	Actuating Lever	1
5	BP0138	3/4-10 x 2 1/2 Hex Head Bolt (Machined)	1
6	N/A	3/4 SAE Flat Washer	5
7	N/A	3/4-10 Lock Nut	3
8	BP0139	Lever Tension Bar	1
9	POO194	Tension Spring	2
10	N/A	1/2-13 Lock Nut	2
11	N/A	1/2-13 x 1 3/4 Hex Head Bolt	2
12	POO376	Slide Plate Support Roller Bearing	2
13	N/A	1/2 SAE Flat Washer	6
14	N/A	1/2 Lock Washer	2
15	N/A	1/2-13 Hex Nut	2
16	POO310	Side Rubber Skirting	2
17	POO309	Rear Rubber Skirting	1
18	BP0142	Rear Skirt Retainer	1
19	BP0143	Side Skirt Retainer	2
20	BP0144	Side Skirt Retainer	2
21	N/A	3/8-16 x 1 1/2 Hex Head Bolt	16
22	N/A	3/8 Lock Washer	16
23	N/A	3/8-16 Hex Nut	16



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HOPPER DISCHARGE GATE
 BATCH PLANT #4 BP-4009-4

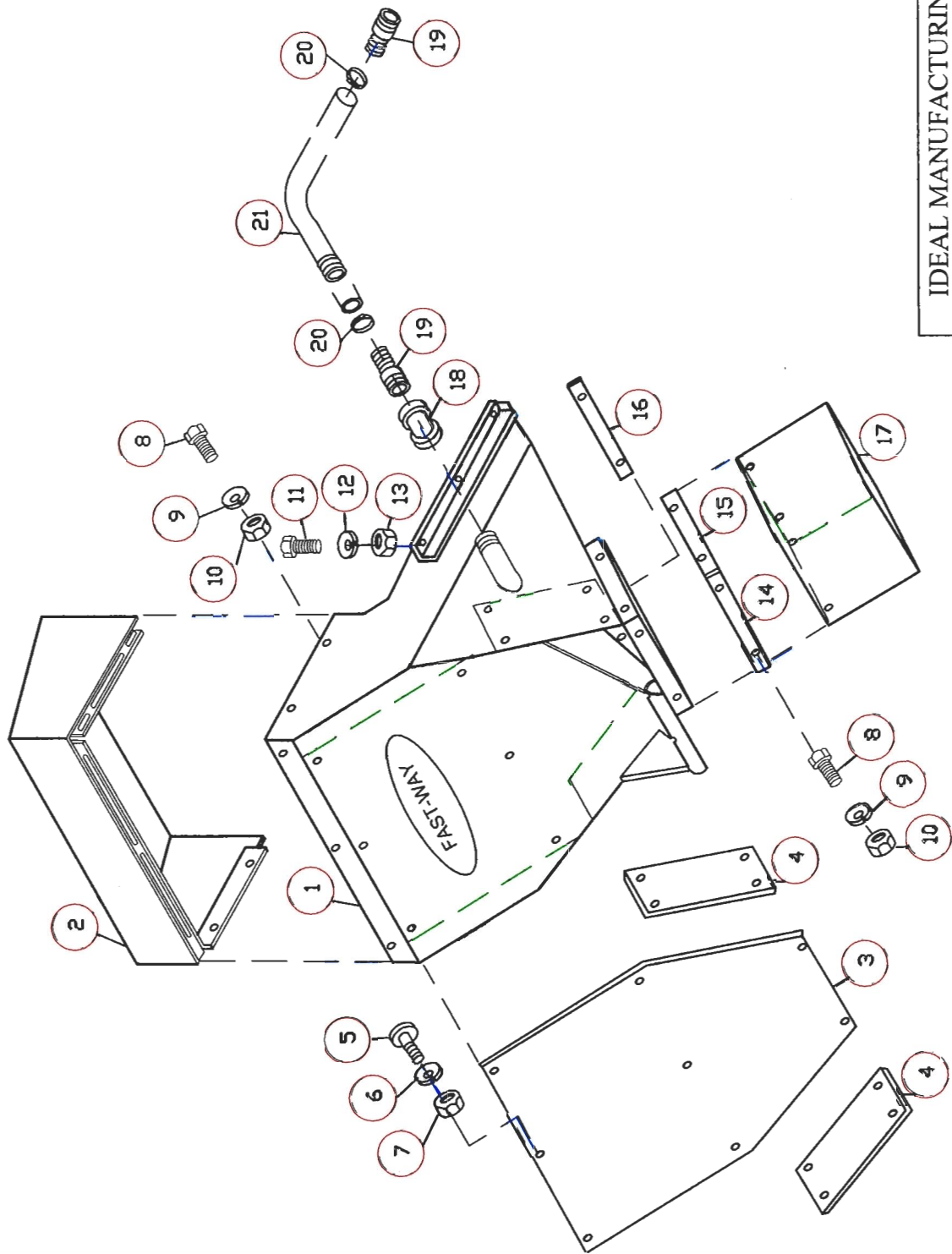
DATE: 12-20-2004

ACAD-PAC

**FAST-WAY BATCH PLANT #4
DISCHARGE CHUTE**

DRAWING BP-4010-4

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	BP0145	Discharge Chute	1
2	BP0146	Discharge Chute Hood	1
3	POO306	Front Rubber Liner	1
4	POO307	Side Rubber Liner	2
5	POO312	Elevator Bolt	16
6	N/A	5/16 Lock washer	16
7	N/A	5/16-18 Hex Nut	16
8	N/A	3/8-16 x 3/4 Hex Head Bolt	15
9	N/A	3/8 Lock washer	15
10	N/A	3/8-16 Hex Nut	15
11	N/A	1/2-13 x 1 1/2 Hex Head Bolt	6
12	N/A	1/2 Lock washer	6
13	N/A	1/2-13 Hex Nut	6
14	BP0149	Front Boot Retainer	1
15	BP0150	Side Boot Retainer	2
16	BP0151	Rear Boot Retainer	1
17	POO223	Flexible Discharge Boot	1
18	POO759	Water Line Elbow	1
19	POO704	Water Hose Nipple	2
20	POO189	Water Hose Clamp	2
21	POO757	Water Hose	1



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DISCHARGE CHUTE
 BATCH PLANT #4 BP-4010-4

DATE: 12-20-2004
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**FAST-WAY BATCH PLANT #4
CONVEYOR RETURN BELT ENCLOSURE**

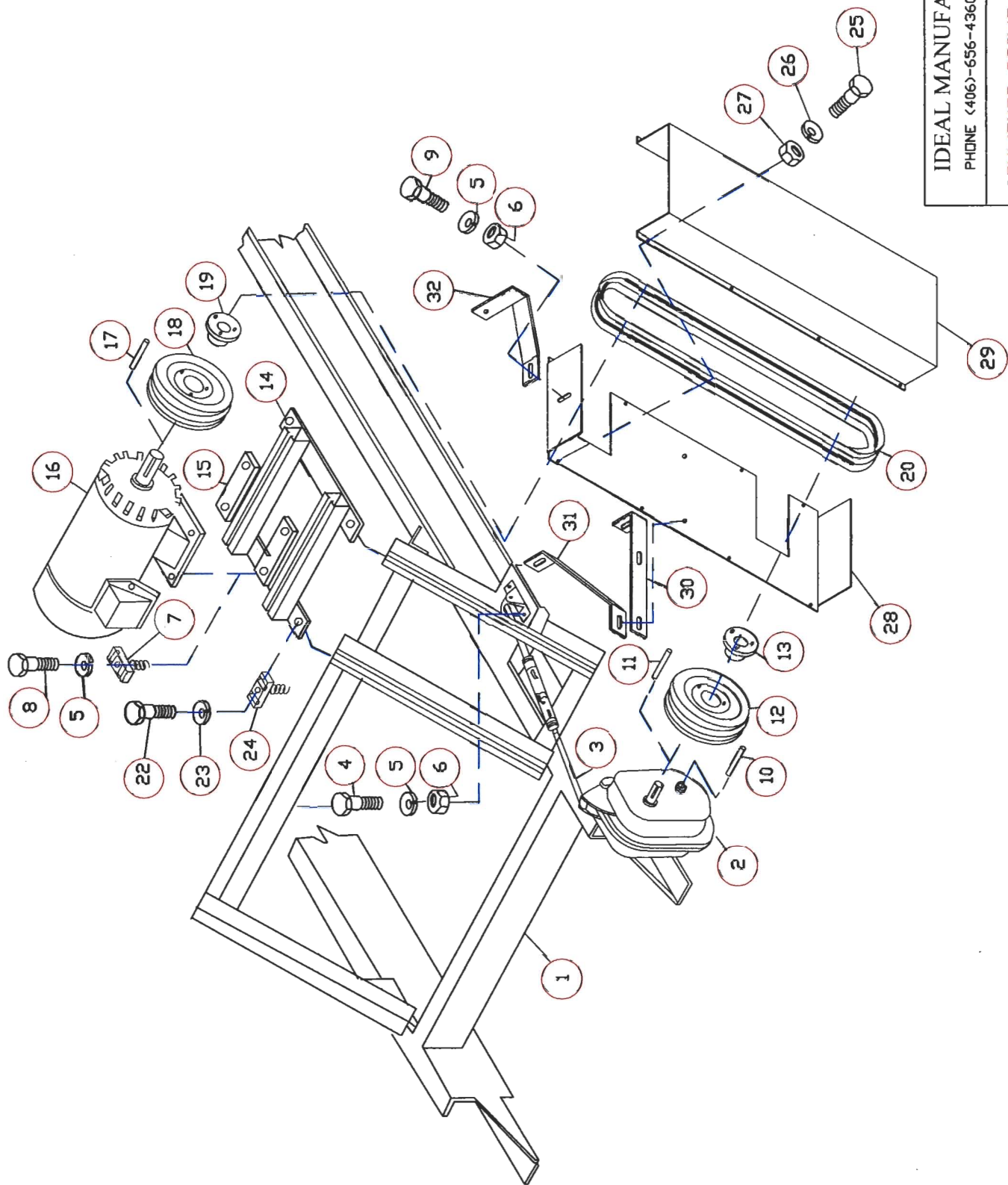
DRAWING BP-4011-4

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	Conveyor Frame (See Drawing BP-4005-4)	
2	BP0152	Forward Enclosure	1
3	BP0153 A	Center Enclosure	1
4	BP0154 A	Rear Enclosure	1
5	N/A	5/16-18 x 3/4 Hex Head Bolt	28
6	N/A	5/16 Lock washer	28
7	N/A	5/16-18 Hex Nut	28
8	BP0155	Rear Clean-Out Section	1
9	N/A	1/2-13 x 1 Hex Head Bolt	2
10	N/A	1/2 USS Flat Washer	2
11	N/A	1/2 Lock Washer	2
12	N/A	1/2-13 Hex Nut	2
13	BP0156	Clean-Out Section Door	1
14	N/A	1/2 USS Flat Washer	2
15	POO452	1/2-13 Wing Nut	2
16	POO787	Pan Liner	2
17	N/A	5/16-18 X 1 Elevator Bolt	20
18	N/A	5/16 Fender Washer	20
19	N/A	5/16-18 Nylock Nut	20

**FAST-WAY BATCH PLANT #4
CONVEYOR DRIVE – ELECTRIC MOTOR**

DRAWING BP-4012-4

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	Conveyor Frame (See Drawing BP-4005-4)	
2	POO232	Speed Reducer	1
3	N/A	Torque Arm Furnish with Reducer	
4	N/A	3/8-16 x 1 Hex Head Bolt	2
5	N/A	3/8 Lock washer	9
6	N/A	3/8-16 Hex Nut	5
7	POO153	3/8-16 Spring Nut	4
8	N/A	3/8-16 x 1 3/4 Hex Head Bolt	5
9	N/A	3/8-16 x 1 1/4 Hex Head Bolt	2
10	BP0157	Reducer Output Shaft Key	1
11	BP0158	Reducer Input Shaft Key	1
12	POO543	Reducer Input Sheave	1
13	POO137	Reducer Input Sheave Bushing	1
14	BP0159	Electric Motor Mount Frame	1
15	BP0160	Mount Frame Spacer	2
16	POO140	Electric Motor 220/440 3 Phase	1
	POO141	Electric Motor 110/220 Single Phase	
17	BP0161	Motor Shaft Key	1
18	POO233	Motor Sheave	1
19	POO234	Motor Sheave Bushing	1
20	POO231	Drive Belt	2
22	N/A	1/2" x 1 1/4" Hex Head Bolt	7
23	N/A	1/2" Lock washer	7
24	POO152	1/2" x Spring Nut	7
25	N/A	1/4-20 x 3/4 Hex Head Bolt	8
26	N/A	1/4 Lock washer	8
27	N/A	1/4-20 Hex Nut	8
28	BPO169	Drive Guard	1
29	BPO170	Guard Cover	1
30	BPO171	Guard Bracket A	1
31	BPO172	Guard Bracket B	1
32	BPO173	Guard Bracket C	1

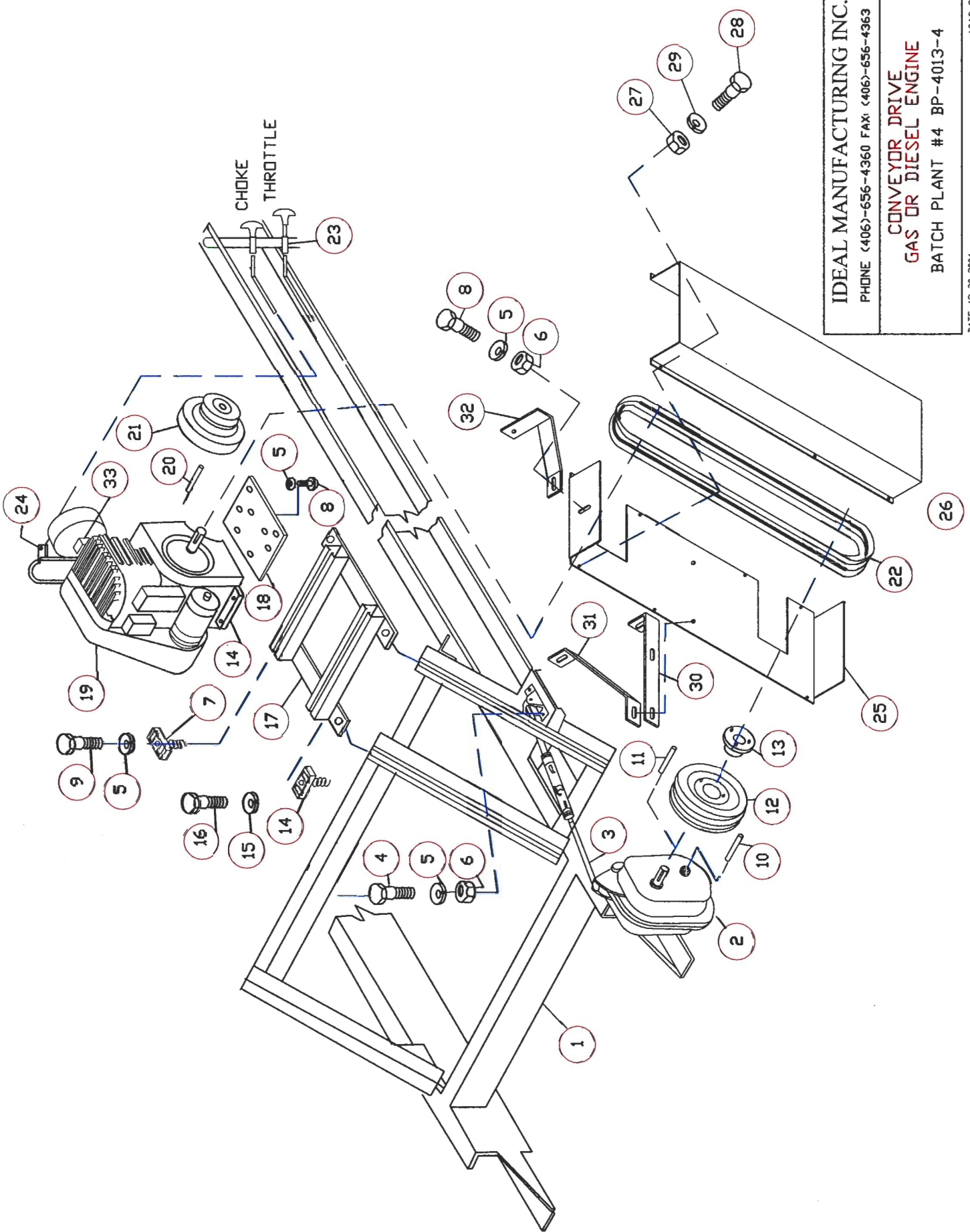


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CONVEYOR DRIVE ELECTRIC MOTOR
 BATCH PLANT #4 BP-4012-4

DATE: 12-20-2004
 ACAD-PAC/THH

**FAST-WAY BATCH PLANT #4
CONVEYOR DRIVE
GAS OR DIESEL ENGINE
DRAWING BP-4013-4**

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	Conveyor Frame (See Drawing BP-4005-4)	
2	POO232	Speed Reducer	1
3	N/A	Torque Arm Furnish with Reducer	
4	N/A	3/8-16 x 1 Hex Head Bolt	2
5	N/A	3/8 Lock washer	13
6	N/A	3/8-16 Hex Nut	5
7	N/A	3/8-16 Spring Nut	4
8	N/A	3/8-16 x 1 1/4 Hex Head Bolt	6
9	N/A	3/8-16 x 1 3/4 Hex Head Bolt	5
10	BP0157	Reducer Output Shaft Key	1
11	BP0158	Reducer Input Shaft Key	1
12	POO233	Reducer Input Sheave	1
13	POO137	Reducer Input Sheave Bushing	1
14	POO153	1/2 Spring Nut	7
15	N/A	1/2 Lock Washer	7
16	N/A	1/2-13 x 1 1/4 Hex Head Bolt	7
17 (gas)	BP0163	Gas Engine Mount Frame	1
17 (diesel)	BPO159	Diesel Engine Mount Frame	1
18 (gas)	BP0164	Gas Engine Base Plate	1
18 (diesel)	BPO204	Diesel Engine Base Plate	1
19 (gas)	POO500	Gas Engine	1
19 (diesel)	POO502	Diesel Engine	1
20	BP0165	Engine Drive Shaft Key	1
21	POO547	Centrifugal Drive Clutch	1
22	POO231	Drive Belt	2
23	POO197	Engine Control	2
24	BP0166	Control Cable Bracket Mounted on Engine	1
25	BPO169	Drive Guard	1
26	BPO170	Guard Cover	1
27	N/A	1/4-20 Hex Nut	8
28	N/A	1/4-20 x 3/4 Hex Head Bolt	8
29	N/A	1/4 Lock washer	8
30	BPO171	Guard Bracket A	1
31	BPO172	Guard Bracket B	1
32	BPO173	Guard Bracket C	1
33	POO507C	Stay Choke Control (Honda Engine only)	1



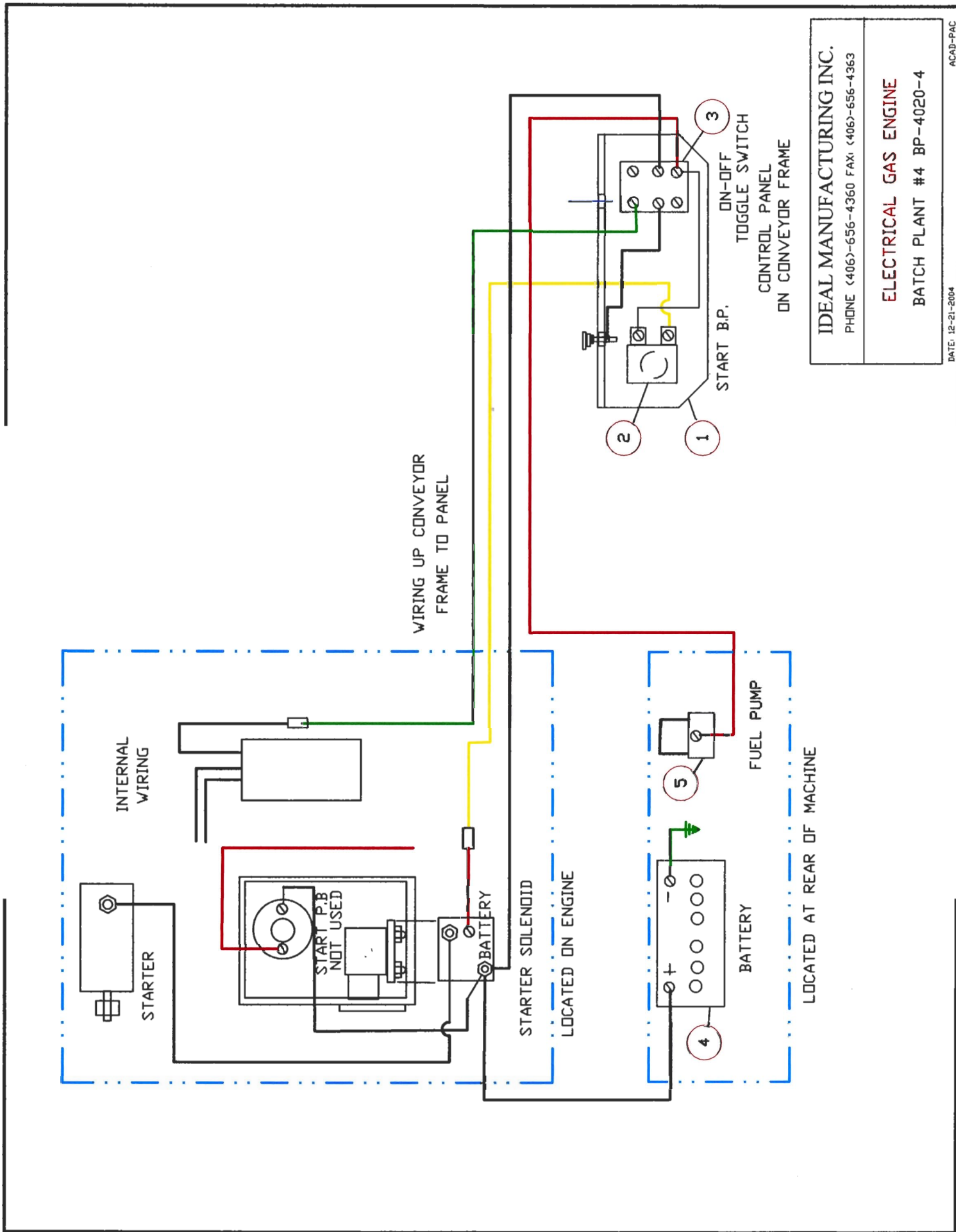
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 CONVEYOR DRIVE
 GAS OR DIESEL ENGINE
 BATCH PLANT #4 BP-4013-4

DATE: 12-20-2004
 ACAD-PAC/THH

**FAST-WAY BATCH PLANT #4
GAS ENGINE DRIVE - ELECTRICAL**

DRAWING BP-4020-4

REF NO.	PARTS NO.	DESCRIPTION	REQ'D NO.
1	BP0126	Mounting Bracket	1
2	POO557	Start Push Button	1
3	POO174	Toggle Switch	1
4	POO374	Battery	1
5	POO182	Fuel Pump	



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ELECTRICAL GAS ENGINE
 BATCH PLANT #4 BP-4020-4

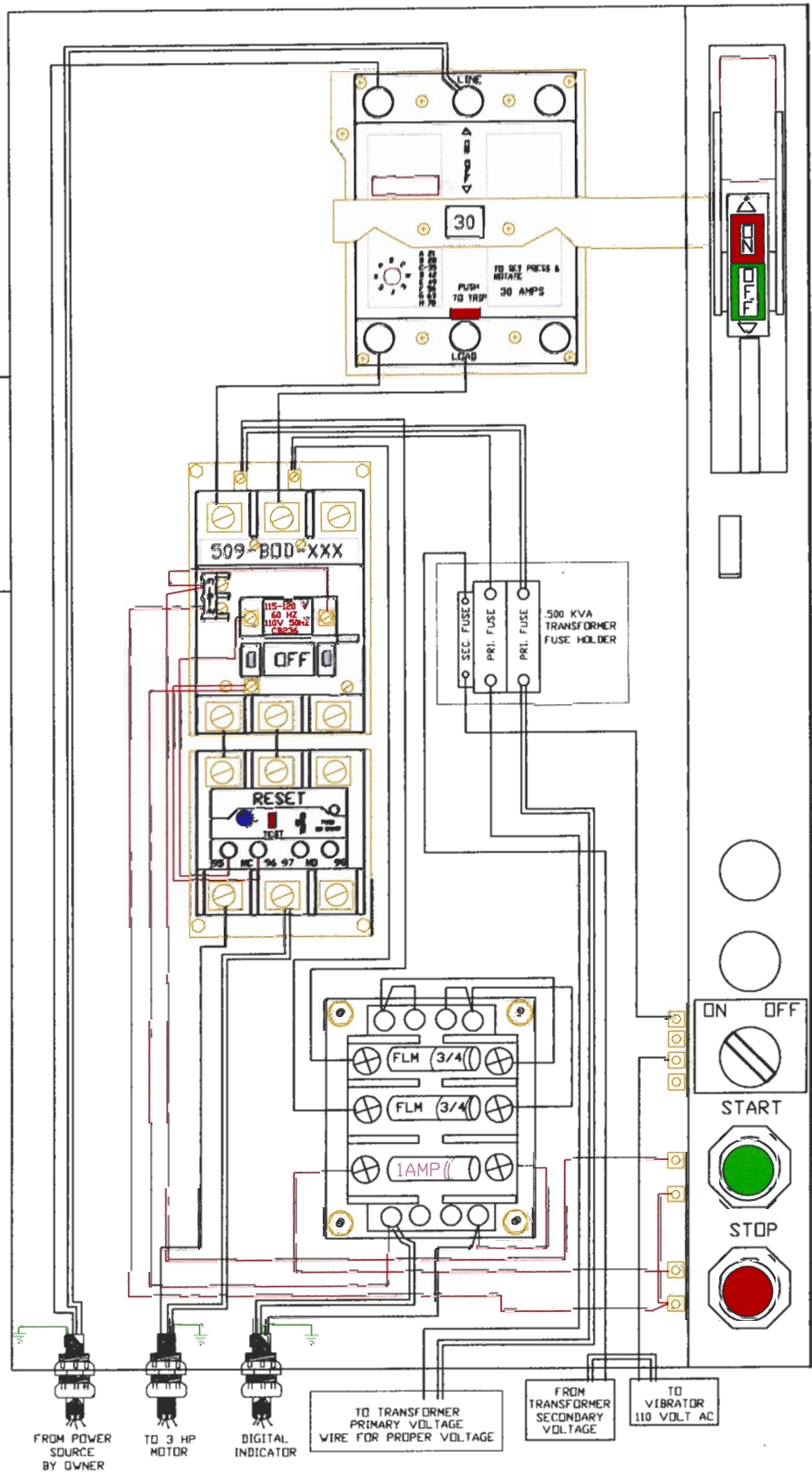
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COMBINATION STARTER
 513-BJA-XXX-1-40-6P
 3 HP SINGLE PHASE 240 V
 NEMA SIZE 1
 30 AMP CIRCUIT BREAKER

509-BDD-XXX STARTER
 592P-S2FC 14-45 AMP OVERLOAD RELAY
 1497-N2PK 80 VA TRANSFORMER
 PRIMARY FUSE 1 AMP/KLDR
 SECONDARY FUSE .75 AMP/FLM
 ENCLOSURE SIZE
 10"W X 26 3/8"H X 8 7/32" DEEP

TRANSFORMER
 .500 KVA #PE0280
 DOUBLE FUSE HOLDER
 #PE0931
 FUSE #PE0932
 SINGLE FUSE HOLDER
 #PE0933
 FUSE #PE0934

TRANSFORMER
 .500 KVA



FROM POWER SOURCE BY OWNER

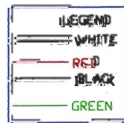
TO 3 HP MOTOR

DIGITAL INDICATOR

TO TRANSFORMER PRIMARY VOLTAGE WIRE FOR PROPER VOLTAGE

FROM TRANSFORMER SECONDARY VOLTAGE

TO VIBRATOR 110 VOLT AC



REVISIONS		
NO	DATE	DESCRIPTION
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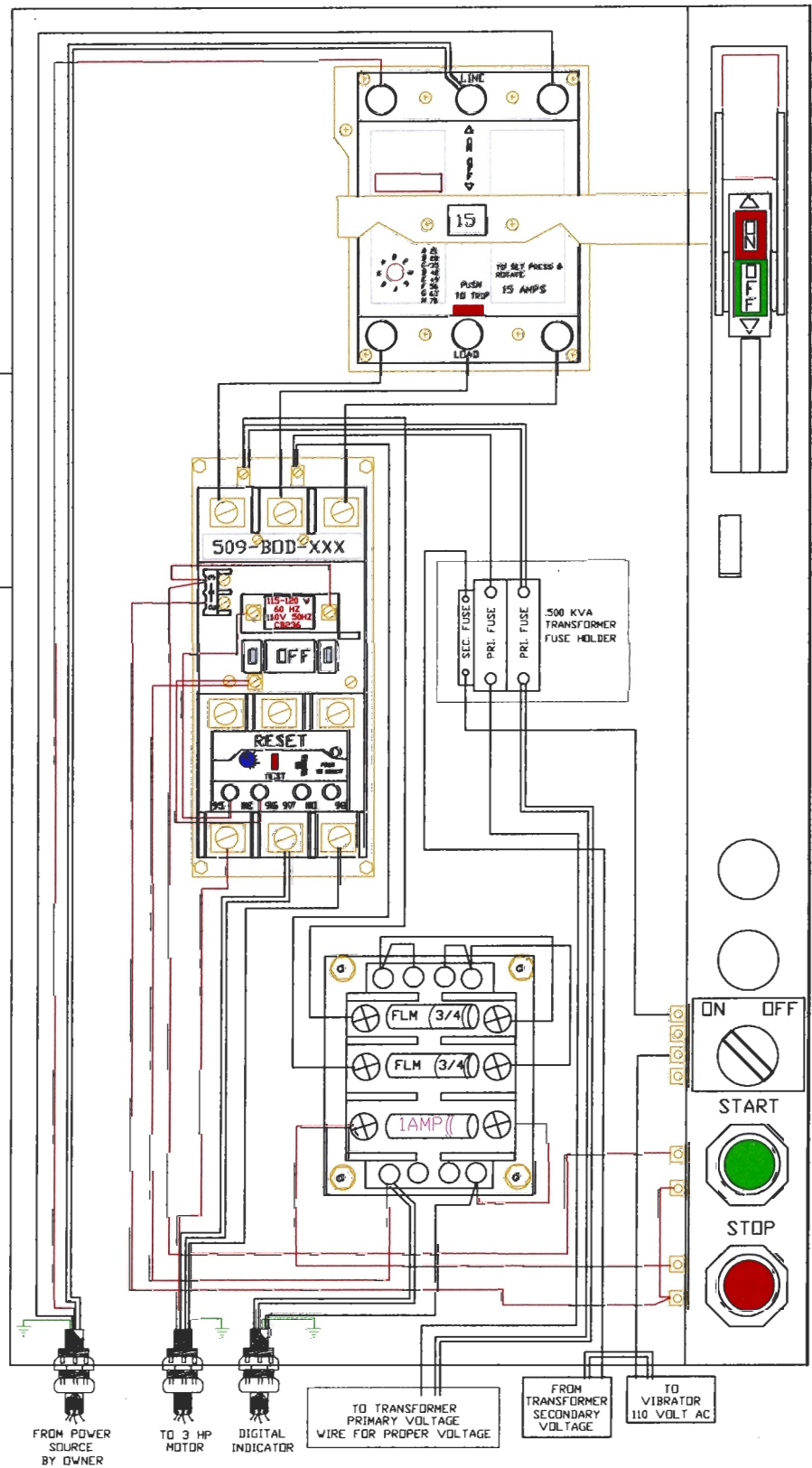
IDEAL MANUFACTURING INC.
 2011 HARNISH BLVD, BILLINGS MT, 59101
 PHONE: (406)656-4360 FAX: (406)656-4363
 BATCH PLANT #4
 ELECTRICAL CONTROL PANEL
 240 VOLT SINGLE PHASE
 PRIMARY 110 V SECONDARY
 PAC ACAD

COMBINATION STARTER
 513-BJA-A2G-1-38-6P
 3 HP 3 PHASE 240 V
 NEMA SIZE 1
 15 AMP CIRCUIT BREAKER

509-BDD-XXX STARTER
 592-A2GA OVERLOAD RELAY
 1497-N2PK 80 VA TRANSFORMER
 PRIMARY FUSE 1 AMP/KLDR
 SECONDARY FUSE .75 AMP/FLM
 ENCLOSURE SIZE
 10"W X 26 3/8"H X 8 7/32" DEEP

TRANSFORMER
 .500 KVA #PE0280
 DOUBLE FUSE HOLDER
 #PE0931
 FUSE #PE0932
 SINGLE FUSE HOLDER
 #PE0933
 FUSE #PE0934

TRANSFORMER
 .500 KVA



LEGEND
 — WHITE
 — RED
 — BLACK
 — GROUND

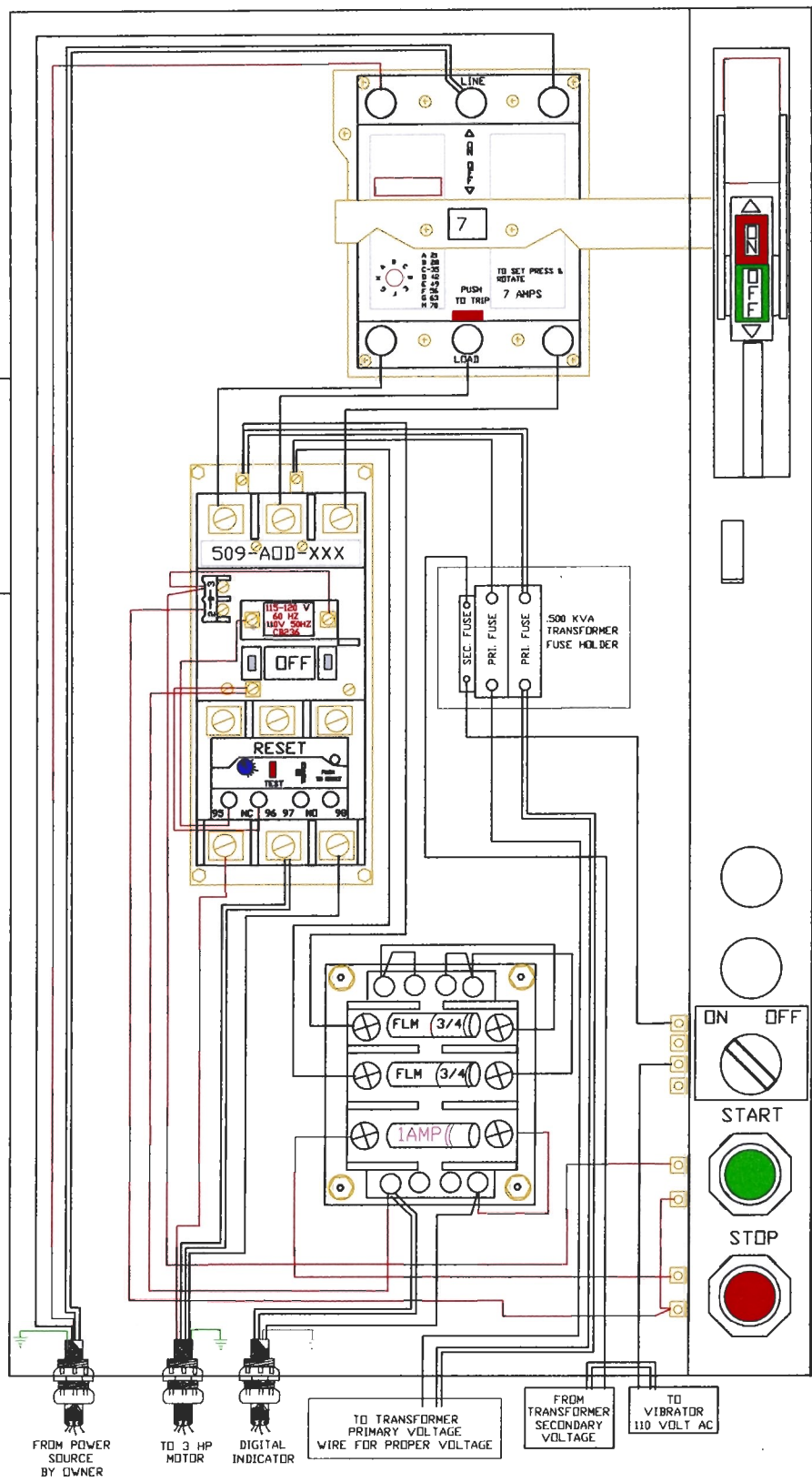
REVISIONS			IDEAL MANUFACTURING INC.	
NO	DATE	DESCRIPTION	2011 HARNISH BLVD, BILLINGS MT, 59101	
01	01-03-08	ADD TRANSFORMER FUSES	PHONE: (406)656-4260 FAX: (406)656-4363	
			BATCH PLANT #4	
			ELECTRICAL CONTROL PANEL	
			240 VOLT 3 PHASE	
			PRIMARY 110 V SECONDARY	
			DATE: 12-20-2004 BVG # BP 2000E-3	

COMBINATION STARTER
 513-AJB-A2F-1-38-6P
 3 HP 3 PHASE 440 V
 NEMA SIZE 0
 7 AMP CIRCUIT BREAKER

509-ADD-XXX STARTER
 592-A2FA OVERLOAD RELAY
 1497-N2PK 80 VA TRANSFORMER
 PRIMARY FUSE 1 AMP/KLDR
 SECONDARY FUSE .75 AMP/FLM
 ENCLOSURE SIZE
 10"W X 26 3/8"H X 8 7/32" DEEP

TRANSFORMER
 .500 KVA #PE0280
 DOUBLE FUSE HOLDER
 #PE0931
 FUSE #PE0932
 SINGLE FUSE HOLDER
 #PE0933
 FUSE #PE0934

TRANSFORMER
 .500 KVA



FROM POWER SOURCE BY OWNER

TO 3 HP MOTOR

DIGITAL INDICATOR

TO TRANSFORMER PRIMARY VOLTAGE WIRE FOR PROPER VOLTAGE

FROM TRANSFORMER SECONDARY VOLTAGE

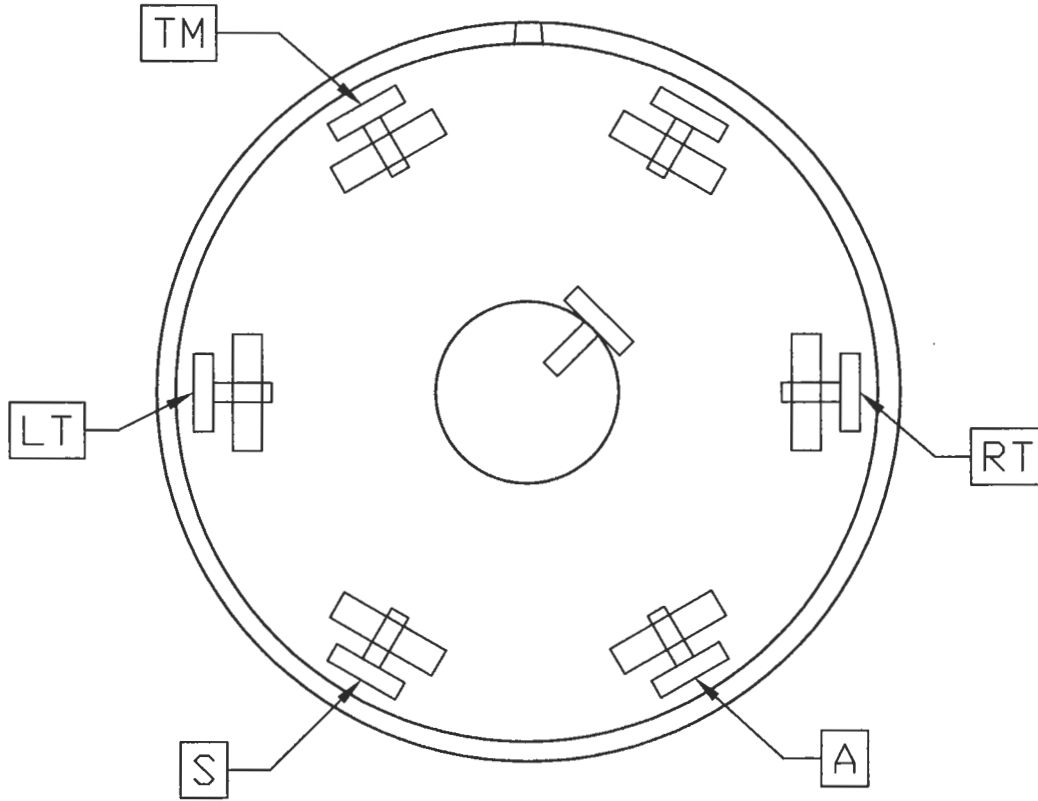
TO VIBRATOR 110 VOLT AC

LEGEND	
—	WHITE
—	RED
—	BLACK
—	GROUND

REVISIONS		
NO	DATE	DESCRIPTION
01	01-03-08	ADD TRANSFORMER FUSES

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BATCH PLANT #4	
ELECTRICAL CONTROL PANEL	
440 VOLT 3 PHASE PRIMARY 110 V SECONDARY	PAC ACAD
DATE: 12-28-2004 DWG # BP 2008E-3	

TOP
INSIDE VIEW



SEVEN POLE PLUG CONNECTOR

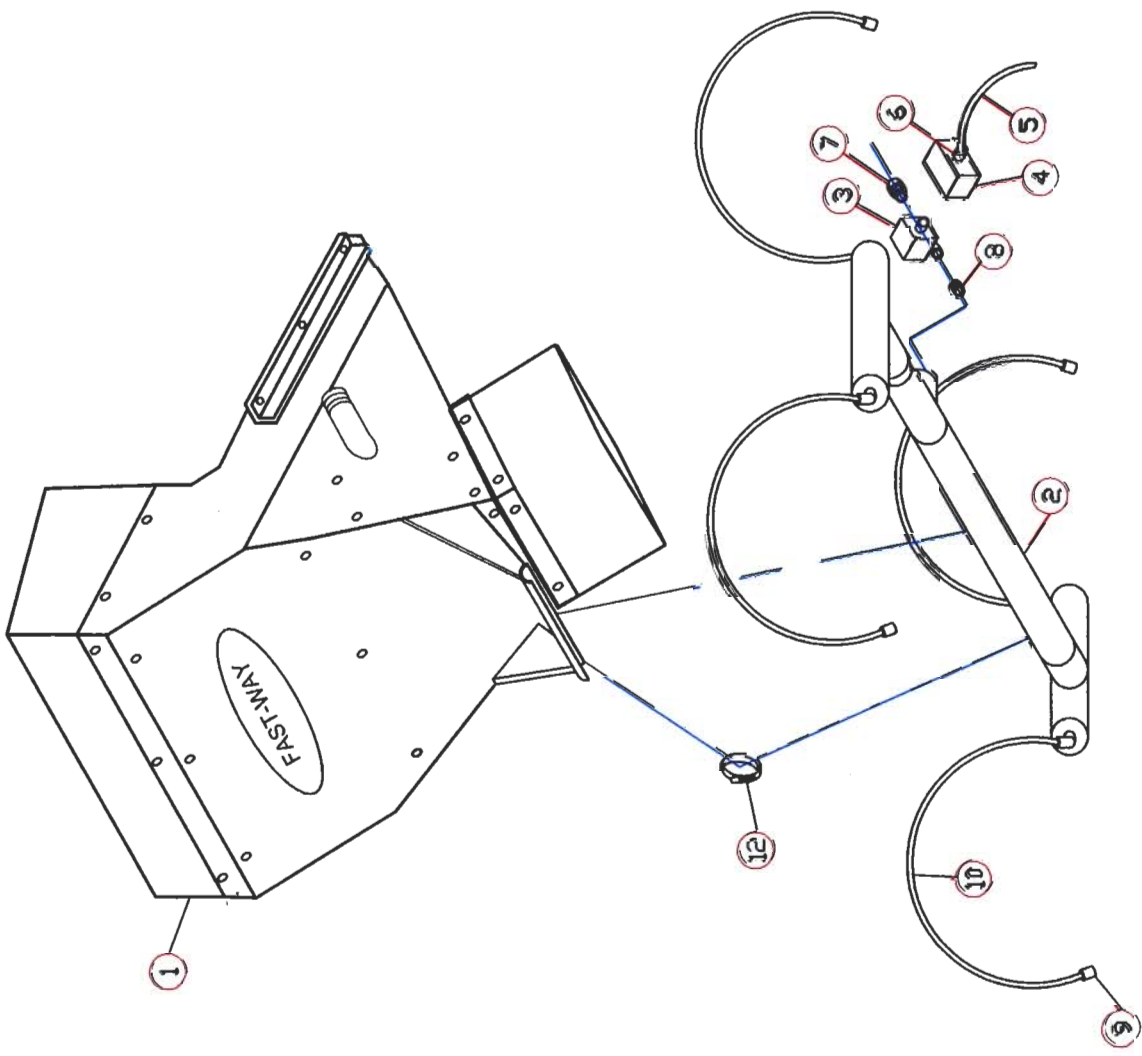
	DESCRIPTION	
TM	Tail & Clearance Lights	BROWN
S	Brake Ground	WHITE
RT	Right Signal	GREEN
LT	Left Signal	YELLOW
GD	Ground for Lights	WHITE
A	Hot Wire for Brake	BLACK

IDEAL MANUFACTURING INC.

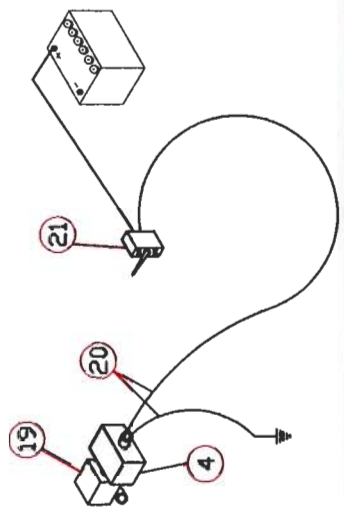
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BATCH PLANT #4 ELECTRICAL
CONNECTION FOR TOWING

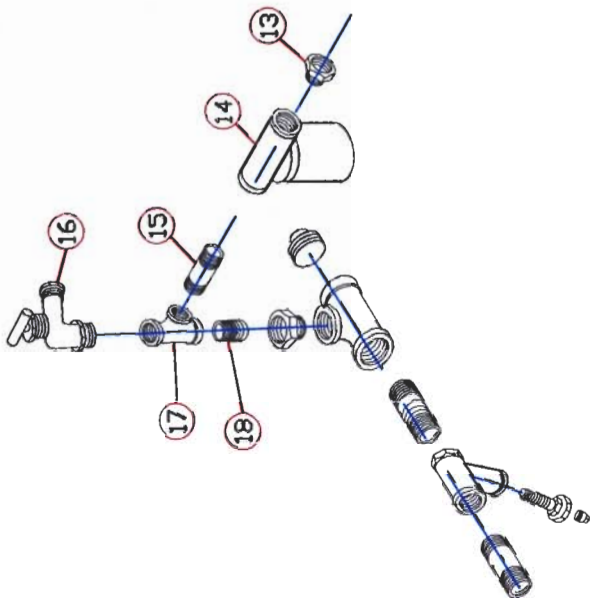
BATCH PLANT #4 DWG # BP-4002-4



12 VOLT DC CONNECTION
 BLACK WIRE TO GROUND
 WHITE WIRE TO FIRST TERMINAL ON SWITCH
 WHITE WIRE FROM SECOND TERMINAL ON SWITCH
 TO POSITIVE ON BATTERY



LINE STRAINER CONNECTION
 LOCATED BY WATER METER



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OPTIONAL
 DUST SUPPRESSION SYSTEM
 BATCH PLANT #4 BP-4020-4

DATE: 07-28-2005

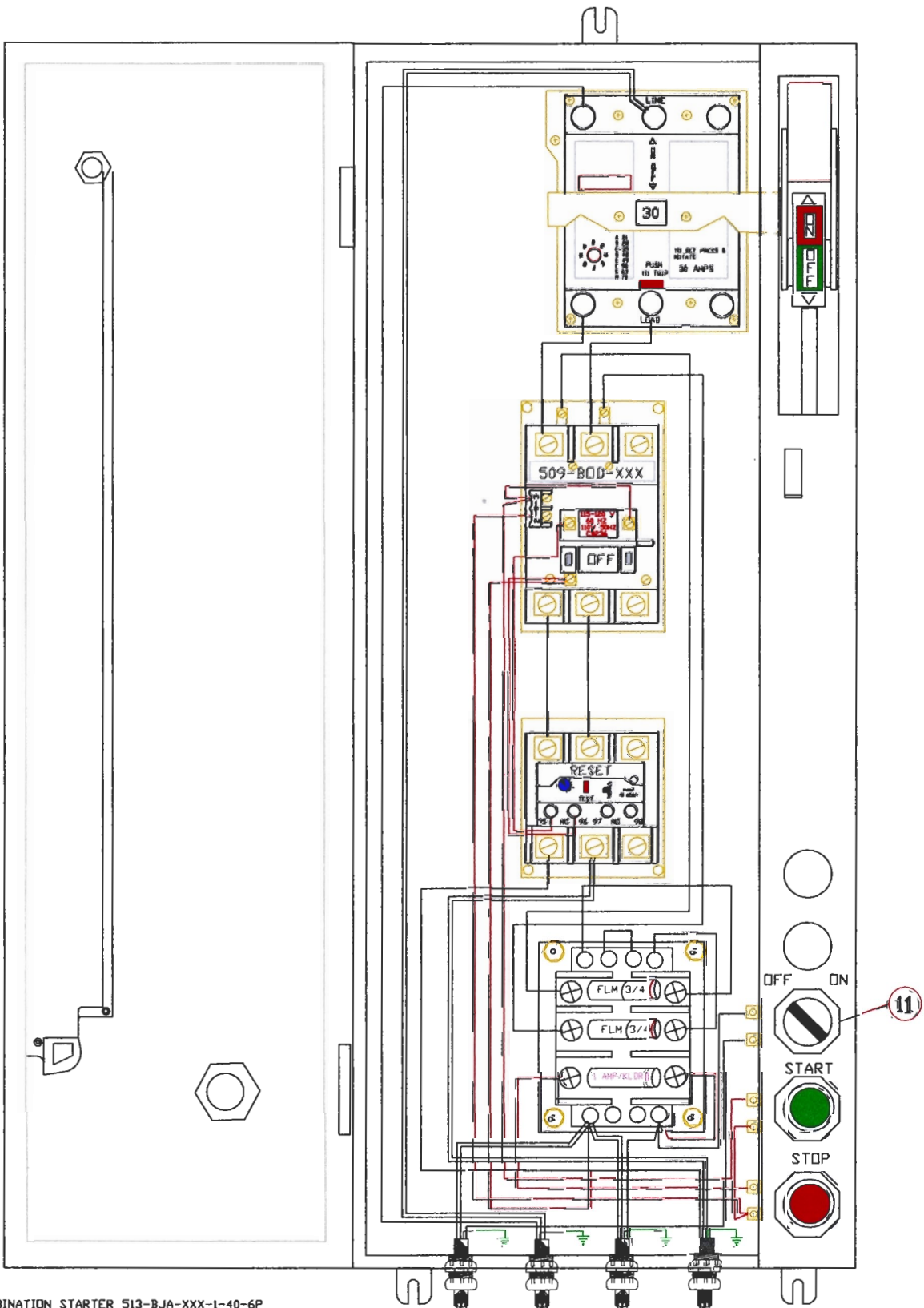
ACAD-T1H

**FAST-WAY BATCH PLANT #4
OPTIONAL
DUST SUPPRESSION SYSTEM
DRAWING BP-4020-4**

REF. NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	BP0145	Discharge Chute	NA
2	?	Manifold	1
3	?	Solenoid Valve 110 volt ac	1
4	?	Junction Box	1
5	?	Electrical wire	1
6	?	Strain Relief	1
7	?	Female Garden Hose Fitting	1
8	OTO133	Nipple	1
9	?	Spray Nozzle	4
10	?	Tubing	4
11	?	Electrical Switch (see drawing page 44)	1
12	?	Hose Clamp	2
13	?	Male Garden Hose Fitting	1
14	?	Line Strainer	1
15	POO420	Nipple	1
16	POO420	Water Hose Bib	1
17	?	Tee	1
18	?	Nipple	1
PARTS FOR 12 VOLT SYSTEM			
19	?	Solenoid Valve 12 volt dc	1
20	?	Electrical wire	1
21	?	Electrical Switch	1

INSTALLATION

Using hose clamps part #12 attach manifold part #2 in saddle on discharge hopper part #1. Level manifold before tightening the hose clamps. Connect garden hose (supplied by customer) to solenoid valve. Secure garden hose and electrical wire down the side of the conveyor frame. Remove hose bib from existing tee. Install close nipple part #18 into the existing tee. Install parts #13 14 15 16 and 17 as shown in drawing BP-4020-4 page 42. Connect garden hose to part #13. See drawing BP-4021-4 for 110 volt ac electrical connections. Bend tubing part #10 to adjust spray nozzles for best spray coverage.



COMBINATION STARTER 513-BJA-XXX-1-40-6P
 3 HP 240 VOLT SINGLE PHASE
 NEMA SIZE 1
 30 AMP CIRCUIT BREAKER

509-BDD-XXX STARTER
 1497-N2PK 80 VA TRANSFORMER
 PRIMARY FUSE 1 AMP/KLDR
 SECONDARY FUSE .75 AMP/FLM
 592P-S2FC 14-45 AMP OVERLOAD RELAY
 (MOUNTED SEPARATE FROM STARTER)

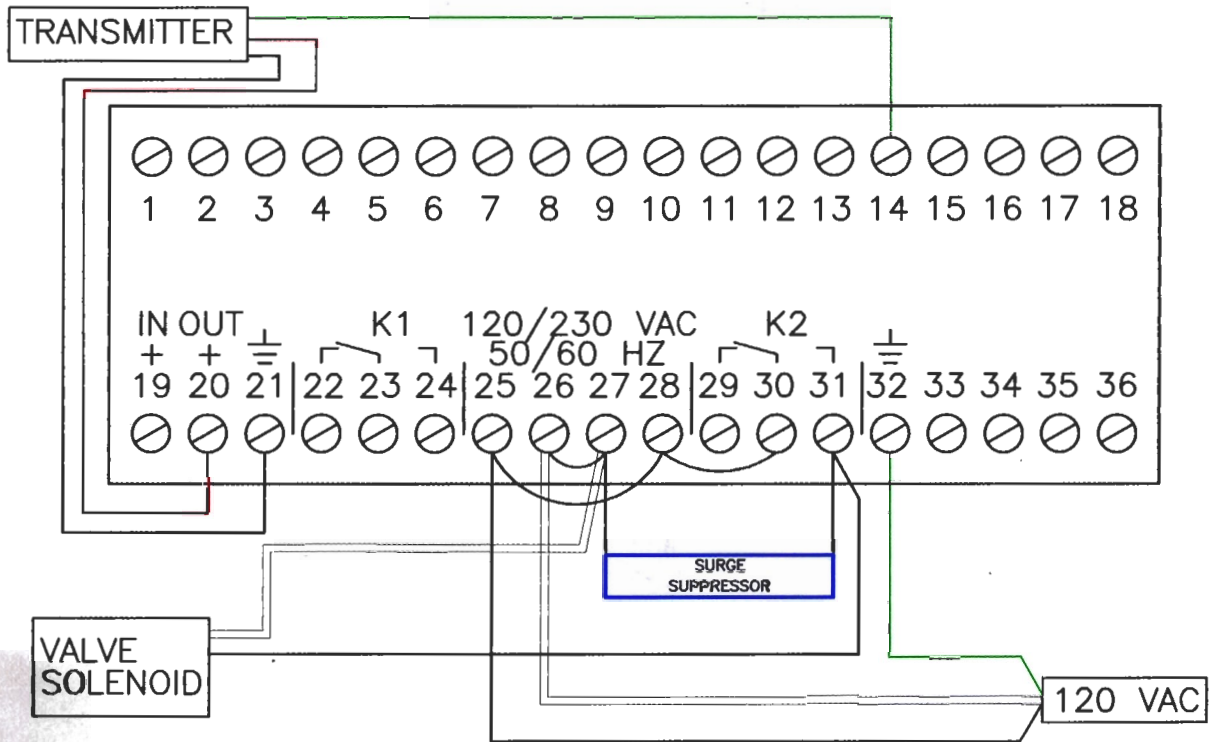
ENCLOSURE SIZE 10" X 24" X 8 7/32" DEEP

LEGEND	
WHITE	POWER
RED	FIELD
BROWN	BRANCH
GREEN	GROUND

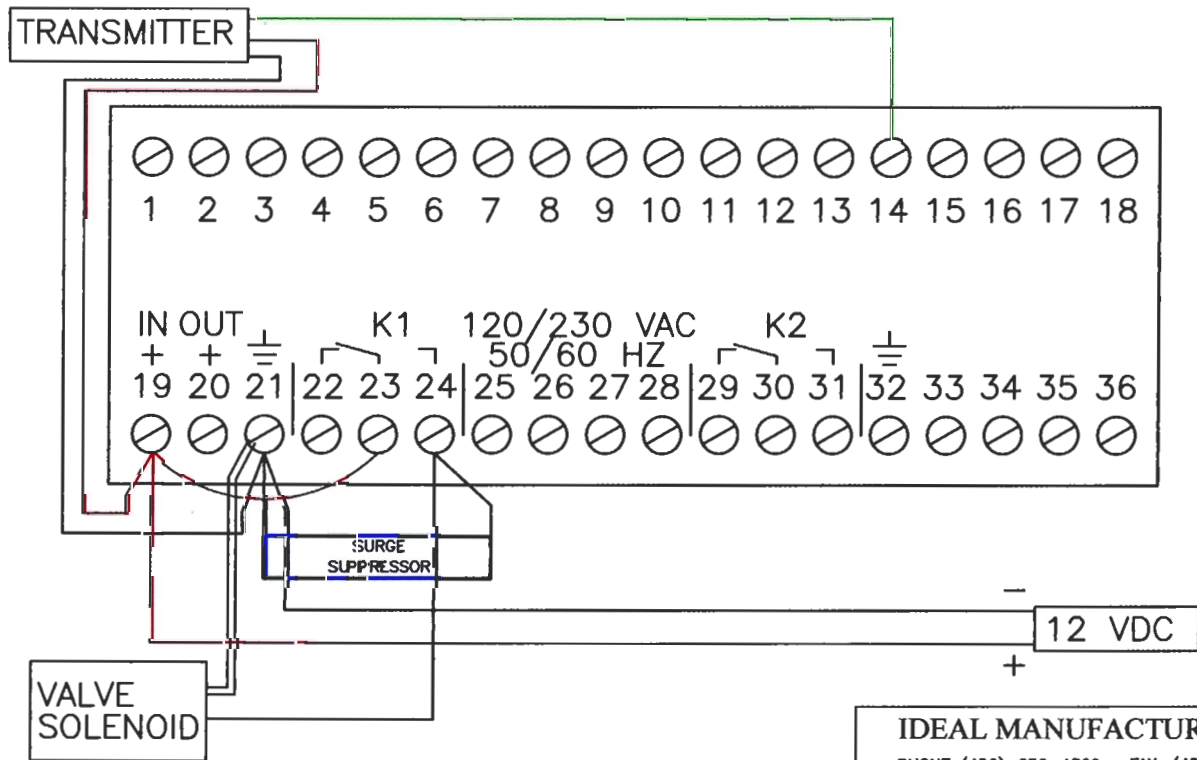
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NO	DATE	DESCRIPTION

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PHONE: (406) 556-4500 FAX: (406) 556-4363	
BATCH PLANT #4	
ELECTRICAL CONTROL PANEL	
OPTIONAL DUST SUPPRESSION SYSTEM	
PAC	THK
REV: 07-29-2005	DES: WJW-0004

120 VOLT AC CONNECTION



12 VOLT DC CONNECTION



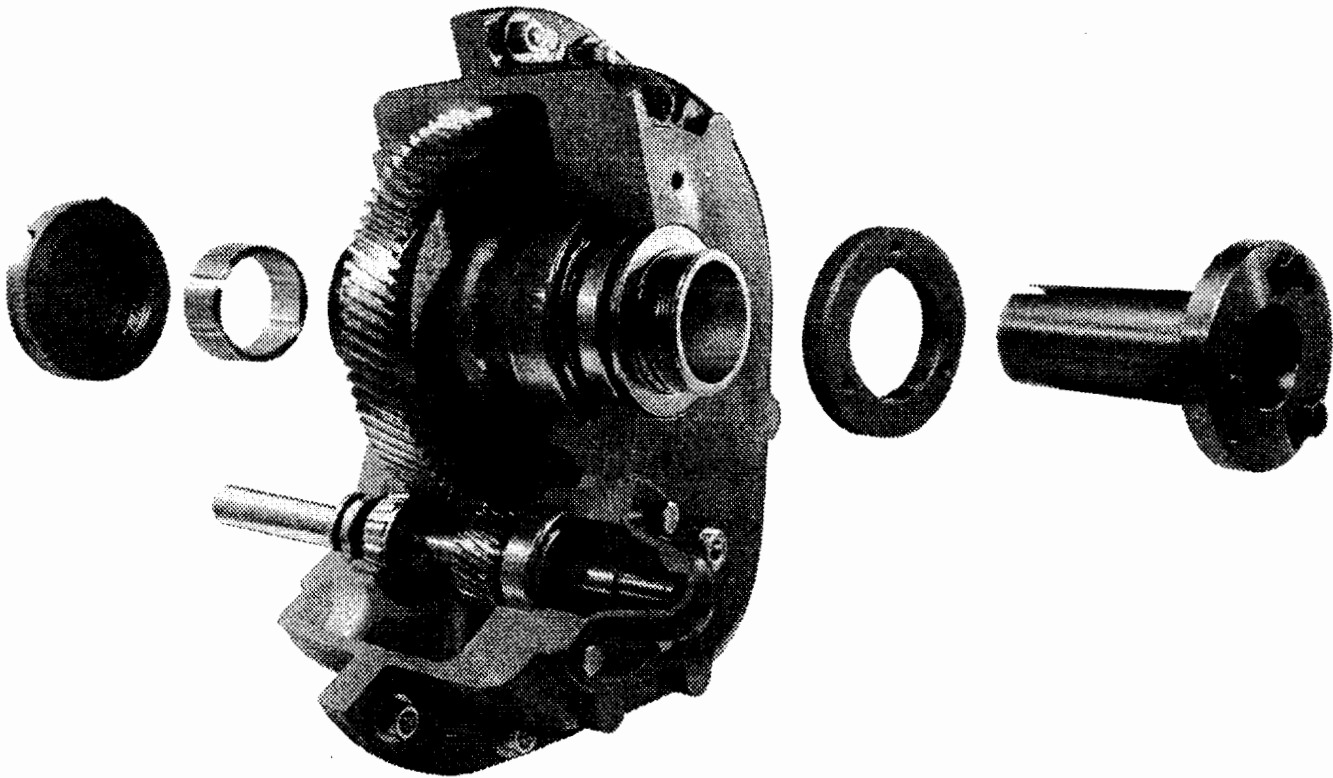
IDEAL MANUFACTURING INC.
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BATCH PLANT #4 ELECTRICAL
WATER METER WIRING
 BATCH PLANT #4 DWG # BP-4022-4

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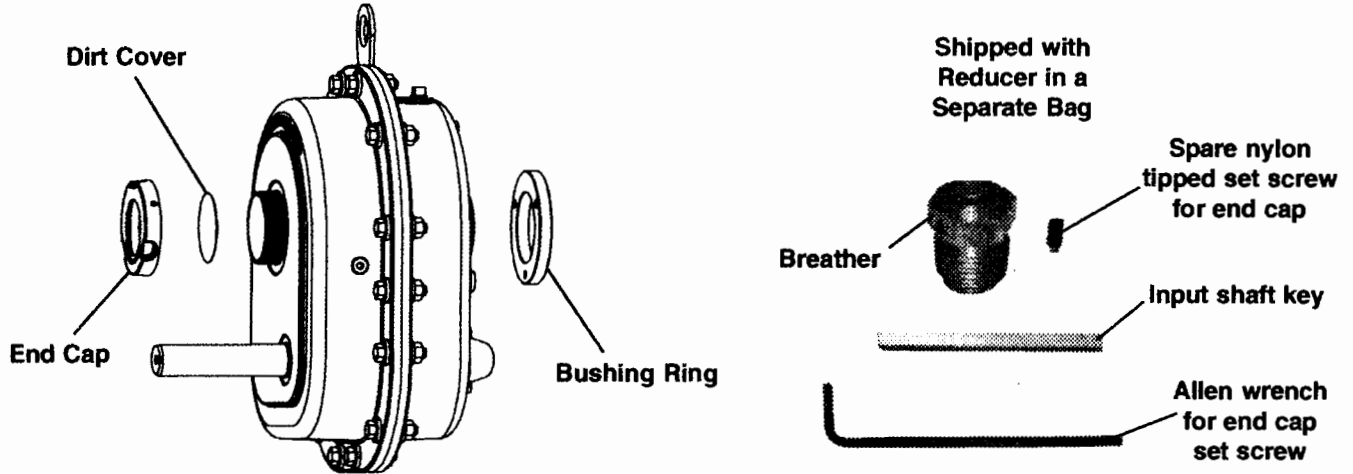
FORM
8780-A
Revised
October 11, 2002

**TORQ TAPER[®] Plus
HELICAL SHAFT MOUNT
SPEED REDUCERS
INSTALLATION &
MAINTENANCE MANUAL**



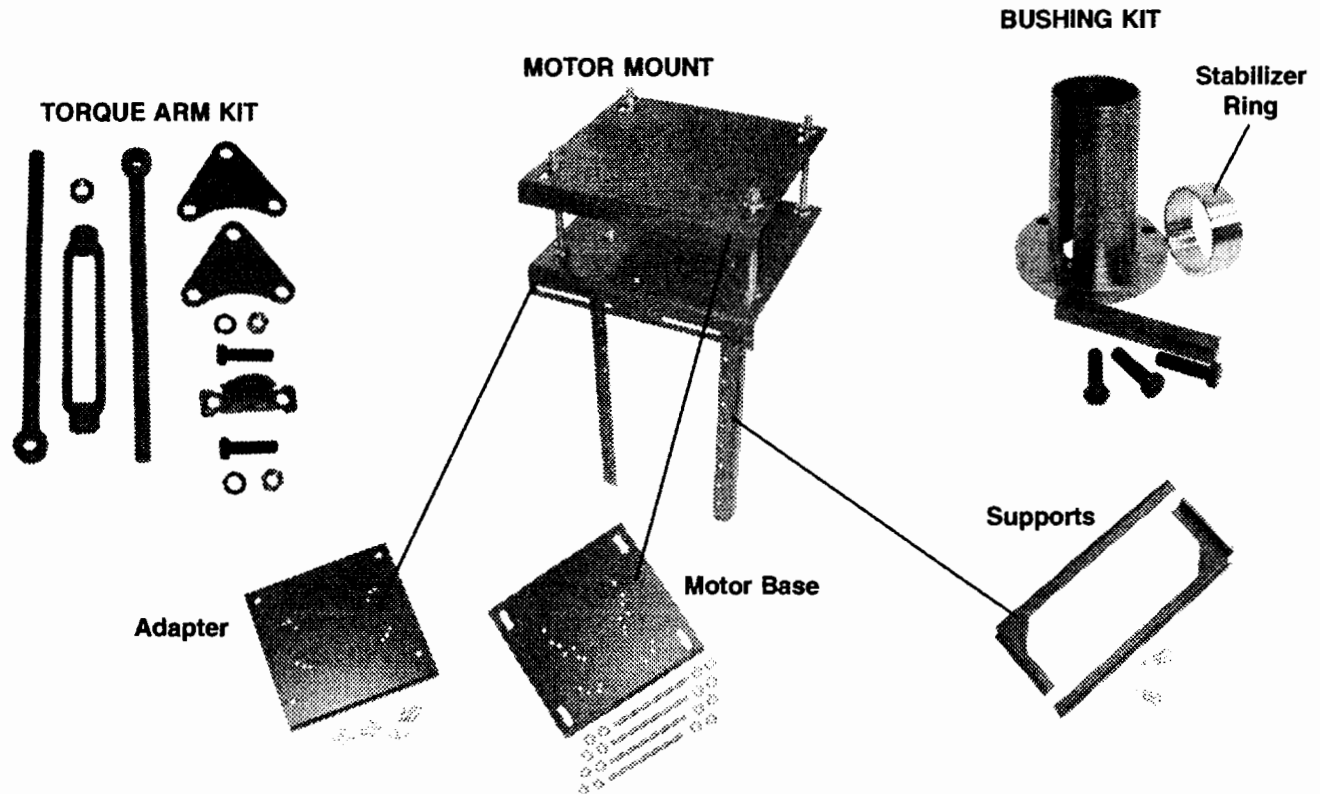

EMERSON
Industrial Automation

PARTS INCLUDED WITH REDUCER



Note: Bushing Ring, End Cap & Dirt Cover are installed on the reducer at time of shipment.

PARTS INCLUDED WITH ACCESSORIES



▲WARNING Disconnect all power before adjusting units

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	▲WARNING High voltage and rotating parts may cause serious or fatal injury. Turn off power to install or service. Operate with guards in place. Read and follow all instructions in this manual.	
--	---	--

▲WARNING Disconnect all power before adjusting units

1. SHAFT MOUNT REDUCER INSTALLATION INSTRUCTIONS

For long service and dependable performance, a shaft mount reducer must be rigidly supported and accurately aligned. The following instructions are a step-by-step guide to meeting these requirements for a BROWNING Torq-Taper Plus shaft mounted reducer. If there is a need to vary from any of these installation instructions, contact the EPT Technical Services Department before completing the installation.

▲CAUTION Shaft mounted reducers use bushings to mount the reducer to various driven shaft sizes. When the driven shaft is smaller than the maximum bushing size for the reducer, the driven shaft and key stresses for the application should be reviewed.

▲WARNING Do not operate without guards. Turn off power to install or service.

1.1 Reducer and Driven Shaft Preparation

1.1.1 The driven shaft diameter is to be within the commercial tolerances for turned and polished round bars. The key and keyseat in the driven shaft are to be in accordance with commercial standards for size, depth, offset, lead and parallelism.

1.1.2 The driven shaft on which the reducer is to be mounted must be straight, clean and free of burrs.

1.1.3 Rotate the driven shaft on which the reducer is to be mounted so the shaft keyseat is in the upward position.

1.1.4 A lifting lug is provided to lift the reducer into position. The lifting lug may be repositioned onto any one of the housing flange bolts as required. After repositioning, all housing flange bolts must be reinstalled to the recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION.

▲WARNING Never lift the reducer by the input shaft. Lifting lug should only be used to lift the weight of the reducer. Do not use lifting lug to lift attached assemblies.

1.1.5 Do not apply grease, oil or an anti-seize compound to the taper bore of the reducer, barrel of the bushing or bushing bore. If any of these substances are applied, equipment failure and personal injury may result.

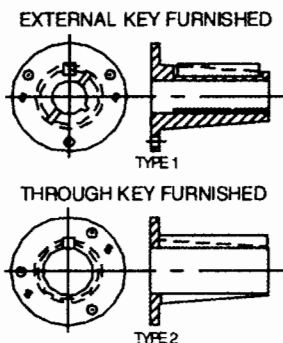


FIGURE 1-1

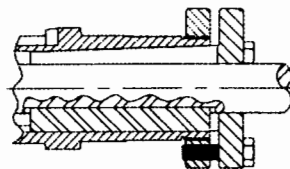


FIGURE 1-2

1.2 Determine Mounting Configuration

Due to its unique design, the BROWNING Torq-Taper Plus shaft mounted reducer may be mounted to a driven shaft in a variety of configurations. The following instructions will help determine the correct mounting configuration based on the available driven shaft and key length.

1.2.1 Measure the available driven shaft length (in inches) starting from the end of the driven shaft to the first obstruction or point of interference. Record this dimension as H - Minimum Shaft Mounting Length.

1.2.2 Measure the length of the available keyseat in the driven shaft (in inches) starting from the end of the driven shaft to the end of the usable keyseat. Record this dimension as K - Minimum Key Connection Length.

1.2.3 The following Sections - 1.3, 1.4 and 1.5, show the three standard mounting configurations for the BROWNING Torq-Taper Plus shaft mounted reducer. Refer to the following sections in sequence to determine the optimum mounting configuration for the application.

1.2.4 Using the appropriate reducer size in the Tables 1-3, 1-4 and 1-5, compare the measured values for H and K to the tabulated values of H and K. If the measured values for H and K are **greater than** the tabulated values, the mounting configuration shown in the figure may be used. If the measured values for H and K are **less than** the tabulated values, proceed to the next figure and repeat this step.

Note: If the measured values for H and K are less than the tabulated values shown in Table 1-5, contact the EPT Technical Services Department.

1.3 Front Mounting Configuration with Stabilizer Ring

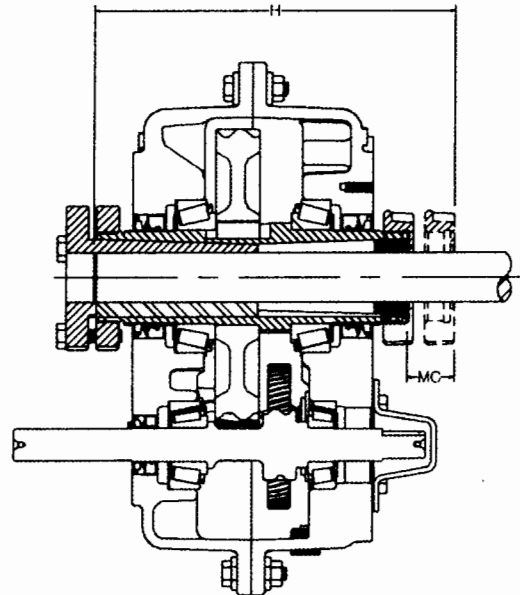


FIGURE 1-3
Front Mounting Configuration with Stabilizer Ring

▲WARNING Disconnect all power before adjusting units

Table 1-3 Dimensions for Front Mounting Configuration with Stabilizer Ring

REDUCER SIZE	ENDCAP CLEARANCE	MINIMUM SHAFT MOUNTING LENGTH	MINIMUM KEY CONNECTION LENGTH
	MC	H	K
107	0.97	8.25	4.38
115	1.03	8.77	4.63
203	1.15	9.46	5.13
207	1.21	10.35	5.63
215	1.31	11.55	6.13

1.3.1 On the input shaft side, thread the bushing ring onto the hollow quill until the bushing ring is flush with the end of the quill.

1.3.2 Place the endcap on the driven shaft with the threaded bore facing the end of the shaft. Slide the stabilizer ring on the driven shaft with the small end of the taper toward the end of the shaft.

1.3.3 Rotate reducer input shaft to align keyway in hollow quill with shaft key. Position reducer on shaft with the bushing ring toward the end of the shaft.

1.3.4 For Type 1 bushings which require an external key and a shaft key Install key (supplied with bushing) in the external keyseat of bushing as shown in Figure 1-1. Install a shaft key (not supplied) in shaft keyseat and retain to prevent movement. Install bushing on shaft, tapered end first. Align bushing keyway with shaft key and position bushing over key.

Note: Key length must be sufficient to engage full length of bushing. Shaft must engage full length of bushing.

1.3.5 For Type 2 bushings which require one key Install bushing on shaft, tapered end first. Align keyway in bushing with keyseat in shaft and install shaft key. Position shaft key flush against the inside flange surface of bushing as shown in Figure 1-2.

Note: There are three (3) series of bushing keys used in the Type 2 bushing system: rectangular, square and offset. In most cases, the key supplied will be rectangular or offset. Use caution when installing rectangular keys as some may visually appear to be square. Key should install in bushing keyway with a sliding type fit. Key in shaft keyseat should be retained to prevent movement.

Note: Shaft must engage full length of bushing.

1.3.6 Rotate bushing ring clockwise until tapped holes align with drilled holes in bushing flange. Prior to tightening capscrews, make sure bushing key is as close as possible to the inside flange of bushing as shown in Figure 1-2 and bushing positioned on shaft as required Figure 1-3.

1.3.7 Slide the stabilizer ring into the hollow quill. Thread the endcap onto the hollow quill until hand tight. Do not over tighten the endcap.

1.3.8 Install bushing capscrews and tighten all capscrews evenly around the bushing flange to the recommended torque See BOLT TORQUE SPECIFICATIONS SECTION.

▲WARNING Capscrews must thread into bushing ring and not bushing. Threaded holes in bushing are for removal only. If assembled incorrectly, equipment failure and personal injury may result.

1.3.9 Tighten the endcap again until hand tight. Tighten setscrew to the recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION.

1.4 Rear Mounting Configuration with Stabilizer Ring

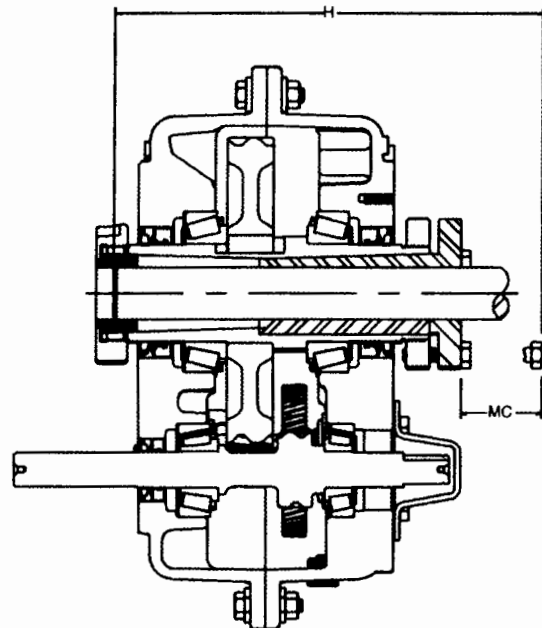


FIGURE 1-4
Rear Mounting Configuration with Stabilizer Ring

Table 1-4 Dimensions for Rear Mounting Configuration with Stabilizer Ring

REDUCER SIZE	BOLT CLEARANCE	MINIMUM SHAFT MOUNTING LENGTH	MINIMUM KEY CONNECTION LENGTH
	MC	H	K
107	1.88	9.27	7.89
115	1.88	9.74	8.36
203	1.88	10.81	9.43
207	1.88	11.13	9.75
215	1.88	12.23	10.85

▲WARNING Disconnect all power before adjusting units

1.4.1 For Type 1 bushings which require an external key and a shaft key Install key (supplied with bushing) in the external keyseat of bushing as shown in Figure 1-1. Install a shaft key (not supplied) in shaft keyseat and retain to prevent movement. Install bushing on shaft, flanged end first, align bushing keyway with shaft key and position bushing over key.

Note: Key length must be sufficient to engage full length of bushing. Shaft must engage full length of bushing.

1.4.2 For Type 2 bushings which require one through key Install bushing on shaft, flanged end first. Align keyway in bushing with keyseat in shaft and install shaft key. Position shaft key flush against the inside flange surface of bushing. See Figure 1-2 Shaft Key and Bushing Location.

Note: There are three (3) series of bushing keys used in the Type 2 bushing system: rectangular, square and offset. In most cases, the key supplied will be rectangular or offset. Use caution when installing rectangular keys as some may visually appear to be square. Key should install in bushing keyway with a sliding type fit. Key in shaft keyseat should be retained to prevent movement.

Note: Shaft must engage full length of bushing.

1.4.3 On the side opposite of the input shaft, thread the bushing ring onto the hollow quill until the bushing ring is flush with the end of the hollow quill. Rotate reducer input shaft to align keyway in hollow quill with bushing/shaft key. Position reducer on shaft with the bushing ring toward the bushing.

1.4.4 Slide the stabilizer ring onto the driven shaft with the small end of the taper toward the reducer. Insert stabilizer ring into the quill.

1.4.5 Thread the endcap and dirt cover (if used) onto the hollow quill until hand tight. Do not over tighten the endcap.

1.4.6 Rotate bushing ring clockwise until tapped holes align with drilled holes in bushing flange. Prior to tightening capscrews, make sure bushing key is as close as possible to the inside flange of bushing as shown in Figure 1-2 and bushing is positioned on shaft as required in Table 1-4 Dimensions for rear mounting configuration with stabilizer ring.

1.4.7 Install bushing capscrews and tighten all capscrews evenly around the bushing flange to the recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION.

1.4.8 Tighten the endcap again until hand tight. Tighten setscrew to the recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION.

▲WARNING Capscrews must thread into bushing ring and not bushing. Threaded holes in bushing are for removal only. If assembled incorrectly, equipment failure and personal injury may result.

1.5 Rear Mounting Configuration Without Stabilizer Ring

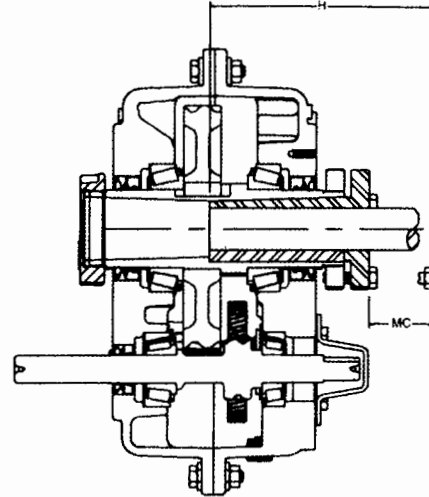


FIGURE 1-5
Rear Mounting Configuration without Stabilizer Ring

Table 1-5 Dimensions for Rear Mounting Configuration

REDUCER SIZE	BOLT CLEARANCE	MINIMUM SHAFT MOUNTING LENGTH	MINIMUM KEY CONNECTION LENGTH
	MC	H	K
107	1.88	6.25	4.38
115	1.88	6.50	4.63
203	1.88	7.00	5.13
207	1.88	7.50	5.63
215	1.88	8.00	6.13

1.5 Rear Mounting Configuration without Stabilizer Ring

1.5.1 For Type 1 bushings which require an external key and a shaft key Install key (supplied with bushing) in the external keyseat of bushing as shown in Figure 1-1. Install a shaft key (not supplied) in shaft keyseat and retain to prevent movement. Install bushing on shaft, flanged end first, align bushing keyway with shaft key and position bushing over key.

Note: Key length must be sufficient to engage full length of bushing. Shaft must engage full length of bushing.

1.5.2 For Type 2 bushings which require one through key Install bushing on shaft, flanged end first. Align keyway in bushing with keyseat in shaft and install shaft key. Position shaft key flush against the inside flange surface of bushing. See Figure 1-2 Shaft Key and Bushing Location.

▲WARNING Disconnect all power before adjusting units

Note: There are three (3) series of bushing keys used in the Type 2 bushing system: rectangular, square and offset. In most cases, the key supplied will be rectangular or offset. Use caution when installing rectangular keys as some may visually appear to be square. Key should install in bushing keyway with a sliding type fit. Key in shaft keyseat should be retained to prevent movement.

Note: Shaft must engage full length of bushing.

1.5.3 On the side opposite of the input shaft, thread the bushing ring onto the hollow quill until the bushing ring is flush with the end of the hollow quill. Rotate reducer input shaft to align keyway in hollow quill with bushing/shaft key. Position reducer on shaft with the bushing ring toward the bushing.

1.5.4 Thread the endcap and dirt cover onto the hollow quill until it bottoms out. Tighten the setscrew to recommended torque, do not overtighten. See BOLT TORQUE SPECIFICATIONS SECTION.

1.5.5 Rotate bushing ring clockwise until tapped holes align with drilled holes in bushing flange. Prior to tightening capscrews, make sure bushing key is as close as possible to the inside flange of bushing as shown in Figure 1-2 and bushing is positioned on shaft as required in Table 1-4 Dimensions for rear mounting configuration with stabilizer ring.

1.5.6 Install bushing capscrews and tighten all capscrews evenly around the bushing flange to the recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION.

2. TORQUE ARM INSTALLATION INSTRUCTIONS

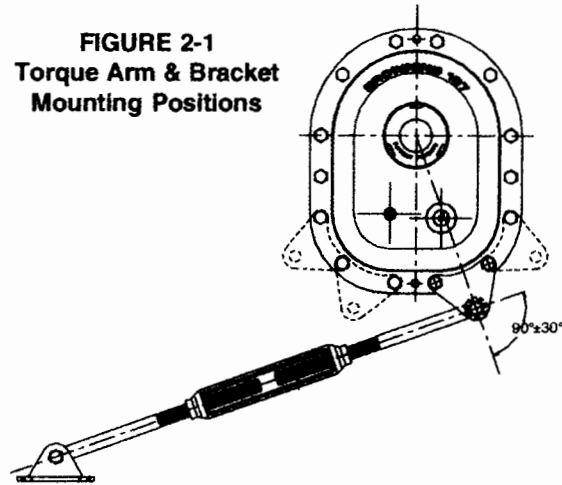
⚠ DANGER

Removal of *Torque Arm* can cause serious injury or death.

The *motor and gear box* assembly must be properly secured *prior to removal* of the *Torque Arm* or components.

2.1.1 The torque arm brackets may be positioned in any of the locations shown in Figure 2-1. Remove the housing flange bolts in the desired location and attach the torque arm brackets to the speed reducer housing flange. Reinstall the housing flange bolts and tighten to the recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION.

**FIGURE 2-1
Torque Arm & Bracket
Mounting Positions**



2.1.2 Thread the jam nut onto the threaded rod of the torque arm. Thread both rods into the turnbuckle. Both rod ends must extend into opening of turnbuckle.

2.1.3 Bolt the torque arm foot to a rigid support.

Note: The torque arm foot should be mounted in-line with the torque arm brackets.

2.1.4 Install the torque arm between the torque arm brackets and torque arm foot. Tighten the bolts to the recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION. The angle between the torque arm and a line through the hollow output shaft and the center of the torque arm bracket should be $90^\circ \pm 30^\circ$.

2.1.5 Rotate the turn buckle to achieve the proper angle then tighten the jam nut against the turn buckle.

Note: It is required that the torque arm be mounted in a tension/pull condition.

3. LUBRICATION INSTRUCTIONS

BROWNING TORQ TAPER^{Plus} reducers are shipped without oil. Before operating, the reducer must be filled with oil to the proper level to avoid equipment and/or personal injury. Refer to LUBRICATION SPECIFICATIONS SECTION for correct lube selection.

BROWNING TORQ TAPER^{Plus} reducers may be operated on horizontal shafts and on vertical shafts.

⚠ WARNING

Reducer shipped without oil. Fill to proper level before operating to avoid equipment damage and/or personal injury. Do not use lubricants with anti-wear/extreme pressure Additives, in units with internal backstops - these additives Decrease the backstops ability to prevent reverse rotation And will result in backstop failure which could cause Personal injury.

⚠ WARNING Disconnect all power before adjusting units

3.1 Horizontal Shaft Mounting

3.1.1 Figure 3-1 shows the breather, magnetic drain and oil level plug locations for the four standard mounting positions. The breather is installed in the fill hole in the top and the magnetic drain plug is installed in the bottom of the reducer in its relative position. Use oil level "A" for speeds at or below those shown in Table No. 3-1 Use oil level "B" for speeds above those shown in Table No. 3-1. For reducers mounted in other positions, refer to steps 3.1.4 or 3.2.

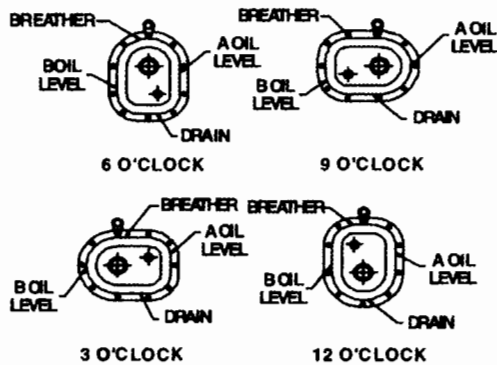


FIGURE 3-1

Table 3-1 Output Speed for Oil Level Selection

REDUCER SIZE	OUTPUT RPM FOR REDUCER RATIOS				
	5:1	9:1	15:1	25:1	35:1
107	400	184	120	70	40
115	382	173	120	70	40
203	326	128	113	70	40
207	275	112	99	70	40
215	236	97	85	70	40

3.1.2 Shaft mount reducers require different amounts of oil in the various mounting positions. For the convenience of having enough oil at the installation site, Table No. 3-2 shows the approximate amount of oil for the position requiring the most oil.

Table 3-2 Approximate Oil Capacities in Quarts

REDUCER SIZE	RATIO & POSITION			
	5:1		9, 15, 25, 35:1	
	HOR	VERT	HOR	VERT
107	1.00	2.00	1.00	2.00
115	1.25	2.75	1.20	2.56
203	3.00	4.50	2.50	4.00
207	3.50	6.75	3.00	6.30
215	5.50	9.50	5.00	9.00

3.1.3 Refer to LUBRICATION SPECIFICATIONS SECTION for the proper viscosity of oil. Remove the oil plug and breather. Fill with oil until it begins to run out the oil level hole. Replace the oil level plug and install breather as shown in Figure 3-1.

▲WARNING Petroleum based and synthetic lubricants which contain anti-wear/extreme pressure additives must not be used in units with internal backstops. These additives decrease the backstop's ability to prevent reverse rotation. Consequently, backstop failure will occur.

3.1.4 Operating positions may vary as much as 10° from the four positions shown in Figure 3-1 and still have adequate oil by using the indicated oil levels. If it is necessary to vary the operating position less than 10° from these positions, complete the following steps. For reducers operating more than 10° from standard position, contact the EPT Technical Service Department.

3.1.4.1 Release the torque arm.

▲WARNING See TORQUE ARM INSTALLATION INSTRUCTIONS SECTION before releasing the torque arm.

3.1.4.2 Rotate the reducer to the nearest of these standard positions.

3.1.4.3 Fill to the proper level.

3.1.4.4 Replace oil level plug.

3.1.4.5 Rotate the reducer back to its operating position and reconnect the torque arm.

Note: Reducers operating other than standard position should have a stand pipe or sight glass installed and marked at proper oil level in order to monitor oil level while in operating position. Contact the EPT Technical Service Department for assistance in selecting and installing required components.

3.2 Vertical Shaft Mounting

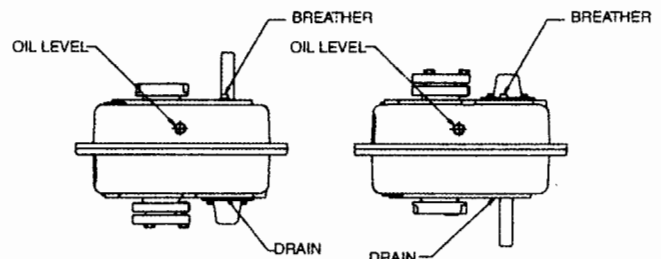


FIGURE 3-2

▲WARNING Disconnect all power before adjusting units

- 3.2.1 Figure 3-2 shows the breather, magnetic drain and oil level plug locations for the two vertical shaft mounting positions. The breather is installed in the fill hole in the top and the magnetic drain plug is installed in the bottom of the reducer in its relative positions.
- 3.2.2 Determine the location of the proper oil level plug and attach the enclosed "Oil Level" label pointing to that plug.
- 3.2.3 Refer to LUBRICATION SPECIFICATIONS SECTION for the proper viscosity of oil. Remove the oil level plug and fill through the breather location until it begins to run out the oil level hole. Install the oil level plug and the breather.

3.3 Relubrication Maintenance Schedule

- 3.3.1 Initial Oil Change
 - 3.3.2.1 After approximately one week or 100 hours of operation, drain the oil. Clean the magnetic drain plug. Refer to LUBRICATION SPECIFICATIONS SECTION for the proper viscosity of oil. Refill with fresh oil to the appropriate oil level.
- 3.3.2 Regularly Scheduled Oil Changes
 - 3.3.2.1 Refer to LUBRICATION SPECIFICATIONS SECTION for the proper viscosity of oil.
 - 3.3.2.2 Petroleum based lubricants—For normal operating conditions, oil should be changed every 2,500 hours or six months, whichever occurs first. If temperatures vary by season, the oil should be changed to suit the ambient operating temperature.
 - 3.3.2.3 Synthetic lubricants—Some types of synthetic lubricants can be used in shaft mount reducers. These lubricants can extend oil change intervals to as much as 8,000 to 10,000 hours based on operating temperatures and lubricant contamination. If temperatures vary by season, the oil should be changed to suit the ambient operating temperature.

CAUTION Certain mineral oils and synthetics are not capable of being mixed. Please contact the lubricant supplier for information regarding lubricant miscibility and proper cleansing procedures.

4. SCREW CONVEYOR DRIVE INSTALLATION INSTRUCTIONS

A shaft mount reducer can be converted to a screw conveyor drive by installing a screw conveyor drive shaft and adapter as follows:

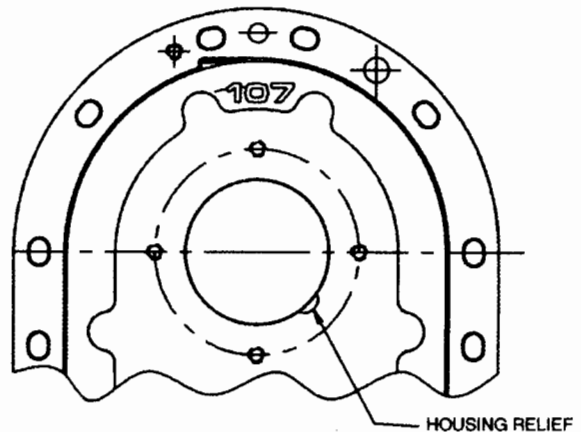
4.1 Screw Conveyor Drive Adapter and Shaft Installation Instructions

- 4.1.1 Remove the bushing ring, endcap and dirt cover from the hollow output shaft.

Note: The endcap and dirt cover may be discarded. DO NOT DISCARD THE BUSHING RING.

- 4.1.2 On the side opposite of the input shaft, place a straight blade screwdriver in the housing relief next to the metal shield of the "Barrier" sealing system. Tap the screwdriver blade into the side of the metal shield. Pry the metal shield out of the reducer. Refer to Figure 4-1.

Note: Do not drive the screwdriver into the metal shield more than 1/4".



**FIGURE 4-1
METAL SHIELD REMOVAL DETAIL**

WARNING Disconnect all power before adjusting units

4.1.3 Remove the V-ring from the metal shield. Discard the metal shield. Re-install the V-ring into the same location. When re-installed properly, the lip of the V-ring will contact the face of the oil seal.

4.1.4 Position the screw conveyor adapter with the small pilot end toward the reducer and align the adapter bolt holes to the bolt holes in the housing face.

4.1.5 Install the four (4) capscrews (supplied with the adapter kit). Tighten capscrews to the recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION.

Note: These capscrews have a coating near the end which will provide positive locking of the fastener.

4.1.6 Install the ring seal plate supplied with the adapter or optional seal cartridge in the screw conveyor adapter housing. See 4.2 Lip Seal/Waste Pack Seal Cartridge Instructions or 4.3 Lip Seal/Packing Gland Seal Cartridge Instructions for optional sealing installation instructions.

4.1.7 Place shaft key (supplied with kit) in keyseat of screw conveyor drive shaft. Insert the drive shaft into the hollow output shaft of reducer, making sure the shaft key aligns with the keyway in the reducer.

4.1.8 On the input shaft side, thread the bushing ring onto the hollow quill one to two turns past the end of the quill.

4.1.9 On the input shaft side of the hollow output shaft, install drive shaft keeper plate and tighten the retaining bolt (supplied with kit) to the recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION. Insert bolts through keeper plate and thread into bushing ring for future removal.

4.1.10 Attach the screw conveyor drive assembly to the trough end using the four (4) flat head capscrews, flat washers, lock washers and nuts supplied with the trough end. On 6 and 9-inch conveyors, install the trough end to the screw conveyor drive before mounting the trough end to the trough.

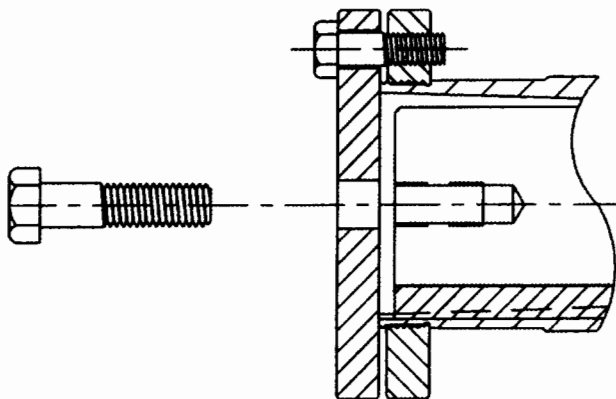


FIGURE 4-2
SCREW SHAFT KEEPER PLATE INSTALLATION

4.2 Lip Seal/Waste Pack Seal Cartridge Instructions

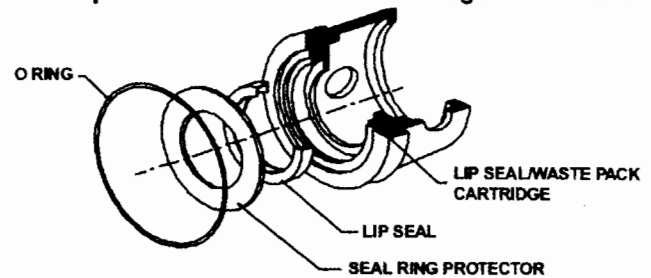


FIGURE 4-3
LIP SEAL/WASTE PACK ASSEMBLY

4.2.1 Install seal cartridge into the adapter housing. Align anti-rotation pin on seal cartridge to the slot in the adapter housing.

4.2.2 Install lip seal (supplied) or felt seal (optional) in the front chamber of the seal cartridge housing.

Note: Install the lip seal with the spring side of the seal toward the reducer.

4.2.3 Install seal protector over shaft even if the lip seal or the felt seal is not used.

4.2.4 Install O-ring in the groove provided on the seal cartridge housing. (Grease or sealant can be used to hold O-ring in place during installation to trough end.)

4.2.5 Proceed with step 4.1.5 of the screw conveyor drive installation instructions.

4.2.6 When step 4.1.8 has been completed, fill seal cartridge cavity with waste packing, if so desired.

Note: Waste packing not supplied.

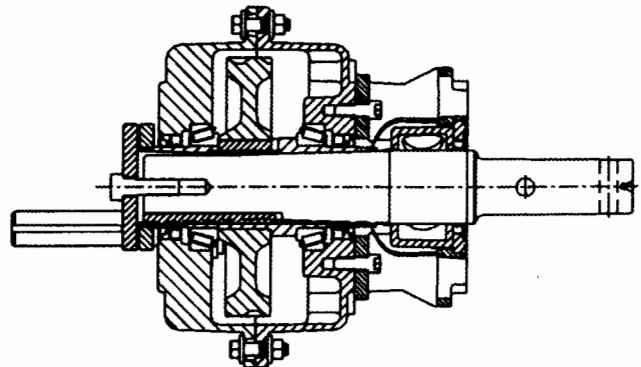


FIGURE 4-4
WASTE PACK ASSEMBLY

4.3 Lip Seal/Packing Gland Seal Cartridge Instructions

▲WARNING Disconnect all power before adjusting units

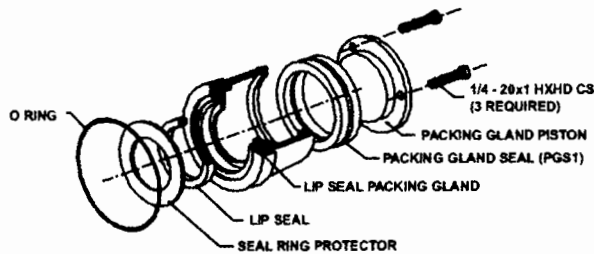
4.3.1 Assemble the packing gland piston and seal cartridge with the bolts provided. The pilot of the packing gland piston fits inside the seal cartridge bore. Do not tighten the bolts at this time.

4.3.2 Install packing gland piston/seal cartridge assembly into the adapter housing. Align anti-rotation pin on packing gland piston/seal cartridge assembly to the slot in the adapter housing.

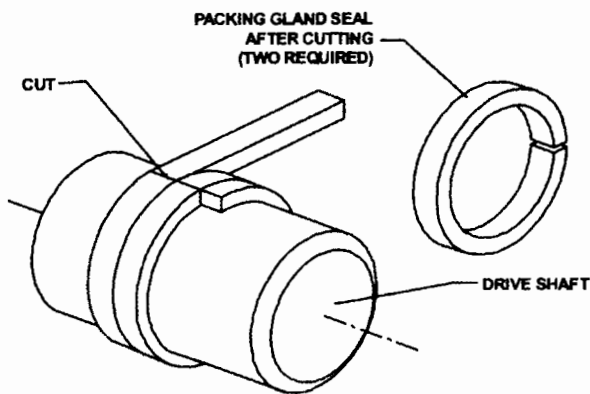
4.3.3 Install lip seal (supplied) or felt seal (optional) in the front chamber of the seal cartridge housing.

4.3.4 Wrap the packing gland material (supplied) around seal diameter of the drive shaft and cut packing to length. Two (2) pieces are required.

Note: Install the lip seal with the spring side of the seal toward the reducer.



**FIGURE 4-5
PACKING GLAND ASSEMBLY**



**FIGURE 4-6
PACKING GLAND ASSEMBLY
WRAP PACKING GLAND SEAL AROUND SEAL DIA. OF
DRIVE SHAFT AND CUT AS SHOWN**

4.3.5 Install O-ring in the groove provided on the seal cartridge housing. (Grease or sealant can be used to hold O-ring in place during installation to trough end.)

4.3.6 Install front seal protector ring and proceed with step 4.1.5 of the screw conveyor drive installation instructions.

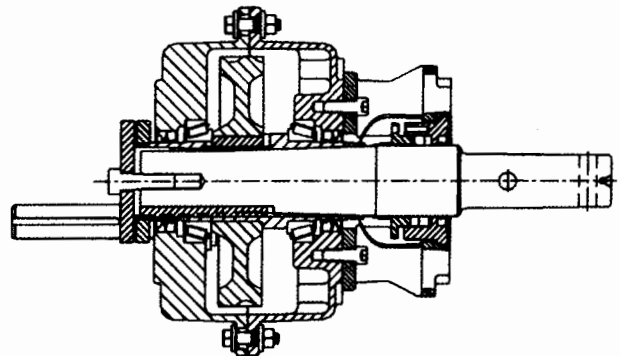
4.3.7 When step 4.1.8 has been completed, remove the bolts in the packing gland piston/seal cartridge assembly.

4.3.8 Install the two (2) cut-to-length packing materials on the shaft in the packing gland chamber of the seal cartridge housing.

4.3.9 Secure the packing gland piston to the seal cartridge housing with the supplied screws. Tighten screws lightly, allowing the packing to compress on the shaft. Do not over tighten packing gland.

4.3.10 Under normal material handling operations, observe the packing gland for leakage. Should the packing gland show signs of leakage, shut the reducer drive assembly off and tighten the packing gland screws evenly to compress the packing material to the shaft. Do not over tighten packing gland. Repeat above procedures until leakage has been stopped.

Note: Over tightening of the packing gland can cause excessive temperatures and premature shaft wear.



**FIGURE 4-7
PACKING GLAND ASSEMBLY**

▲WARNING Disconnect all power before adjusting units

5. MOTOR MOUNT INSTALLATION INSTRUCTIONS

5.1 Top (6 O'Clock) or Bottom (12 O'Clock) Motor Mount Installation Instructions

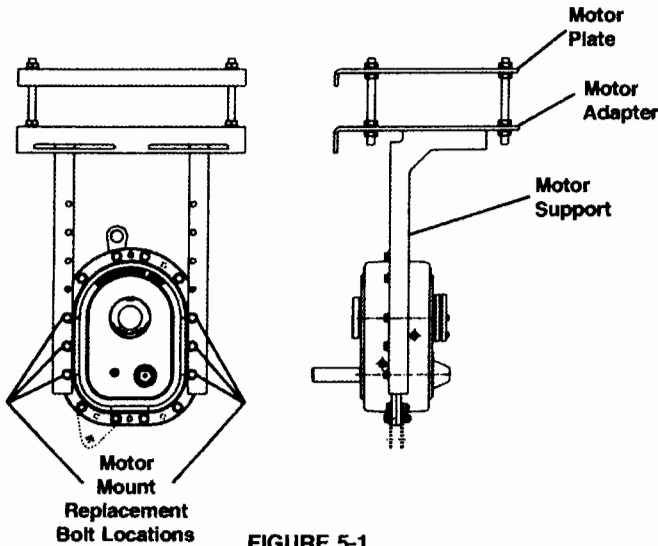


FIGURE 5-1

5.1.1 Remove the three housing flange bolts and washers on each side as shown in Figure 5-1.

5.1.2 Install motor base supports, using the longer bolts furnished with the motor mount kit. One support is used on each side of the unit on the input shaft side of flange. Additional holes provided for various center distances.

5.1.3 Install all flange bolts and washers against flange at this time but do not tighten.

5.1.4 Install motor base adapter; using capscrews provided, tightening capscrews to recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION.

5.1.5 Tighten reducer flange bolts to recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION.

5.2 Side Motor Mount Installation Instruction (3 O'Clock or 9 O'Clock)

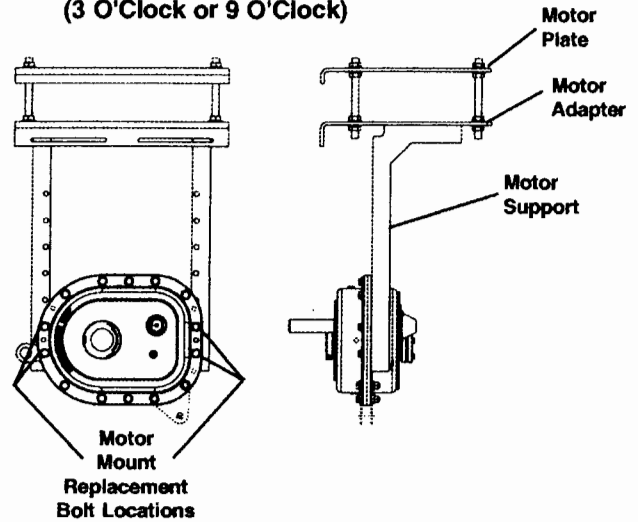


FIGURE 5-2

5.2.1 Remove the housing flange bolts as shown in Figure 5-2.

5.2.2 Install motor base supports, using the longer bolts furnished with the motor base adapter. One support is used on each side of the unit on the side of flange opposite the input shaft.

5.2.3 Install all flange bolts at this time but do not tighten.

5.2.4 Install motor base adapter; using capscrews provided, tightening capscrews to recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION.

5.2.5 Tighten reducer flange bolts to recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION.

▲WARNING Disconnect all power before adjusting units

5.3 Motor Base Plate Installation Instructions

5.3.1 Install a nut on each end of the four threaded rods and position nuts approximately 2" from each rod end. Refer to Figure 5-3 for correct installation of flange nuts.

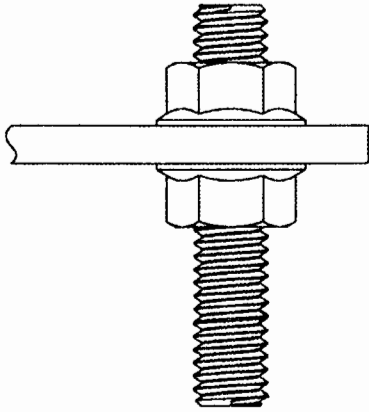


FIGURE 5-3
Detail of flanged nut installation on threaded rod.

5.3.2 Insert threaded rods in the four corner holes of the motor base adapter that match holes in motor base plate and install bottom nut flange end first on each rod but do not tighten.

5.3.3 Position motor base plate over threaded rods and install top nuts, flange end but do not tighten.

5.3.4 Mount motor using holes in motor base plate that match the holes in the base of the motor following motor manufacturer's recommendations.

5.3.5 Using adjusting nuts, lower motor to its lowest position. This can be done by either letting the threaded rods extend above the motor base plate or below the motor base adapter. Either way is acceptable, but nearly equal amounts of threads should be showing.

5.3.6 Mount and align sheaves on motor and input shaft of reducer.

Note: The sheave should be positioned as closely to the reducer housing as possible to reduce overhung load on the input bearings.

5.3.7 Adjust the belt alignment by sliding the motor base plate to the correct position. Mount and adjust belts to the recommended tension by raising the motor equally at all four adjusting rods to assure that the motor base plate remains parallel to the input shaft at the final adjustment. Tighten the flanged nuts to the recommended torque. See BOLT TORQUE SPECIFICATIONS SECTION.

5.3.8 Recheck to be sure all nuts and bolts are tight, sheaves are in alignment and belts are properly tensioned.

6 BACKSTOP KIT INSTALLATION INSTRUCTIONS

6.1.1 Remove capscrews from the input cover and remove cover and gasket from housing.

6.1.2 Place new gasket on backstop and install backstop housing on reducer (See Figure 6-1.)

6.1.3 Position backstop clutch onto reducer pinion shaft, making sure the arrow on the end of the clutch is pointing in the desired direction of rotation. Rotating clutch while pushing onto shaft will ease installation.

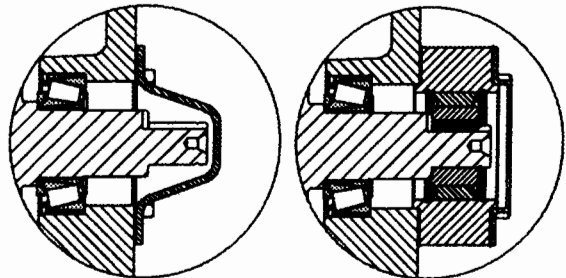
6.1.4 Align keyway in backstop clutch with keyway in backstop housing and install key.

6.1.5 Install snap ring on reducer pinion shaft.

6.1.6 Install cover plate and second gasket with capscrews supplied in kit and tighten to recommended value. See BOLT TORQUE SPECIFICATIONS SECTION.

NOTE: If backstop is required on a reducer mounted in the 12 O'Clock or 3 O'Clock position, contact EPT Technical Services. Do not use a backstop on a reducer mounted vertical input shaft down position.

WARNING PETROLEUM BASED AND SYNTHETIC LUBRICANTS WHICH CONTAIN ANTIWEAR/EXTREME PRESSURE ADDITIVES MUST NOT BE USED IN UNITS WITH INTERNAL BACKSTOPS. THESE ADDITIVES DECREASE THE BACKSTOP'S ABILITY TO PREVENT REVERSE ROTATION AND WILL RESULT IN BACKSTOP FAILURE.



WITHOUT BACKSTOP WITH BACKSTOP
FIGURE 6-1

WARNING Disconnect all power before adjusting units

7. INSTALLATION CHECKLIST

- ✓ Make sure the input shaft rotates properly prior to starting drive.
- ✓ Never use oils of the EP (extreme pressure) type or those which contain slippery additives, if an internal backstop has been installed.
- ✓ Make sure the reducer is filled with correct lubricant and quantity.
- ✓ Make sure all drive guards are in place.
- ✓ Breather location
- ✓ Torque Arm or Anti-rotation device

8. SHAFT MOUNT REMOVAL INSTRUCTIONS

Support reducer by lifting lug. (Lifting lug should only be used to lift the weight of the reducer. Do not use lifting lug to lift attached assemblies to avoid overloading the lifting lug.) Disconnect motor drive.

8.1 Taper Bushing Model

8.1.1 Loosen the setscrew in the endcap. Remove the endcap from the output quill.

8.1.2 Remove capscrews from bushing and install them in the tapped holes in the bushing flange.

8.1.3 Tighten capscrews uniformly until reducer releases from the bushing taper.

8.1.4 Remove reducer from shaft.

Note: A slight rocking movement may be required to release unit from stabilizer ring, if used.

8.2 Screw Conveyor Drive Model

8.2.1 Remove bolts that attach the reducer to the screw conveyor adapter.

8.2.2 Remove keeper plate bolt. Remove capscrews from keeper plate.

8.2.3 Reinstall and tighten keeper plate bolt into tapped hole in tapered drive shaft.

8.2.4 Install the three capscrews through the keeper plate and into the bushing ring as shown on Figure 8-1.

8.2.5 Tighten all capscrews evenly around the keeper plate until reducer releases from tapered drive shaft.

8.2.6 Remove reducer from shaft.

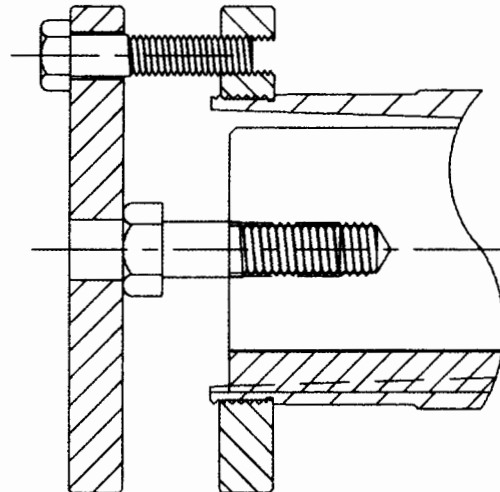


FIGURE 8-1

Note: TorqTaper's seals are grease-packed at assembly. Some purging of grease from around the rotating flingers during initial hours of operation is normal and should be expected.

▲WARNING Disconnect all power before adjusting units



Helical Shaft Mount Speed Reducers



9. BOLT TORQUE SPECIFICATIONS

SMT SIZE	HOUSING FLANGE GRADE 5		TORQ TAPER® BUSHING		ENDCAP SETSCREW NYLON TIPPED	
	BOLT SIZE	FT. LBS.	BOLT SIZE	FT. LBS.	SETSCREW SIZE	IN-LBS.
107	5/16-18	16	5/16-18	16	1/4-20	60
115	3/8-16	25	3/8-16	29	1/4-20	60
203	7/16-14	40	3/8-18	29	1/4-20	60
207	1/2-13	65	3/8-16	29	1/4-20	60
215	1/2-13	65	3/8-16	29	1/4-20	60
307	5/8-11	125	1/2-13	70	1/4-20	60
315	5/8-11	125	1/2-13	70	1/4-20	60
407	5/8-11	125	1/2-13	70	1/4-20	60
415	3/4-10	220	5/8-11	140	1/4-20	60
507	3/4-10	220	3/4-10	250	1/4-20	60
608	3/4-10	220	3/4-10	250	1/4-20	60

UNIT SIZE	SCREW CONVEYOR ADAPTER GRADE 8		KEEPER PLATE RETAINER (SCREW CONVEYOR SHAFT) GRADE 8		INPUT COVER GRADE 5		BACKSTOP GRADE 8	
	BOLT SIZE	FT-LBS	BOLT SIZE	FT-LBS	BOLT SIZE	FT-LBS	BOLT SIZE	FT-LBS
107	5/16-18	23	1/2-13	99	1/4-20	8	1/4-20	12
115	3/8-16	41	5/8-11	200	1/4-20	8	1/4-20	12
203	7/16-14	65	5/8-11	200	5/16-18	16	5/16-18	23
207	1/2-13	99	3/4-10	350	3/8-16	29	3/8-16	41
215	1/2-13	99	3/4-10	350	3/8-16	29	3/8-16	41
307	5/8-11	200	1-8	600	3/8-16	29	3/8-16	41
315	5/8-11	200	1-8	600	1/2-13	70	1/2-13	99
407	5/8-11	200	1-8	600	1/2-13	70	1/2-13	99
415	-	-	-	-	1/2-13	70	1/2-13	99
507	-	-	-	-	5/8-11	140	5/8-11	200
608	-	-	-	-	5/8-11	140	5/8-11	200

▲WARNING Disconnect all power before adjusting units



Helical Shaft Mount Speed Reducers



10. LUBRICATION SPECIFICATIONS

Ambient Temperature Range	MINERAL OILS		SYNTHETIC OILS	
	15° to 60°F (-10° to 15°C)	50° to 125°F (-10° to 50°C)	0° to 90°F (-20° to 30°C)	15° to 125°F (-10° to 50°C)
AGMA Viscosity Grade Viscosity at 104°F SSU (40°C) cST	4 625-765 135-165	5 918-1122 198-242	4 626-765 135-165	5 918-1122 198-242
Mobil Oil Corporation	DTE Oil Extra Heavy	DTE-Oil BB	Mobil SHC 629	Mobil SHC 630
THE FOLLOWING LUBRICANTS CONTAIN EP OR AW ADDITIVES AND MUST NOT BE USED IN UNITS WITH INTEGRAL BACKSTOPS				
Ambient Temperature Range	MINERAL OILS WITH EP ADDITIVES		SYNTHETIC OILS WITH EP ADDITIVES	
	15° to 60°F (-10° to 15°C)	50° to 125°F (10° to 50°C)	0° to 90°F (-20° to 30°C)	15° to 125°F (-10° to 50°C)
AGMA Viscosity Grade Viscosity at 104°F SSU (40°C) cST	4 626-765 135-165	5 918-1122 198-242	4 626-765 135-165	5 918-1122 198-242
Mobil Oil Corporation	Mobilgear 629	Mobilgear 630	Mobilgear SHC 150	Mobilgear SHC 220

The Company names and the names of the Lubricants mentioned in the above tables are the tradenames, trademarks and logotypes of the respective companies, and are not owned by EPT.
Contact lubricant supplier for cross reference if Mobil products are not available.

▲ WARNING

Reducer shipped without oil. Fill to proper level before operating to avoid equipment damage and/or personal injury. Do not use lubricants with anti-wear/extreme pressure Additives. in units with internal backstops - these additives Decrease the backstops ability to prevent reverse rotation And will result in backstop failure which could cause Personal injury.

▲ WARNING Disconnect all power before adjusting units



Helical Shaft Mount Speed Reducers



11. SHAFT MOUNT TERMINOLOGY

TERMS	DEFINITION
Backstop	A device that is used to prevent reverse rotation up to a specified torque limit and rotational speed. Also known as a clutch.
Bushing	A component that is used to adapt the shaft mounted reducer to various driven shaft sizes.
Bushing ring	A ring mounted on the output quill that is used to attach the bushing to the shaft mounted reducer.
Endcap	A ring mounted on the output quill that retains the stabilizer ring or dirt cover.
Inner race	The inside part of the backstop that fits over the input shaft extension.
Overhung load	An external load applied to a shaft. Overhung loads are usually a result of torsional loads, but other loads such as component weights can contribute to the total amount of overhung load.
Packing gland	A material similar to rope that is commonly used in screw conveyor applications as a sealing device.
Quill	A shaft with a bore that extends from end to end. A hollow shaft.
Screw conveyor	A material transporting device typically designed with a screw-like shaft that rotates inside a fixed trough or tube.
Seal	A metal shell with a lip that is used to retain oil and keep dirt and debris from entering the shaft mount reducer.
Sheave	Drive component typically mounted on the input shaft and used with a v-belt to transmit power from a motor to the shaft mount reducer. Also known as a pulley.
Snap ring	Metal ring used to hold accessories, like the backstop inner race, in a certain location. Also known as a retaining ring.
Stabilizer ring	A ring that is placed in the quill on the opposite side of the bushing to provide two mounting points for the shaft mount reducer.
Taconite	An iron ore dust created in the processing of iron.
Thrust	Internal or external force applied along the centerline axis of a shaft.
Torque arm	A device used to counteract the torsional loads created by the shaft mount reducer.
V-ring	A sealing device that mounts on a shaft and seals against a counterface. Also known as a v-seal or flinger.
Waste pack	A material similar to wool fibers that is commonly used in screw conveyor applications as a sealing device.

▲WARNING Disconnect all power before adjusting units



Helical Shaft Mount
Speed Reducers



NOTES

▲WARNING Disconnect all power before adjusting units

Browning[®]

Helical Shaft Mount
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NOTES

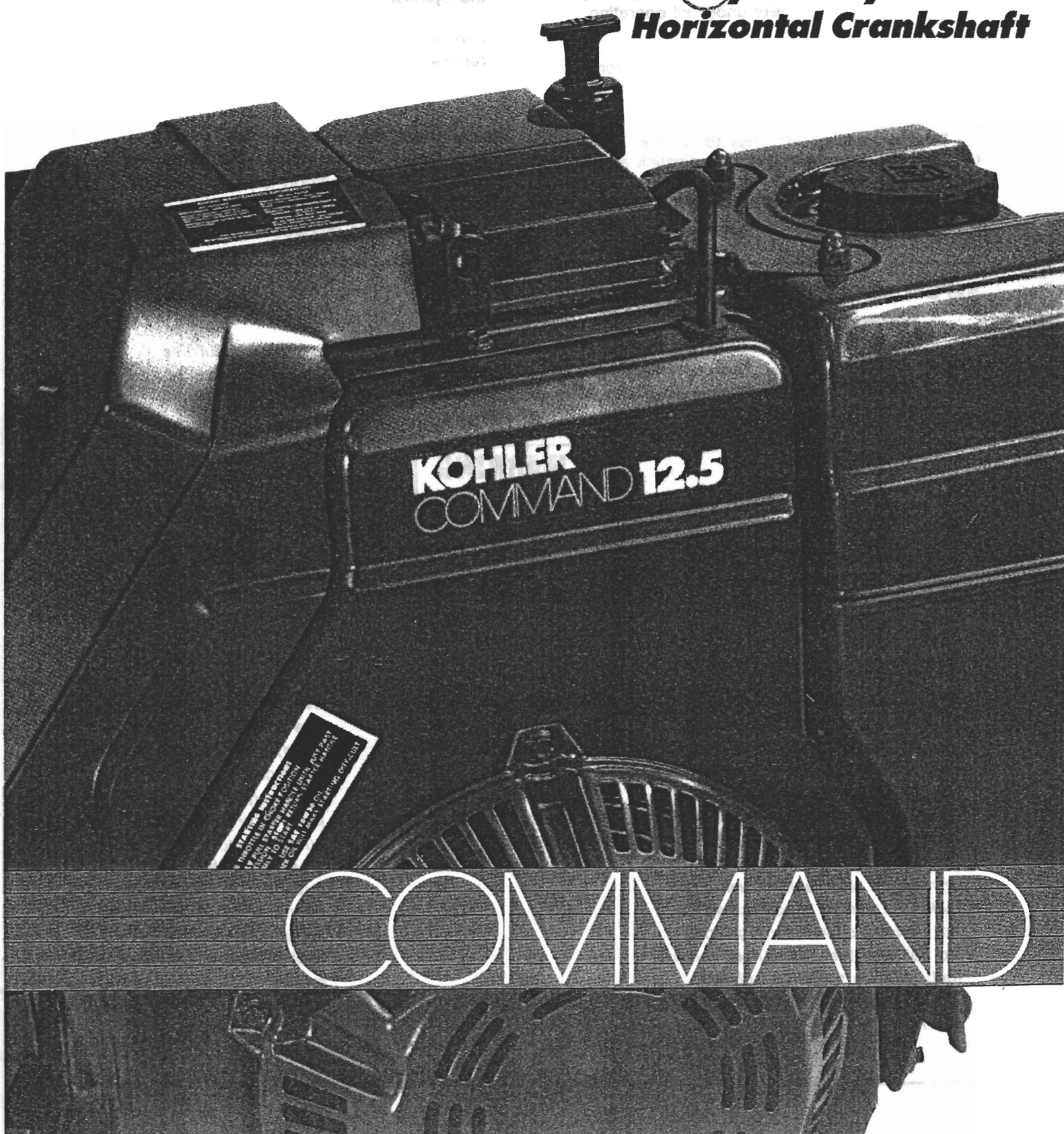
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OWNER'S MANUAL COMMAND 11, 12.5, 14 HP Horizontal Crankshaft



COMMAND

CONGRATULATIONS— You have selected the finest four-cycle, single-cylinder, air-cooled engine that money can buy. Kohler designs long-life strength and on-the-job durability into each engine...making a Kohler engine the most dependable engine available...dependability you can count on. Here are some reasons why:

- Efficient overhead valve design and full-pressure lubrication provide maximum power, torque, and reliability under all operating conditions.
- Dependable, maintenance-free electronic ignition ensures fast, easy starts time after time.
- Kohler engines are easy to service. All routine service areas (like the dipstick and oil fill, oil filter, air cleaner, spark plug, and carburetor) are easily and quickly accessible.
- Parts subject to the most wear and tear (like the cylinder liner, crankshaft, and camshaft) are made from precision formulated cast iron. Because the cylinder liner can be rebored, these engines can last even longer.
- Every Kohler engine is backed by a world-wide network of over 10,000 distributors and dealers. Service support is just a phone call away.

To keep your engine in top operating condition, follow the maintenance procedures in this manual.

SAFETY INFORMATION

WARNING: For Your Safety!



This symbol points out important safety Warnings and Cautions throughout this manual. These Warnings and Cautions should be followed at all times. Failure to follow Warnings and Cautions could result in injury to yourself and others nearby.

▲ WARNING



Explosive fuel can cause fires and severe burns.
Stop Engine before filling fuel tank.
See Owner's Manual.

WARNING: Explosive fuel!
Gasoline is extremely flammable and its vapors can explode if ignited. Store gasoline only in approved containers, in well-ventilated, unoccupied buildings, away from sparks or flames. Do not fill the fuel tank while the engine is hot or running, since spilled fuel could ignite if it comes in contact with hot parts or sparks from ignition. Do not start the engine near spilled fuel; wipe up spills immediately. Never use gasoline as a cleaning agent.

▲ WARNING



Rotating parts can cause severe injury.
See Owner's Manual.

WARNING: Rotating Parts!
Keep hands, feet, hair, and clothing away from all moving parts to prevent injury. Never operate the engine with covers, shrouds, or guards removed.

▲ WARNING



Hot parts can cause severe burns. Do not touch.
See Owner's Manual.

WARNING: Hot Parts!
The crankcase, cylinder head, exhaust system, and other components can get extremely hot from operation. To prevent severe burns, do not touch these areas while the engine is running – or immediately after it is turned off. Never operate the engines with heat shields or guards removed.

CAUTION: Accidental Starts!



Before servicing the engine or equipment, always disconnect the spark plug lead to prevent the engine from starting accidentally. Ground the lead to prevent sparks that could cause fires.

On engines equipped with a 12-volt battery and/or electric start, disconnect the battery cables from the battery. Always disconnect the negative (-) cable first.

Before disconnecting the negative (-) ground cable, make sure all switches are OFF. If ON, a spark will occur at the ground cable terminal which could cause an explosion if hydrogen gas or gasoline vapors are present.

CAUTION: High Voltage!



Never touch electrical wires or components while the engine is running. They can be sources of electrical shock which could cause severe injury or burns.

WARNING: Lethal Exhaust Gases!



Engine exhaust gases contain poisonous carbon monoxide. Carbon monoxide is odorless, colorless, and can cause death if inhaled. Avoid inhaling exhaust fumes, and never run the engine in a closed building or confined area.

WARNING: Overspeed Is Hazardous!



The maximum allowable high idle speed for these engines is 3750 rpm, no-load. Never tamper with the governor components or settings to increase the maximum speed. Severe personal injury and damage to the engine or equipment can result if operated at speeds above maximum.

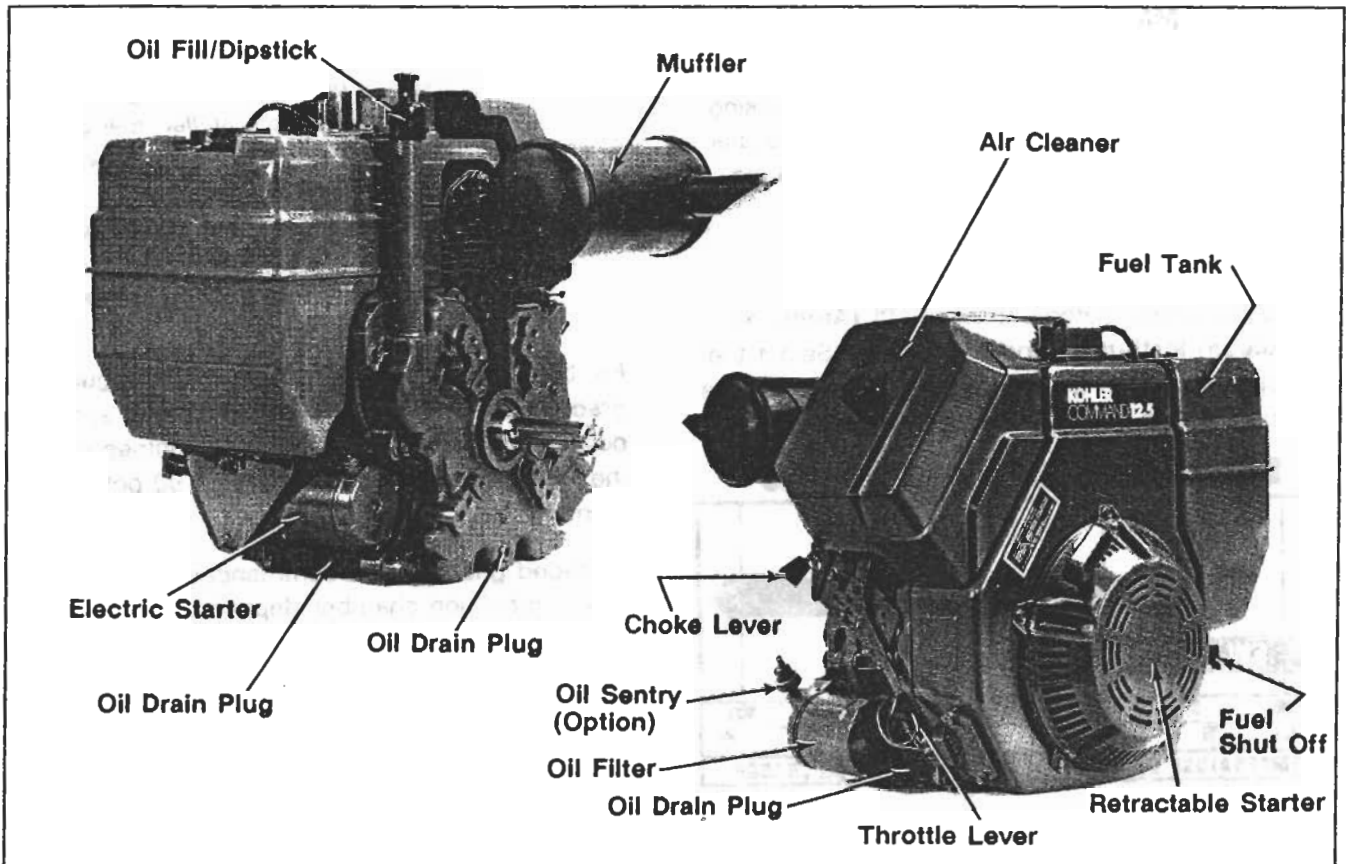


Figure 1. Typical Command Horizontal Shaft Engine.

ENGINE IDENTIFICATION NUMBERS

When ordering parts, or in any communication involving an engine, always give the **Model, Specification, and Serial Numbers** of the engine.

The engine identification numbers appear on decal (or decals) affixed to the engine shrouding. See Figure 1. Include letter suffixes, if there are any.



Figure 2. Engine Identification Plate.

Record your engine identification numbers on the identification plate illustration (Figure 2) for future reference.

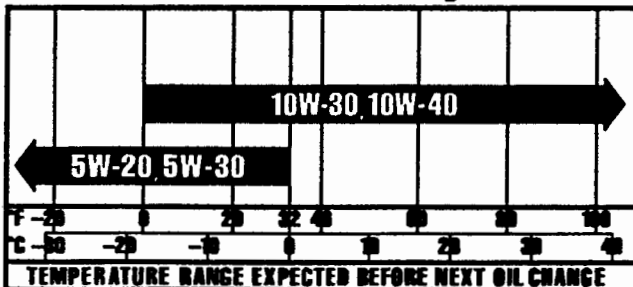
OIL RECOMMENDATIONS

Using the proper type and weight of oil in the crankcase is extremely important. So is checking oil daily and changing oil regularly. Failure to use the correct oil, or using dirty oil, causes premature engine wear and failure.

Oil Type

Use high-quality detergent oil of API (American Petroleum Institute) service class SF. Select the viscosity based on the air temperature at the time of operation as shown in the following table.

Recommended SAE Viscosity Grades



NOTE: Using other than service class SF oil or extending oil change intervals longer than recommended can cause engine damage.

A logo or symbol on oil containers identifies the API service class and SAE viscosity grade. See Figure 3.

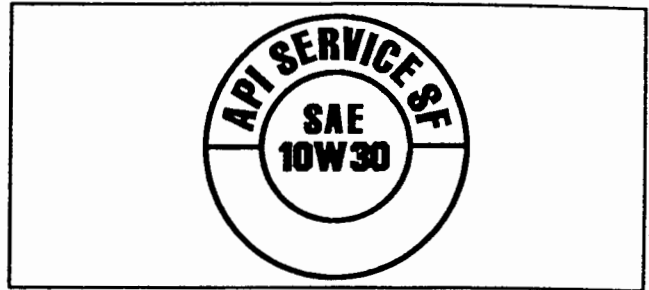


Figure 3. Oil Container Logo.

Refer to "Maintenance Instructions" beginning on page 7 for detailed oil check, oil change, and oil filter change procedures.

FUEL RECOMMENDATIONS

Fuel Type

WARNING: Explosive Fuel!



Gasoline is extremely flammable and its vapors can explode if ignited. Store gasoline only in approved containers, in well-ventilated, unoccupied buildings, away from sparks or flames. Do not fill the fuel tank while the engine is hot or running, since spilled fuel could ignite if it comes in contact with hot parts or sparks from ignition. Do not start the engine near spilled fuel; wipe up spills immediately. Never use gasoline as a cleaning agent.

For best results use only clean, fresh, regular grade, unleaded gasoline with the pump sticker octane rating of 87 or higher. In countries using the Research method, it should be 90 octane minimum.

Unleaded gasoline is recommended since it leaves less combustion chamber deposits. Regular grade, leaded gasoline can also be used; however, be aware that the combustion chamber and cylinder head may require cleaning.

Use fresh gasoline to ensure it is blended for the season and to reduce the possibility of gum deposits forming which could clog the fuel system. Do not use gasoline left over from the previous season. Do not add oil to the gasoline.

OPERATING INSTRUCTIONS

Also read the operating instructions of the equipment this engine powers.

PRE-START CHECKLIST

- Check oil level. Add oil if low.
- Check fuel level. Add fuel if low.
- Check cooling air intake areas and external surfaces of engine. Make sure they are clean and unobstructed.
- Check that the air cleaner components and all shrouds, equipment covers, and guards are in place and securely fastened.
- Check that any clutches or transmissions are disengaged or placed in neutral. This is especially important on equipment with hydrostatic drive. The shift lever must be exactly in neutral to prevent resistance which could keep the engine from starting.

WARNING: Lethal Exhaust Gases!



Engine exhaust gases contain poisonous carbon monoxide. Carbon monoxide is odorless, colorless, and can cause death if inhaled. Avoid inhaling exhaust fumes, and never run the engine in a closed building or confined area.

STARTING

1. **For A Cold Engine** – Place the throttle control midway between the “slow” and “fast” positions. Place the choke control into the “on” position.

For A Warm Engine (normal operating temperatures) – Place the throttle/choke control midway between the “slow” and “fast” positions. Place the choke control into the “off” position. See Figure 4.

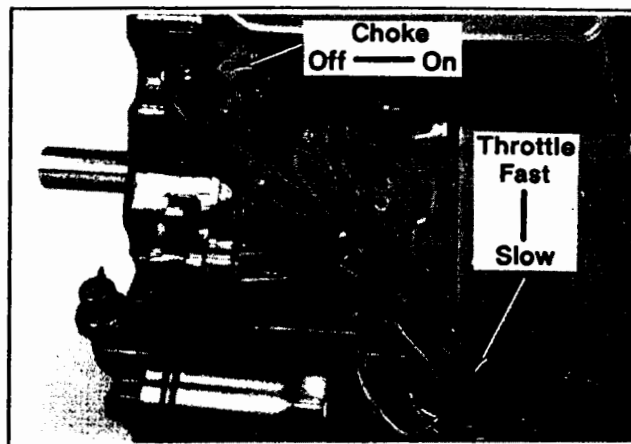


Figure 4. Throttle and Choke Positions For Starting Engine.

2. Start the engine as follows:

For A Retractable Start Engine – Pull the starter handle with a smooth, steady motion. Pull the handle straight out to avoid excessive rope wear from the starter rope guide.

Extend the starting rope periodically and check its condition. If the rope is frayed, replace it immediately.

CAUTION: Accidental Starts!



Before extending and checking the retractable starter rope, remove the spark plug lead to prevent the engine from starting accidentally. Make sure the equipment is in neutral.

For An Electric Start Engine – Activate the starter switch. Release the switch as soon as the engine starts.

NOTE: Do not crank the engine continuously for more than 10 seconds at a time. If the engine does not start, allow a 60-second cool-down period between starting attempts. Failure to follow these guidelines can burn out the starter motor.

NOTE: If the engine develops sufficient speed to disengage the starter but does not

keep running (a false start), the engine rotation must be allowed to come to a complete stop before attempting to re-start the engine. If the starter is engaged while the flywheel is rotating, the starter pinion and flywheel ring gear may clash, resulting in damage to the starter.

3. **For A Cold Engine** – Gradually return the choke control to the "off" position after the engine starts and warms up.

Battery

A 12-volt battery with a rating of approximately 32-amp hours/250 cold-cranking amps is normally used. Refer to the operating instructions of the equipment this engine powers for specific information.

If the battery charge is not sufficient to crank the engine, recharge the battery (see page 11).

NOTE: Do not attempt to jump start the engine with another battery. Starting with batteries larger than those recommended can burn out the starter motor.

OPERATING

Angle Of Operation

This engine will operate continuously at angles up to 25° in any direction.

Refer to the operating instructions of the equipment this engine powers. Because of equipment design or application, there may be more stringent restrictions regarding the angle of operation.

NOTE: Do not operate this engine continuously at angles exceeding 25° in any direction. Engine damage could result from insufficient lubrication.

Cooling

NOTE: If debris builds up on the grass screen or other cooling air intake areas, stop the engine immediately and clean. Operating the engine with blocked or dirty air intake and cooling areas can cause extensive damage due to overheating.

CAUTION: Hot Parts!



The crankcase, cylinder head, exhaust system, and other components can get extremely hot from operation. To prevent severe burns, do not touch these areas while the engine is running—or immediately after it is turned off. Never operate the engine with heat shields or guards removed.

Engine Speed

NOTE: Do not tamper with the governor setting to increase the maximum engine speed. Overspeed is hazardous and will void the engine warranty.

STOPPING

1. If possible, remove the load by disengaging all PTO attachments.
2. Move the throttle control to the "slow" or low idle position.
3. Move the throttle control or ignition switch to the "stop" or "off" position.

MAINTENANCE INSTRUCTIONS

CAUTION: Accidental Starts!



Before servicing the engine or equipment, always disconnect the spark plug lead to prevent the engine from starting accidentally. Ground the lead to prevent sparks that could cause fires.

On engines equipped with a 12-volt battery and/or electric start, disconnect the battery cables from the battery. Always disconnect the negative (-) cable first.

Before disconnecting the negative (-) ground cable, make sure all switches are OFF. If ON, a spark will occur at the ground cable terminal which could cause an explosion if hydrogen gas or gasoline vapors are present.

MAINTENANCE SCHEDULE

These required maintenance procedures should be performed at the frequency stated in the table. They should also be included as part of any seasonal tune-up.

FREQUENCY	MAINTENANCE REQUIRED
Daily Or Before Starting Engine	<ul style="list-style-type: none">● Fill fuel tank.● Check oil level.● Check air cleaner for dirty¹, loose, or damaged parts.● Check air intake and cooling areas, clean as necessary¹.
Every 25 Hours	<ul style="list-style-type: none">● Service precleaner element¹.
Every 100 Hours	<ul style="list-style-type: none">● Service air cleaner element¹.● Change oil.● Check spark plug condition and gap.● Remove cooling shrouds and clean cooling areas¹.
Every 200 Hours	<ul style="list-style-type: none">● Change oil filter.
Annually Or Every 500 Hours	<ul style="list-style-type: none">● Have starter motor drive serviced².

¹Perform these maintenance procedures more frequently under extremely dusty, dirty conditions.

²Have a Kohler Engine Service Dealer perform these services.

CHECK OIL LEVEL

The importance of checking and maintaining the proper oil level in the crankcase cannot be over-emphasized. Check oil **BEFORE EACH USE** as follows:

1. Make sure the engine is stopped, level, and is cool so the oil has had time to drain into the sump.
2. To keep dirt, grass clippings, etc., out of the engine, clean the area around the oil fill cap/dipstick before removing it.
3. Remove the oil fill cap/dipstick; wipe oil off. Reinsert the dipstick into the tube and press onto the tube.

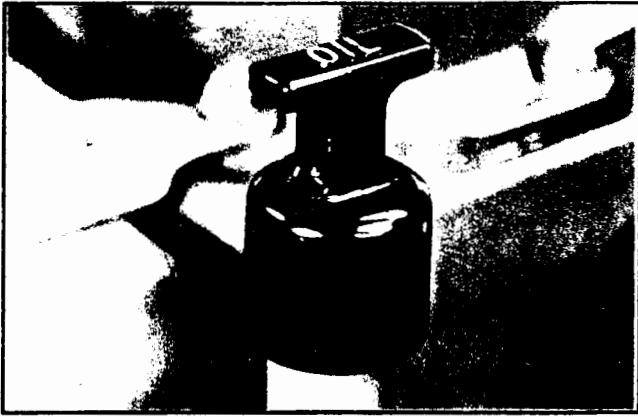


Figure 5. Checking Oil Level.

4. Remove the dipstick and check the oil level.

The oil level should be up to, but not over, the "F" mark on the dipstick. See Figure 6.

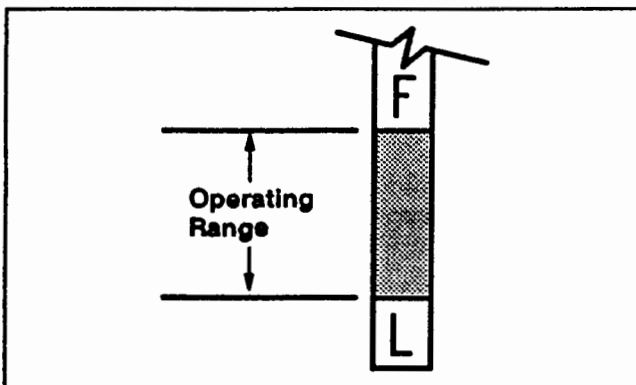


Figure 6. Oil Level Dipstick.

5. If the level is low, add oil of the proper type, up to the "F" mark on the dipstick. (Refer to "Oil Type" on page 4.) Always check the level with the dipstick before adding more oil.

NOTE: To prevent extensive engine wear or damage, always maintain the proper oil level in the crankcase. Never operate the engine with the oil level below the "L" mark or over the "F" mark on the dipstick.

Oil Sentry™

Some engines are equipped with an optional Oil Sentry oil pressure monitor. If the oil pressure gets low, Oil Sentry will either shut off the engine

or activate a warning signal, depending on the application.

NOTE: Make sure the oil level is checked **BEFORE EACH USE** and is maintained up to the "F" mark on the dipstick. This includes engines equipped with Oil Sentry.

CHANGE OIL AND OIL FILTER

Change Oil

For a new engine, change oil after the first 5 hours of operation. Thereafter, change oil after every 100 hours of operation.

For an overhauled engine or those rebuilt with a new short block, use 10W-30 weight service class SF oil for the first 5 hours of operation. Change the oil after this initial run-in period. Refill with service class SF oil as specified in the "Viscosity Grades" table on page 4.

Change the oil while the engine is still warm. The oil will flow freely and carry away more impurities. Make sure the engine is level when filling, checking, and changing the oil.

Change the oil as follows (see Figure 7):

1. Remove the oil drain plug and oil fill cap/dipstick. Be sure to allow ample time for complete drainage.
2. Reinstall the drain plug. Make sure it is tightened to 13.6 N·m (10 ft. lb.) torque.
3. Fill the crankcase, with new oil of the proper type, to the "F" mark on the dipstick. Refer to "Oil Type" on page 4. Always check the level with the dipstick before adding more oil.
4. Reinstall the oil fill cap/dipstick and tighten securely.

NOTE: To prevent extensive engine wear or damage, always maintain the proper oil level in the crankcase. Never operate the engine with the oil level below the "L" mark or over the "F" mark on the dipstick.

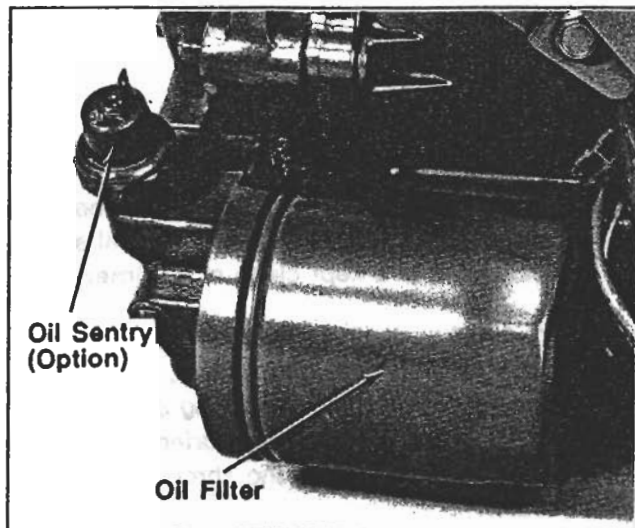


Figure 7. Oil Filter, and Optional Oil Sentry Switch.

Change Oil Filter

Replace the oil filter every other oil change (every 200 hours of operation). Always use a genuine Kohler oil filter, part 52 050 02.

Replace the oil filter as follows:

1. Drain the oil from the engine crankcase.
2. Allow the oil filter to drain.
3. Remove the old filter and wipe off the filter adapter.
4. Apply a thin coating of new oil to the rubber gasket on the replacement oil filter.
5. Install the replacement oil filter to the filter adapter. Turn the oil filter clockwise until the rubber gasket contacts the filter adapter, then tighten the filter an additional 1/2 turn.
6. Reinstall the drain plug.
7. Fill the crankcase with new oil as instructed under "Change Oil." Add an additional 0.24 L (1/2 pint) of oil for the filter capacity.
8. Start the engine and check for oil leaks. Correct any leaks before placing the engine into service.

SERVICE PRECLEANER AND AIR CLEANER ELEMENT

This engine is equipped with a replaceable, high-density paper air cleaner element. Some engines are also equipped with an oiled-foam precleaner which surrounds the paper element. See Figures 8 and 9.

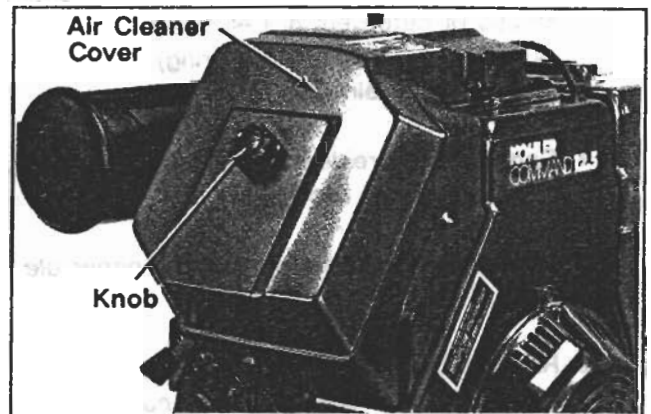


Figure 8. Air Cleaner Housing Components.

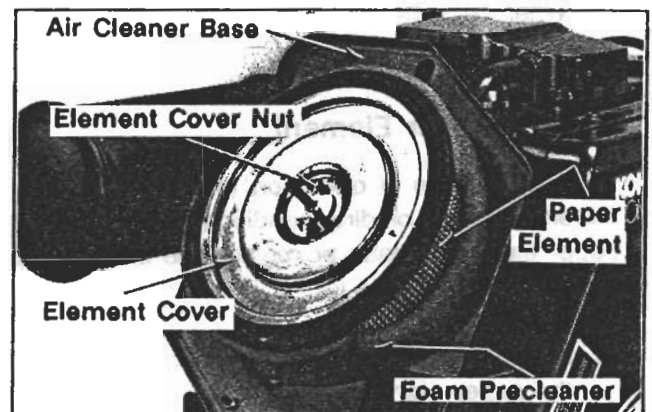


Figure 9. Air Cleaner Elements.

Check the air cleaner daily or before starting the engine. Check for and correct heavy buildup of dirt and debris, and loose or damaged components.

NOTE: Operating the engine with loose or damaged air cleaner components could allow unfiltered air into the engine causing premature wear and failure.

Service Precleaner

If so equipped, wash and reoil the precleaner every 25 hours of operation (more often under extremely dusty or dirty conditions).

-
1. Remove the air cleaner cover retaining knob, air cleaner cover, element cover nut, element cover, and paper element with precleaner.
 2. Remove the precleaner from the paper element.
 3. Wash the precleaner in warm water with detergent. Rinse the precleaner thoroughly until all traces of detergent are eliminated. Squeeze out excess water (do not wring). Allow the precleaner to air-dry.
 4. Saturate the precleaner with new engine oil. Squeeze out all excess oil.
 5. Reinstall the precleaner over the paper element.
 6. Reinstall the paper element with precleaner, element cover, element cover nut, air cleaner cover, and air cleaner cover retaining knob.
 7. When replacement is necessary order part no. 47 083 01.

Service Paper Element

Every 100 hours of operation (more often under extremely dusty or dirty conditions), check the paper element. Clean or replace the element as necessary.

1. Remove the precleaner (if so equipped) from the paper element.
2. Gently tap the flat side of the paper element to dislodge dirt. Do not wash the paper element or use pressurized air, as this will damage the element. Replace a dirty, bent, or damaged element with a genuine Kohler element. Handle new elements carefully; do not use if the sealing surfaces are bent or damaged.
3. When servicing the air cleaner, check the air cleaner base. Make sure it is secured and not bent or damaged. Also check the element cover for damage or improper fit. Replace all damaged air cleaner components.
4. Reinstall all components as described above.

5. When replacement is necessary order part no. 52 083 01.

CLEAN AIR INTAKE/COOLING AREAS

To ensure proper cooling, make sure the grass screen, cooling fins, and other external surfaces of the engine are kept clean at all times.

Every 100 hours of operation (more often under extremely dusty, dirty conditions), remove the blower housing and other cooling shrouds. Clean the cooling fins and external surfaces as necessary. Make sure the cooling shrouds are reinstalled.

NOTE: Operating the engine with a blocked grass screen, dirty or plugged cooling fins, and/or cooling shrouds removed, will cause engine damage due to overheating.

IGNITION SYSTEM

This engine is equipped with a dependable electronic magneto ignition system. Other than periodically checking/replacing the spark plug, no maintenance, timing, or adjustments are necessary or possible with this system.

In the event starting problems should occur which are not corrected by replacing the spark plug, see your Kohler Engine Service Dealer for trouble analysis.

CHECK SPARK PLUG

Every 100 hours of operation, remove the spark plug, check its condition, and reset the gap or replace with a new plug as necessary. Use a Champion® type RC12YC (or equivalent) spark plug.

1. Before removing the spark plug, clean the area around the base of the plug to keep dirt and debris out of the engine.
2. Remove the plug and check its condition. Replace the plug if worn or reuse is questionable.

NOTE: Do not clean the spark plug in a machine using abrasive grit. Some grit

could remain in the spark plug and enter the engine causing extensive wear and damage.

3. Check the gap using a wire feeler gauge. Adjust the gap to 1.02 mm (0.040 in) by carefully bending the ground electrode. See Figure 10.
4. Reinstall the spark plug into the cylinder head. Torque the spark plug to 38.0 / 43.4 N·m (28 / 32 ft. lb.).

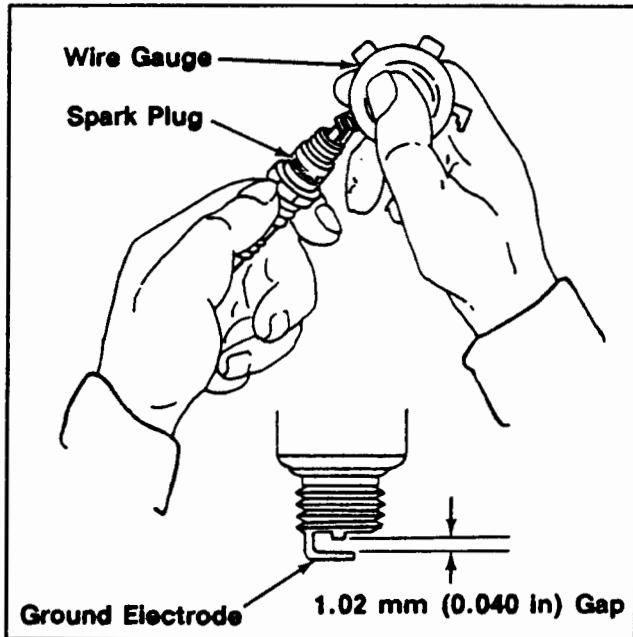


Figure 10. Servicing Spark Plug.

BATTERY

A 12-volt battery with a rating of approximately 32-amp hours/250 cold-cranking amps. is normally used. Refer to the operating instructions of the equipment this engine powers for specific information.

If the battery charge is not sufficient to crank the engine, recharge the battery.

WARNING: Dangerous Acid, Explosive Gases!



Batteries contain sulfuric acid. To prevent acid burns, avoid contact with skin, eyes, and clothing. Batteries produce explosive hydrogen gas while being charged. To prevent a fire or explosion, charge batteries only in well ventilated areas. Keep sparks, open flames, and other sources of ignition away from the battery at all times. Keep batteries out of the reach of children. Remove all jewelry when servicing batteries.

FUEL FILTER

Some engines are equipped with an in-line fuel filter. Visually inspect the filter periodically, and replace when dirty with a genuine Kohler filter.

CARBURETOR TROUBLESHOOTING AND ADJUSTMENTS

NOTE: Carburetor adjustments should be made only after the engine has warmed up.

The carburetor is designed to deliver the correct fuel-to-air mixture to the engine under all operating conditions. The main fuel jet is calibrated at the factory and is adjustable. The low idle fuel adjusting needle is also set at the factory and also normally does not need adjustment.

If, the engine is hard-starting or runs roughly or stalls at low idle speed, it may be necessary to adjust or service the carburetor.

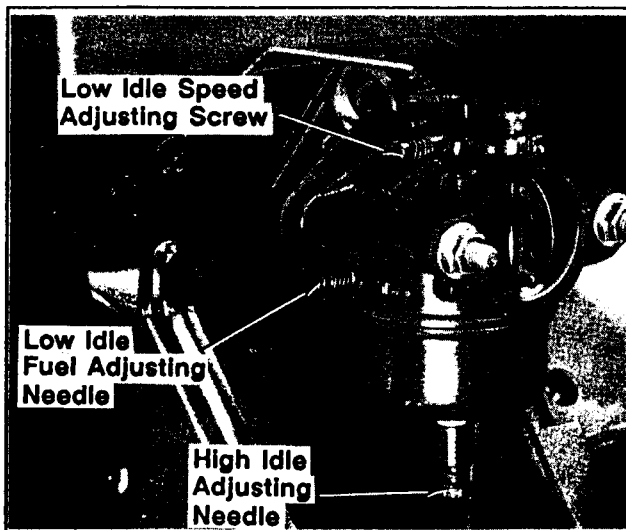


Figure 11. Carburetor.

Troubleshooting

If engine troubles are experienced that appear to be fuel system related, check the following areas before adjusting the carburetor.

- Make sure the fuel tank is filled with clean, fresh gasoline.
- Make sure the fuel tank cap vent is not blocked and that it is operating properly.
- If the fuel tank is equipped with a shutoff valve, make sure it is open.
- If the engine is equipped with an in-line fuel filter, make sure it is clean and unobstructed. Replace the filter if necessary.
- Make sure the air cleaner element is clean and all air cleaner element components are fastened securely.

If, after checking the items listed above, the engine is hard-starting or runs roughly or stalls at low idle speed, it may be necessary to adjust or service the carburetor.

Adjust Carburetor

1. With the engine stopped, turn the low and high idle fuel adjusting needles in (clockwise) until they bottom lightly.

NOTE: The tip of the idle fuel and high idle fuel adjusting needles are tapered to critical dimensions. Damage to the

needles and the seats in carburetor body will result if the needles are forced.

2. **Preliminary Settings:** Turn the adjusting needles out (counterclockwise) from lightly bottomed to the positions shown in the chart.

	TURNS		
	CH11	CH12.5	CH14
IDLE -	1-1/4	1-1/4	1-3/4
HIGH - SPEED	1-1/2	1-1/2	1-1/4

3. Start the engine and run at half-throttle for 5 to 10 minutes to warm up. The engine must be warm before making final settings.
4. **High Idle Fuel Needle Setting:** Place the throttle into the "fast" position. If possible place the engine under load. Turn the high idle fuel adjusting needle in (slowly) until engine speed decreases and then back out approximately 1/4 turn for best high-speed performance.
5. **Low Idle Speed Setting:** Place the throttle control into the "idle" or "slow" position. Set the low idle speed to 1200 rpm* (+ or - 75 rpm) by turning the low idle speed adjusting screw in or out. Check the speed using a tachometer.

*NOTE: The actual low idle speed depends on the application—refer to equipment manufacturer's recommendations. The recommended low idle speed for basic engines is 1200 rpm. To ensure best results when setting the low idle fuel needle, the low idle speed must not exceed 1500 rpm.

6. **Low Idle Fuel Needle Setting:** Place the throttle into the "idle" or "slow" position. Turn the low idle fuel adjusting needle in (slowly) until engine speed decreases and then back out approximately 1/8 to 1/4 turn to obtain the best low speed performance.
7. Recheck the idle speed using a tachometer. Readjust the speed as necessary.

TROUBLESHOOTING

When troubles occur, be sure to check the simple causes which, at first, may seem to obvious to be considered. For example, a starting problem could be caused by an empty fuel tank. Some common causes of engine troubles are listed in the following table.

Do not attempt to service or replace major engine components, or any items that require special timing or adjustment procedures. Have your Kohler Engine Service Dealer do this work.

Possible Cause Problem →	No Fuel	Improper Fuel	Dirt In Fuel Line	Dirty Grass Screen	Incorrect Oil Level	Engine Overloaded	Dirty Air Cleaner	Faulty Spark Plug
Will Not Start Hard Starting	•	•	•			•	•	•
Stops Suddenly Lacks Power	•	•	•	•	•	•	•	•
Operates Erratically Knocks Or Pings		•	•	•		•	•	•
Skips Or Misfires Backfires		•	•	•		•	•	•
Overheats High Fuel Consumption			•	•	•	•	•	•

STORAGE

If the engine will be out of service for two months or more, use the following storage procedure:

1. Change the oil and filter while the engine is still warm from operation. See "Change Oil And Oil Filter" on page 8.
2. Drain the fuel tank and fuel system (or run the engine until the fuel tank and fuel system are empty).
3. Remove the spark plug. Add one tablespoon of engine oil into the spark plug hole. Install the plug, but do not connect the plug lead. Crank the engine two or three revolutions.
4. Remove the spark plug. Cover the spark plug hole with your thumb, and turn the engine over until the piston is at the top of its stroke. (Pressure against thumb is greatest.) Reinstall the plug, but do not connect the plug lead.
5. Clean the exterior surfaces of the engine.
6. Store the engine in a clean, dry place.

PARTS ORDERING

The engine Specification, Model, and Serial numbers are required when ordering replacement parts from your Kohler Engine Service Dealer. These numbers are found on the identification plate which is affixed to the engine shrouding. Include letter suffixes if there are any. See "Engine Identification Numbers" on page 4.

Always insist on genuine Kohler parts. All genuine Kohler parts meet strict standards for fit, reliability, and performance.

MAJOR REPAIR

Major repair information is available in Kohler Engine Service Manuals. However, major repair generally requires the attention of a trained mechanic and the use of special tools and equipment. Your Kohler Engine Service Dealer has the facilities, training, and genuine Kohler replacement parts necessary to perform this service. Check the Yellow Pages under "Engines-Gasoline" for the Kohler Engine Service Dealer nearest you.

SPECIFICATIONS

MODEL:		CH11	CH12.5	CH14
BORE:	inches (millimetres)	3.43 (87)	3.43 (87)	3.43 (87)
STROKE:	inches (millimetres)	2.64 (67)	2.64 (67)	2.64 (67)
DISPLACEMENT:	cubic inches (cubic centimetres)	24.3 (398)	24.3 (398)	24.3 (398)
POWER: (@3600 RPM):	horsepower (kilowatts)	11* (8.2)	12.5* (9.33)	14* (10.50)
MAX. TORQUE:	(Ft. Lbs. @ RPM)	20.2 @2000	20.5 @2000	21.3 @2500
COMPRESSION RATIO:		8.5:1	8.5:1	8.5:1
WEIGHT:	Lbs. (kilograms)	92 (41.73)	92 (41.73)	92 (41.73)
OIL CAPACITY (w/filter)	U.S. pints (litres)	4 (1.9)	4 (1.9)	4 (1.9)
LUBRICATION:		Full Pressure w/full Flow Filter	Full Pressure w/full Flow Filter	Full Pressure w/full Flow Filter

*Horsepower ratings are established in accordance with Society of Automotive Engineers -- Small Engine Test Code -- J1349 GROSS. Kohler Co. reserves the right to change product specifications, design, and standard equipment without notice and without incurring obligation.

LIMITED 2 YEAR COMMAND ENGINE WARRANTY

We warrant to the original consumer that each new COMMAND engine sold by us will be free from manufacturing defects in materials or workmanship in normal service for a period of two (2) years from date of purchase, provided it is operated and maintained in accordance with Kohler Co.'s instructions and manuals.

Our obligation under this warranty is expressly limited, at our option, to the replacement or repair at Kohler Co., Kohler, Wisconsin 53044, or at a service facility designated by us of such parts as inspection shall disclose to have been defective.

EXCLUSIONS:

This warranty does not apply to defects caused by casualty or unreasonable use, including faulty repairs by others and failure to provide reasonable and necessary maintenance.

The following items are not covered by this warranty:

Engine accessories such as fuel tanks, clutches, transmissions, power-drive assemblies, and batteries, unless supplied or installed by Kohler Co. These are subject to the warranties, if any, of their manufacturers.

WE SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OF ANY KIND, including but not limited to labor costs or transportation charges in connection with the repair or replacement of defective parts.

ANY IMPLIED OR STATUTORY WARRANTIES, INCLUDING WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY LIMITED TO THE DURATION OF THIS WRITTEN WARRANTY. We make no other express warranty, nor is any one authorized to make any in our behalf.

Some states do not allow limitations on how long an implied warranty lasts, or the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

TO OBTAIN WARRANTY SERVICE:

Purchaser must bring the engine to an authorized Kohler service facility. For the facility nearest you, consult your Yellow Pages or write Kohler Co., Attn: Engine Warranty Service Dept., Kohler, Wisconsin 53044.

ENGINE DIVISION, KOHLER CO., KOHLER, WISCONSIN 53044



210-F
WEIGHT INDICATING INSTRUMENT
TECHNICAL and OPERATION MANUAL

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SERIAL NUMBER _____
DATE OF PURCHASE _____
PURCHASED FROM _____


RETAIN THIS INFORMATION FOR FUTURE USE

PRECAUTIONS


Before using this instrument, read this manual and pay special attention to all "WARNING" symbols:



IMPORTANT



ELECTRICAL
WARNING



STATIC
SENSITIVE

STATIC ELECTRICITY PRECAUTION



CAUTION! This device contains static sensitive circuit cards and components. Improper handling of these devices or printed circuit cards can result in damage to or destruction of the component or card. Such actual and/or consequential damage IS NOT covered under warranty and is the responsibility of the device owner. Electronic components must be handled only by qualified electronic technicians who follow the guidelines listed below:



ATTENTION! ALWAYS use a properly grounded wrist strap when handling, removing or installing electronic circuit cards or components. Make certain that the wrist strap ground lead is securely attached to an adequate ground. If you are uncertain of the quality of the ground, you should consult a licensed electrician.

ALWAYS handle printed circuit card assemblies by the outermost edges. NEVER touch the components, component leads or connectors.



ALWAYS observe warning labels on static protective bags and packaging and NEVER remove the card or component from the packaging until ready for use.

ALWAYS store and transport electronic printed circuit cards and components in anti-static protective bags or packaging.

FCC COMPLIANCE STATEMENT

WARNING! This equipment generates, uses and can radiate radio frequency and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference in which case the user will be responsible to take whatever measures necessary to correct the interference.

You may find the booklet "How to Identify and Resolve Radio TV Interference Problems" prepared by the Federal Communications Commission helpful. It is available from the U.S. Government Printing Office, Washington, D.C. 20402. Stock No. 001-000-00315-4.

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SPECIFICATIONS

Power Requirements:	90 to 264 VAC (50/60 Hz) at 0.4A
Enclosure Type, Size:	Fiberglass NEMA 4X/IP66: 17.5"W x 15.25"H x 7.25"D
Operating Environment:	Temperature: 14 to 104 °F (-10 to +40 °C) Humidity: 90% non-condensing (maximum)
Display:	6-digit, 3" high, 7-segment transreflective LCD with 6 each annunciators and light sensitive backlighting for low light view
Sensitivity:	0.45 uV/V/d (0-3.3 mV/V Input)
Signal Input Range:	1.0 mV min. to 40 mV max. (with dead load boost)
Transducer Excitation:	12 VDC
Number of Load Cells:	8 each, 350 OHM minimum resistance
Load Cell Cable Length:	1500 feet maximum. Consult factory for other requirements 30 feet maximum without sense lines
Resolution:	1 part in 100,000 displayed, normal mode 1 part in 1,000,000 internal
Capacities:	100 to 10,000 divisions commercial, Up to 200,000 divisions non-commercial
Tare Capacity:	Scale Capacity
Division Value:	1, 2, or 5 x 10, 1, 0.1, 0.01, and 0.001, commercial 0 to 99, non-commercial
Sample Rate:	1 to 50 samples per second, selectable
Auto Zero Range:	0.5 or 1 through 9 divisions
Weighing Units:	Tons, Pounds, Pounds-Ounces, Ounces, Metric Tons, Kilograms, Grams
Keypad:	Membrane type with 22 color-coded keys
Standard I/O:	(1) Bi-directional RS232 and 20mA and (1) RS232/20mA output only
Optional I/O:	14 bit Analog Output (0 to 10v, 4 to 20mA)

Standard Features:

- Push button tare function
- Gross, tare, net conversion
- Selectable key disable
- Hi-Resolution mode
- Adjustable filtering
- Gross and Net accumulators
- Remote input lines for Zero, Tare, Gross and Print (1000 feet maximum)
- Programmable print format using Visual Print (2, available)
- SMA level 2 compliant serial communications
(For more information see <http://www.scalemanufacturers.org>)
- Field re-program mable via PC interconnection
- Test feature (performs display and internal tests)
- Auto Shutoff & Sleep mode
- Keypad tare function
- Count feature
- Time and Date
- Three Preset Weight Comparators or Checkweigher (setup selectable)

Optional Features:

- Analog Output
- Special Filtering

SITE PREPARATION REQUIREMENTS

The 210-F Weight Indicator is a precision weight measuring instrument. As with any precision instrument, it requires an acceptable environment to operate at its peak performance and reliability. This section is provided to assist you in obtaining such an environment.

Electrical Power

The 210-F indicator has been designed to operate from 90 to 264 VAC at 50/60 Hz. Note that a special order is not required for operation at 230 VAC.



CAUTION! - To avoid electrical hazard and possible damage to the indicator, **DO NOT**, under any circumstance, cut, remove, alter, or in any way bypass the power cord grounding prong.

On models requiring 230 VAC power, it is the responsibility of the customer to have a qualified electrician install the proper power cord plug that conforms to national electrical codes and local codes and ordinances.

The power outlet for the indicator should be on a separate circuit from the distribution panel. This circuit should be dedicated to the exclusive use of the indicator. The wiring should conform to national and local electrical codes and ordinances and should be approved by the local inspector to assure compliance.

To prevent electrical noise interference, make certain all other wall outlets for use with air conditioning and heating equipment, lighting or other equipment with heavily inductive loads, such as welders, motors and solenoids are on circuits separate from the indicator. Many of these disturbances originate within the building itself and can seriously affect the operation of the instrument. These sources of disturbances must be identified and steps must be taken to prevent possible adverse effects on the instrument. Examples of available alternatives include isolation transformers, power regulators, uninterruptible power supplies, or simple line filters.

PRECAUTIONS

In general, the 210-F Indicator will perform well within a temperature range of 14 to 104 °F (-10 to +40 °C).

Insure that the indicator has good, clean AC power and is properly grounded.

In areas subject to lightning strikes, additional protection to minimize lightning damage, such as surge suppressors, should be installed.

Care And Cleaning

DO NOT submerge indicator in water, pour or spray water directly on instrument.

DO NOT use acetone, thinner or other volatile solvents for cleaning.

DO clean the indicator with a damp soft cloth and mild non-abrasive detergent.

DO remove power before cleaning with a damp cloth.

DO keep the surroundings clear to provide clean and adequate air circulation.



PROVIDE GOOD, SAFE GROUND AND CLEAN AC POWER



PROVIDE ADEQUATE PROTECTION TO MINIMIZE LIGHTNING DAMAGE

INSTALLATION

Before beginning installation of your Model 210-F Weight Indicating Instrument, make certain that the instrument has been received in good condition. Carefully remove the instrument from the shipping carton and inspect it for any evidence of damage (such as exterior dents or scratches) that may have taken place during shipment. Keep the carton and packing material for return shipment if it should become necessary. It is the responsibility of the purchaser to file all claims for any damages or loss incurred during transit.

Mounting the 210-F

The 210-F in a NEMA 4X enclosure is normally mounted on the wall or some vertical surface. The enclosure is attached to the wall with four (4) bolts. Refer to Figure No. 1 for the hole layout for the NEMA 4X enclosure.

First make certain that the mounting surface is strong enough to support the enclosure while being close enough to provide the operator easy access to the keypad. Next, in order to avoid glare on the 210-F display, a mounting location should be chosen that would prevent direct sunlight reflection. If such a location is not possible, then the enclosure should be mounted using spacers to tilt it such that the glare is reduced or eliminated.

Carefully layout the mounting hole locations, then drill and install the anchor bolts. Attached the enclosure to the wall and securely tighten the retaining bolts.

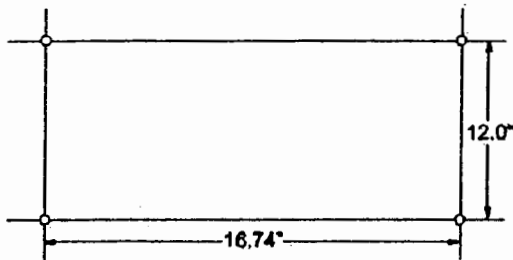
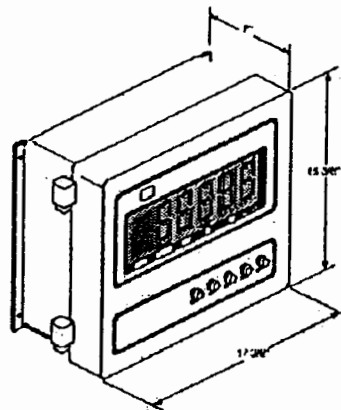


Figure No. 1



Interconnections

Continue by opening the front cover on the instrument enclosure. Loosen the two (2) retaining screws. DO NOT remove these screws. Fully open the front cover of the instrument exposing the 210 indicator.

Load Cell Connection



CAUTION! Disconnect any external load cell power supply before connecting load cells to the instrument. Failure to do so will result in permanent damage to the instrument.

For installations with over 30 feet of cable between the indicator and the load cells, sense wires should be used. The sense wires must be connected between the +SENS, -SENS terminals on the indicator and the +EXCITATION, -EXCITATION wires of the load cells or the +SENS, -SENS terminals of the load cell trim board or the section seal trim board. For the indicator to use the sense wires, the +SENS jumper J4 and the -SENS jumper J5 must be open (see Figure No. 6).

INSTALLATION, Cont.

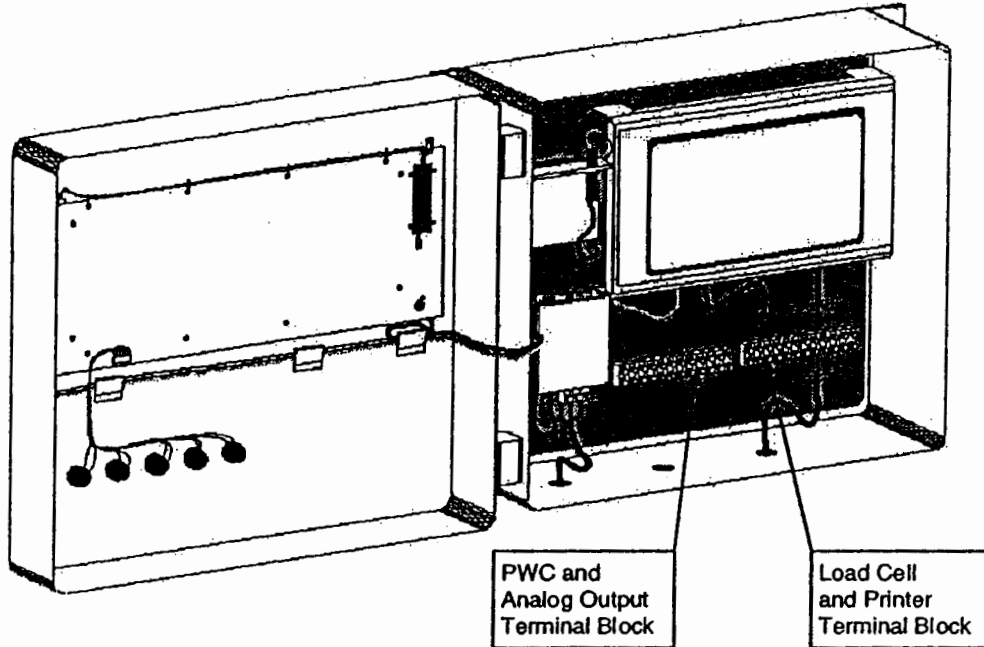
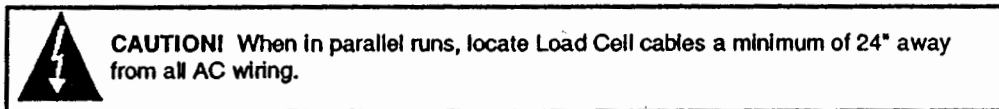


Figure No. 2



Loosen the cable gland connector for the load cell. This gland connector is located on the bottom of the enclosure on the right-hand side. Refer to Figure No. 2 for an illustration of the connector layout.

Slip the single cable from the load cell or load cell junction box through the gland connector and into the enclosure.

Remove 2" of the outer insulation jacket then remove 1/4" of insulation from each of the 4 wires and shield without sense leads or 6 wires and shield with sense leads (refer to Figure No. 3). Connect each of the wires to terminal block as shown in Figure No. 3.

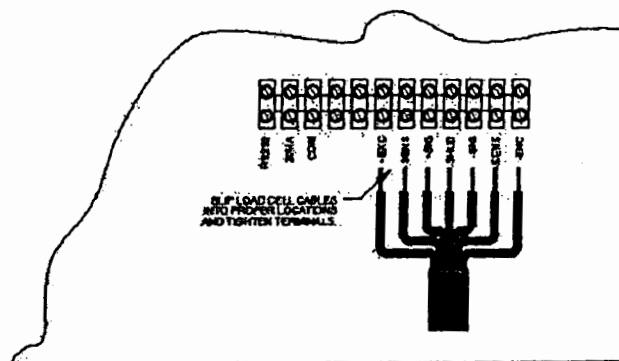


Figure No. 3

NOTE! If the sense leads are NOT used, you must install plug-in jumpers at J4 and J5 on the 210 main board (see Figure No. 6). These jumpers attach the sense leads to the excitation leads. If sense leads ARE used, these plug-in jumpers should be positioned on one plug-in pin only or removed and stored for later use.

INSTALLATION, Cont.

Printer Output Connection

If a printer is used, it may be connected to the printer output connector located on the sub panel. Figure No. 4 shows the connections for both RS232 compatible data and 20 mA current loop interfaces for the printer output.

Printer Cable Installation

Loosen the gland connector adjacent to the load cell gland connector (see Figure No. 2) and slip the printer cable through it and into the enclosure. Remove 2" of the outer insulation jacket from the cable then remove 1/4" of insulation from each of the wires. These wires are to be connected to the terminal block at the bottom of the sub panel. Refer to Figure No. 2 for the location of the terminal block.

Slip the wire into the terminal opening and tighten the screw to lock the wire in place.

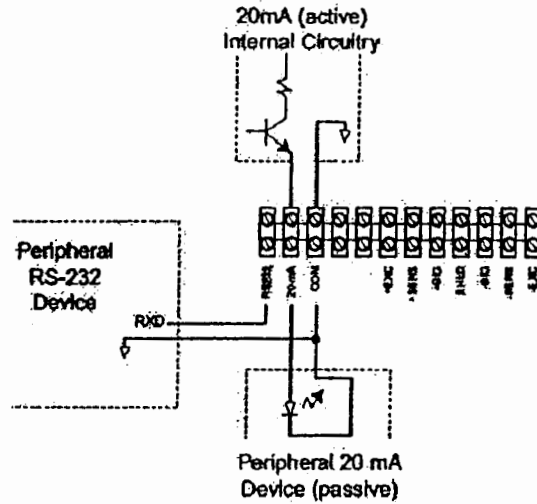


Figure No. 4

NOTE! The printer output can be either RS232 compatible or 20 mA current loop.

Custom Power Cord

The 210-F comes with a 6' power cord. However, if you have a custom power cord, loosen the cable gland connector for the power cord, located on your far left, then insert the cable through the connector and into the enclosure.

Optically Isolated Inputs

Included with the I/O are 5 programmable inputs that may be used to remotely (up to 100 feet) initiate various functions within the indicator. These inputs are accessed via a terminal block at the bottom of the sub panel. Refer to Figure No. 2 for the location of the terminal block.

The 4 inputs are defined as follows:

- one is for Zero
- the second is for Gross/Net
- the third is for Mode (lb/kg)
- the fourth is for Tare
- the fifth is for Print

Figure No. 5 illustrates the layout of this connector and identifies the Inputs for Zero, Gross/Net, Lb/kg, Tare, and Print.

Remember that the input must be connected to GND to initiate the function.

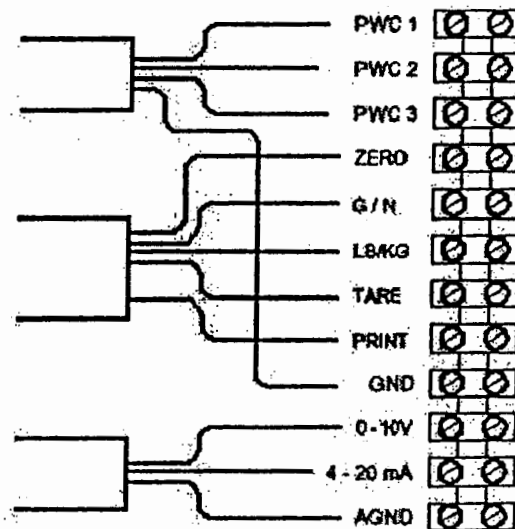


Figure No. 5

INSTALLATION, CONT.

Preset Weight Comparator/Checkweigher Logic Level Output

If you so choose, you may use the logic level outputs from your Model 210 Indicator's preset weight comparators or checkweigher to control peripheral devices used to manage the flow of material or signal when the weight is within preset limits. Note that these outputs are at logic level and cannot drive external devices directly. Solid-state relays can be used to accept the logic level output from the 210 and in turn, drive the external device.

To connect the control cable to the preset weight comparator/checkweigher logic level output connector P10, first loosen the gland connector located on the back of the 210 on the right side. Refer to Figure No. 4 for the exact location of this connector. Slip the cable through this connector and into the enclosure. Remove 2 inches of the cable-insulating jacket then 1/4 inch of insulation from each of the internal wires (refer to Figure No. 5). Make the proper terminations on terminal block P10. To terminate a wire, first press down on the terminal block release bar, insert the wire into the terminal and remove pressure from the release bar locking the wire in place.

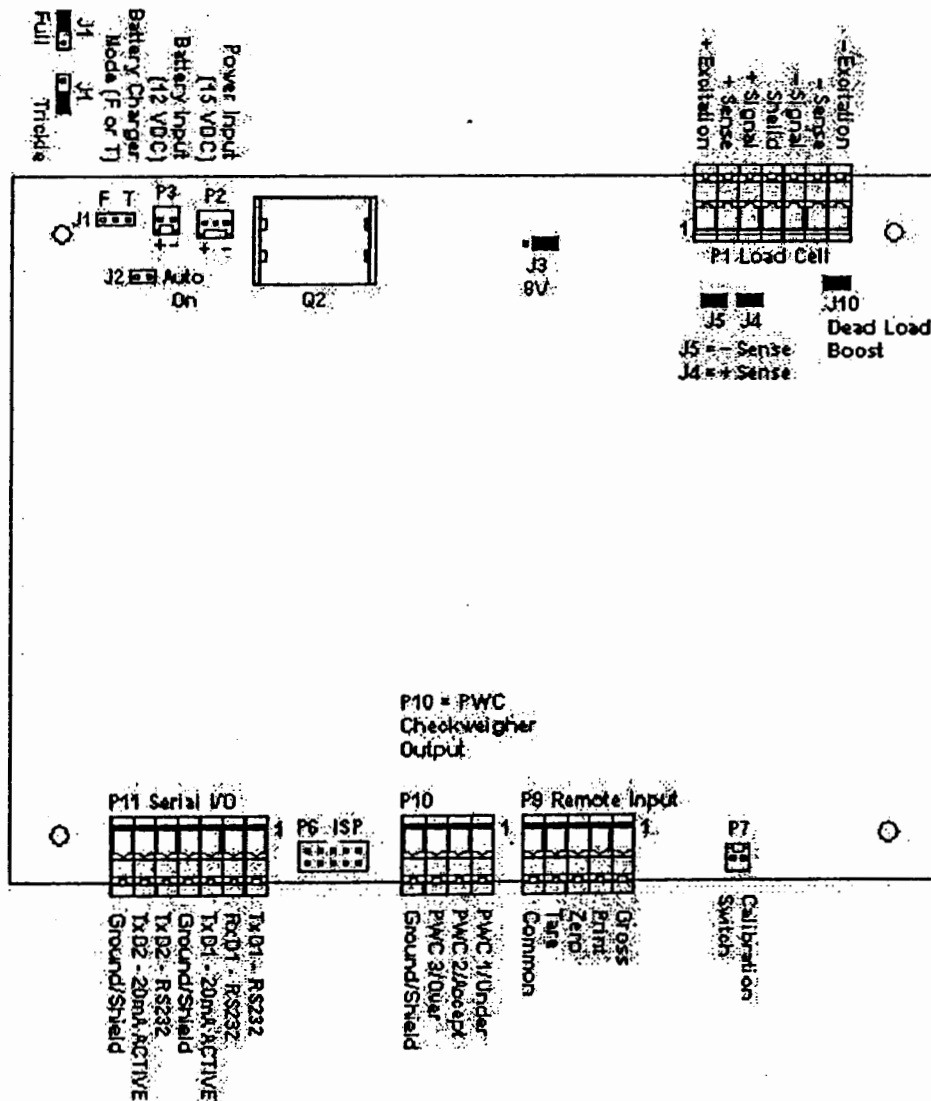


Figure No. 6

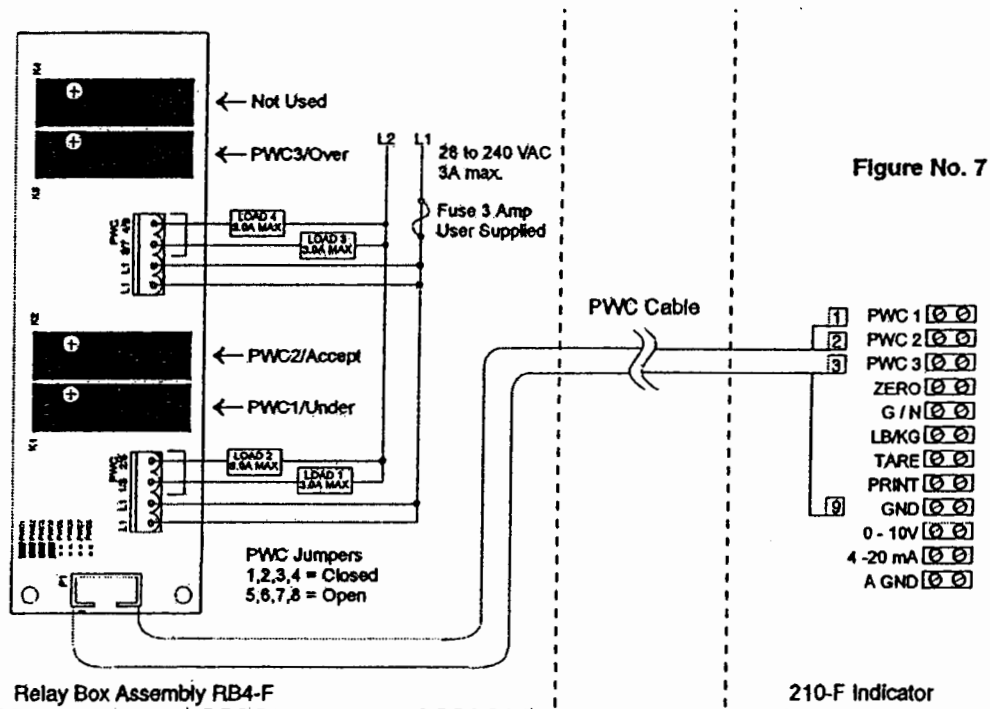
INSTALLATION, Cont.

Relay Board

The relay board (Cardinal p/n 8539-C062-0A) is mounted in the RB4-F external junction box for use with the 210-F Indicator. Connect the devices to be controlled as shown in Figure No. 7.

The individual relays can be configured to be on (closed) or off (open) at weights under the preset weight then switch at the preset weight from on-to-off or off-to-on by setting the under weight condition to on or off during setup and calibration or setup review. Refer to the Setup and Calibration, "d out" (Digital Output) section of this manual for more information.

EXAMPLE: d oUt= 1,1



PWC1 relay is on (closed) for weights under the preset weight and off (open) for weights equal to or over the preset weight.

NOTE! All relays are the normally open type that will open when power to indicator is lost.

Auto-On Jumper

AUTO-ON jumper J2, when connected, will cause the indicator to power on automatically whenever power is applied to the power input connector. If power is lost momentarily and then reapplied, the indicator will turn on without pressing the ON key. See Figure No. 6 for location.

NOTE! After all terminations have been made, remove the excess cable from the instrument enclosure and securely tighten each of the cable gland connectors. Do not over-tighten these connectors but make certain they are snug. **DO NOT USE TOOLS!** Tighten with fingers!

210-F FRONT PANEL SWITCHES

ZERO - Pressing the ZERO switch will set the currently displayed gross weight to zero. The ZERO key is operational only if displaying gross weight.

G/N - This is the GROSS/NET switch. Pressing it will alternate the display between gross and net weight if a tare weight is stored in memory.

LB/KG - Pressing the LB/KG switch will alternate the displayed weight between pound units and kilogram units if enabled during setup.

TARE - This switch will store the current gross weight as the tare weight and cause the net weight to be displayed. It is operable while displaying gross or net weight and must be enabled during setup.

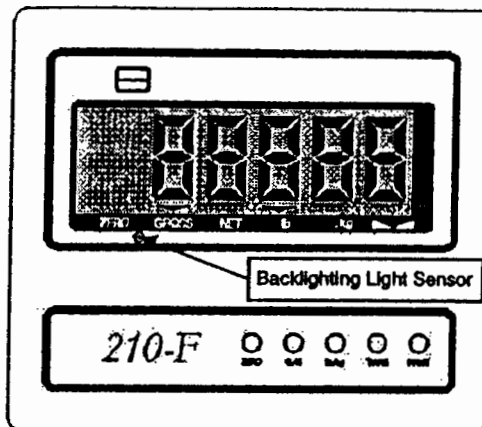


Figure No. 8

PRINT - Pressing this key will initiate the transmission of weight data via the printer output port unless the continuous data feature of this port was enabled during setup and calibration. Note that the 210 will not respond to this command unless the weight display is stable and not less than zero. If displaying gross weight, the only weight printed is gross weight. If displaying net weight, the gross, tare, and net weights are printed. Pressing this key during calibration or review will step to the bAUd? prompt.

FRONT PANEL ANNUNCIATORS

The front panel annunciators are turned on to indicate that the display is in the mode corresponding to the annunciator label or that the status indicated by the label is active. The annunciators flash on and off to indicate that the 210F is waiting for an input from the keypad for the mode indicated by the flashing annunciator.

ZERO

The ZERO annunciator is turned on to indicate that the weight is within +/- 1/4 division of the center of zero.

GROSS

The GROSS annunciator is turned on to indicate that the displayed weight is the gross weight.

NET

The NET annunciator is turned on to show that the displayed weight is the net weight (gross weight less tare weight).

lb

The lb (pound) annunciator is located to the left of the weight display and is turned on to show that the displayed weight unit is pounds.

kg

The kg (kilograms) annunciator is located to the left of the weight display and is used to indicate that the displayed unit of weight measurement is kilograms.

STABLE

The STABLE annunciator is identified with two (2) small triangle shapes and is turned on when the weight display is stable. This means that the change in successive weight samples is less than the motion limits selected during setup and calibration of the instrument.

INTERNAL KEYPAD FUNCTIONS

The Model 210-F is equipped with a 22-key keypad. The keypad is used to enter commands and data into the instrument. This section describes each key along with its normal function. It is helpful to refer to the actual instrument while reading this section.



The membrane keypad is not to be operated with pointed objects (pencils, pens, fingernails, etc). Damage to keypad resulting from this practice is NOT covered under warranty.

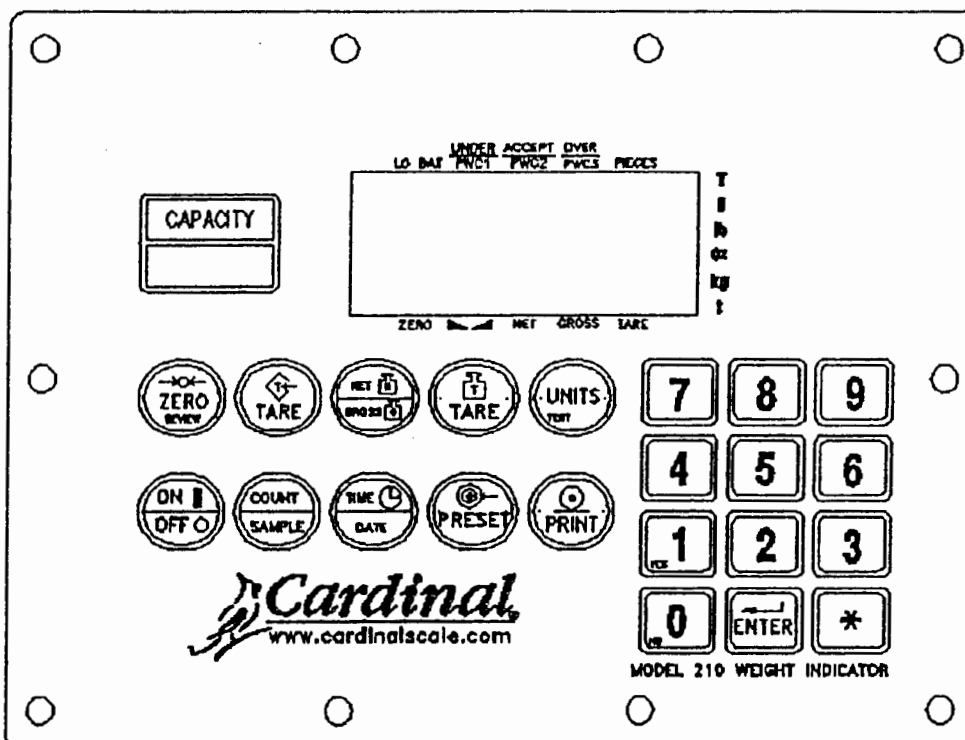


Figure No. 9

ON/OFF KEY

This key performs two functions. Pressing it when the indicator is off will apply power to the instrument. If the indicator is already on, pressing this key will turn the indicator off.

COUNT/SAMPLE KEY

This key performs two functions. The first time it is pressed, the indicator will count (unless piece weight is 0). The second time it is pressed (or if pcwt=0 on the first press) will show the prompt "ADD=5" on the display. Continued pressing of the COUNT/SAMPLE key will toggle between the ADD=5, 10, 25, 50, 75 prompts to select a sample size. When desired sample size is displayed, press the ENTER key OR with "ADD=XX" (5, 10 etc.) displayed, using the numeric keypad, key-in any desired sample value, then press the ENTER key. Press the ASTERISK key to abort the input operation. To exit the count function and display weight, press the NET/GROSS key.

INTERNAL KEYPAD FUNCTIONS, Cont.

TIME/DATE KEY

Pressing the **TIME/DATE** key will enter the clock mode with the 210 displaying **HoUr=**, the prompt to enter the time. Press the **ENTER** key to display the current time. If the time displayed is correct, press the **ENTER** key to proceed the date input prompt, **dAtE=**. If the time is incorrect, use the numeric keys to enter the correct time then press the **ENTER** key to save the new time and display the date prompt. Note that if the time is displayed in a 24-hour format, 12 is added to all times after noon, i.e. 3 PM would be 1500.

If the date displayed is correct, press the **ENTER** key to proceed to the consecutive number prompt, **CnC n=**. If the displayed date is incorrect, use the numeric keys to enter the correct date and press the **ENTER** key to display the consecutive number prompt. Remember to enter the date in the same format (month-day-year or day-month-year) as selected by the USA setup parameter. With the **USA=yes** setting, the date format is month-day-year.

Consecutive Number

If the consecutive number displayed is correct, press the **ENTER** key to resume normal operation. If the consecutive number displayed is incorrect, use the numeric keys to enter the correct consecutive number (up to 6 digits) and press the **ENTER** key to resume normal operation.

PRESET KEY

This key is used to enter the weight values for the three preset weight comparators or for the checkweigher feature depending on which feature was selected (setup parameter "d out") during setup and calibration.

Preset Weight Comparator

If the Preset Weight Comparator feature was selected, the PWC1 annunciator will flash and the display will show the currently stored value for the number 1 preset weight comparator. If the value displayed is acceptable, press the **ENTER** key, otherwise, use the numeric keys to enter the new preset value and press the **ENTER** key. The PWC2 annunciator will now flash and the display will show the currently stored value for the number 2 preset weight comparator. As before, if the value displayed is acceptable, press the **ENTER** key, otherwise, use the numeric keys to enter the new value and press the **ENTER** key. The PWC3 annunciator will now flash and the display will show the currently stored value for the number 3 preset weight comparator. Again, if the value displayed is acceptable, press the **ENTER** key, otherwise, use the numeric keys to enter the new value and press the **ENTER** key.

Checkweigher

If the Checkweigher feature was selected and the **PRESET** key pressed, the **ACCEPT** and **UNDER** annunciators will flash and the preset value for the minimum acceptable weight will be displayed. Press the **ENTER** key if the displayed value is correct or use the numeric keys and enter the new value and press the **ENTER** key. The **ACCEPT** and **OVER** annunciators will now flash and the display will show the minimum value of weight over the accepted range. As before, if the value shown is correct, press the **ENTER** key. If the value is incorrect, enter the new value and press the **ENTER** key to save it. Note that this value must be greater than the accept value. Remember that both the preset weight comparators and checkweigher functions operate on the absolute value of the weight ignoring the polarity. After the second preset value is entered, the 210 will return to normal operation.

INTERNAL KEYPAD FUNCTIONS, Cont.

PRINT KEY

Pressing this key will add the displayed gross or net weight to the associated accumulator and initiate the transmission of weight and other data selected during setup of the Print menu items via the selected printer output port (see Port= under Print menu) unless the continuous data feature of this port was enabled during setup and calibration.

Note that the indicator will not respond to the Print command unless the weight display is stable. If displaying gross weight, the only weight printed is gross weight. If displaying net weight, the gross, tare, and net weights are printed.

The 210-F includes support for Visual Print. Visual Print is a PC based program that designs a ticket then downloads the ticket information to the indicator. The 200 Series allows two programmable formats in addition to the standard print tab settings format. Print formats are selected by using the **ASTERISK** and **PRINT** keys in combination (refer to the Asterisk Key section for details). **NOTE!** When the **PRINT** key is pressed the indicator looks for the selected format. If no Visual Print ticket is found it reverts to the print tab settings. *For more information on Visual Print, refer to the Visual Print Programming and Operation manual.*

#2
10:19 23/08/2000
100.00 lb G
20.00 lb T
80.00 lb N
0.00 lb GROSS ACCUM
272.00 lb NET ACCUM

SAMPLE TICKET

ZERO/REVIEW KEY

This key performs two functions. In normal operation, pressing this key will cause an immediate zeroing of the weight display up to the selected limit of 4% or 100% of the scale's capacity. Note that this selection is made during the setup and calibration of the instrument. Pressing this key after the **ASTERISK** key will enter the Review mode of Setup and Calibration. Refer to description of **ASTERISK** key and the Setup Review section of this manual for details.

TARE KEY (with diamond "T" symbol)

This key is a dual function key. Pressing the **TARE** key alone (Pushbutton Tare mode) will cause the current gross weight to be stored as the new tare weight and cause the weight display to change to the net weight display mode (Net annunciator will turn on). Pressing this key after entering a numeric value (Keypad Tare) will cause the value entered to be accepted as the new tare weight.

NOTE: Tare weights equal to or greater than scale capacity cannot be entered. In addition, the keypad tare weight division value must be the same as the scale division value. For example, a unit with .005 lb as the division value will display -Error if you attempt to enter 1.003 for the tare weight.

NET/GROSS KEY

This key is used to toggle between Net and Gross weight modes. The selected mode is indicated by turning on the appropriate annunciator on the display. Note that if no valid tare weight has been entered, pressing this key will cause a momentary "notArE" display error and the indicator will remain in the Gross weight mode.

TARE KEY (with weight "T"symbol)

Pressing this key will display the current tare weight for three seconds.

INTERNAL KEYPAD FUNCTIONS, Cont.

UNITS/TEST KEY

This key performs two functions. In normal operation, this key is used to select the units in which the weight is to be displayed. The available units of measure ("unit1" and "unit2") are enabled or disabled in setup. The available units include tons, pounds only, pound-ounces, ounces only, tonnes (metric tons), kilograms, and grams. Note that not all combinations are supported. Pressing this key after the **ASTERISK** key will enter the Test mode. The Test mode is used to conduct a test of all display elements. Refer to description of **ASTERISK** key for details.

0 THROUGH 9 KEYS

These keys are used to enter numeric data during the setup and calibration as well as during normal operation of the instrument. **NOTE:** The 1 and 0 keys have dual functions. They are used to enter numeric data during setup and calibration as well as during normal operations and are also used to answer yes (1 = YES) or no (0 = NO) to various prompts.

ENTER KEY

The **ENTER** key serves two purposes. First, when reviewing setup parameters, pressing the **ENTER** key will display the current setting of the parameter. Second, the **ENTER** key is used to signal completion of the entry of data and causes the indicator to process the data entered.

ASTERISK KEY

This key is used for several functions. During Setup, when a setup parameter (not a parameter value) is displayed, pressing this key will "backup" to the previous prompt. In normal operation, this key is used in conjunction with the other keys on the keypad to access additional indicator features. These features and their associated key combinations are as follows:

ASTERISK, ZERO/REVIEW KEY

This combination will enter the Review mode of Setup and Calibration. Refer to Setup Review section of this manual for details.

ASTERISK, NET/GROSS KEY

This combination will display the Net accumulator.

ASTERISK, NET/GROSS KEY, PRINT KEY

This combination will print the Net accumulator.

ASTERISK, NET/GROSS KEY, ZERO KEY

This combination will zero (clear) the Net accumulator.

ASTERISK, NET/GROSS KEY, NET/GROSS KEY

This combination will display the Gross accumulator.

ASTERISK, NET/GROSS KEY, NET/GROSS KEY, PRINT KEY

This combination will print the Gross accumulator.

ASTERISK, NET/GROSS KEY, NET/GROSS KEY, ZERO KEY

This combination will zero (clear) the Gross accumulator.

ASTERISK, UNITS KEY

This combination will enter the Test mode. The Test mode is used to conduct a test of all display elements. The test consists of five (5) cycles, each lasting about one (1) second:

1. All horizontal segments will turn on (no annunciators).
2. All vertical segments and decimal points will turn on (no annunciators).
3. All annunciators will turn on.
4. All display elements off.
5. The model number (205, 210) and the software version X.X.
6. The calibration numbers (C1 to C4).

INTERNAL KEYPAD FUNCTIONS, Cont.

ASTERISK, PRINT KEY

This combination is used to *change* the selected print ticket format. Pressing the **ASTERISK** then the **PRINT** key will display a prompt "Prt=". Press the **ENTER** key to show the current value. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, using the numeric keys enter the new setting, then press the **ENTER** key to save it. Allowable values are:

0 = print tab settings 1 = Visual Print Format 1 2 = Visual Print Format 2

In addition to using the **ASTERISK, PRINT** key combination to change the print ticket format, the operator (just prior to printing the ticket) can change the print ticket format at the end of the weighing operation. This is accomplished by performing the normal weighing operation, and then pressing the desired format number (0, 1 or 2), followed by pressing the **PRINT** key.

NOTE! When a print format is selected (by either method), it will remain active until changed by the operator.

INTERNAL ANNUNCIATORS

Annunciators are turned on to indicate that the display is in the mode corresponding to the annunciator label or that the status indicated by the label is active. The annunciators flash on and off to indicate that the 210F is waiting for an input from the keypad for the mode indicated by the flashing annunciator.

ZERO

The **ZERO** annunciator is turned on to indicate that the weight is within +/- 1/4 division of the center of zero.

STABLE

The **STABLE** annunciator is identified with two (2) small triangle shapes and is turned on when the weight display is stable. This means that the change in successive weight samples is less than the motion limits selected during setup and calibration of the instrument.

NET

The **NET** annunciator is turned on to show that the displayed weight is the net weight (gross weight less tare weight).

GROSS

The **GROSS** annunciator is turned on to indicate that the displayed weight is the gross weight.

TARE

The **TARE** annunciator is turned on to show that the displayed weight is the tare weight.

LO BAT

The **LO BAT** annunciator is used with the battery operation and will turn ON to indicate that the battery has less than one hour useful life before recharging will be required. If continued use furthers drains the battery, no change in operation will occur until just before the battery voltage drops to a level where operation is affected. At this level, the indicator will automatically turn itself off. Refer to the Optional Battery Pack Operation section of this manual for more details.

INTERNAL ANNUNCIATORS, Cont.

UNDER/PWC1

The UNDER annunciator is used to signal that the displayed weight is less than the minimum value of acceptable weight used in the Checkweigher feature. Note that this annunciator is active only when the Checkweigher feature is enabled.

The PWC1 annunciator is turned on to indicate that the displayed weight is equal to or greater than the weight value stored as preset number 1. Note that this annunciator is active only when the Preset Weight Comparator feature has been enabled.

ACCEPT/PWC2

The ACCEPT annunciator is used to signal that the displayed weight is within the acceptable weight limits for the Checkweigher feature. That is, it is equal to or greater than the minimum acceptable weight and equal to or less than the maximum acceptable weight. Note that this annunciator is active only when the Checkweigher feature has been enabled.

The PWC2 annunciator is turned on to indicate that the displayed weight is equal to or greater than the weight value stored as preset number 2. Note that this annunciator is active only when the Preset Weight Comparator feature has been enabled.

OVER/PWC3

The OVER annunciator is used to signal that the displayed weight is equal to or greater than the minimum value of over weight used in the Checkweigher feature. Note that this annunciator is active only when the Checkweigher feature has been enabled.

The PWC3 annunciator is turned on to indicate that the displayed weight is equal to or greater than the weight value stored as preset number 3. Note that this annunciator is active only when the Preset Weight Comparator feature has been enabled.

T

The T (tons) annunciator is located to the right of the weight display and is turned on to show that the displayed weight unit is tons.

g

The g (gram) annunciator is located to the right of the weight display and is used to indicate that the displayed unit of weight measurement is grams.

lb

The lb (pound) annunciator is located to the left of the weight display and is turned on to show that the displayed weight unit is pounds.

oz

The oz (ounce) annunciator is located to the right of the weight display and is turned on to show that the displayed weight unit is ounces.

kg

The kg (kilograms) annunciator is located to the left of the weight display and is used to indicate that the displayed unit of weight measurement is kilograms.

t

The t (tonnes, metric tons) annunciator is located to the right of the weight display and is used to indicate that the displayed unit of weight measurement is tonnes (metric tons).

SETUP AND CALIBRATION

The 210-F Indicator has been thoroughly tested and calibrated before being shipped to you. If you received the indicator attached to a scale, calibration is not necessary. If the indicator is being connected to a scale for the first time or recalibration is necessary for other reasons proceed as indicated.

The calibration switch is located on the lower left side of the main printed circuit board mounting bracket. You may gain access to this switch simply by opening the door on the enclosure. The calibration switch is identified in Figure No. 10. Once you have located the calibration switch proceed with the calibration instructions.

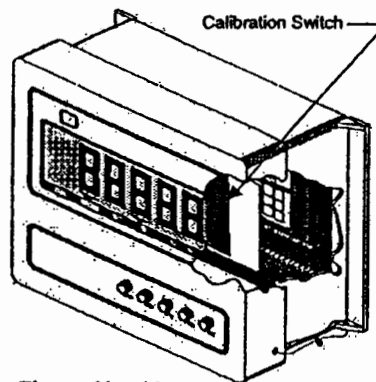


Figure No. 10

NOTE! During the setup and calibration process it is necessary to enter operational parameters via the 210's keypad. Pressing the ENTER key without entering a new value will retain the current setting and advance the 210 to the next prompt. To change a setting, enter a new value and press the ENTER key. This will save the new value and advance the 210 to the next prompt. Pressing the ASTERISK key will "backup" to the previous prompt.



CAUTION: The membrane keypad is not to be operated with pointed objects (pencils, pens, fingernails, etc). Damage to keypad resulting from this practice will NOT be covered under warranty.

Enter Setup Mode

To enter the setup mode, with the indicator ON, insert a small screwdriver or other tool through the calibration switch access hole on the rear panel. Press and release the calibration switch. The menu SetUP will be displayed. Continue to press and release the switch to rotate through the beginning point for entering the setup mode.

SETUP	Setup Mode (starts at USA prompt)
A-d	Analog to Digital Filtering (starts at dFLt= prompt)
CAL	Calibration (starts at CAL1 prompt)
Slo	Serial Input/Output (starts at BAUD prompt)
Print	Print Tab Settings (starts at PORT prompt)
F SPAn	Fine Span Adjustment
Hi rES	Display high-resolution weight mode
LoCoUt	Key lock out function
dAC	Digital to Analog Converter (If DAC board is installed, Calibration of 10 volt or 4 to 20 mA Analog Output)

If you press the ENTER key at the SetUP prompt, you may proceed through to the next section (up to and including fSPAn) by pressing the ENTER key.



NOTE! Setup may be interrupted at any time. ALL data previously entered and finalized with the ENTER key will be retained in the non-volatile memory.

SETUP AND CALIBRATION, Cont.

Pressing the calibration switch *at any prompt* will return you to the SETUP menu. To exit setup, press the **ASTERISK** key with any of the above menu selections displayed or cycle power at any time (press the **ON/OFF** key twice).

NOTE! With the exception of the SETUP prompt, the prompts displayed for each section are different if you push the calibration switch instead of pressing the **ENTER** key to proceed through the section. *For example*, if you press the calibration switch with the SETUP displayed, the next prompt displayed will be A-d. If you step through the setup prompts by pressing the **ENTER** key, the next prompt displayed will be A-d?. In addition, at a prompt with the ? displayed, you must press the **ENTER** key, the **1/YES** key then the **ENTER** key again to proceed with that section. To skip the section and advance you to the next menu selection, press the **ENTER** key twice.

SETUP

USA (domestic or international)

With SETUP displayed, press the **ENTER** key. The display will change to USA=. Press the **ENTER** key to show the current value. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, using the numeric keys, **0/NO** or **1/YES**, enter the new setting, then press the **ENTER** key to save it.

USA = 1 (Domestic)

Date = mm/dd/yy
Trl = no
Cap + 4% to OC

USA = 0 (International)

Date = dd/mm/yy
Trl = yes
Cap + 9 grads to OC
PT printed with tare
Lamp test on power up

LfT (Legal For Trade)

Press the **ENTER** key to show the current value. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, using the numeric keys, **0/NO** or **1/YES**, enter the new setting, then press the **ENTER** key to save it.

LfT = 1

Interval Settings (Int=) allowed
are: 1, 2, 5, 10, 20, 50

LfT = 0

Interval Setting (Int=) is
selectable from 1 to 99.

NOTE! When both *LfT=1 and USA=1*, the followings results occur:

Scale must have between 100 and 10,000 divisions
Tra = .5 or 0 to 3
Inhibit serial data during input
Disables **COUNT** key
Date = mm/dd/yy
Trl = no
Cap + 4% to OC

NOTE! When *LfT=1 and USA=0*, the followings results occur:

Uns = 1
Date = dd/mm/yy
Trl = yes
Cap + 9 grads to OC
PT printed with tare
Lamp test on power up

SETUP AND CALIBRATION, Cont.

Unit1= (Weighing Unit 1)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the new setting, then press the ENTER key to save it. Allowable values are:

0 = none	4 = oz (ounces)
1 = tn (tons)	5 = kg (kilograms)
2 = g (grams)	6 = tonnes (metric tons)
3 = lb (pounds)	7 = lb/oz (pounds/ounces)

Int= (Interval Setting)

Press the ENTER key to show the current value.

If LFI = 1 (Legal For Trade = YES), using the numeric keys enter the new setting, then press the ENTER key to save it. Allowable values are: 1, 2, 5, 10, 20 or 50.

If LFI=0 (Legal For Trade = NO), using the numeric keys enter the new setting, then press the ENTER key to save it. Allowable values are: 1 through 99.

In either case, if the setting displayed is acceptable, press the ENTER key again it.

dPP= (Decimal Point Setting)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the new setting, then press the ENTER key to save it. Allowable values are: 0, 1, 2 or 3.

0 = XXXXXX	2 = XXXX.XX
1 = XXXXX.X	3 = XXX.XXX

CAP= (Capacity)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the new setting, then press the ENTER key to save it. Allowable values are: 1 through 999,999.

NOTE! Capacity cannot exceed 999,999.

Unit2= (Weighing Unit 2)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the new setting, then press the ENTER key to save it. Allowable values are:

0 = none	4 = oz (ounces)
1 = tn (tons)	5 = kg (kilograms)
2 = g (grams)	6 = tonnes (metric tons)
3 = lb (pounds)	7 = lb/oz (pounds/ounces)

NOTE! Not all units are available. Dependent upon selection made for UNIT1.

trA= (Zero Tracking Range)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the new setting, then press the ENTER key to save it. Allowable values are: 0 (disables Zero Tracking), .5, or 1 through 9.

SETUP AND CALIBRATION, Cont.

trL= (4% Zero Range)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys, 0/NO or 1/YES, enter the new setting, then press the ENTER key to save it.

Trl = 1 (Yes)
4% of scale capacity

trl = 0 (No)
Full capacity (no limit)

PUO= (Power-Up Zero Feature)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys, 0/NO or 1/YES, enter the new setting, then press the ENTER key to save it.

PUO = 1 (Yes)
Automatic Re-Zero on Power-Up

PUO = 0 (No)
No Re-Zero on Power-Up

td= (12 or 24 Time Format)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, use the numeric keys to select the format (12 or 24 hour) of the Model 210 clock operation, then press the ENTER key to save it. Note that in the 24-hour format, 12 is added to all times after noon, i.e. 3 PM would be 1500.

td = 12
12 hour clock (3PM displays 3:00)

td = 24
24 hour clock (3PM displays 15:00)

d oUt= X,Y (Digital Output)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, use the numeric keys to select the X, Y values for the digital output, then press the ENTER key to save it.

d out= X, Y

Where: X = State below cutoff (0 = LOW, 1 = High)
Y = Preset Number or Checkweigher Mode

0, 0 or 0*	Digital Output is disabled
0, 1 or 1*	Low State before cutoff with 1 active Preset
0, 2 or 2*	Low State before cutoff with 2 active Presets
0, 3 or 3*	Low State before cutoff with 3 active Presets
1, 1	High state before cutoff with 1 active Preset
1, 2	High state before cutoff with 2 active Presets
1, 3	High state before cutoff with 3 active Presets
0, 4 or 4*	Low State before cutoff on Checkweigher Mode
1, 4	High state before cutoff on Checkweigher Mode

* It is not necessary to enter the leading zero (0) for X values on selections. The program will assign a zero (0) to the X value if only one (1) number is entered.

SETUP AND CALIBRATION, Cont.

SLEEP= (Sleep Mode Feature)

The Sleep Mode feature conserves battery power when the indicator remains unused for a selected period of time. With the feature enabled, the load cell excitation will be reduced and the display will be blank.

Press the **ENTER** key to show the current status of this feature. If a number other than 0 is shown, this feature is selected and the number shown corresponds to the number of minutes of a stable zero weight reading before the indicator enters the sleep mode. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, use the numeric keys to enter a new value (0 to 10) then press the **ENTER** key to store the new setting. Note that entry of a 0 disables this feature.

A OFF= (Auto Shutoff)

The Automatic Shutoff feature will automatically turn the indicator off (when it is not in use) after a predetermined period of inactivity to prolong battery life. To turn the instrument back on you must press the **ON / OFF** key.

Press the **ENTER** key to show the current status for this feature. A number other than 0 indicates that the auto shutoff feature is enabled and the displayed number corresponds to the number of minutes of stable weight displayed before the indicator is turned off automatically. Note that a 0 indicates the feature has been turned off. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, use the numeric keys to enter a new value (0 to 10) then press the **ENTER** key to store the new setting.

CLtAr= (Clear Tare)

The Clear Tare feature allows the indicator to clear the Stored Tare weight when the Net weight goes below zero (a negative net weight after display of a positive net weight). With this feature enabled, the operator must re-set the tare after completion of a transaction when the load (container plus item) is removed from the scale.

Press the **ENTER** key to show the current value. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, using the numeric keys, **0/NO** or **1/YES**, enter the new setting, then press the **ENTER** key to save it.

CLtAr = 1 (Yes)

Automatically clears Stored Tare
when Net weight goes below zero

CLtAr = 0 (No)

Stored Tare is not cleared when
Net weight goes below zero

The following is a typical example of the Clear Tare feature in use.

1. Place container on scale, then press **TARE** key (with diamond "T" symbol on 210).
2. Load container with item to be weighed and perform normal weighing operation.
3. Remove load (item *AND* container) from scale.
4. Scale weight returns to below zero (the weight of the container) and is then reset to zero.
5. Operator is required to repeat step 1 before next weighing operation.

SETUP AND CALIBRATION, Cont.

A - d (A - d?) - Analog to Digital Filtering

dFLt= (Digital Filtering)

With A - d (A - d?) displayed, press the **ENTER** key. The display will change to dFLt=. Press the **ENTER** key to show the current value. If the setting displayed is acceptable, press the **ENTER** key to save it. Otherwise, using the numeric keys enter the new setting, then press the **ENTER** key to save it. Allowable values are: 0, 1, 2 or 3. Note, that if you select 3 (Custom Filtering) two additional prompts will be displayed.

dFLt=	
0	Disabled – NO Filtering
1	MINIMAL FILTERING (sample rate = 2)
2	MODERATE FILTERING (sample rate = 1)
3	CUSTOM FILTERING

NOTE! The prompts, F= (Filter Level) and b= (Break Range) will only be displayed if you selected 3 (Custom Filtering) for the dFLt= (Digital Filtering) prompt.

F= (Filter Level)

Press the **ENTER** key to show the current setting for the filter level. The filter level is a number from 1 to 99 that corresponds to the level of filtering with 99 being the greatest filtering and 1 the least. To accept the value displayed, press the **ENTER** key, otherwise, use the numeric keys to enter a new value then press the **ENTER** key to save it.

b= (Break Range)

Press the **ENTER** key to show the current setting for the break range. The break range is a number from 1 to 255 that corresponds to the number of division change to break out of the filtering. Press the **ENTER** key to keep the displayed value or use the numeric keys to enter a new value and press the **ENTER** key to save the new setting.

Sr= (Sample Rate)

Press the **ENTER** key to show the current setting for the sample rate. The value displayed is the sample rate in samples per second. Press the **ENTER** key to save the displayed value or use the numeric keys to enter a new value (1 to 50) and press the **ENTER** key to save it.

UnS= (Motion Range)

Press the **ENTER** key to view the current setting for the range of motion detection. If the displayed value is acceptable, press the **ENTER** key to save it. Otherwise, use the numeric keys to enter the new range (the number of divisions of change permitted before indicating unstable), then press the **ENTER** key to save the new setting. Allowable range values are: 0 through 99 divisions.

SETUP AND CALIBRATION, Cont.

FILTER SETTING RECOMMENDATIONS

Non-Critical Sample Rate

If the sample rate is not critical, as in static weighing, set dFLt= to "0" (no filtering), dFLt= "1" (F=6, b=12, Sr= 2/Sec), or dFLt= "2" (F=6, b=8, Sr= 1/Sec).

Critical Sample Rate

If the sample rate is critical, as in a filling operation, use the Custom Filtering (set dFLt= to "3").

1. Sr= SAMPLE RATE (1 to 50 samples/second) determination:

Set the sample rate as close as possible to produce a display graduation change for every graduation of material added to the scale.

$$\frac{\text{Material Flow Rate (lbs/second)}}{\text{Resolution}} = \text{Sr}$$

EXAMPLE: $\frac{100\text{lbs/sec}}{10\text{lbs}} = 10\text{s/s} = \text{Sr}$

2. b= BREAK RANGE (1 to 255 graduations) determination:

Turn the filtering off by setting the dFLt= setting to "0". Operate the system as it will be normally used and, by observation, determine the number of grads of instability that needs to be filtered out. Set the break range (b=) to that value.

$$\frac{\text{Weight Change}}{\text{Graduation Value}} = b$$

EXAMPLE: 20,000 x 10lb capacity scale with 800lb variation in the weight display.

$$\frac{800}{10} = b = 80$$

3. F= FILTER SETTING (1 to 99) determination: Set to desired results.

4. If stability is unacceptable with any setting of F=, reduce the sample rate and/or increase the break range, b= setting for increased filtering.

SETUP AND CALIBRATION, Cont.

CAL (CAL?) - Calibration

With CAL (CAL?) displayed, press the ENTER key. The display will change to show the current setting NO. To skip calibration and proceed to the Sio menu, press the ENTER key again. To begin calibration, press the numeric key 1/YES then the ENTER key. After pressing the ENTER key the display will change to CAL1=.

NOTE! If the indicator was calibrated previously and the four (4) calibration "C" numbers were recorded, you may enter the values for C1 through C4 instead of using test weights. By entering the previously recorded "C" numbers, you can return to that calibration setting without having to use test weights. Refer to the Calibration "C" Number section of this manual for instructions on viewing the "C" numbers.

1. With "CAL1=" displayed, press the "diamond T" TARE key.
2. At the "C1=" prompt, press the ENTER to show the current value of the C1 number.
3. If the "C" number displayed is acceptable, press the ENTER key again to save it.
4. Otherwise, use the numeric keys to enter a new "C" number, then press the ENTER key to save it.
5. Repeat steps 2 through 4 for C2, C3 and C4.

If you wish to use test weights (or are required to) for calibration, press the ENTER key at the "CAL1=" prompt.



If any components have been changed that affect calibration and/or your scale is used in a commercial application and must be "Legal for Trade" you cannot use "C" numbers to re-calibrate.

CAL1= - (First Calibration Weight, 0 to Scale Capacity)

This is the first of two calibration weights: This weight could be ZERO (NO LOAD) or the TEST WEIGHTS (TEST LOAD). Press the ENTER key. The display will show 0.0.

If the first calibration weight is to be ZERO or NO LOAD, press the ENTER key.

If the first calibration weight is to be the TEST WEIGHTS or TEST LOAD, use the numeric keys to input the value of the calibrated test weights. Place these weights on the scale platform, then press the ENTER key.

Starting at the left and proceeding right, a series of dashes will appear on the display. The dashes will stay on the display momentarily, then starting at the left and proceeding right disappear, after which the display will show: CAL2=.

CAL2= - (Second Calibration Weight, 0 to Scale Capacity)

This is the second of two calibration weights. Press the ENTER key. The display will show 0.0.

If this second calibration weight is to be zero, make certain the scale platform is empty then press the ENTER key again.

If this second calibration weight is to be the test load, use the numeric keys and enter the total weight of the calibrated test weights. Place the weights on the scale platform and press the ENTER key.

Starting at the left and proceeding right, a series of dashes will appear on the display. The dashes will stay on the display momentarily, then starting at the left and proceeding right disappear, after which the display will show: Sio?.

SETUP AND CALIBRATION, Cont.

Sio (Sio?) - Serial Input/Output

With Sio (Sio?) displayed, press the ENTER key. The display will change to show the current setting "no". To skip configuring the Sio (serial input/output) and proceed to the Print? menu, press the ENTER key again. To configure the Sio, press the numeric key 1/YES then the ENTER key. After pressing the ENTER key, the display will change to bAud=.

bAud= (Serial Port Baud Rate)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, use the numeric keys to enter a new baud rate for the serial ports, then press the ENTER key to save it. Allowable values are:

12 = 1200 Baud	24 = 2400 Baud	48 = 4800 Baud
96 = 9600 Baud	19 = 19.2k Baud	38 = 38.4k Baud
76 = 76.8k Baud		

Prty= (Serial Port Parity)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the new setting, then press the ENTER key to save it. Allowable values are: 0, 1, or 2.

0 = NONE (No Parity)	1 = Odd Parity	2 = Even Parity
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bitS= (Serial Port Data Bits)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the new setting, then press the ENTER key to save it. Allowable values are: 7 or 8.

StoP= (Serial Port Stop Bits)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the new setting, then press the ENTER key to save it. Allowable values are: 1 or 2.

Cont1= (Continuous Output Serial Port 1)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys, 0/NO or 1/YES, enter the new setting, then press the ENTER key to save it.

Cont1= 1 (Yes)	Cont1= 0 (No)
Continuous Output	No Continuous Output

If you selected Cont1= 1 (Yes Continuous Output), an additional prompt, "tyPE=" will be displayed.

If you selected Cont1= 0 (No Continuous Output) proceed to the Weight On Demand section.

tyPE= (Continuous Output Format)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the new setting, then press the ENTER key to save it. Allowable values are: 0, 1, 2 or 3.

0 = SMA	1 = SB-400	2 = SB-200	3 = Rice Lake IQ355
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SETUP AND CALIBRATION, Cont.

If SMA is selected, the data will be transmitted in the following format:

<lf><s><r><n><m><f><xxxxx.xxx><uuu><cr>

Where:

lf =	Line Feed	
s =	Flags	Z = center of Zero, O = Over cap, E = zero Error, e = weight not currently being displayed
r =	Range	1, 2, 3, ...
n =	Mode	G = Gross, T = Tare, N = Net
m =	Motion	M = Motion, " " (blank) = no motion
f =	Custom	Custom flag
xxxxx.xxx =	Weight	Six digits with decimal point
uuu =	Units	tn, lb, l/o, oz, t, kg, g
cr =	Carriage Return	(hex 0D)

If SB-400* or Computer is selected, the data will be transmitted in the following format:

<s><xxxxxx><d><uu><m><cc><cr>

Where:

s =	Sign	"-" = negative, " " (blank) = positive
xxxxxx.xxx =	Weight	Six digits
d =	Decimal point	Added to string if enabled in setup
uu =	Units	tn, lb, l/o, oz, t, kg, g
m =	Mode	G = Gross, N = Net
cc =	Weight Status	OC = over cap BZ = below zero MO = motion ee = weight not currently being displayed
cr =	Carriage Return	(hex 0D)

*The SB-80, SB-300 (multiple displays not supported) and WinVRS use the SB-400 format.

If SB-200 is selected, the data will be transmitted in the following format:

<cr><s><xxxxxx><d><c><uu><m> ETX

Where:

cr =	Carriage Return	(hex 0D)
s =	Sign	"-" = negative, " " (blank) = positive
xxxxxx.xxx =	Weight	(with leading zeros)
d =	Decimal point	Embedded into weight (after weight dpp=0)
c =	status	m = motion o = over cap e = weight not currently being displayed
uu =	Units	tn, lb, l/o, oz, t, kg, g
m =	Mode	G = Gross, N = Net
ETX =	End of TeXt	(hex 03) MUST terminate ALL serial commands

SETUP AND CALIBRATION, Cont.

If Rice Lake IQ355 is selected, the data will be transmitted in the following format:

<stx><polarity><wwwwwww><units><g/n><status><crlf>

Where:

stx =	Start of TeXt	(hex 02)
polarity =	Sign	"-" = negative, "" (blank) = positive
wwwwwww =	Weight	Seven digits
units =	Units	"" (blank) = none, L = lb, K = kg, T = tons, G = grams, O = ounces
g/n	Mode	G = Gross, N = Net
status	status	"" (blank) = valid I = Invalid M = motion O = over cap
CRLF =	Carriage Return with Line Feed	(hex 0D) with (hex 0A)

Weight On Demand

If continuous output has not been selected for Serial Port 1 (Cont1=NO), the 200 Series indicator will respond to a weight request (ENQ).

The host device (computer) sends:

ENQ - (hex 05)

The 210-F will respond:

<s><xxxxxx><d><uu><m><cc><cr>

Where:

s =	Sign	"-" = negative, "" (blank) = positive
xxxxxx.xxx =	Weight	Six digits
d =	Decimal point	Added to string if enabled in setup
uu =	Units	tn, lb, lo, oz, t, kg, g
m =	Mode	G = Gross, N = Net
cc =	Weight Status	OC = over cap BZ = below zero MO = motion ee = weight not currently being displayed
cr =	Carriage Return	(hex 0D)

NOTE! The Weight On Demand function is not available for Serial Port 2.

Cont2= (Continuous Output Serial Port 2)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys, 0/NO or 1/YES, enter the new setting, then press the ENTER key to save it.

Cont2= 1 (Yes)
Continuous Output

Cont2= 0 (No)
No Continuous Output

If you selected Cont2= Yes (Continuous Output) an additional prompt, "tyPE=" will be displayed.

SETUP AND CALIBRATION, Cont.

tyPE= (Continuous Output Format)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the new setting, then press the ENTER key to save it. Allowable values are: 0, 1, 2 or 3.

0 = SMA 1 = SB-400 2 = SB-200 3 = Rice Lake IQ355

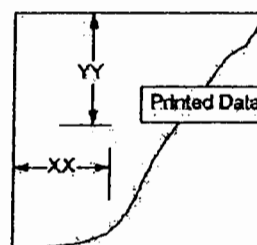
NOTE! See Continuous Output Serial Port 1, tyPE= for description of output formats.

Print (Print?) - Print Tab Settings

With Print (Print?) displayed, press the ENTER key. The display will change to show the current setting "no". To skip configuring the Print Tab Settings and proceed to the FSPAn? menu, press the ENTER key again. To configure the Print Tab Settings, press the numeric key 1/YES then the ENTER key. After pressing the ENTER key the display will change to Port=.

The general format for the input is A = YY.XX where A is the character identifying the data printed, YY is the number of lines down and XX is the number of spaces to the right.

NOTE! Enter 00 in either location, YY or XX, to disable the data from printing.



Port= (Select Port for Printer)

Press the ENTER key to show the current value. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the new setting, then press the ENTER key to save it. Allowable values are: 1 or 2.



NOTE! Although either port can be used for the printer port, it is recommended to use the bi-directional port 1 with a bi-directional cable.

HoUr= (Time Print Location)

Press the ENTER key to show the current setting for the location of the time printing. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, use the numeric keys to enter the new location then press ENTER to save it.

dAtE= (Date Print Location)

Press the ENTER key to show the current setting for the location of the date printing. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, use the numeric keys to enter the new location then press ENTER to save it.

CnC n= (Consecutive Number Print Location)

Press the ENTER key to show the current setting for the location of the consecutive number printing. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, use the numeric keys to enter the new location then press ENTER to save it.

GroSS= (Gross Weight Print Location)

Press the ENTER key to show the current setting for the location of the Gross weight printing. If the setting displayed is acceptable, press the ENTER key again to save it. Otherwise, use the numeric keys to enter the new location then press ENTER to save it.

SETUP AND CALIBRATION, Cont.

tArE= (Tare Weight Print Location)

Press the **ENTER** key to show the current setting for the location of the Tare weight printing. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, use the numeric keys to enter the new location then press **ENTER** to save it.

nEt= (Net Weight Print Location)

Press the **ENTER** key to show the current setting for the location of the Net weight printing. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, use the numeric keys to enter the new location then press **ENTER** to save it.

G ACC= (Gross Weight Accumulator Print Location)

Press the **ENTER** key to show the current setting for the location of the Gross weight accumulator printing. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, use the numeric keys to enter the new location then press **ENTER** to save it.

n ACC= (Net Weight Accumulator Print Location)

Press the **ENTER** key to show the current setting for the location of the Net weight accumulator printing. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, use the numeric keys to enter the new location then press **ENTER** to save it.

CoUnt= (Count "number of pieces on the scale" Print Location)

Press the **ENTER** key to show the current setting for the location of the Count (number of pieces on the scale) printing. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, use the numeric keys to enter the new location then press **ENTER** to save it.

EACH= (Piece Weight Print Location)

Press the **ENTER** key to show the current setting for the location of the Piece weight printing. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, use the numeric keys to enter the new location then press **ENTER** to save it.

CrLF= (Carriage Return Line Feed) - Data Format Termination

Data transmitted from the serial I/O port can be terminated with a single carriage return and either no line feed or a single line feed command. Press the **ENTER** key to view the current setting. A "YES" on the display means the data will be terminated with a carriage return AND a line feed while a "no" on the display means the data will be terminated with a single carriage return only.

If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, using the numeric keys, 0/NO or 1/YES, enter the new setting, then press the **ENTER** key to save it.

EoP= (End-Of-Print Line Feeds)

At the end of a data transmission to a printer, the indicator can transmit a pre-selected number of line feed commands to space the paper in the printer to the desired position for withdrawal or for the next print.

Press the **ENTER** key to view the current setting. If the displayed value is acceptable, press the **ENTER** key to save it. Otherwise, use the numeric keys to enter the new the number of End-Of-Print linefeeds, then press the **ENTER** key to save the new setting. Allowable values are: 0 through 99.

SETUP AND CALIBRATION, Cont.

F SPAn (FSPAn?) - Fine Span Adjustment

With the F SPAn? prompt displayed after pressing the ENTER key at the last Print prompt:

With F SPAn? displayed, press the ENTER key. The display will change to show the current setting "no". To skip the Fine Span Adjustment and return to the SETUP menu, press the ENTER key again. To perform the Fine Span Adjustment, place a calibrated test weight on the scale and press the numeric key 1/YES then the ENTER key.

After pressing the ENTER key, the display will change to show the amount of the test weight and the annunciators will alternately flash off and on i.e. (all ON, weighing unit off, then all OFF, weighing unit ON). Press the 1/YES to increase the span OR press the 0/NO key to decrease the span. Press the ASTERISK key to return to the previous prompt or press the ENTER key to exit F SPAn and return to the SetUP menu.

With the F SPAn prompt displayed after pressing the Calibration switch:

With F SPAn displayed, place a calibrated test weight on the scale and press the ENTER key. After pressing the ENTER key, the display will change to show the amount of the test weight and the annunciators will alternately flash off and on (all ON, weighing unit off, then all OFF, weighing unit ON). Press the 1/YES to increase the span OR press the 0/NO key to decrease the span. Press the ASTERISK key to return to the previous prompt or press the ENTER key to exit F SPAn and return to the SETUP menu.

Hi rES - Display High Resolution Weight

With Hi rES on the display, pressing the ENTER key will show the active weight in "high resolution" mode (in 1/10 interval). Press the PRINT key to print the weight (followed by the text TEST) via the selected printer output port enabled during setup and calibration.

LoCoUt - Key Lock Out Function

With LoCoUt on the display, pressing any key will display "LoCd" (locked) or "UnLoCd" (unlocked) for the current key state. Pressing a locked key during normal operation will result in a 1/2 second display "LoCd" and the key will be ignored. To exit the LoCoUt function, press the calibration switch or cycle power (press the ON/OFF key twice).



NOTE! The menu selections Hi rES and LoCoUt can only be selected using the calibration switch.

After all the setup selections have been made, insure that no cables or wires are exposed between the main housing and the front cover of the enclosure. Close the front cover and tighten the two (2) retaining screws.

SETUP REVIEW

The 210-F allows several operational parameters to be reviewed and changed without breaking the calibration seal. These operational parameters are:

Power Up Zero Reset Enable/Disable
Time Format
Digital Output Control Enable/Disable
Sleep Mode Feature Enable/Disable
Auto Shutoff Feature Enable/Disable

Serial Input / Output Configuration

Baud Rate
Parity
Number of Data Bits
Number of Stop Bits
Continuous Output Port 1
 Continuous Output Format
Continuous Output Port 2
 Continuous Output Format

Print Tab Settings

Printer Port Selection
Time
Date
Consecutive Number
Gross Weight
Tare Weight
Net Weight
Gross Weight Accumulator
Net Weight Accumulator
Count
Piece Weight

To enable the Setup Review feature, with the Indicator ON:

1. Press the **ASTERISK** key. The indicator will respond by showing the FunCt= (Function) prompt and alternately flashing off and on (all ON, weighing unit off, then all OFF, weighing unit ON) the annunciators.
2. Press the **ZERO/REVIEW** key. The display will change to the prompt for the selection of power-up zeroing (PUO=).
3. Using the same procedure as described in the Setup and Calibration section of this manual make the required changes.
4. Press the **ASTERISK** key to return to the previous prompt.
5. To exit Setup Review, press the **ENTER** key to step the remaining prompts *OR* at anytime, cycle the power (press the **ON/OFF** key twice).

CALIBRATION "C" NUMBERS

The "C" numbers are displayed only during the Test mode operation by pressing the **ASTERISK** key then the **UNITS/TEST** key. The "C" numbers are shown at the end of the test operation and each number is displayed for approximately 4 seconds, allowing you to record them. Each number may be up to three (3) digits in length. By recording these numbers you will be able to return the indicator to its present calibration settings without using test weights simply by entering the "C" numbers. *Refer to the Setup and Calibration, "CAL" section of this manual for instructions on using the "C" numbers.*



If any components have been changed that affect calibration and/or your scale is used in a commercial application and must be "Legal for Trade" you cannot use "C" numbers to re-calibrate.

ACCUMULATORS

To view the NET accumulator:

1. Press the **ASTERISK** key then the **NET/GROSS** key.
2. Press the **ASTERISK** key to return to normal operation.

To print the NET accumulator:

1. Press the **ASTERISK** key, the **NET/GROSS** key, then the **PRINT** key
2. The indicator will return to normal operation when printing has been completed.

To clear (zero) the NET accumulator:

1. Press the **ASTERISK** key, the **NET/GROSS** key, then the **ZERO** key
2. Press the **ASTERISK** key to return to normal operation.

To view the Gross accumulator:

1. Press the **ASTERISK** key then the **NET/GROSS** key twice.
2. Press the **ASTERISK** key to return to normal operation.

To print the Gross accumulator:

1. Press the **ASTERISK** key; the **NET/GROSS** key twice, then the **PRINT** key
2. The indicator will return to normal operation when printing has been completed.

To clear (zero) the Gross accumulator:

1. Press the **ASTERISK** key, the **NET/GROSS** key twice, then the **ZERO** key
2. Press the **ASTERISK** key to return to normal operation.

BEFORE YOU CALL FOR SERVICE

The 210-F Indicator has been designed to provide you with years of trouble-free operation. In spite of this, troubles sometimes happen. Before calling for service assistance you should make some initial checks to verify that a problem does exist. The following describes several types of symptoms along with suggested remedies.

PROBLEM	POSSIBLE SOLUTIONS
Display does not turn on	<p>AC Operation: Is the AC power cord fully inserted into the wall receptacle? Check wall receptacle for proper AC power. Try another electrical appliance in the same receptacle, does it work? Check the circuit breaker. Has there been power failure?</p> <p>Battery operation: Check if battery is installed and correctly. Is battery discharged - replace or recharge.</p>
Incorrect weight displayed	<p>Has the instrument been calibrated? Insure that the scale platform isn't touching an adjacent object. Check the load cell connector wiring. If using four (4) wire load cells, insure the sense lead jumpers (J4 & J5) are installed. Have proper operation procedures been followed?</p>
Indicator will not display weight	<p>Refer to Error Codes section and make certain that the "oCAP" message is not displayed. If so, and scale is not loaded, perform the calibration sequence.</p>

ERROR CODES

The 200 Series Indicator is equipped with software that indicates when an error in the operation takes place. The following lists the error codes displayed by the 200 Series along with their meaning. Should you encounter an error code, please refer to this list for the cause.

UnStb (Unstable)

Motion is present when trying to power up, print, zero or perform a push button tare function.

CORRECTIVE ACTION: Wait for a stable weight display (*STABLE* annunciator on) before performing any of these operations.

-oF- (Overflow)

The Indicator is attempting to display a positive number greater than six (6) digits in length or a negative number of more than five (5) digits.

CORRECTIVE ACTION: Return to Gross Weight mode and review Tare value. May indicate miscalibration.

OCAP (Over Capacity)

The load on the scale exceeds the scale capacity plus nine (9) divisions.

CORRECTIVE ACTION: Remove the over capacity load from the scale platform. May indicate miscalibration.

ConFIG (Configuration)

E²PROM checksum failure. Indicates improper stored calibration data, calibration is necessary.

CORRECTIVE ACTION: Recalibrate with calibrated test weight.

ERROR CODES, Cont.

CALbtn (Calibration Button)

CALbtn will be displayed (until the condition changes), on power-up if the calibration switch is pressed in by the operator, the calibration access screw is the wrong length and is depressing the switch, the switch is disconnected from the PC board, or the switch is defective.

CORRECTIVE ACTION: Release the switch. Insure correct screw (#10 x ½ Stainless Steel fillister head) was installed for the calibration access screw. Referring to Figure No. 6, make sure calibration switch cable is plugged into P7 on the PC board. Replace calibration switch assembly. Consult your scale service provider.

Error

An invalid keypad entry was attempted:

- A. PRINT key pressed with a negative weight.
- B. TARE key pressed to enter a push button tare value of a negative value.
- C. ENTER key pressed to enter a tare weight value that exceeds the scale capacity.
- D. ENTER key pressed to enter a tare weight value that is inconsistent with the scale division value (i.e. attempt to enter a tare of 123 with scale divisions of 5).
- E. ZERO key pressed when the gross weight is outside the scale zero weight range.
- F. lb/kg key pressed to change to kilograms when the kilogram tare weight value exceeds 4 digits in length.

CORRECTIVE ACTION: Determine which of the reasons for the error display is applicable and take the appropriate corrective action.

ErrAh (Analog Error High)

1. The load cell input is above the range of the indicator.

CORRECTIVE ACTION: Check for improper load cell wiring, excessive load, and for output of 1 to 40mV.

2. Load cell or circuit failure.

CORRECTIVE ACTION: Consult your scale service provider.

ErrAL (Analog Error Low)

1. The load cell input is below the range of the indicator.

CORRECTIVE ACTION: Check for improper load cell wiring and for output of 1 to 40mV.

2. Load cell or circuit failure.

CORRECTIVE ACTION: Consult your scale service provider.

Err1

A program checksum mismatch has been detected.

CORRECTIVE ACTION: Consult your scale service provider.

Err3

Internal RAM failure.

CORRECTIVE ACTION: Consult your scale service provider.

notArE

NET key pressed with no stored tare weight value.

CORRECTIVE ACTION: Determine the reason for the error display and take the appropriate corrective action.

ERROR CODES, Cont.

HuH?

UNITS key pressed in an attempt to perform a "unit" conversion that is not allowed.

CORRECTIVE ACTION: Determine the reason for the error display and take the appropriate corrective action.

toobIG

UNITS key pressed in an attempt to perform a "unit" conversion where the interval would have been greater than 50.

CORRECTIVE ACTION: Determine the reason for the error display and take the appropriate corrective action.

CALIBRATION SEAL INSTALLATION

If your 210-F Weight Indicating Instrument is used in a commercial application it must be tested and sealed by your local weights and measurements official. The 210-F is designed to accept a lead and wire security seal to prevent unauthorized access to the calibration adjustments. Refer to the Figure No. 11 for details on the installation of these seals.

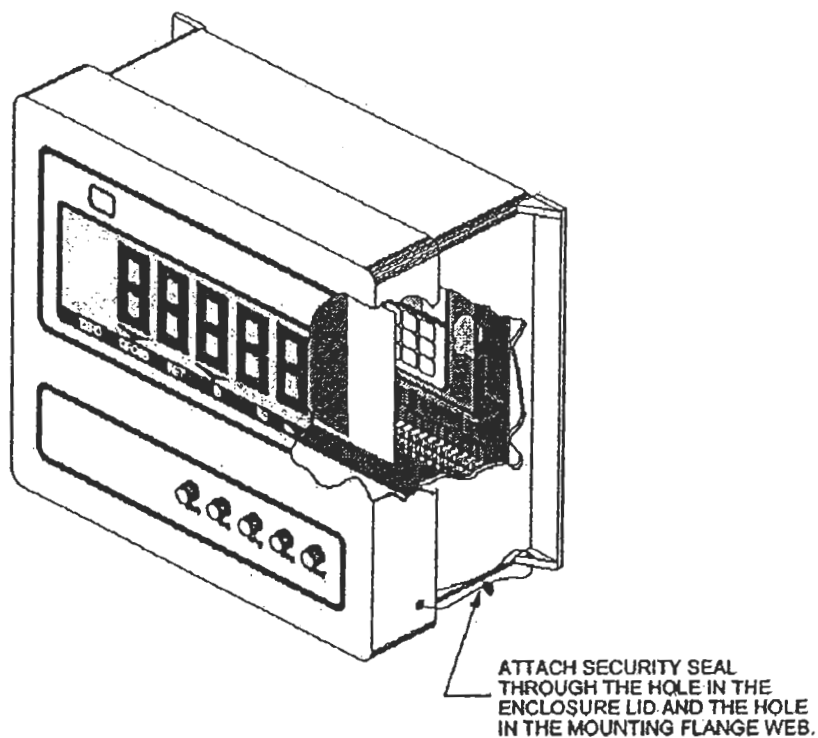


Figure No. 11

APPENDIX A – ANALOG OUTPUT OPTION (DAC) BOARD

This appendix describes the installation, setup and calibration of the optional Analog Output Option DAC (Digital to Analog Converter) board. This option consists of both a 0 to 10 volt and 4 to 20 mA analog output.

The Analog Output Option (DAC) board (Cardinal p/n 8200-C210-0A) is a 14-bit (16,383 states) analog representation of the displayed weight. The maximum load resistance for the current output is 500 ohms. The minimum load resistance for the voltage output is 2K ohms. Connections are made via a terminal block on the back of the option board. Refer to Figure No. 12 for the connector pin layout.

The 210-F Indicator features complete "ranging" for DAC output. Users may select a weight range to be used for a selectable voltage range. This covers all current indicators/users and expands the capabilities for new applications. The 210-F also has auto-detect for option board installation. When the DAC board is found, additional prompts will be added to Setup. The main menu adds "dAC" (dAC?) after "LoCoUt". In addition, the calibration sequence includes the steps necessary to calibrate the analog output.

INSTALLATION

Mounting the DAC Board

NOTE! Should your indicator come with the DAC board already installed, the following information describing the mounting of the board does not apply. Proceed to the Cable Installation section.

1. Make sure the power to the indicator is OFF. Unplug the AC adapter.
2. Open the front cover of the enclosure.
3. Raise the board on the hinge, taking care not to stretch the cable and wires between the panel and main housing.
4. Locate the threaded mounting stud (below J2) and connector P5 on the main board.
5. To install the DAC board, carefully align the DAC board P1 (pins on trace side of DAC board) with connector P5 on the main board.
6. Align the hole in the DAC board with the threaded mounting stud (below J2) on the main board.
7. Apply even downward pressure to the end of the DAC board with P1.
8. Using the lock washer and hex nut supplied with the DAC board, secure the DAC board to the main board.

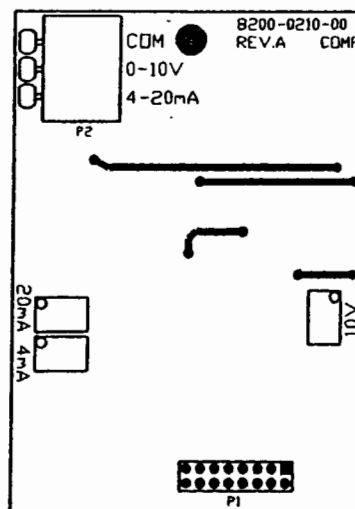


Figure No. 12 - DAC Board, Rear View

Cable Installation

1. Loosen a cable gland connector for the Analog Output cable. The gland connector(s) are located on the bottom of the enclosure.
2. Slip a two-wire cable through the gland connector and into the enclosure.
3. Remove 2" of the outer insulation jacket then remove 1/4" of insulation from each of the wires.
4. Connect each of the wires to the terminal block (see Figure No. 5).
5. To terminate, first press down on the release bar for the terminal, insert the wire into the opening then allow the release bar to return to its original position, locking the wire in place. Repeat the procedure until all of the wires are in place.

ANALOG OUTPUT – INSTALLATION, CONT.

TERMINAL BLOCK

<u>PIN NO.</u>	<u>Function</u>
COM	Common
0-10V	0 to 10 volt output (2K Ω Min. Load)
4-20 mA	4 to 20 mA current output (500 Ω Max. Load)

After all terminations have been made, remove the excess cable from the instrument enclosure and securely tighten each of the cable gland connectors. Do not over-tighten these connectors but make certain they are snug. **DO NOT USE TOOLS!** Finger tighten only! Ensure any unused gland connectors are plugged.

Insure that no cables or wires are exposed between the main housing and the front cover of the enclosure. Close the front cover and tighten the two (2) retaining screws.

CALIBRATION OF THE ANALOG OUTPUT

The analog output has been calibrated at the factory and should require no other adjustment. If, for some reason, it is found necessary or desirable to readjust this output, the procedure listed below may be used.

In order to calibrate the analog output, it is first necessary to enter the Calibration mode by gaining access to the calibration switch. Refer to the Setup and Calibration section of this manual for additional information.

NOTE! The following questions in the "dAC" section apply only if the board is installed.

dAC (dAC?) – Digital to Analog Converter

With dAC? displayed, press the ENTER key. The display will change to show Lo=.

Lo=

Press the ENTER key to show the stored value. This is the value, in weight, which outputs zero volts (or 4 mA) from the "dAC". All weight below this target will output zero volts (or 4 mA). If the setting is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the desired weight value, then press the ENTER key to save it. Allowable values are: -99999 to 999999.

NOTE! The NET/GROSS key will change the weight sign. i.e. -1000 press 1 0 0 0 NET.

Hi=

Press the ENTER key to show the stored value. This is the value, in weight, which outputs the maximum selected voltage and current (see oUt=). All weights above this value will output maximum volts from the "dAC". If the setting is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the desired weight value, then press the ENTER key to save it. Allowable values are: 1 to 999999.

NOTE! This weight must be a positive value, up to capacity of scale, and above the Lo= value.

ANALOG OUTPUT – INSTALLATION, CONT.

oUt=

Press the ENTER key to show the stored value. This is the maximum output value in volts (00.01 to 10.00). All weight values equal to or greater than "Hi=" will output this value. Note, that if the scale goes OCAP (over capacity), this value is used also. If the setting is acceptable, press the ENTER key again to save it. Otherwise, using the numeric keys enter the desired, then press the ENTER key to save it. Allowable values are: 00.01 to 10.00.

NOTE! If the 4 to 20 mA current output is to be used, set "oUt=" to: $10 \times \frac{(\text{max current} - 4)}{16}$

$$\text{Current} = \frac{\text{"oUt="}}{10} \times 16 + 4 \text{ (mA)} \quad (\text{Cannot be greater than 20 mA})$$

Adj HI

This sets the "dAC" output to "oUt=" level for adjusting the level. Adjustment potentiometers "pots" (10V and 20 mA) on the option board are used.

- Adjust the 10V pot for the maximum voltage output entered for "oUt=".
- If the 4 to 20 mA current output is to be used, adjust the 20mA pot for the calculated maximum current.

Press the ENTER key to proceed to "Adj Lo", or the ASTERISK key to return to the previous prompt.

Adj Lo

This sets the "dAC" output to zero for adjusting the level. Adjustment "pots" (10V and 4 mA) on the option board are used.

- There is no adjustment for zero volts out.
- If the 4 to 20 mA current output is to be used, adjust the 4mA pot for the low (4 mA) current output.

Press the ASTERISK key to return to "Adj HI", or the ENTER key to return to the SETUP prompt



NOTE! Cycling between "Adj HI" and "Adj Lo" is necessary when adjusting the current out. This must be repeated until no adjustment is necessary.

PART IDENTIFICATION

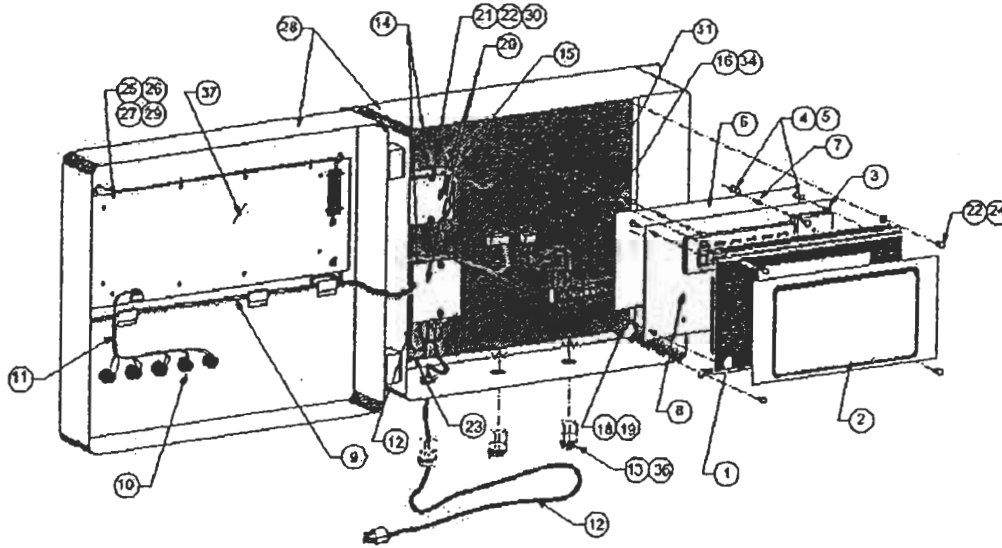


Figure No. 13

Item	Part No.	Description	Item	Part No.	Description
1	8200-C230-0A	Board Mount Weldment	21	6021-0665	6-32 Pan Head Screw
2	8200-D202-08	LCD Keypad	22	6680-0004	#6 Lock Washer
3	6680-0049	Nylon Spacer	23	8530-B281-0A	Ground Wire Cable
4	6680-0004	#6 Lock washer	24	6021-0654	6-32 Pan Head Screw
5	6013-0039	#6-32 Hex Nut	25	6021-0867	8-32 Flat Head Screw
6	8200-C210-0A	210 Analog Output	26	6024-1000	#8 Lock Washer
7	6680-0121	Nylon Spacer	27	6013-0255	8-32 Hex Nut
8	8200-D201-1A	210 DWI Board	28	8539-D215-08	Enclosure
9	8539-B225-0A	748-F Cable	29	6680-1004	8-32 Hex Spacer
10	6910-2384	Switch	30	6680-1104	6680-1104
11	8539-C224-0A	Switch Cable Assembly	31	8200-D224-08	Sub panel
12	6980-1030	8' Power Cord	32	8539-D201-08	Display Overlay (not shown)
13	6610-2248	Gland Connector	33	8200-C214-08	Switch Overlay (not shown)
14	6800-1033	Power Supply, 15V	34	6021-0695	6-32 Screw
	6800-1034	Power Supply, 12V	36	6540-1104	Hole Plug
15	6770-0005	EMI Filter Board	37	8539-D204-0A	Display Board
16	6610-5080	Terminal Strip	38	8539-B227-08	Stiffener
18	6021-1020	10-32 Round Head Screw	39	8539-B209-0A	Optional Analog Cable (not shown)
19	6024-0033	#10 Lock Washer	40	8539-C232-0A	Optional PWC Cable (not shown)
20	8200-C018-08	Power Supply Cover			