Parts List and Operating & Maintenance Manual

MODEL **V20F & V20F-Extend**

Vertical Bandsaw w/variable frequency drive

Built better to work stronger and last longer

REV 191007

Wellsaw®
Made In The USA
Quality Metal Cutting Bandsaws
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WELLSAW MODEL V-20 HISTORY

The Model V-20 WELLSAW, like other WELLSAWS, is the result of continuous development and refinement. It's vertical design began with the Model W-20, introduced in 1976. Drawing on field experience gained over 14 years, WELLSAW decided to launch a re-design of the vertical saw - the new V-20 - to meet the most difficult operating conditions.The newer design featured a 2-speed gear box, variable speed blade drive, all steel construction plus the unique rotating blade guides which greatly increase the saw's ability to cut very long pieces. To field test the new V-20 design, the prototype model was placed in a foundry. It was used to cut gates and runners from sand castings; a rough, abrasive, continuous operation that tested every component's durability. The best measure of the V-20's performance is the fact that the foundry ordered a second V-20.

Now, WELLSAW has added the variable frequency drive and changed the model number to V-20F. The V-20F continues to be manufactured to conform to WELLSAW'S recognized high standards of quality and performance. Each saw must pass a series of final inspection tests, including actual metal cutting operations before it is shipped. For this saw to provide satisfactory service, it is necessary that it be properly installed, operated and maintained. This manual has been prepared to assist you in carrying out these functions. We urge you to study this manual and follow its suggestions.

FULL YEAR LIMITED WARRANTY

This WELLSAW is warranted against defects in material or workmanship installed or performed at the factory. Within one year from date of purchase, we will free of charge and at our option, either repair or replace any part of this WELLSAW which our examination discloses to be defective because of workmanship or a defect in the material. This warranty does not apply if this WELLSAW has been used in a manner not consistent with its' design or which has been subject to accident, alteration, abuse or misuse or which fails due to lack of care or is the result of inadequate power supply and specifically does not apply to normal wear parts. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION OF THE FACE HEREOF.

WELLSAW shall not be liable for consequential or incidental damages suffered or incurred with respect to defective materials or workmanship.

We do not authorize any person or representative to make any other warranty or to assume for us any liability in connection with the sale of our products other than those contained herein. Any agreements outside of or contradictory to the foregoing shall be void and of no effect.

All transportation costs on products or parts submitted to WELLSAW under this warranty must be paid by the user. No products or parts are to be returned without first obtaining permission.

RECEIVING AND INSTALLATION

Un-crating

Carefully remove the protective crating and skid so the saw and its parts are not marred or otherwise damaged. In the event of damage in transit, notify the carrier and file a Proof of Loss Claim immediately.

Shortages

Inspect the complete shipment carefully against the itemized packing list. Make sure that all items are present and in good condition. In the event of any shortage, notify the distributor from whom you purchased the saw and the carrier who made the final delivery.

Utility Hook-Up

The use of a qualified electrician is always recommended when connecting the saw to the main power supply. Electrical codes differ from area to area and it is the customer's responsibility to ensure that their saw complies with applicable codes. Your WELLSAW is pre-wired at the factory for a specified voltage. Always check the motor and electrical panel to ensure that they are both wired to correspond to your electrical power supply.

PARTS ORDERING

When contacting your WELLSAW Supplier of the Company for parts or service, it is essential that you have your MODEL NUMBER, SERIAL NUMBER and PURCHASE DATE available. Jot them down here for handy reference.

MODEL: _____

SERIAL NUMBER: _____

PURCHASE DATE: _____

Safety Instructions

1. Always wear protective eye wear when operating machinery. Eye wear shall be impact resistant, protective safety glasses with side shields which comply with ANSI Z87.1 specifications. Use of eye wear which does not comply with ANSI Z87.1 specifications could result in severe injury from breakage of eye protection.
2. Keep hands in sight and clear of all moving parts and cutting surfaces.
3. Wear proper apparel. No loose clothing or jewelry which can be caught in moving parts. Rubber soled footwear is recommended for best footing.
4. Do not overreach. Failure to maintain proper working position can cause you to fall into the machine or cause your clothing to get caught - pulling you into the machine.
5. Keep guards in place and in proper working order. Do not operate the machine with guards removed.
6. Avoid dangerous working environments. Do not use stationary machine tools in wet or damp locations. Keep work areas clean and well lit. Special electrics should be used when working on flammable materials.
7. Avoid accidental starts by being sure the start switch is “OFF” before plugging in the machine.
8. Never leave the machine running while unattended. Machine shall be shut off whenever it is not in operation.
9. Disconnect electrical power before servicing. Whenever changing accessories or general maintenance is done on the machine, electrical power to the machine must be disconnected before work is done.
10. Maintain all machine tools with care. Follow all maintenance instructions for lubricating and the changing of accessories. No attempt shall be made to modify or have makeshift repairs done to the machine. This not only voids the warranty but also renders the machine unsafe.
11. Secure work. Use clamps or a vise to hold work when practical. It is safer than using your hands and it frees both hands to operate the machine.
12. Never brush away chips while the machine is in operation.
13. Keep work area clean. Cluttered areas invite accidents.
14. Remove adjusting keys and wrenches before turning the machine back on.
15. Use the right tool. Don’t force a tool or attachment to do a job it was not designed for.
16. Use only recommended accessories and follow manufacturer’s instructions pertaining to them.
17. All visitors should be kept at a safe distance from the work area. Make workshop completely safe by using padlocks, master switches, or by removing starter keys.
18. Know the tool you are using - its application, limitations, and potential hazards.
19. Some dust created by power sanding, sawing, grinding, drilling and other construction activities contains chemicals known to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are:
    - Lead from lead based paints
    - Crystalline silica from bricks and cement and other masonry products, and
    - Arsenic and chromium from chemically treated lumber.
20. Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: work in a well ventilated area, and work with approved safety equipment, such as dust masks that are specifically designed to filter out microscopic particles.

General Electrical Cautions

This saw should be grounded in accordance with the National Electrical Code and local codes and ordinances. This work should be done by a qualified electrician. The saw should be grounded to protect the user from electrical shock.

Wire Sizes

Caution: for circuits which are far away from the electrical service box, the wire size must be increased in order to deliver ample voltage to the motor. To minimize power losses and to prevent motor overheating and burnout, the use of wire sizes for branch circuits or electrical extension cords according to the following table is recommended:

Conductor Length	AWG (American Wire Gauge) Number	
	240 Volt lines	120 Volt lines
0-50 feet	No. 14	No. 14
50-100 feet	No. 14	No. 12
Over 100 feet	No. 12	No. 8

Safety Instructions

Misuse of this machine can cause serious injury.
For safety, this machine must be set up, used and properly serviced.
Read, understand and follow instructions in the Parts and Maintenance manual.

DISCONNECT POWER before adjusting or servicing the saw or changing a blade.

STAY CLEAR of all moving parts. Keep hands and fingers away form the saw blade.

WHEN MOVING SAW, with hinged frame (saw head), secure the head in its down position.

WHEN CUTTING MAGNESIUM, take special precautions. Use a sharp saw blade, make only dry cuts, prevent chip accumulation, and keep fire-fighting equipment nearby.

THIS SAW SHOULD BE GROUNDED WHILE IN USE TO PROTECT THE OPERATOR FROM ELECTRICAL SHOCK.

CORD CONNECTED TOOLS. If the saw is equipped with an approved 3-conductor cord and a 3-prong grounding type plug, it should only be connected to a properly equipped and grounded receptacle. The green conductor in the cord is the grounding wire. Never connect the green wire to a live terminal.

Use only a 3-wire extension cord having a 3-pronged receptacle, a 3-pronged plug and ample amperage rating. Replace or repair a damaged or worn cord immediately.

PERMANENTLY CONNECTED TOOLS. The saw should be connected to a grounded, metal-enclosed wiring system or an equipment-grounding conductor should be run with the circuit conductors and connected to the saw's grounding terminal or lead.

To reset the manual starter after a power interruption, return the switch to OFF and press the RESET button before restarting.

KEEP GUARD IN PLACE and in working order.

REMOVE ADJUSTING KEYS AND WRENCHES. Form a habit. Check to see that all keys and wrenches are removed from the tool before turning the tool on.

KEEP WORK AREA CLEAN. Cluttered areas and benched invite accidents.

AVOID DANGEROUS ENVIRONMENT. Do not use power tools in damp or wet locations. Keep your work area well lighted.

KEEP CHILDREN AWAY. All visitors should be kept a safe distance from work area.

MAKE WORKSHOP KID-PROOF with padlocks, master switches, or by removing starter keys form tools.

DON'T FORCE TOOL. It will do the job better and safer at the rate for which it is designed

USE RIGHT TOOL. Don't use a tool a or attachment to do a job for which it was not designed.

WEAR PROPER APPAREL. No loose clothing or jewelry to get caught in moving parts. Rubber-soled footwear is recommended for best footing.

USE SAFETY GLASSES. Also use face or dust mask if operation is dusty.

SECURE WORK. Use clamps or a vise to hold work. Provide adequate support to prevent injury from falling work pieces.

MACHINE SET UP

- Always avoid using machine in damp or poorly lighted work areas.
- Always be sure machine is securely anchored to the floor
- Always keep machine guards in place.
- Always put start switch in "OFF" position before plugging in machine.

MACHINE USE

- Never operate with machine guards missing.
- Always wear safety glasses with side shields (See ANSI Z87.1)
- Never wear loose clothing or jewelry.
- Never overreach - you may slip into the machine.
- Never leave machine running while away from it.
- Always shut off the machine when not in use.

MACHINE SERVICING

- Always unplug machine from electrical poser while servicing.
- Always follow instructions in Parts and Maintenance manual when changing accessory tools or parts.
- Never modify the machine.

Read and follow these simple rules for best results and full benefits from your machine. Used properly, WELLSAW's machinery is among the best in design and safety. However, any machine used improperly can be rendered inefficient and unsafe. It is absolutely mandatory that those who use our products be properly trained in how to use them correctly. They should read and understand the Parts and Maintenance manual as well as all labels affixed to the machine. Failure in following all of these warnings can cause serious injury.

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Specifications

Capacity	
Throat	20" Deep
Table to Guide	16" High
V-20F-Extend	24" High
Blade Size	
Standard	3/16" through 3/4"
Optional	1/2" through 1" (This Option Not Available on V-20-24)
Blade Length	
V-20F,	14'9" (177")
V-20F-Extend	16'1" (193")
Band Wheels	21" Cast Aluminum with Replacable Rubber Tires
Blade Speeds	
Low Range	45-400 SFPM
High Range	325-3000 SFPM
Blade Guides	Sealed Ball Bearings with 90° Rotation Feature
Table Size	26" x 26" Cast Iron
Tilt	5° Inside and 45° Outside
Height	37-1/2"
Drive Motor	
Three Phase	3hp 208/230/460 Volt
Single Phase	2hp 115/208/230 Volt
Floor Area	32" Wide x 48" Deep
Height Standard	83-1/2"
V-20F-Extend	91-1/2"
Shipping Weight	
Standard	950 Lbs.
V-20F-Extend	1050 Lbs.

Standard Features

- Heavy Tube Steel Frame
- Variable Frequency Motor Controller
- Precision Ground Cast Iron Table with Replaceable Throat Plate
- Unique Heavy Duty Roller Guides Rotate 90° to Accommodate Long Materials
- Baldor® Motor
- Magnetic Starter with Undervoltage and Overload Protection
- 115 Volts at Controls
- Two Speed Cast Iron Gearbox with Helical Gears and Oil Bath Lubrication for Quiet Operation
- Blade Speed Indicator
- Blade Tension Indicator
- Flexible Arm Worklight
- Chip Blower (Shop Air)
- Removable Chip Tray
- Tiger-Tooth® Bi-Metal Blade
- OSHA Blade Guarding
- Rotary Blade Brush

Factory Installed Options

- Ideal® Blade Welder, Grinder and Shear
- 24" Extended Height (Model V20F-Extend)
- Miter Gauge
- Rip Fence, 26"
- 1" Blade (Not Available on V-20F-Extend)
- Spray Mist Coolant System
- Vacuum Nozzle
- Extension Table
- Stock Stand
- 5' and 10' Non-Powered Roller Conveyor
- J.I.C. or NFPA Electrics (with Fused Disconnect)
- Consult Factory for Additional Options

TROUBLE SHOOTING

NOTES ON SAWING

It is widely recognized that a proficient operator is a key to optimum bandsawing. He makes certain the machine is properly maintained and adjusted for dependable operation. He carefully sets up each cutting job to prevent damage to the machine and obtain the best performance from the equipment.

Experienced blade dealers can be very helpful in selecting the grade and proper tooth blade for each sawing job. All blades should be straight, have sharp teeth with uniform set, and be "broken in" at a reduced feed rate to obtain good cutting performance and blade life.

Every cutting situation has special characteristics requiring some experimentation to determine which blade, speed and feed rate will achieve the most satisfactory result. Cutting charts indicate a good starting point, but must be modified by direct experience if optimum performance is desired.

Here are some helpful pointers for adjusting speed and feed for cutting performance.

1. Make sure the saw is cutting a good chip from the workpiece.
2. Watch for blue chips or excessive "smoke" indicating heat in the cut which could damage the blade or work harden the material being cut.
3. Watch for excessive vibration or chatter marks on the cut-off piece indicating possible damage to the saw teeth by "hammering"
4. Check the cut-off for flatness. A dull blade or excessive feed will produce a "belly" in the cut.
5. Inspect the blade for worn, rounded or shiny cutting edges. avoid force cutting which will allow chips to "weld" to saw teeth and eventually cause the teeth to be stripped off the blade.
6. When experimenting, start with a slow speed and feed rate. Gradually increase blade speed and then feed pressure by small amounts until adverse effects are noted. You can then set the speed and feed at a reasonable level for continuous cutting. Remember that blade speed and feed pressure must be balanced to keep cutting a good chip.

CUTTING TIPS

1. Select blade and speed for material being cut. Use the coarsest tooth blade suitable for the workpiece while proving for at least two teeth cutting at all times. Use fastest suitable band speed and minimum feed source adequate to produce good cutting action. Work with work-hardening steels, maintain a steady feed; do not let teeth rub without cutting.
2. Keep the blade guides as close as possible to the workpiece.
3. If teeth wear off unusually fast, use a slower band speed.

PREMATURE DULLING OF BLADE

1. Feed rate too high or low. Check recommendation.
2. Blade speed too slow or too fast.
3. Faulty material; heavy scale, hard spots, etc.
4. Verify material analysis
5. If coolant flow is not covering saw teeth, increase coolant flow rate.
6. If saw is vibrating in cut, reduce a blade speed or increase feed rate.
7. Chipped or broken tooth may be lodged in cut.
8. "Chip welding" caused by improper feed and speed.
9. Incorrect coolant mixture.
10. Incorrect blade selection.
11. Improper break-in of new blade. New blades should be run initially with reduced feed pressure for approximately 50 to 100 square inches.
12. Saw blade teeth may be hitting blade guides. Check for proper blade size.

SAW BLADE VIBRATION

1. Incorrect blade speed for material.
2. Blade tension insufficient.
3. Back-up bearing may be worn.
4. Incorrect choice of saw tooth pitch.
5. Incorrect coolant mixture.
6. Incorrect feed setting. Increase feed.
7. Work piece not firmly clamped to vice.
8. Worn or improperly adjusted saw guides. Check and make necessary adjustments.

BLADE TEETH CHIPPING OR RIPPING OUT

1. Blade pitch too coarse. Use a fine pitch saw blade on thin work sections.
2. Improper break-in of new blade. Do not start a new blade in an old cut.
3. Work piece not held firmly enough. Clamp work securely.
4. Introduce cooling if it is not being used.
5. Faulty material; scale or hard spots.
6. Blade gullets may be loaded. Use higher viscosity lubricant or coolant.
7. Blade speed and feed may need adjustment.

OPERATION

READ CAREFULLY

The MODEL V20 METAL CUTTING BAND SAW is designed for efficient performance. With proper care, it will give you many years of dependable service. **READ THIS MANUAL CAREFULLY BEFORE OPERATING YOUR NEW SAW**.

After final assembly, each saw is inspected and tested. No adjustment should be needed.

This manual has been prepared to assist you in the operation and maintenance of your new saw. If you desire additional information or assistance, please contact your dealer's service representative.

PLACING BLADE ON SAW

1. Disconnect electrical supply. *Wear gloves and safety goggles throughout the blade changing operation!*
2. Open front cover, swing blade guard aside and move tie-bar at front bottom of table aside.
3. Hold blade carefully while loosening blade tension screw. Remove blade.
4. Uncoil new blade. Make certain that blade teeth point in direction of band travel; downward toward the table.
5. Place new 14'9" blade on band wheels and in saw guides. The back of the blade should make contact with the back-up bearing in both upper and lower blade guides and the bearing on the frame. The frame bearing has a groove in it to help with proper adjustment. Turn the band wheel by hand to verify proper band tracking on wheels and through and through blade guides. (When changing blade sizes, adjust both upper and lower back-up bearings.)
6. Reposition top and bottom blade guards, and close and latch covers. Door interlocks prevent saw from being turned on when doors are open.
7. Start the saw at slow speed to check proper blade installation before cutting.

SWITCHES

Always press the stop switch to turn off the saw before opening the cover, making any adjustment, or performing any maintenance. Restarting is required after the saw automatically stops from power interruption (undervoltage protection) or overloading.

BLADE GUIDES

When changing blade sizes, adjust the guides to the blade after it is installed on the band wheels. The side guides should contact the blade without galling and be recessed behind the toothed portion of the blade. Each side guide is mounted on an eccentric stud secured by an Allen screw which provides adjustment for sideways clearance. Back-up guides are set to contact the back of the blade for blade tracking on the wheels. If necessary, the back-up bearing contacts the back of the blade. *Be sure that both upper and lower blade guides are adjusted so that the blade travels in a straight line.* (The work table is adjusted to the blade after the blade is installed and the guides are properly adjusted).

⚠WARNING The top blade guide should always be placed as close to the workpiece as possible to reduce the amount of exposed blade. Keep all guards on the machine and in position when the saw is in use.

ROTATING BLADE GUIDES

This saw is equipped with blade guides that can be rotated a full 90° to allow cutting very long materials. To rotate these guides:

1. Remove the throat plate from the center of the work table.
2. Loosen the cap screws on both the top and bottom blade guide mounts.
3. Rotate the Blade Guide Assemblies to guide the blade into the desired direction. Tighten the cap screws and re-install the throat plate. It is not normally necessary to loosen the blade tension when rotating the guide assemblies.

⚠CAUTION Adjust the Blade Guard as close to the work surface as practical to limit the amount of exposed saw blade.

BLADE BRUSH

Keep the brush positioned so that the brush bristles contact the toothed portion of the blade.

TABLE

To adjust the angle of the table to the blade, loosen the table pivot clamp screw under the rear of the table. Pivot the table to the desired angle and tighten the clamp screw.

VARIABLE FREQUENCY MOTOR CONTROLLER

To adjust the bandspeed, burn the small knob on the front of the saw. Band speeds are indicated on the legend plate behind te knob. The gearbox has high and low ranges.

WHEEL PITCH

If the blade tends to run off the front of the top (idle) wheel, loosen the locknuts on the back of the slide block, tighten set screw 1/4 turn and reset the locknuts. Repeat if necessary. The blade does not have to be loosened to adjust wheel pitch.

To make a similar adjustment on the the lower (drive) wheel, loosen the lower pair of cap screws on the wheel mounting plate, loosen the corresponding pair if set screws one turn and tighten the cap screws.

After making a wheel pitch adjustment, turn the wheel several times by hand to confirm proper blade tracking. When everything appears normal, turn the saw on at slow speed to confirm proper tracking of the blade.

LUBRICATION

Lubricated-for-life components are used through the saw, including the motor. The blade tensioning screw and slide should be oiled and greased occasionally for ease of operation.

Blade Tensioning Screw:

1. Inspect monthly.
2. Use Lubriplate grease 130-A or equivalent.
3. Viscosity at 100°F: SUS 750-800.
4. Military Specification: Mil-G-46003

Gear Case:

1. Inspect monthly.
2. Use 80W90 Gear Kube, Mobile HD 80W90 or equiv.
3. Viscosity at 100°F: SUS 750
4. Military Specification: None.

IDLE WHEEL TIRE

The upper (idle) wheel's rubber tire fits into a recess machined into the wheel. This allows blades of different sizes to be used without damaging the set of blade teeth.

To change the idle wheel tire, remove the wheel assembly from the saw. Secure the wheel in a vise, remove the old tire and install the new tire. Glue is not normally needed to hold the tire to the wheel.

DRIVE WHEEL TIMING BELT

The timing belt id also the tire for the driven wheel. It transfers power from the gear box to the driven wheel and also allows blades of different sizes to be used without damaging the set of blade teeth.

CHANGING THE TIMING BELT

1. Loosen the four cap screws holding the gear box mount to release tension on the belt.
2. Remove the old belt and install the new one.
3. Adjust tension so the timing belt is tight and re-tighten the cap screws on the gear box mount.
4. Check the new belt for tightness after two hours of operation. Adjust as necessary.

MAINTENANCE

GEAR BOX

1. Periodically check the oil level in the gear box. To do this, remove the pipe plug (part number 63 on Gear Box drawing, page 10). Fill to the level of the opening with 90-weight gear oil as needed. Re-install plug
2. Drain and refill the gear box every three years or as needed.

ROUTINE MAINTENANCE

1. Keep the saw clean and free of chips.
2. Check, adjust and replace blade brushes as needed.
3. Inspect guides and bearings.
4. Check drive belt for proper tightness.

ANNUAL MAINTENANCE

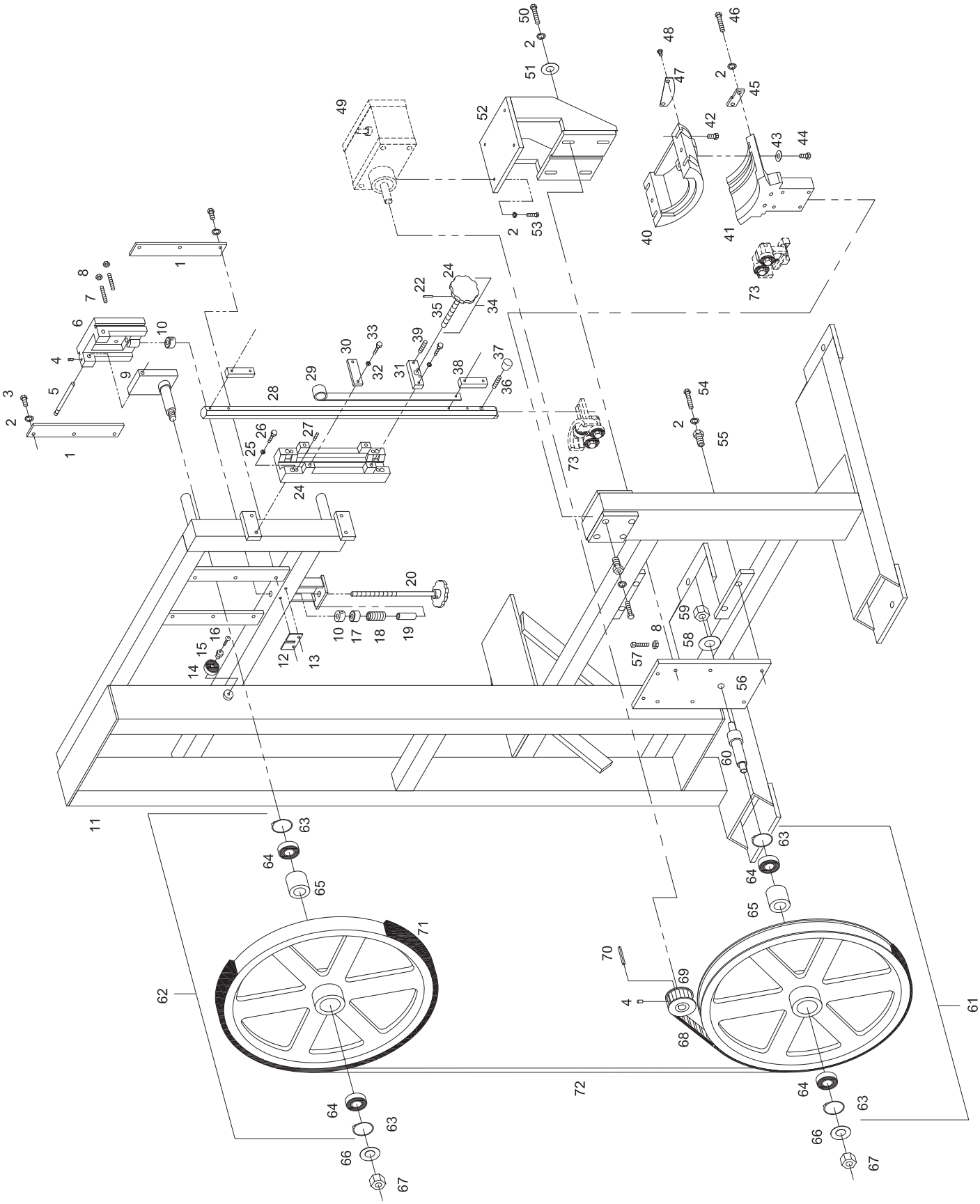
1. Inspect gear box. Lubricate as needed.
2. Replace Blade Guide Rollers

Recommended Service Kits for Insurance Against Downtime

1 year		
100133-004	Blade Brush	1
2 years		
100066-021	V belt	2
100140-005	Timing belt	1
100406-001	Blade guide bearings	6
100133-004	Brush	1
210044-006	Idle wheel tire	1

1" option - use 4-100416-001 bearings
and 2-100406-001 bearings

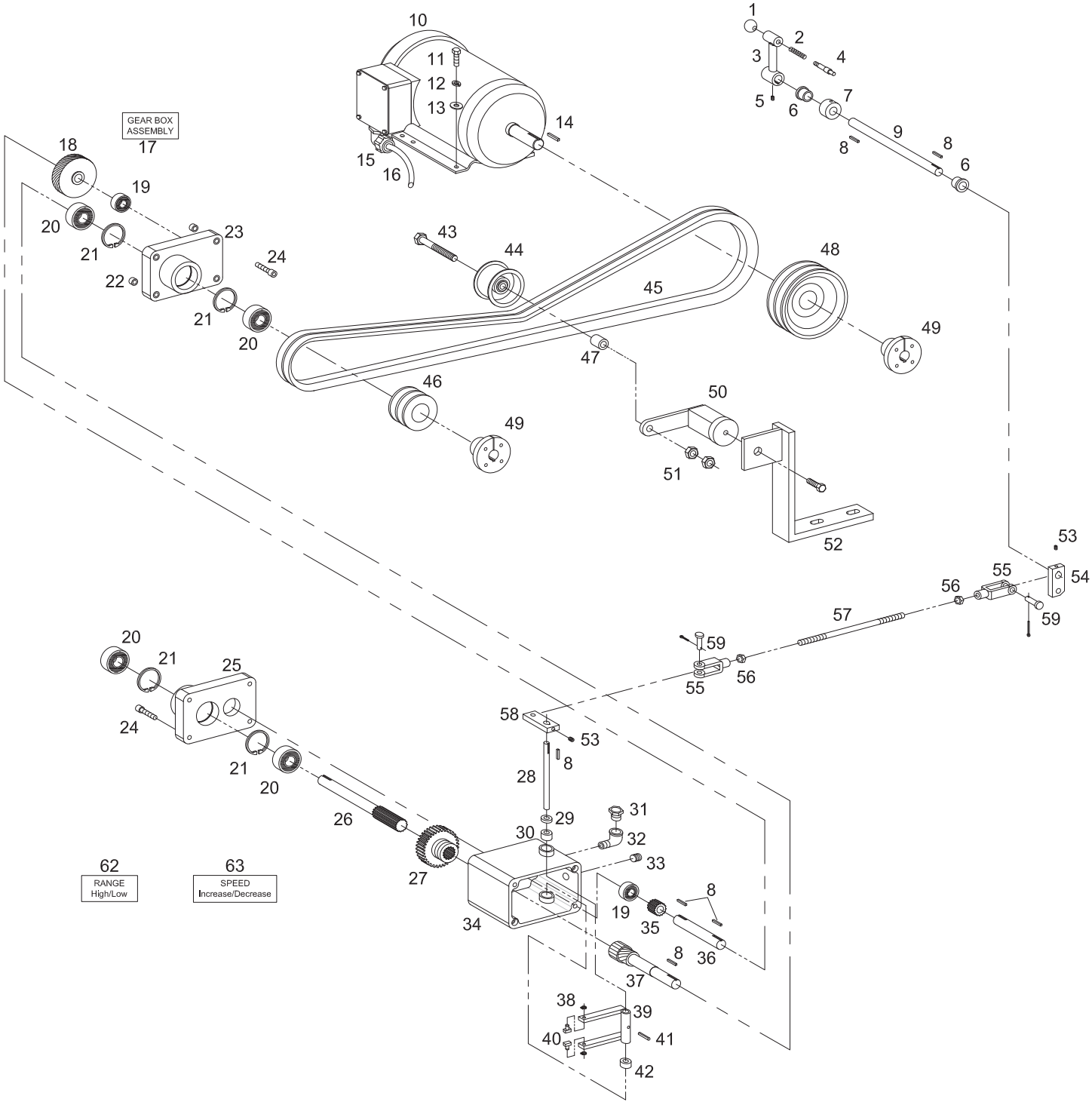
FRAME



FRAME

1	210027	WAY, TENSION SLIDE (2 REQUIRED)
2	100025-002	LOCK WASHER, $\frac{5}{16}$
3	100004-063	CAP SCREW, HH, $\frac{5}{16}$ -18 X $\frac{3}{4}$
4	100034-004	SET SCREW, SH, $\frac{5}{16}$ -18 X $\frac{1}{2}$
5	210010	PIN, SPRING PLATE HINGE
6	210029	SLIDE, TENSION
7	100034-031	SET SCREW, SH, $\frac{5}{16}$ -18 X 1 $\frac{3}{4}$
8	100019-002	JAM NUT, $\frac{5}{16}$ -18
9	210012	UPPER BAND WHEEL SHAFT ASSEMBLY
10	210025	COLLAR WITH SET SCREW
11	210310	FRAME, SAW (WELDMENT)
12	210024	FLATE, TENSION INDICATOR
13	100000-018	MACHINE SCREW, RH, 10-32 X $\frac{3}{8}$
14	100414-009	BEARING (BEFORE SN 2288)
	100406-001	BEARING (AFTER SN 2287)
15	210065	RETAINER, BLADE GUIDE
16	100000-021	MACHINE SCREW, RH, 10-32 X $\frac{7}{8}$
17	100410-001	THRUST BEARING
18	210072	SPRING, BLADE TENSION
19	210026	SLEEVE, TENSION
20	210326	TENSION SCREW ASSEMBLY (INCLUDES ITEMS 21 - 23)
21	210028	SCREW, TENSION ADJUSTING
22	100053-005	ROLL PIN, $\frac{3}{16}$ X 1
23	101166	HANDWHEEL
24	210060	BRACKET, SAW GUIDE
25	100029-001	FLAT WASHER, $\frac{3}{16}$
26	100004-102	CAP SCREW, HH, $\frac{1}{4}$ -20 X 2
27	100034-026	SET SCREW, SH, $\frac{1}{4}$ -20 X $\frac{3}{4}$
28	210280	ARM, SAW GUIDE
29	210066	SPRING, CONSTANT FORCE
30	210063	RETAINER, GUIDE, UPPER
31	210064	RETAINER, GUIDE, LOWER
32	100025-001	LOCK WASHER, $\frac{1}{4}$
33	100004-053	CAP SCREW, HH, $\frac{1}{4}$ -20 X 1
34	106220-003	HAND WHEEL AND SCREW ASSEMBLY (INCLUDES ITEMS 22, 24 & 35)
35	106221-003	SCREW
36	100034-024	STUD
37	100139-001	KNOB
38	210274	GUARD SPACER
39	100127-002	SET SCREW, NYLON POINT, 10-32 X $\frac{15}{64}$
40	210269	TABLE PIVOT
41	210268	TABLE PIVOT SUPPORT
42	100013-015	CAP SCREW, BH, $\frac{3}{8}$ -16 X 1
43	100029-006	FLAT WASHER, $\frac{1}{2}$
44	100004-037	CAP SCREW, HH, $\frac{1}{2}$ -13 X 1 $\frac{1}{2}$
45	210007	POINTER, TABLE
46	100155-001	MACHINE SCREW, TRUSS HD, $\frac{1}{4}$ -20 X $\frac{1}{2}$
47	210006	PROTRACTOR, TABLE
48	100000-024	MACHINE SCREW, RH, $\frac{1}{4}$ -20 $\frac{3}{8}$
49	210251	**GEAR BOX ASSEMBLY (SEE PAGE 10)**
50	100004-020	CAP SCREW, HH, $\frac{5}{16}$ -18 X 1 $\frac{1}{4}$
51	102360	SPACER
52	210301	GEAR BOX MOUNT, WELDMENT
53	100004-018	CAP SCREW, HH, $\frac{5}{16}$ -18 X 1
54	100004-054	CAP SCREW, HH, $\frac{5}{16}$ -18 X 1 $\frac{3}{4}$
55	210273	ADJUSTING SCREW
56	210286	WHEEL PLATE WELDMENT
57	100033-024	SET SCREW, SQ HD, $\frac{5}{16}$ -18 X 1 $\frac{1}{2}$
58	100029-008	FLAT WASHER, $\frac{5}{8}$
59	100065-007	HEX NUT, $\frac{5}{8}$ -18
60	210270	AXLE, DRIVE WHEEL
61	210018	**WHEEL ASSEMBLY, DRIVE END (INCLUDES BAND WHEEL & ITEMS 63-66)**
62	210357	**WHEEL ASSEMBLY COMPLETE, IDLE END (INCLUDES BAND WHEEL & ITEMS 63-65 & 71)**
63	100068-005	SNAP RING (2 REQUIRED PER W
64	100414-006	BEARING (2 REQUIRED PER WH
65	210014	SPACER
66	100030-009	FLAT WASHER, $\frac{5}{8}$
67	100019-016	JAM NUT, $\frac{5}{8}$ -18
68	100140-005	TIMING BELT
69	100141-010	PULLEY, TIMING BELT
70	100056-037	KEY, $\frac{3}{16}$ X $\frac{3}{16}$ X 1
71	210044-006	RUBBER TIRE, IDLE WHEEL
72	BLADE	$\frac{1}{2}$ X 14' 9" FOR V-20 $\frac{1}{2}$ X 16' 1" FOR V-20-24 OR EXT.
73		**UPPER AND LOWER BLADE GUI ASSEMBLIES (SEE PAGE 12)**

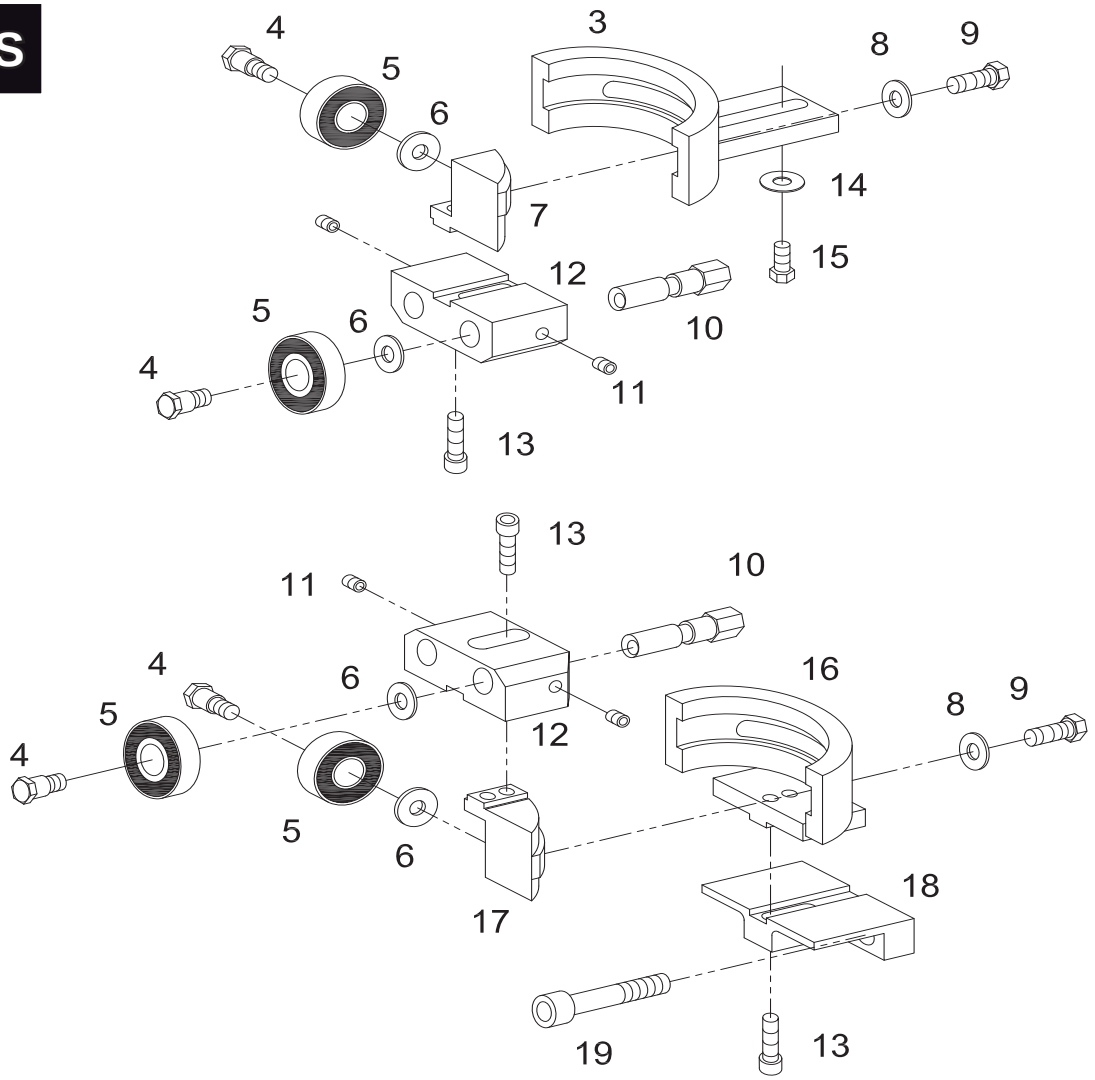
Motor, Gearbox-Frequency Drive



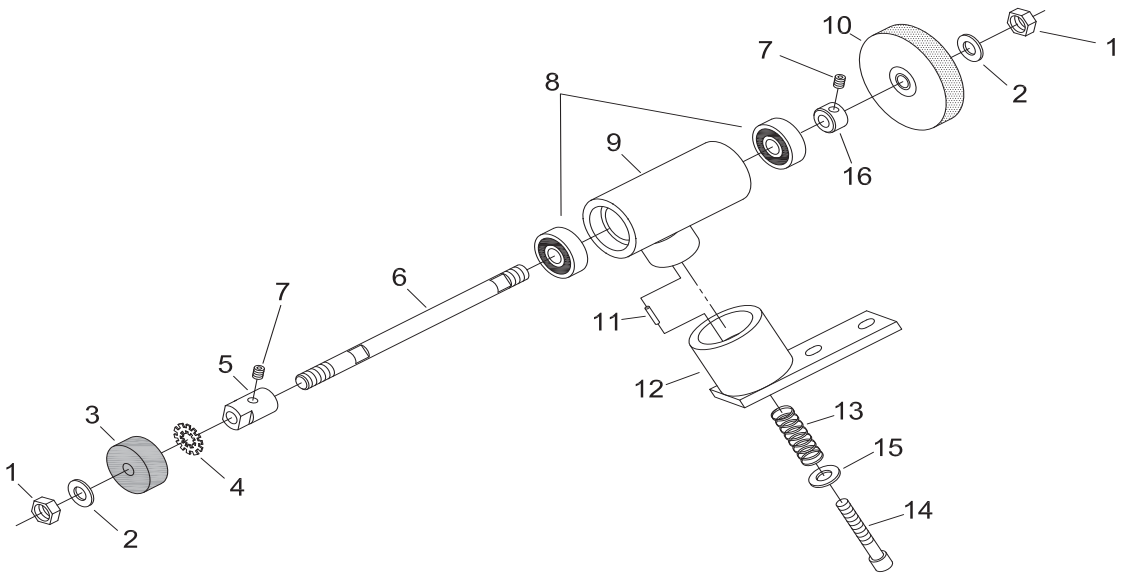
Motor, Gearbox-Freqency Drive

1	100139-006	CONTROL KNOB
2	210350	SPRING
3	210252	SHIFT LEVER
4	210256	PLUNGER
5	100034-025	SET SCREW, SH 1/4-20 X $\frac{3}{8}$
6	100442-005	SHOULDER BUSHING
7	098030-006	COLLAR W/ SET SCREW
8	100056-001	SQUARE KEY, $\frac{1}{8}$ X $\frac{1}{8}$ X $\frac{1}{2}$
9	210261	SHIFT LEVER SHAFT
10	100835-037	MOTOR, 3HP, 3PH, 60HZ
11	100004-018	CAP SCREW, HH, 5/16-18 X 1
12	100025-002	LOCK WASHER, $\frac{5}{16}$
13	100029-003	FLAT WASHER, $\frac{5}{16}$
14	100056-037	SQUARE KEY, $\frac{3}{16}$ X 2
15	100612-015	CONNECTOR, T& B 2250
16	100555-096	WIRE, MOTOR, 58" LONG 14 / 4
17	210251	**GEAR BOX ASSEMBLY (ITEMS 8,18-43)**
18	210218	HELICAL GEAR
19	100404-001	BEARING (2 REQUIRED)
20	100414-003	BEARING (4 REQUIRED)
21	100068-002	SNAP RING (4 REQUIRED)
22	210250	LOCATOR BUSHING (2 REQUIRED)
23	210237	GEAR BOX COVER, REAR
24	100008-021	CAP SCREW, SH, 5/16-18 X 1-1/4
25	210238	GEAR BOX COVER, FRONT
26	210216	SPLINE SHAFT
27	210217	SLIDE GEAR
28	210249	SHIFT FORK SHAFT
29	100454	SEAL
30	100419-033	BUSHING, SHIFT FORK UPPER
31	100317-012	BREATHER VENT
32	100206-002	STREET ELBOW, 90°, $\frac{1}{4}$ NPT
33	100211-011	PIPE PLUG, $\frac{1}{4}$
34	210239	GEAR BOX, MACHINED
35	210219	PINION
36	210261	SHIFT LEVER SHAFT
37	210221	PINION SHAFT ASSEMBLY
38	100069-001	SNAP RING, EXTERNAL (2 REQ'D)
39	210245	SHIFT FORK ASSEMBLY
40	210248	SHIFT FORK DOG (2 REQUIRED)
41	100053-021	ROLL PIN, $\frac{3}{16}$ X $\frac{7}{8}$
42	100419-043	BUSHING, SHIFT FORK LOWER
43	100004-039	CAP SCREW, HH, 1/2-13 X 2-1/2
44	100167-012	PULLEY, IDLER
45	100066-021	V-BELT (2 REQUIRED)
46	098080-061	2 SHEAVE PULLEY
47	210438	SPACER
48	098080-120	2 SHEAVE PULLEY
49	098080-075	SPLIT TAPER BUSHING
50	098085	BELT TENSIONER
51	100019-005	JAM NUT, HEAVY HEX, 1/2-13
52	210379-001	TENSION SUPPORT WELDMENT
53	100034-025	SET SCREW, SH, 1/4-20 X $\frac{3}{8}$
54	210260	SHIFT LEVER LINKAGE ARM
55	210307	CLEVIS 1/PIN (2 REQUIRED)
56	100019-012	JAM NUT, 3/8-24
57	210258	SHIFT LINKAGE
58	210259	LINKAGE ARM
59	100054-003	YOKE PIN

BLADE GUIDES



BLADE BRUSH



BLADE GUIDES

1	**210332**	**UPPER BLADE GUIDE ASSY**
2	**210333**	**LOWER BLADE GUIDE ASSY**
3	210327	UPPER GUIDE MOUNT
4	101298	ROLLER AXLE, (3 PER GUIDE ASSY)
5	100406-001	BEARING, (3 PER GUIDE ASSY)
6	100097-001	WASHER, (2 PER GUIDE ASSY)
7	210329	UPPER PIVOT GUIDE BLOCK, (1 PER GUIDE ASSY)
8	100030-004	FLAT WASHER, SAE, 5/16
9	100004-015	CAP SCREW, HEX HD, 5/16-18 X 3/4
10	210325	ROLLER ADJUSTER SHAFT (2 PER GUIDE ASSY)
11	100034-008	SET SCREW, CUP PT, 1/4-20 X 1/4 (2 PER GUIDE ASSY)
12	210322	GUIDE BLOCK
13	100008-049	CAP SCREW, SOCKET HO, 1/4-20 X 7/8 (3 PER GUIDE)
14	100030-003	FLAT WASHER, SAE, 1/4
15	100004-003	CAP SCREW, HEX HD, 1/4-20 X 1/2
16	210328	LOWER GUIDE MOUNT
17	210330	LOWER PIVOT GUIDE BLOCK
18	210331	LOWER BLOCK MOUNT
19	100008-027	CAP SCREW, SOCKET HD, 3/8-16 X 2

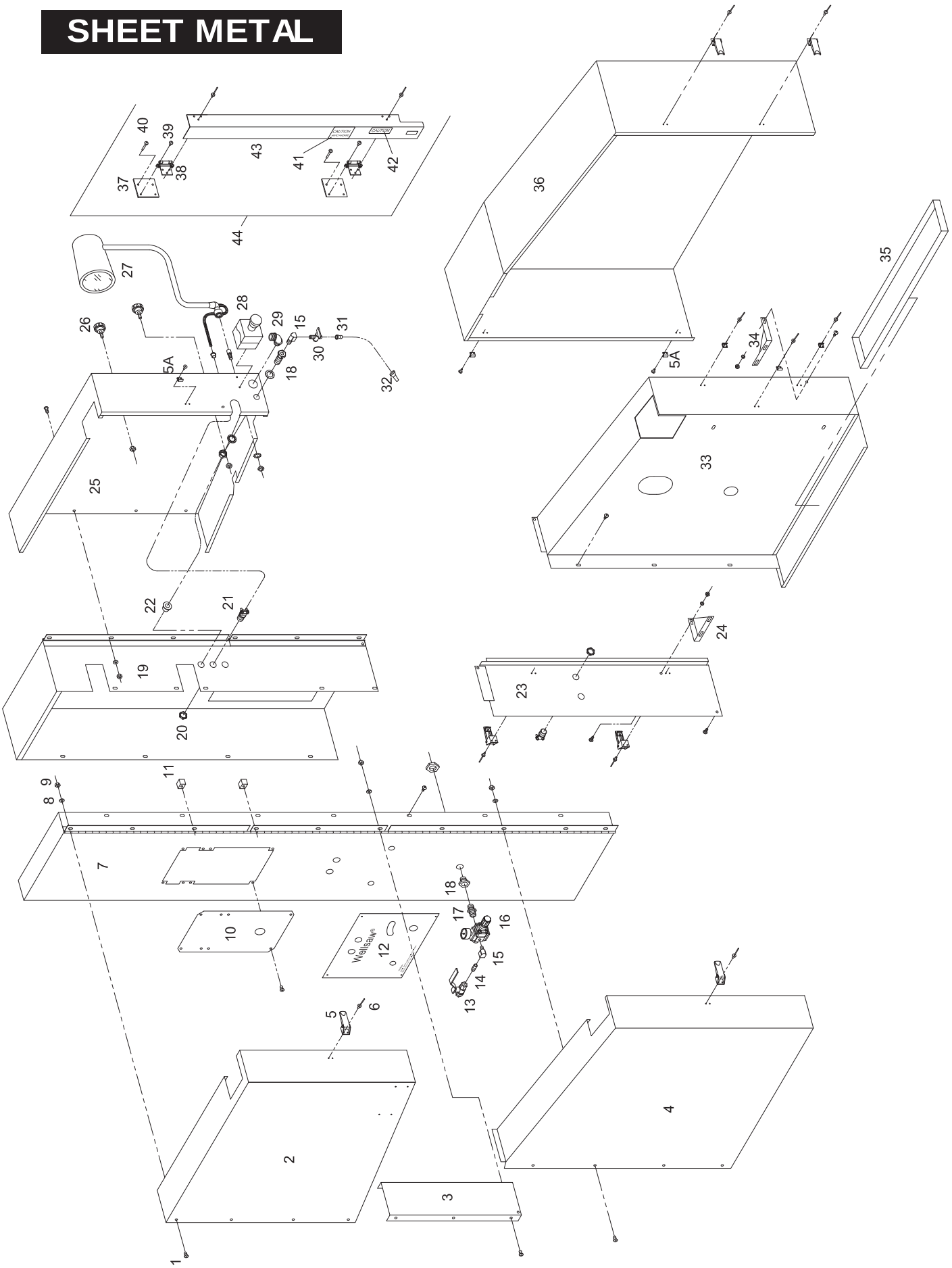
OPTIONAL 1” GUIDES

4	101298	ROLLER AXLE (1 PER GUIDE ASSY)
4A	B-043	ROLLER AXLE (2 PER GUIDE ASSY)
5	100406-001	BEARING (1 PER GUIDE ASSY)
5A	100416-001	BEARING (2 PER GUIDE ASSY)

BLADE BRUSH

1	100019-003	HEAVY HEX JAM NUT 3/8-16 (2)
2	100030-005	FLAT WASHER 3/8 (2)
3	210394	RUBBER WHEEL
4	100028-006	EXT/INT LOCK WASHER 3/8
5	210395	SPACER
6	210393	SHAFT
7	100034-001	SET SCREW 1/4-20 X 3/16
8	100443-005	BEARING
9	210396	BEARING HOUSING
10	100133-004	BRUSH
11	100052-027	DOWEL PIN
12	210397	BASE
13	100136-008	SPRING
14	100008-037	CAP SCREW SH 5/16-18 X 1-3/4
15	100030-004	FLAT WASHER 5/16
16	M-107	COLLAR W/ SET SCREW
	210398	**BLADE BRUSH ASSEMBLY COMPLETE**

SHEET METAL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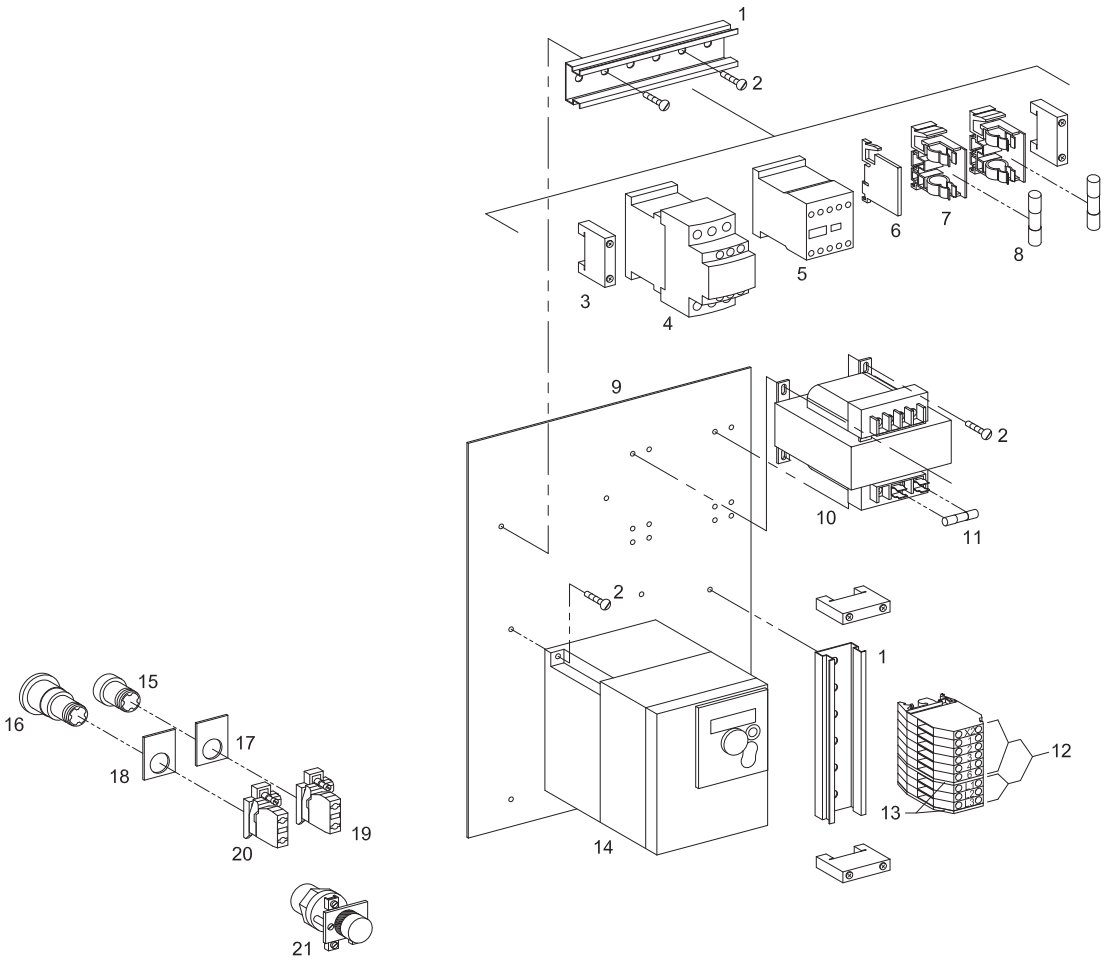
Wellsaw

SHEET METAL

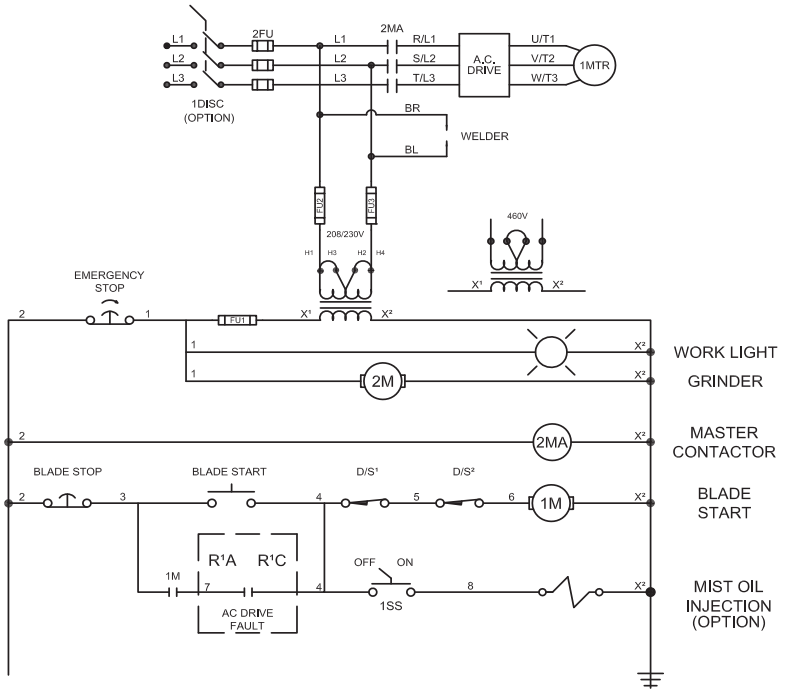
1	100155-001	MACHINE SCREW, TRUSS HEAD
2	210222	UPPER FRONT WHEEL COVER
3	210298	BLADE GUARD, COLUMN
4	210224	LOWER FRONT WHEEL COVER
5	100142-001	LATCH
5A	100142-002	CATCH
6	100131-012	POP RIVET
7	210229	FRONT FRAME COVER WELDMENT
8	100030-003	FLAT WASHER, SAE 1/4
9	100017-001	HEX NUT, 1/4
10	210306	WELDER COVER PLATE
11	210179	DOOR SWITCH OPERATOR (2 REQUIRED)
12	210323	LEGEND PLATE
13	100286-010	BALL VALVE
14	100203-018	CLOSE NIPPLE, 1/4
15	100234-007	STREET ELBOW, 1/4
16	210259-019	REGULATOR W/GAGE
17	100332-001	HEX NIPPLE,1/4
18	210334	BULKHEAD FITTING
19	210231	REAR FRAME COVER WELDMENT
20	100240-001	CONDUIT LOCK NUT 1/2
21	100597-001	CONNECTOR, 1/2
22	100731-002	WIRE GUIDE
23	210227	FRAME COVER FILLER
24	210321	GUSSET (BACK)
25	210223	UPPER REAR WHEEL COVER
26	210320	KNOB & SET SCREW ASSEMBLY
27	100781-007	WORKLIGHT W/ MOUNTING BRACKET
28	100871-028	CONTROL STATION STOP, TURN TO RELEASE
29	100612-024	CONNECTOR 1/2, 90 DEGREE
30	100372	LOC-LINE VALVE 1/4
31	100370	LOC-LINE HOSE
32	100371	LOC-LINE NOZZLE
33	210225	LOWER CENTER COVER
34	210324	GUSSET (FRONT)
35	210290	CHIP PAN
36	210226	LOWER REAR COVER
37	210084	PLATE, SAW GUARD HINGE
38	105550	HINGE, SPRING LOADED
39	100013-005	CAP SCREW 10-32 X 3/8 BUTTON HEAD
40	100013-017	CAP SCREW 10-32 X 1 BUTTON HEAD
41	098055-010	"CAUTION HAND HAZARD" LABEL
42	106815	"CAUTION" LABEL
43	210272	GUARD, SAW
44	**210074**	**SAW GUARD & HINGE ASSEMBLY (INCLUDES ITEMS 37-43)**

ELECTRICAL

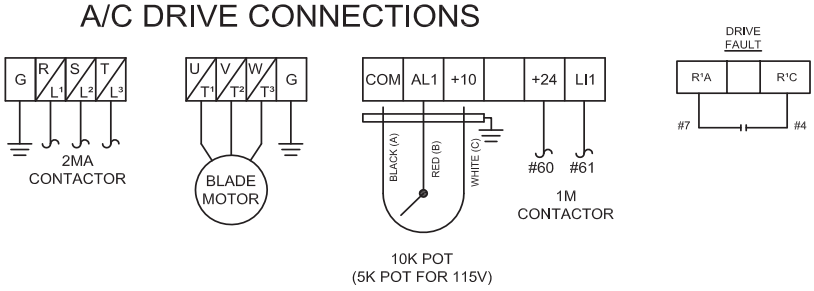


1	100717-016T	MOUNTING CHANNEL, 6"
2	100000-017	10-32 X 1/4 PHILLIPS HEAD MACHINE SCREW
3	100717-017T	END CLAMP, DIN RAIL (4 REQ'D)
4	100867-023	MAGNETIC STARTER
5	100746-028	CONTROL RELAY
6	100717-015A	FUSE BLOCK END BARRIER
7	100717-014A	FUSE BLOCK
8	100628-036	FUSE, 1.0 AMP (2 REQ'D FOR 308V/230V/460V)
	100628-035	FUSE, 1.5 AMP (2 REQ'D FOR 115V)
9	210233-001	BACK PANEL
10	100869-005	TRANSFORMER (230V/460V)
	100869-007	TRANSFORMER (308V)
		(NOT REQ'D FOR 115V)
11	100628-035	FUSE, 1.5 AMP
		(NOT REQ'D FOR 115V)
12	100717-012D	TERMINAL BLOCK (9 REQ'D)
13	100717-013D	END SECTION, SNAP IN (2 REQ'D)
14	100907-008	ALTIVAR 312 (460V)
	100907-006	ALTIVAR 312 (230V/308V)
	100907-010	ALTIVAR 312 (115V)
15	100871-001	GREEN PUSH BUTTON OPERATOR
16	100871-013	RED MUSHROOM HEAD STOP BUTTON
17	100699-107	LEGEND PLATE, "START"
18	100699-108	LEGEND PLATE, "STOP"
19	100871-004	CONTACT BLOCK W/BASE, NORMALLY OPEN
20	100871-005	CONTACT BLOCK W/BASE, NORMALLY CLOSED
21	100796-032	POTENTIOMETER, 10kOHM (208V,230V AND 460V)
	100796-032A	POTENTIOMETER, 5kOHM (115V)

ELECTRICAL SCHEMATIC



A/C DRIVE CONNECTIONS



Altivar 312 SETTINGS

drC
- bFr = 60
- CoS = Motor Tag Power Factor (P.F.)
- tFr = 125.0
- unS = Motor Voltage
- nCr = Rated Motor Tag AMPS
- nSP = Rated Motor Tag R.P.M.
- uFt = L

Ctl
- Fr1 = AI1

Fun
- StC = Stt = nSt (rNP for programmed braking. Adjust dEC accordingly)

Set
- ACC = 3.0
- dEC = 8.0
- LSP = 15.0
- HSP = 123.5

I - O
- Aolt = OA
- do = ofr

drC
- tun = yes
- scs = strl

NOTE: FOR SINGLE PHASE
1) FLT = IPL-NO
2) CONNECT INCOMING POWER TO R/L1 & S/L2

Altivar 12 SETTINGS (115V)

ConF

FULL

drC
- bFr = 60 or 50
- NPC = Cos ((Motor Tag Power Factor (P.F.))
- UnS = Motor Voltage
- nCr = Rated Motor Tag AMPS
- FrS = 60 or 50
- nSP = Rated Motor Tag R.P.M.
- tFr = 125.0

ConF
- ACC = 3.8
- dEC = 8.0
- LSP = 15.0
- HSP = 125.0

FULL

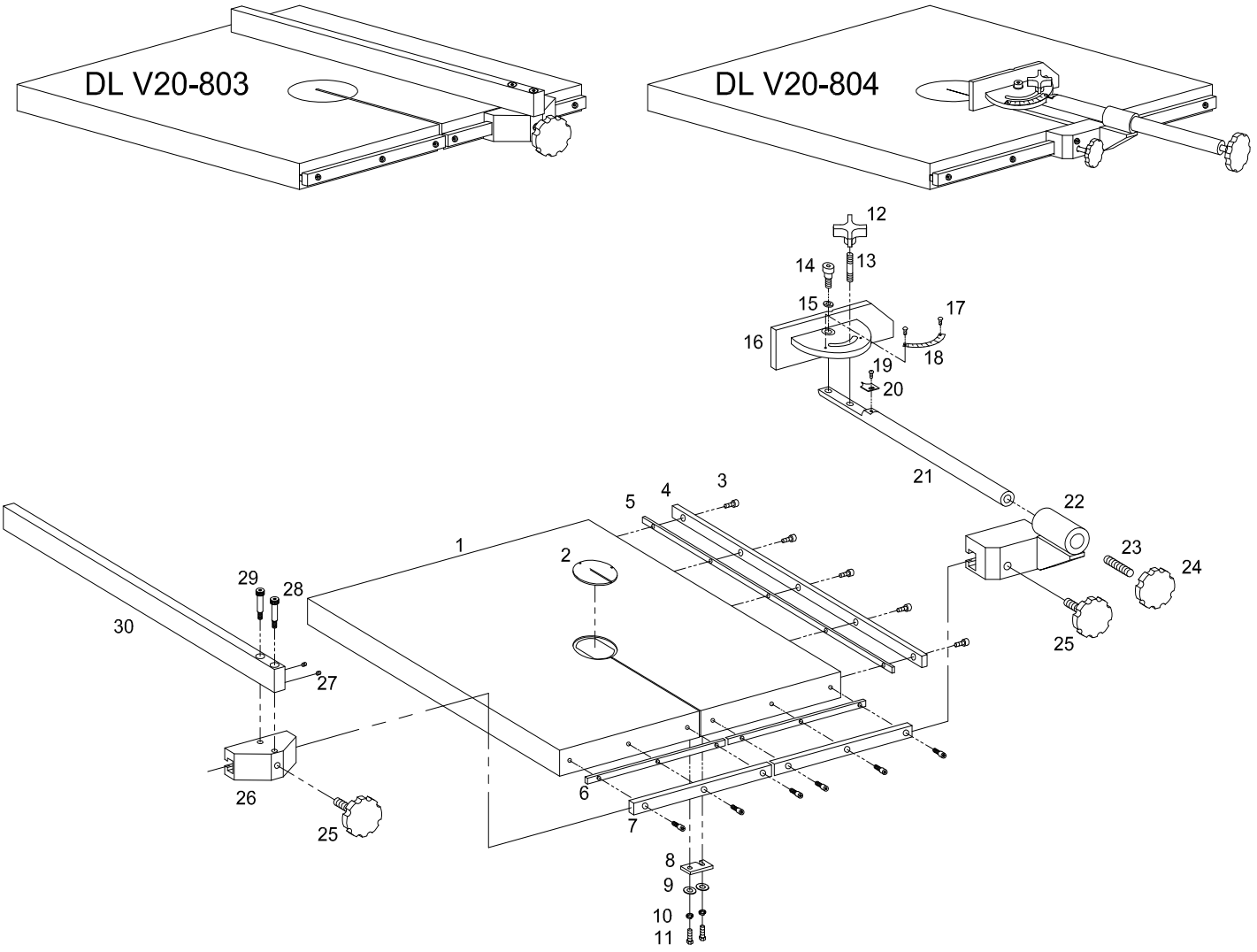
FUN
- Stt = nSt = no
- (Stt = rNP for programmed braking. Adjust dEC accordingly.)

I-O
- All = Allt =IOU

drC
- tUn = yes

SCS = Strl (Set after above settings are complete)

TABLE ASSEMBLY
W/ OPTIONS



1	210267	TABLE
2	210266	PLATE, THROAT
3	100008-018	CAP SCREW, SH, $\frac{3}{8}$-16 X 1
4	210278	"T" RAIL BAR
5	210279	"T" RAIL SPACER
6	210277	"T" RAIL SPACER (2 REQ'D)
7	210276	"T" RAIL BAR (2 REQ'D)
8	210275	TABLE TIE PLATE
9	100030-005	WASHER, FLAT, $\frac{3}{8}$
10	100025-003	WASHER, LOCK, $\frac{3}{8}$
11	100004-027	CAP SCREW, HH, $\frac{3}{8}$-16 X 1
12	210346	KNOB
13	100035-012	SET SCREW, SH, $\frac{3}{8}$-16 X 1 $\frac{3}{4}$
14	100165-002	SHOULDER BOLT, $\frac{1}{2}$-13 X 1 $\frac{1}{4}$
15	100171-001	CLAMP WASHER
16	210340	MITER GUIDE HEAD
17	100049-001	DRIVE SCREW, #4 X $\frac{1}{4}$
18	210344	PROTRACTOR
19	100013-012	CAP SCREW, BH, 8-32 X $\frac{3}{8}$
20	210335	POINTER
21	210343	GUIDE ROD
22	210336	GUIDE BLOCK WELDMENT
23	100035-013	SET SCREW, SH, $\frac{1}{2}$-13 X 1 $\frac{1}{4}$
24	210345	KNOB
25	105335-001	HAND WHEEL & SCREW ASSEMBLY
26	210305	CLAMP BLOCK
27	100035-014	SET SCREW, SH, $\frac{5}{16}$-18 X $\frac{3}{16}$
28	100165-014	SHOULDER BOLT, $\frac{1}{2}$-13 X 1 $\frac{1}{2}$
29	210079	SHOULDER BOLT, $\frac{1}{2}$-13 X 1 $\frac{1}{2}$ MODIFIED
30	210304	RIP FENCE
31	**DL V20-803**	**RIP FENCE WITH "T" RAILS (OPTION) (INCLUDES ITEMS 3-7 & 25-30)**
32	**DL V20-804**	**MITRE GUIDE WITH "T" RAILS (OPTION) (INCLUDES ITEMS 3-7, 12-19, 21-22 & 24- 25)**

Wellsaw® Select-O-Chart

To assist in selecting the right blade and the right speed for your job!

Speed = Suggested blade speed in feet-per-minute

Feeding pressure: L = light, **M =** medium, **H =** heavy • **T =** teeth per inch

Stock Dimensions Tooth Pitch	Up to 1" 10/14, 8/12		From 1" - 3" 6/10,8/12,5/8		From 3" - 6" 5/8,4/6,3/4,3 Sab.		Over 6" 3/4,2/3,2 Sab., 1 Tooth, 3/4" T.S.	
Material (Annealed)	**Blade Spee (SFPM)**	**Cutting Rate (SIPM)**	**Blade Spee (SFPM)**	**Cutting Rate (SIPM)**	**Blade Spee (SFPM)**	**Cutting Rate (SIPM)**	**Blade Spee (SFPM)**	**Cutting Rate (SIPM)**
Carbon Steels:								
1008-1013	250	8 - 10	275	9 - 12	280	12 - 15	250	9 - 12
1015-1018	250	8 - 10	275	9 - 12	250	12 - 15	230	9 - 12
1048-1065	200	5 - 7	200	5 - 7	175	8 - 10	150	6 - 8
1065-1095	200	4 - 6	200	5 - 7	150	6 - 8	120	6 - 8
Free Machining Steels:								
1108-1111	300	9 - 11	330	12 - 14	275	13 - 15	220	11 - 14
1112-1113	300	8 - 11	330	11 - 13	275	12 - 15	220	12 - 15
1115-1132	300	7 - 10	330	10 - 13	275	13 - 16	220	11 - 14
1137-1151	275	6 - 8	250	8 - 10	250	8 - 11	200	7 - 10
1212-1213	300	8 - 10	320	11 - 13	300	13 - 15	255	11 - 14
Manganese Steels:								
1320-1330	250	5 - 7	250	5 - 8	200	8 - 11	175	7 - 10
1335-1345	250	5 - 7	225	5 - 7	200	7 - 9	175	5 - 8
Nickel Steels:								
2317	270	4 - 5	270	4 - 6	250	5 - 7	230	4 - 6
2330-2345	220	2 - 3	220	3 - 5	190	3 - 5	170	3 - 5
2512-2517	200	2 - 3	200	3 - 5	160	4 - 6	150	4 - 6
Nickel Chrome Steels:								
3115-3130	260	4 - 6	260	5 - 7	230	5 - 7	225	5 - 7
3135-3150	220	4 - 6	200	4 - 7	180	6 - 8	150	5 - 8
3310-3315	200	3 - 4	180	4 - 5	180	5 - 7	160	4 - 6
Molybdenum Steels:								
4017-4024	300	3 - 5	270	4 - 7	250	6 - 8	220	5 - 8
4032-4042	300	3 - 5	270	4 - 7	250	6 - 8	230	5 - 8
4047-4068	250	3 - 5	220	4 - 6	200	5 - 7	180	3 - 5
Chrome Moly Steels:								
4130-4140	280	4 - 6	250	5 - 8	250	8 - 10	220	6 - 8
4142-4150	230	3 - 5	200	4 - 6	200	5 - 7	170	4 - 6
Nickel Chrome Moly Steels:								
4317-4320	250	3 - 5	225	4 - 6	200	5 - 7	170	4 - 6
4337-4340	230	3 - 4	200	4 - 5	200	4 - 6	170	4 - 5
8615-8627	250	4 - 5	230	6 - 7	230	6 - 8	200	6 - 7
8630-8645	250	3 - 5	230	4 - 6	230	5 - 7	180	4 - 6
8647-8660	220	2 - 4	200	3 - 5	200	4 - 6	150	3 - 5
8715-8750	250	3 - 5	220	4 - 6	220	5 - 7	180	4 - 6
9310-9317	200	1 - 3	160	2 - 3	160	2 - 4	150	2 - 3
9437-9445	250	4 - 5	230	4 - 5	230	5 - 6	180	4 - 5
9747-9763	250	2 - 4	230	3 - 5	200	4 - 6	180	3 - 5
9840-9850	240	4 - 5	220	4 - 6	200	5 - 7	180	4 - 6
Nickel Moly Steels:								
4608-4621	250	3 - 5	220	5 - 6	220	6 - 7	200	5 - 6
4640	220	3 - 5	200	4 - 6	200	5 - 7	170	4 - 6
4812-4820	200	3 - 5	180	3 - 5	180	4 - 6	160	4 - 5
Chrome Steels:								
5045-5046	280	4 - 6	250	5 - 7	250	8 - 10	200	7 - 8
5120-5135	280	4 - 6	250	6 - 7	240	7 - 8	180	5 - 8
5140-5160	250	3 - 5	230	4 - 6	230	5 - 7	200	4 - 6
50100-52100	180	2 - 4	160	3 - 5	150	4 - 6	100	3 - 5
Chrome Vanadium Steels:								
6117-6210	225	4 - 5	225	5 - 7	200	6 - 8	170	5 - 7
6145-6152	225	3 - 4	200	4 - 5	200	5 - 6	150	4 - 5
Silicon Steels:								
9255-9260	200	2 - 4	180	3 - 5	180	3 - 5	150	3 - 5
9261-9262	200	1 - 3	160	2 - 3	160	2 - 4	150	2 - 3

Stock Dimensions Tooth Pitch	Up to 1" 10/14, 8/12		From 1" - 3" 6/10,8/12,5/8		From 3" - 6" 5/8,4/6,3/4,3 Sab.		Over 6" 3/4,2/3,2 Sab., 1 Tooth, 3/4" T.S.	
Material (Annealed)	Blade Spee (SFPM)	Cutting Rate (SIPM)	Blade Spee (SFPM)	Cutting Rate (SIPM)	Blade Spee (SFPM)	Cutting Rate (SIPM)	Blade Spee (SFPM)	Cutting Rate (SIPM)
High Speed Tool Steels:								
T-1, T-2	130	1 - 2	110	2 - 3	100	2 - 4	90	2 - 3
T-4, T-5	110	1 - 2	100	1 - 2	90	2 - 3	80	1 - 2
T-6, T-8	110	1 - 2	100	1 - 2	80	1 - 2	70	1 - 2
T-15	80	1	80	1	70	1	50	1
M-1	150	1 - 3	140	2 - 4	130	3 - 5	110	2 - 4
M-2, M-3	120	1 - 2	110	2 - 3	100	3 - 4	80	2 - 3
M-4, M-10	100	1 - 2	90	1 - 2	80	1 - 3	60	1 - 2
Die Steels:								
A-2,	210	2 - 3	200	3 - 4	190	3 - 4	180	2 - 3
D-2, D-3	110	1 - 2	100	1 - 2	90	1 - 2	80	1 - 2
D-7	90	1	80	1	70	1	70	1
O-1, O-2	240	3 - 4	210	4 - 5	190	5 - 6	170	4 - 5
O-6	230	3 - 4	200	4 - 6	180	5 - 7	150	4 - 6
Hot Work Steels:								
H-12, H-13, H-21	150	2 - 4	125	3 - 5	125	2 - 4	125	2 - 4
H-22, H-24, H-25	150	1 - 3	125	1 - 3	125	1 - 3	125	1 - 3
Shock Resisting Tool Steels:								
S-1	220	2 - 4	180	3 - 5	165	3 - 5	150	2 - 4
S-2, S-5	170	1 - 3	150	2 - 4	120	2 - 4	100	1 - 3
Special Purpose Tool Steels:								
L-6	200	2 - 4	180	3 - 5	170	3 - 5	150	2 - 4
L-7	200	2 - 4	180	3 - 5	150	3 - 5	100	2 - 4
Stainless Steels:								
201, 202, 302, 304	120	2 - 4	100	2 - 4	100	2 - 4	100	1 - 3
303, 303F	140	2 - 4	120	2 - 4	100	3 - 5	100	2 - 4
308, 309, 310, 330	90	1	70	1	60	2	60	1
314, 316, 317	90	1	80	1	70	2	60	1
321, 347	130	1 - 3	110	1 - 3	100	2 - 4	80	1 - 3
410, 420, 420F	150	1 - 3	130	1 - 3	120	2 - 4	100	1 - 3
416,430F	200	3 - 5	180	4 - 6	170	5 - 7	150	4 - 6
430, 446	100	1 - 3	90	2 - 4	80	2 - 4	80	1 - 3
440 A,B,C	120	1 - 3	10	1 - 3	90	2 - 4	70	1 - 3
440F, 443	150	1 - 3	130	1 - 3	120	2 - 4	100	1 - 3
17-4PH, 17-7PH	100	2 - 3	90	2 - 4	80	3 - 4	80	2 - 3
A-7	100	1 - 2	100	1 - 2	100	2 - 3	100	2 - 3
Beryllium Copper #25								
BHN 100-120	350	4 - 6	300	5 - 7	275	6 - 8	225	5 - 7
BHN 220-250	250	2 - 4	225	3 - 5	200	4 - 6	175	3 - 5
BHN 310-340	200	1 - 2	160	1 - 2	140	2 - 3	100	1 - 2
Nickel Base Alloys:								
Monel	100	1 - 2	100	1 - 2	80	1 - 2	60	1
R Monel	140	2 - 3	140	2 - 4	125	2 - 4	75	2 - 3
K Monel	100	1	80	1	60	1	60	1
KR Monel	100	1 - 3	90	1 - 3	80	1 - 3	60	1 - 2
Inconel	110	1 - 2	100	1 - 3	80	1 - 3	80	1 - 2
Inconel X	90	1	80	1	70	1	60	1
Hastelloy A	120	1 - 2	100	1 - 2	85	2 - 3	75	1 - 2
Hastelloy B	110	0 - 1	100	1 - 2	90	1 - 2	75	0 - 1
Hastelloy C	100	0 - 1	90	0 - 1	70	0 - 1	60	0 - 1
Rene 41	90	1	90	1	90	1 - 2	90	1 - 2
Udimit	100	1	90	1 - 2	90	1 - 2	90	1 - 2
Waspalloy	90	1	90	1 - 2	90	1 - 2	90	1 - 2
Titanium	100	1 - 2	100	2 - 3	100	2 - 3	100	2 - 3
Titanium Alloys:								
TI-4AL-4MO Alpha Beta Alloy	100	0 - 1	90	0 - 1	80	0 - 1	70	0 - 1
TI-140A 2CR-2MO	100	0 - 1	90	0 - 1	80	0 - 1	60	0 - 1
TI-150A	100	0 - 1	90	0 - 1	80	0 - 1	60	0 - 1
MST-6AL-4V	100	0 - 1	90	0 - 1	80	0 - 1	60	0 - 1
99% Pure Titanium	100	0 - 1	90	0 - 1	80	0 - 1	60	0 - 1

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