DEPARTMENT
OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT

AND GENERAL SUPPORT MAINTENANCE

MANUAL INCLUDING REPAIR PARTS LIST

FOR

17" Variable Speed Drill Press

Model 17-232

(3413-00-316-0248)

HEADQUARTERS,
DEPARTMENT OF THE ARMY

MARCH 1984

WARNING PAGE

FOR YOUR OWN SAFETY--DON'T WEAR GLOVES WHEN OPERATING A DRILL PRESS.

CAUTION

WHEN PRACTICAL, USE CLAMPS OR A VISE TO SECURE WORKPIECE TO KEEP THE WORKPIECE FROM ROTATING WITH THE DRILL BIT OR CUTTING TOOL.

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2, located in the back of this manual direct to: Commander, US Army Armament, Munitions and Chemical Command, ATTN: DRSMC-MAS, Rock Island, IL 61299. A reply will be furnished directly to you.

Operator, Organizational, Direct Support and General Support Maintenance Manual Including Repair Parts List for:

17" Variable Speed Drill Press
Model 17-232
3413-00-316-0248

NOTE

This manual is published for the purpose of identifying an authorized commercial manual for the use of the personnel to whom this equipment is issued.

Manufactured by: Rockwell International Corporation
400 N. Lexington Avenue
Pittsburgh, PA 15208
Procured under Contract No. DAAA09-79-M-6552

INSTRUCTIONS FOR REQUISITIONING PARTS

NOT IDENTIFIED BY NSN

When requisitioning parts not identified by National Stock Number, it is mandatory that the following information be furnished the supply officer.

1 - Manufacturer's Federal Supply Code Number - 83738

2 - Manufacturer's Part Number exactly as listed herein.

3 - Nomenclature exactly as listed herein, including dimensions, if necessary.

4 - Manufacturer's Model Number - 17-232

5 - Manufacturer's Serial Number (End Item).

6 - Any other information such as Type, Frame Number, and Electrical Characteristics, if applicable.

7 - If DD Form 1348 is used, fill in all blocks except 4, 5, 6, and Remarks field in accordance with AR 725-50.

Complete Form as Follows:

(a) In blocks 4, 5, 6, list manufacturer's Federal Supply Code Number - 83738 followed by a colon and manufacturer's Part Number for the repair part.

(b) Complete Remarks field as follows:

Noun:	(nomenclature or repair part)
For:	NSN: 3413-00-316-0248
Manufacturer:	Rockwell International Corporation
	400 N. Lexington Avenue
Model: 17-232	Pittsburgh, PA 15208
Serial:	(of end item)

Any other pertinent information such as Frame Number, Type, Dimensions, etc.

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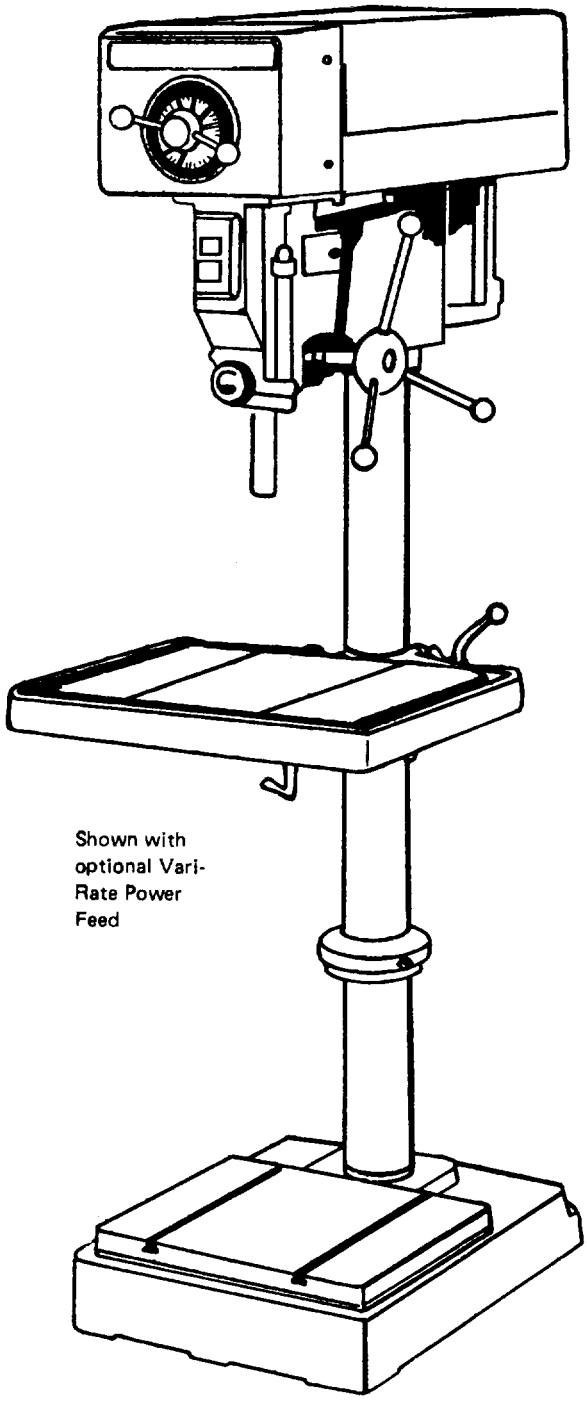
Variable Speed Drill Press (beginning with serial #141-1800)



Shown with optional Vari-Rate Power Feed

SAFETY RULES FOR ALL TOOLS

As with all power tools there is a certain amount of hazard involved with the operator and his use of the tool. Using the tool with the respect and caution demanded as far as safety precautions are concerned will considerably lessen the possibility of personal injury. However, if normal safety precautions are overlooked or completely ignored, personal injury to the operator can develop.

There are also certain applications for which this tool was designed. It is strongly recommends that this tool NOT be modified and/or used for any application other than for which it was designed. If you have any questions relative to its application DO NOT use the tool until you have written and we have advised you.

1. KNOW YOUR POWER TOOL. Read the owner's manual carefully Learn the tools applications and limitations, as well as the specific potential hazards peculiar to it.

2. KEEP GUARDS IN PLACE and in working order.

3. GROUND ALL TOOLS. If tool is equipped with three-prong plug, it should be plugged into a three-hole electrical receptacle. If an adapter is used to accommodate a two-prong receptacle, the adapter lug must be attached to a known ground. Never remove the third prong.

4. REMOVE ADJUSTING KEYS AND WRENCHES. Form habit of checking to see that keys and adjusting wrenches are removed from tool before turning It on.

5. KEEP WORK AREA CLEAN. Cluttered areas and benches invite accidents.

6. AVOID DANGEROUS ENVIRONMENT. Don't use power tools in damp or wet locations, or expose them to rain. Keep work area well lighted.

7. KEEP CHILDREN AND VISITORS AWAY. All children and visitors should be kept a safe distance from work area.

8. MAKE WORKSHOP KIDPROOF - with padlocks, master switches, or by removing starter keys.

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

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

11. WEAR PROPER APPAREL. No loose clothing, gloves, neckties, or jewelry to get caught in moving parts. Nonslip footwear is recommended. Wear protective hair covering to contain long hair.

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

13. SECURE WORK. Use clamps or a vise to hold work, when practical. It's safer than using your hand and frees both hands to operate tool

14. DON'T OVERREACH. Keep your proper footing and balance at all times.

15. MAINTAIN TOOLS IN TOP CONDITION. Keep tools sharp and clean for best and safest performance. Follow instructions for lubricating and changing accessories.

16. DISCONNECT TOOLS before servicing and when changing accessories such as blades, bits, cutters.

17. USE RECOMMENDED ACCESSORIES. Consult the owner's manual for recommended accessories The use of improper accessories may cause hazards

18. AVOID ACCIDENTAL STARTING. Make sure switch is in "OFF" position before plugging in cord.

19. NEVER STAND ON TOOL. Serious injury could occur if the tool is tipped or if the cutting tool is accidentally contacted.

20. CHECK DAMAGED PARTS. Before further use of the tool, a guard or other part that is damaged should be carefully checked to ensure that it will operate properly and perform Its intended function - check for alignment of moving parts, binding of moving parts, breakage of parts, mounting, and any other conditions that may affect its operation A guard or other part that is damaged should be properly repaired or replaced.

21. DIRECTION OF FEED. Feed work into a blade or cutter against the direction of rotation of the blade or cutter only.

22. NEVER LEAVE TOOL RUNNING UNATTENDED. TURN POWER OFF. Don't leave tool until it comes to a complete stop.

23. DRUGS, ALCOHOL, MEDICATION. Do not operate tool while under the influence of drugs, alcohol or any medication.

ADDITIONAL SAFETY RULES FOR DRILL PRESSES

1. BE SURE drill bit or cutting tool is securely locked in the chuck.

2. 8E SURE chuck key is removed from the chuck before turning on power.

3. ADJUST the table or depth stop to avoid drilling into the table.

4. SHUT OFF the power, remove the drill bit or cutting tool, and clean the table before leaving the machine.

5. CAUTION: When practical, use clamps or a vise to secure workpiece to keep the workpiece from rotating with the drill bit or cutting tool.

6. WARNING: For Your Own Safety - Don't wear gloves when operating a drill press.

SETTING UP

Your 17" Variable Speed Drill Press was completely assembled and tested at the factory. When selecting floor space, please note that vibration transmitted through inadequately constructed floors by adjacent machinery or other source can impair the accuracy of your machine. Supplied with your drill are four anti-vibration pads and four steel plates. When the drill is moved to it's permanent shop location, position the four anti-vibration pads and the four 1/16" steel plates under each corner of the drill press base, with the steel plates between the pads and the base of the drill. If the machine is to be fastened to the floor, the compressed height to the top of the steel plates should be 5/16". The head and table of your drill press have been lowered on the column for convenience in packaging. To raise the head, proceed as follows:

1. Place a block of wood, about 7" long, between the drill press head and the table, as close to the column as possible.
2. Make sure the collar at the bottom of the raising mechanism rack is tight on the column and unlock the table clamp. Then loosen the two bolts, located on the right hand side of the head, that lock the head to the column.
3. Turn the raising mechanism hand crank clockwise to raise the table and head simultaneously.
4. When the table approaches the top of the raising mechanism, lock the table and head to the column. Then loosen the raising mechanism collar and turn the raising mechanism hand crank counter-clockwise. This will slide the rack of the raising mechanism further up the column.
5. Repeat STEPS 2, 3 and 4 until the top of the head is at the desired height. Be sure not to raise the top of the head casting beyond the top end of the column.
6. With the head and table still loose, visually line up the spindle with center of the base and lock the head to the column.
7. Position the table and raising mechanism to the desired position on the column and lock them in place.

The table and all other machined or unpainted surfaces of the drill press are protected with a coating of rust preventive. This coating may be removed with a soft cloth moistened with kerosene (do not use acetone, gasoline or lacquer thinner for this purpose.) After cleaning, cover all unpainted surfaces with a light film of good machine oil.

MOTOR AND SPEEDS

The 3/4 hp or 1 hp 8 1/2 frame motors may be used on 17" Drill Presses. However, 3/4 hp motors should not be used for any power feed or variable speed machines when they are intended for full capacities.

With a 1140 rpm motor, spindle speeds between 230 and 2830 rpm can be obtained.

With a 1725 rpm motor, spindle speeds between 350 to 4250 rpm can be obtained.

When selecting a motor of any other make, be certain that it has the above specifications and is a NEMA 182 frame motor. Also be sure it is protected against loss of lubricant when operated in a vertical position.

When assembled to the drill press, the motor should turn in a clockwise direction as viewed from the top.

ADJUSTING SPINDLE

RETURN SPRING

For the purpose of automatically returning the spindle upward after a hole has been drilled, a spring is provided enclosed in the case (A) Fig. 1, and is located on the left side of the drill press head. This spring has been properly adjusted at the factory and this adjustment should not be disturbed unless absolutely necessary.

If it should become necessary to adjust it, proceed as follows:

1. Back off the two nuts (B) Fig. 1. NOTE: Do not remove the inside nut from the shaft. The nuts (B) should be backed off just far enough so that the spring housing (A) can be disengaged from the roll pin in the head casting.
2. With a firm hold on the spring housing (A) Fig. 1, disengage it from the pin in the drill press head, by pulling the housing straight out, and turn the housing counterclockwise to increase or clockwise to decrease tension. CAUTION: BE CAREFUL NOT TO BOTTOM THE RETURN SPRING WHILE TURNING THE HOUSING COUNTERCLOCKWISE. THERE SHOULD BE ENOUGH SLACK LEFT IN THE SPRING TO PERMIT LOWERING THE SPINDLE THE FULL AMOUNT OF TRAVEL. Be sure the pin in the drill press head is engaged with the spring housing before releasing grip.
3. Retighten the two nuts (B) Fig. 1. NOTE: Do not over-tighten the inside nut against the spring housing (A) as this may cause binding of the pinion shaft.
4. The tension of the spring can be tested by turning pilot wheel counterclockwise. Be sure quill is not locked while testing.

NOTE: The spindle return spring will lift approximately 40 pounds. When tapping heads, multiple spindles, or other heavy tooling is mounted on the quill or spindle of your machine, the use of our Cat. No. 17-836 Booster Spindle Return Spring Kit, along with the return spring supplied with your drill press, will enable the spindle to lift approximately 80 pounds.

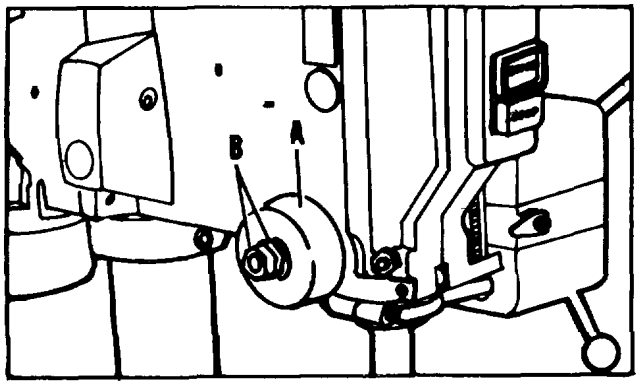


Figure 1. Adjusting Spindle

CONNECTING DRILL PRESS TO POWER SOURCE

A separate electrical circuit should be used for your power tools. This circuit should not be less than #12 wire and should be protected with a 20 Amp time lag fuse. If an extension cord is used, use only 3-wire extension cords which have 3-prong grounding type plugs and 3-pole receptacles which accept the tools plug. For distances up to 100 feet use #12 wire. For distances up to 150 feet use #10 wire. Before connecting the motor to the power line, make sure the switch is in the "OFF" position and be sure that the electric current is of the same characteristics as stamped on motor nameplate. All line connections should make good contact. Running on low voltage will injure the motor. Have a registered electrician replace or repair damaged or worn cords immediately.

GROUNDING INSTRUCTIONS - 115 VOLT

This tool must be grounded while in use to protect the operator from electric shock. If the motor supplied with your drill press is wired for 115 Volt, Single Phase it is equipped with an approved 3-conductor cord and 3-prong grounding type plug to fit the proper grounding type receptacle, as shown in Fig. 2. The green conductor in the cord is the grounding wire. Never connect the green wire to a live terminal.

An adapter, shown in Fig. 3, is available for connecting 3-prong grounding type plugs to 2-prong receptacles. THIS ADAPTER IS NOT APPLICABLE IN CANADA. The green-colored rigid ear, lug, etc., extending from the adapter is the grounding means and must be connected to a permanent ground such as to properly grounded outlet box, as shown in Fig. 3.

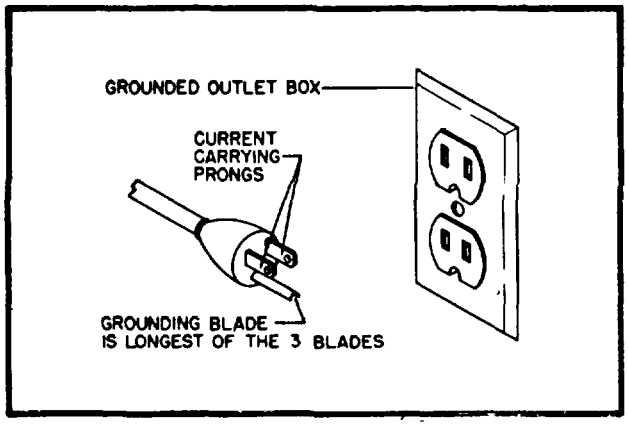


Figure 2. Grounding Receptacle

GROUNDING INSTRUCTIONS - 230 VOLT

If the motor on your machine is wired for 230V single phase, the power cord must be equipped with a plug that has two flat, current-carrying prongs in tandem, and one round or "U"-shaped longer ground prong. This is used only with the proper mating 3conductcr grounding type receptacle, as shown in Fig. 4. When the three-prong plug on your machine is plugged into a grounded 3-conductor receptacle, the long ground prong on the plug contacts first so the machine is properly grounded before electricity reaches it.

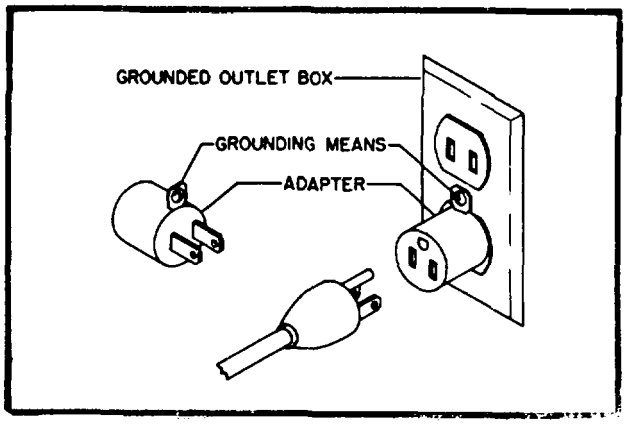


Figure 3. Adapter Grounding Receptacle

THREE PHASE INSTALLATION

If the motor on your machine is wired for 200V, 230V, or 460V three phase, the necessary wiring from the starter to the power source should be completed by a competent electrician.

IMPORTANT: IN ALL CASES, MAKE SURE THE RECEPTACLE IN QUESTION IS PROPERLY GROUNDED. IF YOU ARE NOT SURE HAVE A RE(IPSTERED ELECTRICIAN CHECK THE RECEPTACLE.

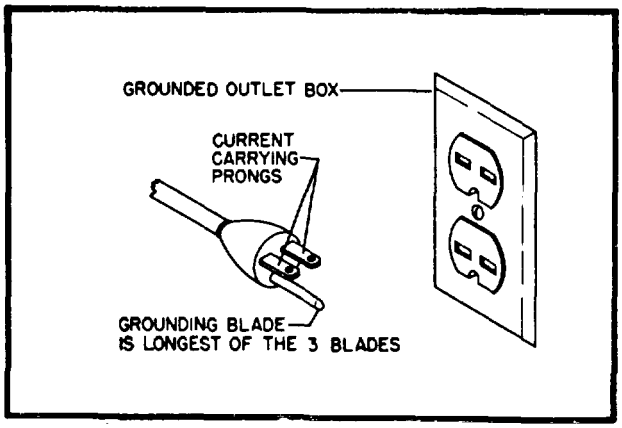


Figure 4. 3-Conductor Grounding Receptacle

VARIABLE SPEED CONTROL

The pilot wheel (A) Fig. 5, for Variable Speed Drive should not be turned except when the motor is running, to avoid putting unnecessary strain on the variable speed drive belt and variable speed drive pulley assembly. The pilot wheel is turned clockwise to make the drill press run faster, and counterdock-wise to slow it down.

While changing speeds the pointer (B) Fig. 5, on the speed dial will indicate the speed of the drill press.

A drag plug or "dampener" is provided to restrict the free rotation of the pilot wheel. The drag plug is properly adjusted at the factory so that the drill press will hold a constant speed and will not change speeds even on long production runs, but still the pilot wheel can be turned manually to change speeds as desired. If it ever becomes necessary to change the adjustment, use a long allen wrench and insert it down through the hole located in the top of the guard, as shown in Fig. 6. Turn the set screw 'A) Fig. 6, clockwise to increase or counter-clock-wise to decrease the "dampener" pressure on the pilot wheel.

CHANGING LOWER SPINDLE ASSEMBLY

To replace the lower spindle assembly or to change drill presses fitted with #2 Taper Spindle to 1/2" capacity key chuck spindle assembly, proceed as follows:

1. Lower the table to allow sufficient space between the table and head to remove the spindle.

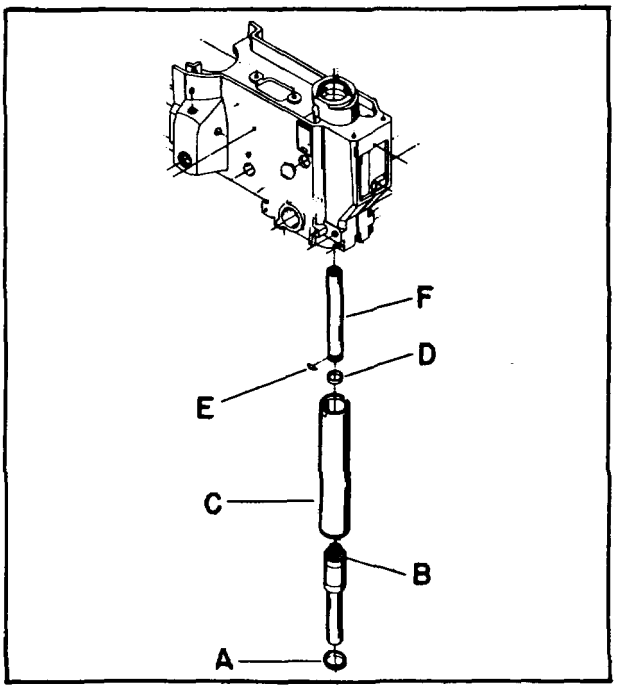


Figure 7. Changing Lower Spindle Assembly

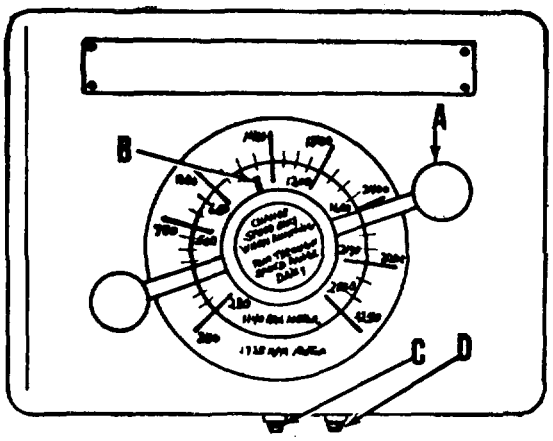


Figure 5. Pilot Wheel and Pointer

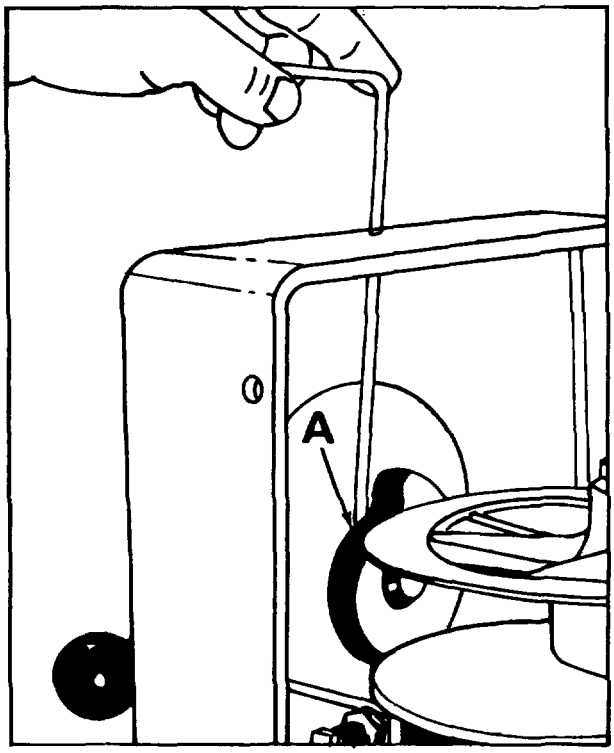


Figure 6. Setscrew

2. Lower quill approximately 2" to 4" and lock quill locking nut.

3. Using a spanner wrench remove bearing closure nut (A), and pull lower spindle (B) out of quill (C) Fig. 7.

4. Remove garter spring (D), and key (E), Fig. 7. Dis-engage sleeve (F) from spindle.

5. Reassemble in reverse order.

QUILL ADJUSTMENTS

The quill can be locked at any desired point in its travel by tightening the quill locking nut (A) Fig. 8. This is an especially desireable feature for set-up of tooling for production type operations. After considerable use, Play might develop between the quill and the head casting. This play can be eliminated by loosening quill locking nut (A) and lock nut (B) Fig. 8. The screw (C) can then be turned clockwise which will draw the split halves of the head casting together to compensate for wear. When the final adjustment is accomplished tighten lock nut (B), Fig. 8.

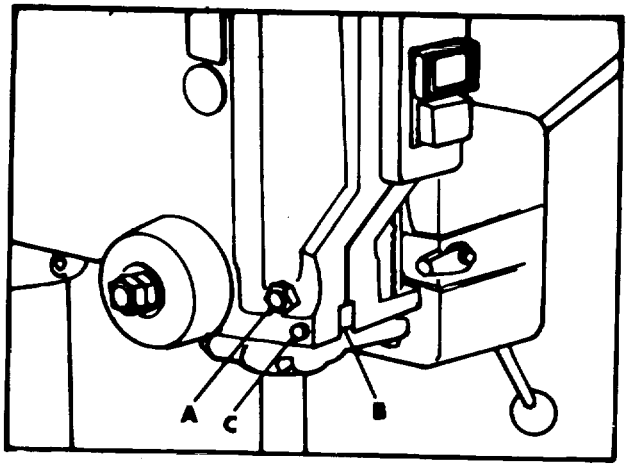


Figure 8. Quill Adjustments

DRILLING HOLES TO DEPTH WITH HAND FEED DRILL PRESS

When drilling one or two holes to a predetermined depth, the graduations on the face of the depth stop rod (A) Fig. 9, can be used.

When drilling a number of holes to a predetermined depth, or if a more exact setting is required, proceed as follows:

1. Raise the locking sleeve (B) Fig. 9, and turn the micro-nut (C) to the desired position on the stop rod (A).

2. Lower the locking sleeve (B) so it will engage micro-nut (C) Fig. 9. Lock sleeve (B) in place with thumb screw if drill press head is mounted in other than vertical position. When the drill press is mounted with the chuck pointing "up", the locking sleeve (B) and micro-nut (C) Fig. 9, should be reversed on the stop rod (A).

3. When locking sleeve (B) is in place on the micro-nut (C) Fig. 9, the micro-nut can not be turned. When a change in depth is required, the locking sleeve (B) must be raised, and while it is raised, turn the micro-nut (C) the necessary graduation marks. Each mark represents .002". Then lower the locking sleeve (B).

4. The use of the micro-set stop nut will maintain the same hole depth, no matter how many holes are to be drilled. However, we recommend that the hole depth be checked whenever a drill has to be sharpened or changed.

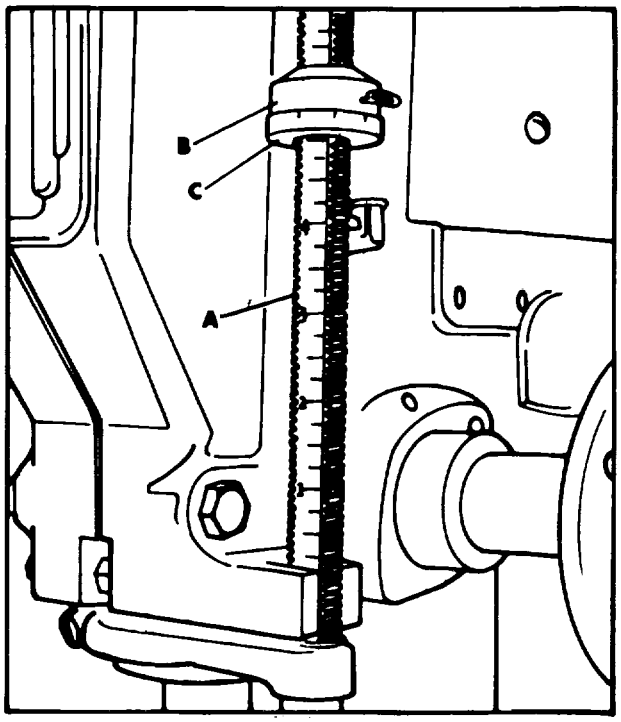


Figure 9. Hand Feed Drill Press

HOW TO CHANGE SPINDLE ADAPTERS

One of the unique features of 17" Key Chuck Drill Presses is that they come equipped with a lower spindle assembly having a 1 1/16" - 20 thread (A) Fig. 10, and the Cat. No. 15-830 Drill chuck which has a threaded mounting collar (B) Fig. 10. Various spindle adapters, shown in Fig. 11, can also be adapted to the threaded spindle of your 17" key chuck Drill Press. These adapters are available as an accessory.

The spindle adapters, shown in Fig. 11, along with the Cat. No. 15-830 Drill Chuck, shown in Fig. 10, can be used on 17" Taper Drill Presses when the lower spindle cartridge (Part No. 402-07,301-5001 is installed in the drill press instead of the standard #2 Taper Spindle Cartridge.

When removing either the chuck or the spindle adapters, we recommend the use of the Cat. No. 15-838 spanner wrench which is supplied with Key Chuck Drill Presses. Turn the locking collar of the adapter or chuck with the spanner wrench while keeping the spindle from turning by either holding belt or holding the chuck with the chuck key in one of the pilot holes in the nose of the chuck, as shown in Fig. 12.

When attaching adapters to the spindle, it is very important to wipe clean both the spindle taper and taper hole in adapter. Then place the adapter on the spindle and tighten the locking collar (A) Fig. 12.

If in checking the spindle for accuracy, there should be a run out, we suggest that the adapter be removed and turned perhaps one quarter or one-half turn and replaced. This may reduce or eliminate the run out, it may also increase it, in which case, remove the adapter and turn it some more on the spindle.

LUBRICATION

The quill and pinion gear should be lubricated occasionally with medium oil in the oil hole provided on the right hand side of the drill press head.

The spindle return clock spring should be oiled twice a year using light machine oil.

The raising mechanism support collar should be lubricated with medium oil applied to periphery of the column.

The spindle splines should be lubricated every three months with MIL-L-2105 Gear Oil, Multipurpose.

NOTE: The bearings of motors are grease sealed for life and need no further lubrication. DO NOT USE OIL ON MOTOR.

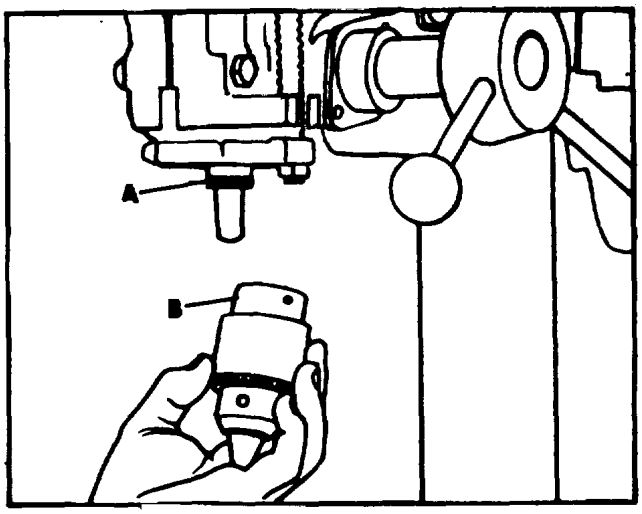


Figure 10. Lower Spindle Assembly and Drill Chuck

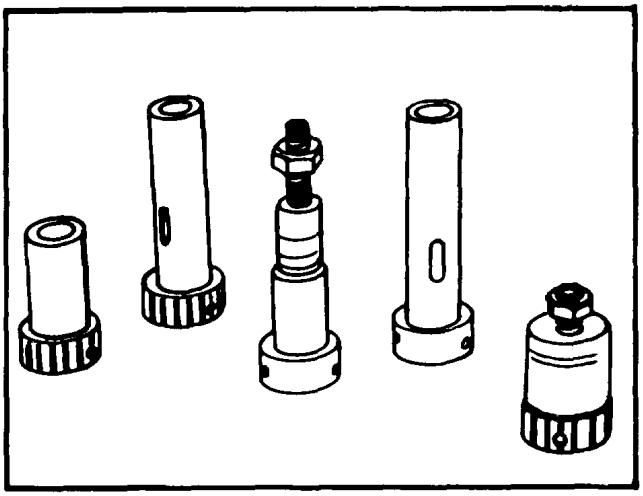


Figure 11. Spindle Adapters

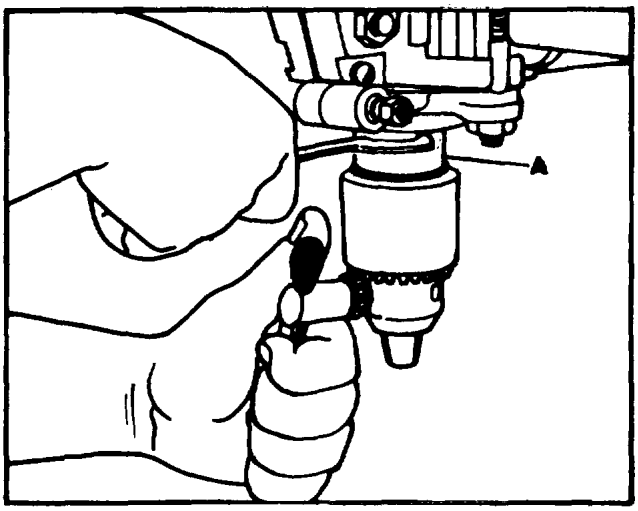


Figure 12. Locking Collar

INSTALLING MOTOR AND BELT

NOTE: When installing a 8'S" Frame Motor, the No. 41-964 motor pulley that comes with the drill press is used, as this pulley fits the %y" shaft of the motor. When a NEMA 182 frame motor is used, the accessory motor pulley, number 41-965 with 7/8" bore must be purchased.

1. Insert the key in the keyway of the motor shaft and place the pulley on the motor shaft until the edge of the pulley sleeve is against the shoulder of the motor shaft.
2. Make sure the key is in place and tighten the two set screws against the motor shaft.
3. Mount the motor to the motor plate, (A) Fig. 13, using the four 5/16" - 18 x 1" carriage bolts, the speed nuts, the plain washers and the four 5/16" - 18 hex nuts. Tighten the hex nuts only finger tight.
4. Loosen the two screws (C and D) Fig. 13, and also loosen the screw (E) on the right hand side of the head. Set the motor plate 7/8" from the back of the drill press head casting and tighten the three screws.
5. Loosen nut (A) Fig. 14. Then turn the pilot wheel until the pointer (B) Fig. 15, is set to the lowest speed. (350 rpm if a 1750 rpm motor is being used, or 230 rpm if an 1140 rpm motor is being used.) Now tighten nut (A) Fig. 14, just enough so that It adjusts the top half of. the spindle pulley downward, until it just touches the lower pulley half. NOTE: This adjustment is made with the belt off.
6. Turn the pilot wheel until the pointer (B) Fig. 15, is set to the highest speed.
7. With a crow bar, raise the front end of the bracket (B) Fig. 14, in order to separate the two halves of the spindle pulley as far as possible. Put the belt on the spindle pulley, jerking it into the pulley to keep the two halves wedged apart, and remove the crowbar.
8. Work the belt onto the motor pulley with one hand, while rotating the spindle pulley with the other hand.
9. It is important that the motor shaft is parallel with the drill press spindle. Place a spirit level in a left to right position, first on the spindle pulley and then on the motor pulley. The bubble should be in the same relative position when testing the motor pulley as when testing the spindle pulley. If an adjustment is necessary, adjust the motor on the motor plate, until the motor shaft and drill press spindle are parallel.
10. Then place the level in front to back position first on the spindle pulley and then on the motor pulley. (Make a mental note of the position of the bubble.) If the motor pulley has to be tilted to the front or rear, loosen the three screws (C, D, E) Fig. 13, and using a crowbar pry out the top or bottom of the motor plate until the motor shaft is in parallel alignment with the drill press spindle. Then tighten the three screws (C, D, E) Fig. 13.

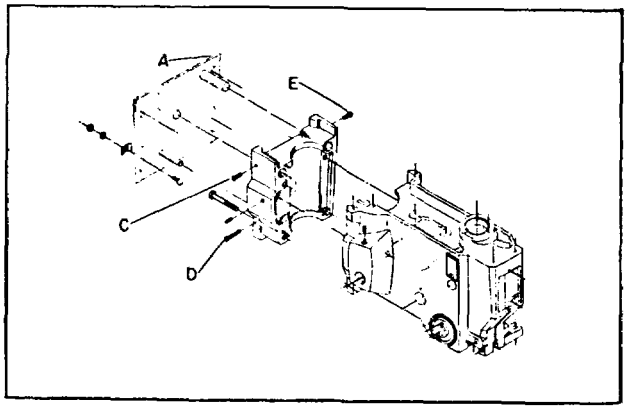


Figure 13. Installing Motor and Belt

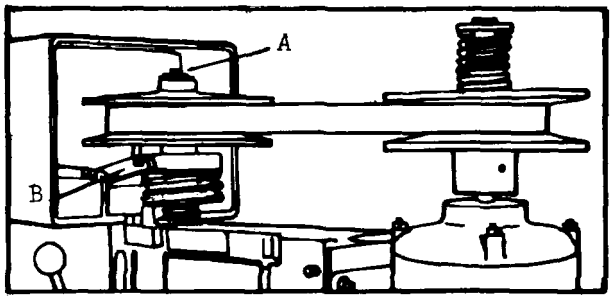


Figure 14. Nut

11. Place the spirit level on the belt midway between the pulleys. If the bubble appears the same as in step 10, the height of the motor pulley is correct.

12. If necessary, adjust the height of the motor pulley on the shaft of the motor. (In some cases, the height of the motor on the motor plate must be changed,. If this is done, repeat steps 9 and 11.)

13. Tighten the four 5/16" - 18 hex nuts mentioned in step 3.

CALIBRATING SPINDLE SPEEDS

1. Turn on the motor and set the pointer (B) Fig. 15, to the lowest speed. (Either 350 or 230 rpm.)
2. Loosen the hex lock nut and then adjust screw (C) Fig. 15, to provide a positive stop for the pointer at the lowest speed. The best way is to turn the screw clockwise (up) until the pointer cannot be turned to the lowest speed, and then turn the screw counter clockwise (down) a little at a time until the pointer is stopped positively, just as it comes to the lowest speed. Tighten the hex lock nut.
3. Increase the speed until the pointer is set at the highest speed. (4250 or 2830 rpm.) Loosen the hex lock nut and adjust the screw (D) Fig. 15, until the spindle pulley is stopped from opening any additional amount, just as the pointer shows 4250 (or 2830) rpm. The pointer will go on past the mark, but there will be no actual change in spindle speeds or pulley opening beyond the movement allowed by stop screw (D), Fig. 15. Tighten the hex nut.
4. With the pointer at the highest speed, the outside circumference of the belt should now protrude about 1/32" beyond the outside circumference of the motor pulley. If the belt does not protrude enough, move the motor plate in toward the head, until the clearance is a little bit less than 7/8", as mentioned in paragraph 4 under INSTALLING MOTOR AND BELT. If the belt protrudes too much, the clearance between head and motor plate should be increased. (Be sure to keep the motor shaft parallel with the spindle of the drill press.)
5. When greater accuracy is required, a tachometer should be used. Before following steps 1 through 4 above, proceed as follows.
6. Turn on the motor and turn the pilot wheel (A) Fig. 15 counterclockwise, until the tachometer shows a speed of 350 or 230 rpm, depending on whether the motor runs at 1725 or 1140 rpm. Then, without changing speeds, adjust the pilot wheel so that the pointer shows exactly 350 (or 230) rpm. This adjustment is made as follows.
7. Unscrew and remove the two spokes (A) of the pilot wheel shown in Fig. 15. Then loosen the two set screws found in the holes thus exposed in the hub of the pilot wheel and rotate the hub so that pointer (B) indicates the lowest speed on the dial. Tighten the two set screws and replace the two spokes.
8. Follow steps 2, 3 and 4. After completing step 4, check the top speed with the tachometer. If necessary, move the motor plate in to increase the spindle speed as shown on the tachometer or out to decrease it.
9. If the motor plate is moved in or out in step 8, above, the lowest speed will be affected, percentage wise, the same as the highest speed. But the change in rpm will be very slight at the lowest speed setting. No further adjustment of the lowest speed is recommended.

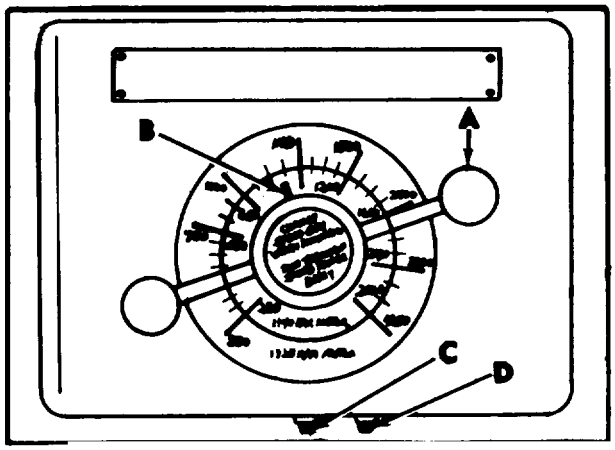


Figure 15. Calibrating Spindle Speeds

SPECIAL NOTE

The tension on the belt is governed by the specially engineered spring of the motor pulley. No adjustment is possible to change the belt tension. If the speeds are properly calibrated and the pulleys properly lined up, the correct belt tension will be maintained automatically regardless of normal wear on the belt and the pulleys. This feature provides long belt life by avoiding the slippage which is experienced due to insufficient tension on belt drives which are not fully engineered. The automatic belt tensioning feature also provides longer bearing life in both drill press and motor, because excessive belt tension is avoided.

After a long period of time pulley and belt wear and stretching of the belt may cause a slight change in the speed of the drill press. To compensate for this change In speed, use a tachometer and move the motor toward or away from the spindle pulley until the correct speed is obtained.

REPLACEMENT PARTS

Ref. No.	Part No.	Description
1	49-159	Variable Speed Belt
2	402-07-054-5010	Rear Guard (Non-Power Feed)
2	402-07-354-5007	Rear Guard Ass'y., (Power Feed), Incl:
3	402-07-054-5012	Cover
4	901-05-390-3711	#10-24 X 5/8" Rd. Hd. Scr.
5	904-08-021-5995	Rubber Washer
6	901-01-060-0605	5/16-18'X 1/2" Hex Hd. Scr.
7	904-01-010-1620	11/32 X 11/16 X 1/16" Washer
8	902-03-050-2974	Speed Nut
9	402-07-104-5004	Foam Spacer
10	41-964	Motor Pulley Ass'y., (3/4" Bore), Incl:
12	904-15-010-7025	Retaining Ring
13	402-07-079-5009	Retainer
14	928-01-601-8891	Spring
15	402-04-108-5010	3/16" Dia. X 4" Lg. Nylon Rod
16	901-04-150-9402	5/16-18 X 3/4" Soc. Set Scr.
11	41-965	Motor Pulley Ass'y., (7/8" Bore), Incl:
12	904-15-010-7025	Retaining Ring
13	402-07-079-5009	Retainer
14	928-01-601-8891	Spring
15	402-04-108-5010	3/16" Dia. X 4" Lg Nylon Rod
16	901-04-150-9402	5/16-18 X 3/4" Soc. Set Scr.
17	904-15-010-7008	Retaining Ring
18	402-07-019-5001	Cam
19	927-01-010-2633	Key
20	402-04-106-5010	Shaft
21	928-06-011-8888	Spring Washer
22	901-04-150-0208	1/4-28 X 1/4" Soc. Set Scr.
23	402-04-063-5001	Drag Plug
24	901-01-060-0608	5/16-18 X 7/8" Hex Hd. Scr.
25	904-01-010-1605	Special Washer
26	Nameplate	By Request Only
27	901-06-450-2250	#4 X 3/16" Drive Scr.
28	402-07-054-4011	Front Guard (Early Model, See A)
28	1202877	Front Guard (Current Model, See B)
29	402-04-072-5008	Instruction Plate
30	402-04-107-5001	Hub
31	402-04-075-5003	Pointer
32	901-04-150-1111	3/8-16 X 3/8" Soc. Set Scr.
33	1202610	Rod w/Knob, Incl:
34	931-01-011-3519	Screw on Knob (Early Models Only)
34	1201644	Slip on Knob (Current Models Only)
35	928-06-011-8888	Spring Washer
36	901-06-450-2250	#4 X 3/16" Drive Screw
37	402-07-037-5006	Speed Dial
38	901-04-190-0287	5/16-18 X 1-1/4" Soc. Set Scr.
39	902-01-020-5435	5/16-18 Hex Jam Nut
40	901-05-390-3711	#10-24 X 5/8" Truss Hd. Scr.
*	402-07-385-5003	Spindle Pulley Ass'y., (Early Models, See A), Const. of:
41	426-04-079-5006	Special Nut

REPLACEMENT PARTS
Continued

Ref. No.	Part No.	Description
42	904-01-031-4963	1-1/32 X 1-1/2 X 1/8" Washer
43	925-05-992-5531	Pulley Ass'y., Fired, Incl: (See C)
44	901-04-150-6215	1/4-20 X 3/8" Soc. Set Scr.
45	402-07-379-9001	Pulley Retaining Ass'y., (Current Models Only, See A & C)
46	402-07-072-5006	Plate
47	904-15-010-7025	Retaining Ring
48	920-04-021-5116	Bearing
49	926-01-051-6349	Pulley
50	920-04-020-5360	Bearing
51	402-04-108-5012	3/16" Dia. X 3-1/2" Lg. Nylon Rod
52	402-07-085-5004	Spindle (See C)
53	927-01-010-2600	Special Woodruff Key
*	402-07-385-5005	Spindle Ass'y., (Current Models Only, See B)
54	901-03-061-2470	Spec. Soc. Hd. Scr. (Early Models, See A)
55	402-07-314-5004	Bracket (Early Models, See A)
56	402-07-112-5002	Special Scr.
57	902-01-020-5435	5/16-18 Hex Jam Nut
58	402-04-080-5001	Roller
59	901-03-061-2471	5/16 X 3/4" Soc. Hd. Shoulder Scr.
60	902-01-020-5435	5/16-18 Hex Jam Nut (Early Model, See A)
61	901-04-130-4538	Special Set Scr. (Early Model, See A)
62	905-01-010-2734	5/16 X 1" Roll Pin (Current Model, See B)
63	1202880	Pen Bracket (Current Models, See B)
64	1200219	Rod (Current Models, See B)
65	0906855	Ret. Ring (Current Models, See B)
66	928-01-601-8897	Spring
67	901-20-241-6107	#10-32 X 3/8" Hex Hd. Washer Scr.
68	402-07-089-5004	Support
69	923-06-010-7352	Spring Washer
70	902-01-010-1300	5/16-18 Hex Nut
71	904-01-010-1620	11/32 X 11/16 X 1/16" Washer
72	1200031	Motor Plate, Incl:
73	902-03-000-2951	Speed Nut
74	901-11-020-0834	5/16-18 X 3/4" Car. Role
75	901-04-190-0207	5/16-18 X 1/2" Soc. Set Scr.
76	901-04-020-0303	5/16-18 X 1-1/4" Sq. Hd. Set. Scr.
77	901-04-020-0308	5/16 X 18 X 3/4" Sq. Hd. Set. Scr.
78	402-07-357-5020	Head Ass'y., Incl:
79	901-01-060-0615	7/16-14 X 1-3/4" Hex Hd. Scr.
80	402-07-020-5005	Cap
81	901-01-080-3114	7/16-14 X 2-1/2" Hex Hd. Scr.
82	904-07-010-5575	Special Washer
83	402-05-106-5010	Compound Gear Shaft
84	402-07-051-5002	Compound Gear
85	901-06-450-2250	14 X 3/16" Drive Scr.
86	Nameplate	By Request Only
87	901-04-150-0205	5/16-18 X 1/4" Hd'ls Set Scr.
88	950-05-991-4757	Bail Crank, Incl:
89	901-04-150-0206	5/16-18 X 5/16" Soc. Set Scr.

REPLACEMENT PARTS
Continued

Ref. No.	Part No.	Description
90	902-07-030-7179	Bearing Closure Nut
91	402-05-406-9008	Worn Shaft
92	901-02-010-0912	1/4-20 X 4-1/2" Rd. Hd. Scr.
93	960-03-010-2413	Lubrication Plate
94	961-01-010-7473	Plug
95	905-01-010-6715	1/16 X 5/8" Roll Pin
96	901-03-040-8015	1/4-20 X 1/2" Soc. Nut Hd. Scr.
97	401-02-079-5001	Retainer
98	928-08-011-5876	Return Spring
99	401-04-031-5001	Spring Housing
100	904-01-010-1622	21/32 X 1-5/16 X 12 Ga. Washer
101	902-01-020-1226	5/8-18 Hex Jam Nut
102	902-01-010-5437	7-16/14 Hex Jam Nut
103	901-05-013-1026	1/4-20 X 1-3/4" Fil. Hd. Scr.
104	902-01-200-9706	Special Nut
105	438-01-308-0009	Switch Cover Ass'y.
106	0905907	#6-32 X 1/2" Scr.
*	1201164	LVC Box Mounting Bracket
107	402-07-104-5007	Spacer
108	402-07-111-5002	Stud
109	904-03-030-1788	#6 Ext. Tooth Lockwasher
110	902-01-120-9232	#6-32 Nut
111	402-04-031-5002	Switch Opening Cover
112	901-06-120-3019	#6-32 X 1/2" Scr. (Early models only)
113	438-01-021-0081	Plate (Early models only)
114	901-06-120-3019	#6-32 X 1/2" Scr. (Early models only)
115	907-01-050-5239	Oiler
116	402-07-072-5001	Cover Plate
117	902-01-120-1034	1/4-20 Hex Jam Nut
118	901-01-060-0633	7/16-14 X 3-1/4" Hex Hd. Scr.
119	952-01-121-3274	Spring Pin
*	402-07-406-5018	Pinion Assembly Connection Of:
120	402-07-106-5024	Pinion
121	402-04-107-5002	Hub
122	905-01-010-6745	3/16 X 1-7/8" Roll Pin
123	1202603	Rod w/knob, incl:
124	981-01-011-3519	Screw on knob (Early models only)
124	1201642	Slip on knob (Current models only)

* NOT SHOWN ASSEMBLED
** NOT SHOWN

SERVICE NOTES:

A. Early Model Prior to Serial Number 167-4100
B. Current Model Beginning with Serial Number 167-4200
C. When Replacing the Spindle or Spindle Pulleys on Machines with Serial Numbers Between 141-1800 and 147-7349 The Complete Spindle Pulley Ass'y., 402-07-385-5003 Must Be Ordered.

Figure 16. 17" Variable Speed Drill Press

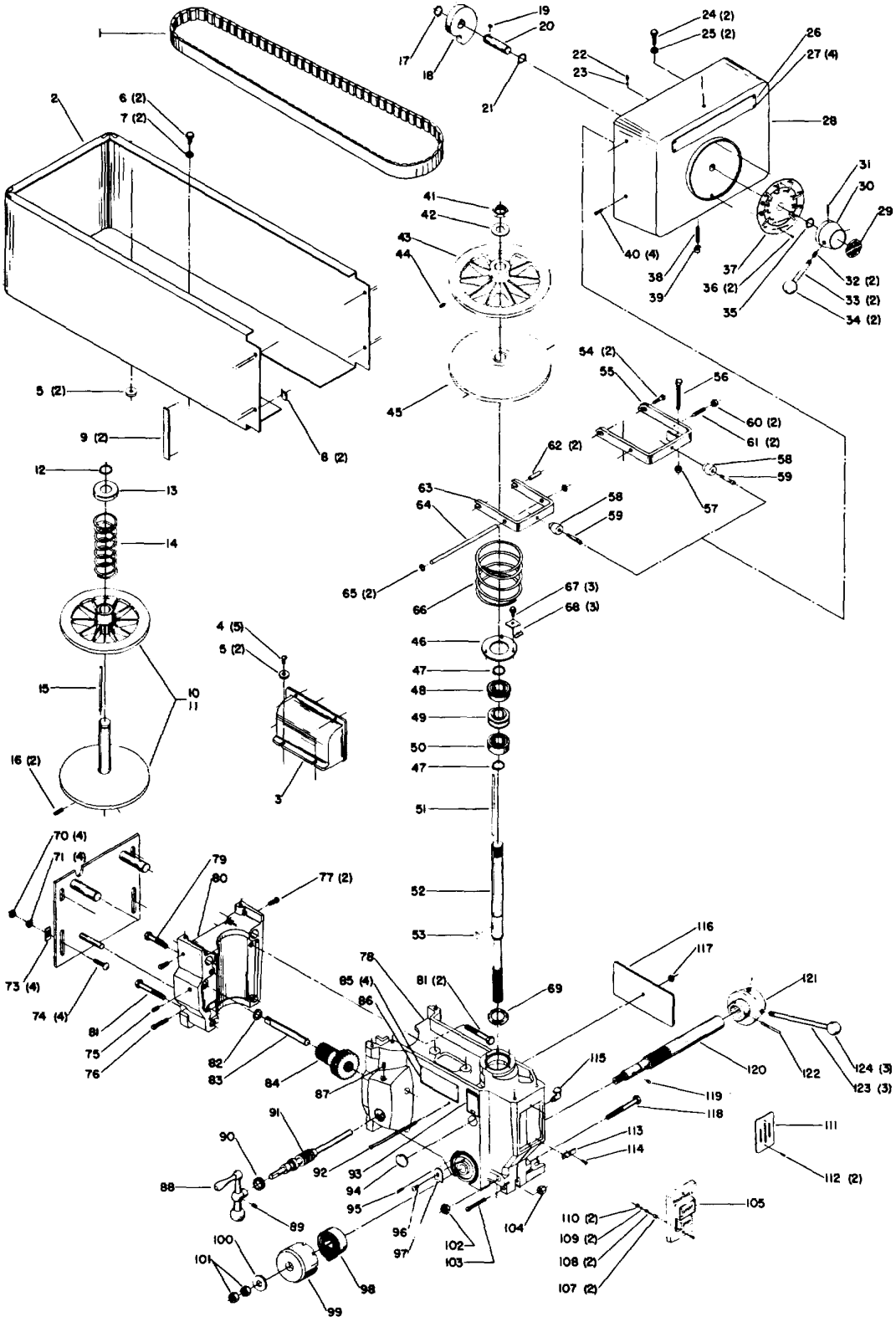
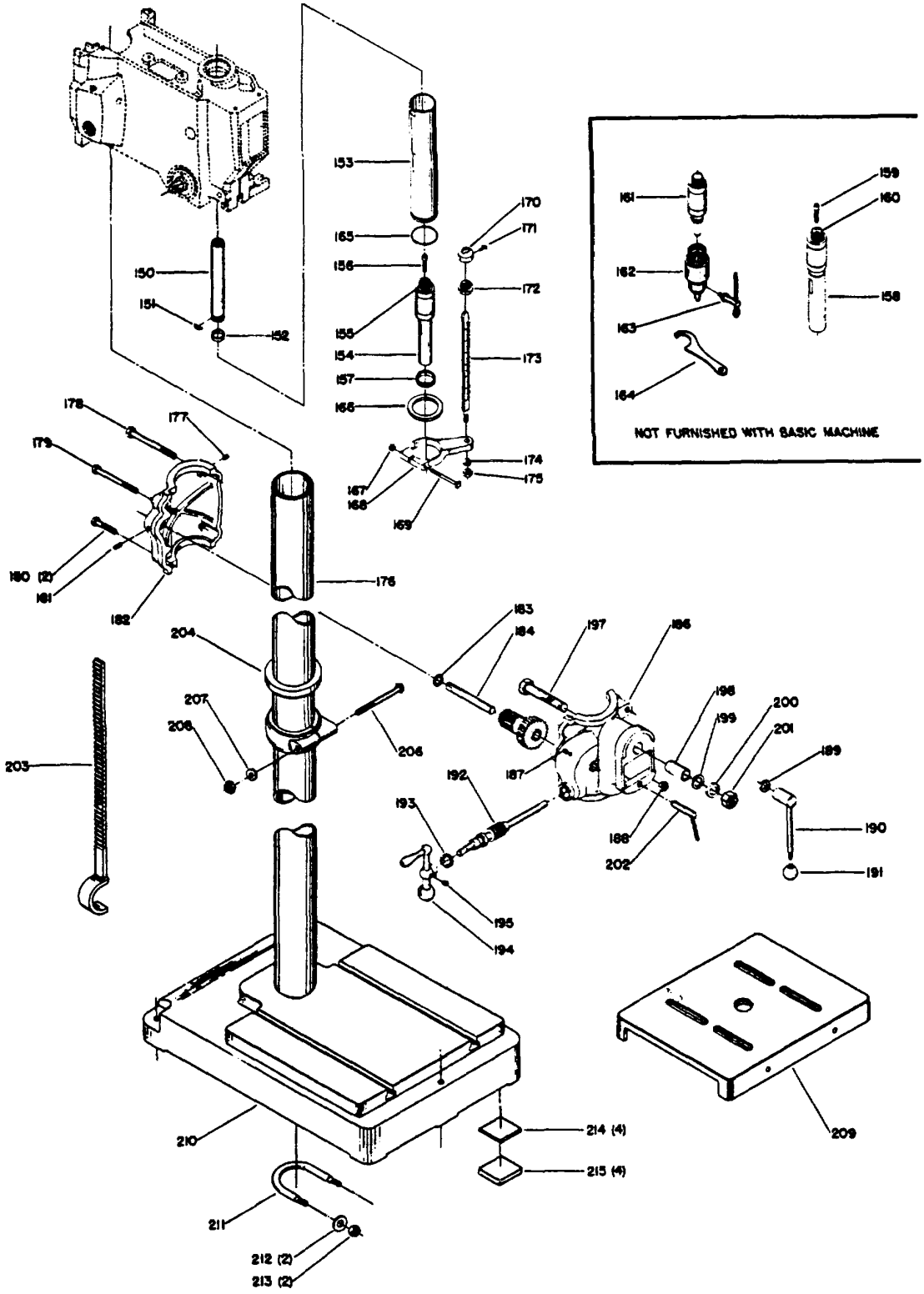


Fig. 17. 17" Variable Speed Drill Press



Replacement Parts

Ref. No.	Part No.	Description
*	402-07-377-5001	Quill Ass'y., (#2 Morse Taper)
150	402-05-105-5004	Sleeve
151	927-01-201-3720	Key
152	904-15-021-4139	Garter Spring
153	402-07-077-5001	Quill
154	402-05-301-5006	Lower Spindle, #2 M.T., Incl:
155	402-07-OS-5005	Pinion Gear
156	901-02-010-0750	5/16-18 X 1" Soc. Md. Scr.
157	902-07-020-7176	Bearing Closure Nut
158	402-05-385-5001	Lower Spindle, #3 M.T., Ind:
159	901-03-010-0750	5/16-18 X 1" Soc. Hd. Scr.
160	402-07-051-5005	Pinion Gear
* *	402-07-377-5002	Quill Ass'y., w/1/2" Chuck, Const. Of:
150	402-05-105-5004	Sleeve
151	927-01-201-3720	Key
152	904-15-021-4139	Garter Spring
153	402-07-077-5001	Quill
157	902-07-020-7176	Bearing Closure Nut
161	402-07-301-5001	Lower Spindle #33 Male Taper
162	15-830	1/2" Cap Chuck, m:
163	955-03-081-3708	Chuck Key
164	15-838	Spanner Wrench
165	904-15-021-4138	Carter Spring
166	904-07-061-2942	Rubber Bumper
*	402-07-388-5002	Stop Ass'y, Const. Of:
167	902-01-120-1034	1/4-20 Hex Jam t
168	402-07-014-5002	Bracket
169	901-11-011-1453	1/4-20 X 2-1/2" Sq. Hd. Bolt
170	402-04-012-5001	Body
171	901-04-260-1534	#6-32 X 1/4" Thumb Scr.
172	402-04-088-5005	Stop
173	402-04-108-5007	Rod
174	904-02-020-1704	3/8" Lockwasher (Early Model Only)
175	902-01-020-5433	3/8-16 Hex Jan t
176	17-764	3-1/2" X 38-1/2" Column (Bench Model)
176	17-763	3-1/2 X 62" Column (Floor Model)
*	402-07-314-5001	Table Brkt. Ass'y., Const. Of:
177	901-04-190-0201	5/16-1 X 5/16 Soc. ld. Se Scr.
178	901-01-060-063	1/2-13 X 4" Hex Hd. Scr.
179	901-01-0-0637	7/16-14 X 3-3/4" Hex Hd. Scr.
180	901-01-060615	7/16-14 X 1-3/4" Hex Md. Scr.
181	90S-090-0 207	5/16-18 X 1/2" Soc. Md. Set Sct.
182	402-07-020-5003	Cap
183	904-07-010-5575	5/8 X 1" 1/32 Washer
184	402-05-106-5010	Compound Gear Shaft
185	40207-051-5002	Compound Gear
186	402-07-014-9006	Bracket
187	901 150-0205	5/16-18 X 1/8" Hd's. Set Scr.
188	902-01-020-5438	7/16-14 Hex Jam Nut
189	904-1031-3893	33/64 X 1 X 3/16 Collar
190	402--327-9002	Clamp Handle w/Knob Incl:
191	931-01-011-3519	Screw on Knob (Early Model Only)
192	1201642	Sip on Knob (Current Model Only)
193	402-05-406-5008	Worn Shaft
194	902-07-030-7179	Brg. Closure Spanner Nut
195	930-05-991-4787	Ball Crank, Incl:
196	901-04-150-0206	s/16-18 X 5/16" Soc. Hd. Set Scr.
197	901-01-060-0630	3/4-10 X 3-1/2" Hex Hd. Scr.
198	402-05-105-5002	Sleeve
199	904-O1-031-4954	25/32 X 1-1/4 X 3/32" Washer
200	04-02-020-1707	3/4" Lockwasher
201	902-01-010-1245	3/4"-10 Hex Nut
202	402-05-371-5002	Index Pin
203	402--351-5001	Gear Rack
204	920-52-991-3936	Rock Thrust ring
205	402-05-389-5001	Collar Ass'y., tl:
206	901-01-060-0631	7/16-14 X 4" Hex Hd. Scr.
207	904-10-031-2097	29/64 X 1 X 1/8" Washer
208	902-01-040-1004	7/16-14 Hex Nut
209	402-05-09-5001	Table
210	402-07-005-5002	Base
211	402-07-027-5001	"U" Bolt
212	904-01-010-1618	9/16 X 1-3/8" X 12 Ga. Washer
213	902-01-010-1282	1/2"-13 Ha NA
214	402-07-0205006	Cap For Pad
215	402-07-089-5005	2 X 2 X S/16" Pad

* NOT SHOWN ASSEMBLED
* * NOT SHOWN

17" DRILL PRESSES

CATALOG LISTING

SINGLE SPINDLE MODELS (Less Motor, Control and Feed-See Below)

TYPE	NO.2 MORSE TAPER SLO SPEED	NO 2 MORSE TAPER HIGH SPEED	NO 2 MORSE TAPER VARIABLE SPEED
Standard Tilting Table Floor Models	*17410 300 lbs.	*17-440 300 lbs.	*17-520 330 lbs.
Production Table Floor Models	17420 312 lbs.	17-450 312 lbs	*.17-530 348 lbs.
Heads Only	17430 9 lbs.	17-460 99 lbs.	* 17-540 127 lbs.

*Includes Safety Collar for head. Table working surface-Standard x Std. tabtilts9OLandR. Production table for floor models tilts 17 ° L and R.
14", Production (floor model) 12 1/2 x 17" with one 3/4 pipe tap at rear,
***NOTE**: Variable Sfed Models furnished only with electricals, factory mounted and wired, ready to run.

NOTE: **For ordering multiple spindle set-ups, see Section A6, Pages 5 and 6.**

MOTORS, CONTROLS (Factory Mounted and Wired) and Feed Optlons-(On multiple spindle units, designate head (lst, 2nd, etc.) on which each motor and control group is to be factory mounted.)
HOW TO ORDER-Select Drill Press Model Number. Then, for motor, control and feed option, replace zero in last digit of number with appropriate option number from 1 to 8.

Example-to order a Standard Tilting Table Floor Model with No. 2 MT and Slo Speed, choose Model No. 17-410. If unit Is to have a three phase, 1 HP, 230 V LVC Motor and Controls with Power Feed, replace the zero in last digit of the number with a 7. The one ordering number for the complete machine, as described, will be Cat. No. 17-417.
NOTE: For complete description of Power Feed, see Section A6, Page 9.

MOTOR	MOTOR CONTROL	MOTOR ENCLOSURE	HZ. AND MOTOR RPM	MOTOR VOLTAGE	HAND FEED		POWER FEED	
					CAT NO.	SHIP. WT	CAT.NO.	SHIP WT.
	Push Button Switch Only	TEFC	60-1725	115/230	1	61	5	106
Single Phase 1 Horse-power	24V Push button Station Magnetic Starter, Transformer and Overload Protection (LVC)	TEFC	60-1725	115/230	2	67	6	112
	24V Push Button Station, Magnetic Starter Transformer and 3-Leg Overload Protection (LVC)	TEFC	60-1725	230/460	+3	57	+7	102
Three Phase 1 Horse-power	24V Push Button Station, Magnetic Starter Transformer and 3-Leg Overload Protection (LVC)	TEFC	60-1725	200	4	57	8	102

NOTE: Single phase electricals will be supplied wired for 115 V, unless 230 V is specified. Three phase electricals will be supplied wired for 230 V, unless 460 V is specified. Power Cord and Plug supplied for single phase only. Motors and Motor Controls for 17" Drill Presses may be ordered unmounted. For listing, see Sections P and Q. +No. 49-000 "JIC" Type Control Kit. Specify this Catalog Number, in addition to Electric Option No. 3 or 7, in order to obtain 17" Drill Press
with "JIC" type electricals, factory mounted and wired.

NOTE: To obtain 1140 RPM Motor in place of standard 1725 RPM Motor, order Cat No 49-006 for single phase and Cat No 49-007 for three phase. in addition to complete machine and electricals as selected above

MACHINE DATA

Overall Dimensions:

Bench Type:
Height (Step Pulley) .....49 3/8" (1254.1 mm)
(VS) .....51 1/8" [1298.6 mm)
Width (Step Pulley) .....23 1/2" (596.9 mm)
(VS) .....23 5/8" (800.1 mm)
Front to Rear (Step Pulley) .....35 15/32" (900.9 mm]
(VS) .....36 3/8" (923.9 mm)
Floor Type [with Production Table]:
Height (Step Pulley) .....70" (1778.0 mm)
(VS) ..... 71 3/4" (1822.5 mm)
Width (Step Pulley) .....18 1/4" (463.6 mm)
(VS) .....20 1/2" (520.7 mm)
Front to Rear (Step Pulley) .....32 11/32" (821.5 mm)
(VS) .....32 3/8" (822.3 mm)

Table Working Surface, Ground:

Standard ..... 11 x 14" (279.4 x 355.6 mm)
Production:
Overall ..... 16 x 20 1/2" (406.4 x 520.7 mm)
Inside of Coolant Trough..... 12 1/2" x 17'
(317.5 x 431.8 mm)
T-Slots (Two on 9" Centers) ..... . 9/16 (14.3 mm)

Base Working Surface:

Bench .....16 x 18" (406.4 x 457.2 mm)
Floor ..... 13 3/4 x 16 3/16" (349.25 x 411.2 mm)

Quill:

Stroke (Manual Feed). .0 to 5' (0 to 127 mm)
(Power Feed).. /2 to 5' (12.7 to 127 mm]
Diameter .....2 1/4" (57.2 mm)

Capacities:

Key Chuck ..... 0 to 1/2 "(0 to 12.7 mm)
Die. Hole in Steel .....11/16" (17.5 mm)
In Cast Iron .....7/8" (22.2 mm)

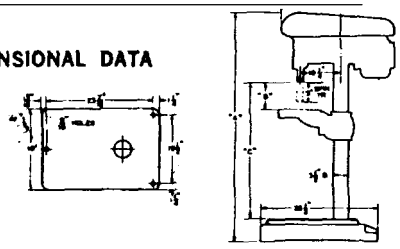
Spindle Speeds:

Step Pulley Models:
With 1725 RPM Motor:
High Speed Model 700,1150,1750, 2750, and 4250 RPM
Slo Speed Model ..... 385, 600, 935,1450 and 2240 RPM
With 1140 RPM Motor:
High Speed Model. .460, 760, 1140, 1815, and 2800 RPM
Slo Speed Model .....255, 400, 815, 960 and 1475 RPM
Variable Speed Models:
With 1725 RPM Motor .....350 to 4250 RPM
With 1140 RPM Motor .....230 to 2830 RPM

Power Feed Models:

Feeds:
Variable Rate Mechanical Type . .. from .003 to .018 ipr
(.075 to .45 mmpr)
Column: Diameter ..... 3 1/2" (88.9 mm)
Wall Thickness .....11/64" (4.37 mm)
Motor Plate: Accommodates NEMA 143T, 145T and 182 Frame Motors.

DIMENSIONAL DATA



17"STEP PULLEY AND VARIABLE SPEED DRILL PRESSES Var. Speed)	Model (Step Pulley or	No. 2 M.T. Models "A" Overall Height	"B" Spindle To Table (Max.)	"C" Spindle To Base (Max.)
Production Table	SP	49 1/2"	25 1/2"	----
	VS	51 1/2"	23 3/4"	----
	SP	70"	34 1/4"	45 1/4"
Floor Type w/Tilting Table	V5	71 1/4"	34 1/4"	45 1/4"
	SP	70"	33"	45 1/4"
Floor Type w Production Table	VS	71 1/4"	33"	45 1/4"

24 Volt
LVC (Low Voltage Control)
MAGNETIC MOTOR
CONTROL SYSTEMS

INTRODUCTION

The single and three phase Rockwell definite purpose Low Voltage Control (LVC) motor starters have been designed exclusively for use on the stationary power tools.

The basic function of a definite purpose starter is to provide ON-OFF motor control. In addition to providing ON-OFF control, every Rockwell motor starter offers the following features:

Motor Overload Protection - All starters are supplied with thermal overload relays which protect the power tool motor from burnouts due to excessive heat resulting from a sustained motor overload, extended motor cycling, or stalled rotor.

No Voltage or Low Voltage Protection (LVP) - No voltage or low voltage protection prevents the dangerous restarting of a power tool following a temporary power failure. Upon a loss of voltage or a reduction of voltage, the magnetic contactor in the starter will open. When power is restored, the motor will not automatically restart, but must be manually restarted by pushing the start button of the ON-OFF switch.

Low Voltage Control (LVC)-The definite purpose motor starters provide low voltage control as a unique safety feature. The pushbutton ON-OFF switch operates at a 24 volt level, not at line voltage. The 24 volt low voltage control eliminates the possibility of electrical shock to the operator.

This manual includes a description of the basic LVC motor starters, instructions for wiring the starters to the power source, and instructions for changing the voltage of an LVC motor starter.

SAFETY RULES

1. Installing and servicing should always be accomplished by qualified electrical personnel.

2. Read the instruction manual before wiring and operating this motor starter. Failure to follow instructions can cause injury.

3. Always disconnect the electrical power before removing the cover of the starter.

4. Operate the motor starter only with the cover of the starter in place.

5. Do not operate the machine unless the motor starter is properly grounded as specified in the instructions.

6. Follow national and local electrical codes when wiring the motor starter.

7. Always use proper heater coils as specified in the heater coil chart located on the inside of the starter cover.

8. Make sure the motor starter is disconnected from the electrical power source before the primary connections of the control transformer are changed.

9. The LVC Motor Starter has been designed and engineered for use only on Stationary Power Tools.

10. Occasionally inspect the starter to ensure that it is securely mounted, clean and dry.

SINGLE PHASE LVC MAGNETIC MOTOR STARTER

Fig. **18** illustrates the standard single phase LVC magnetic motor starter, Part No. 52-540.

The starter is made up of four basic components: 1) overload block, 2) magnetic contractor, 31 transformer, and 4) start/stop station. The start/stop station is not shown in Fig. **18**..Neither are the input connections from the start/stop station, input connections for single phase electrical power, or the leads from the power tool motor.

A wiring diagram and schematic diagram of the single phase LVC magnetic motor starter is shown in Fig. **19**.

The wiring diagram indicates the relative physical location of each component, wire, and terminal; whereas, the schematic diagram does not show the physical relationship of the components. The schematic diagram does show in a straight line form the circuit functions of the various components.

The single phase starter is comprised of a power circuit and a control circuit.

The power circuit carries the motor load current and is shown with heavy lines in the wiring and schematic diagrams to represent heavy gage wire sized for the motor current. In the motor starter, the power circuit is wired with black wires.

The main function of the control circuit is to start and stop the electric motor by means of the start/stop pushbuttons. The diagrams in Fig. l illustrates the control circuit with light lines to represent light gage wire sized for control current. The control circuit consists of the control transformer with fuse, start/stop push buttons, start button interlock contact, magnetic contactor coil, and overload switch. The control circuit is wired with red wires in the motor starter.

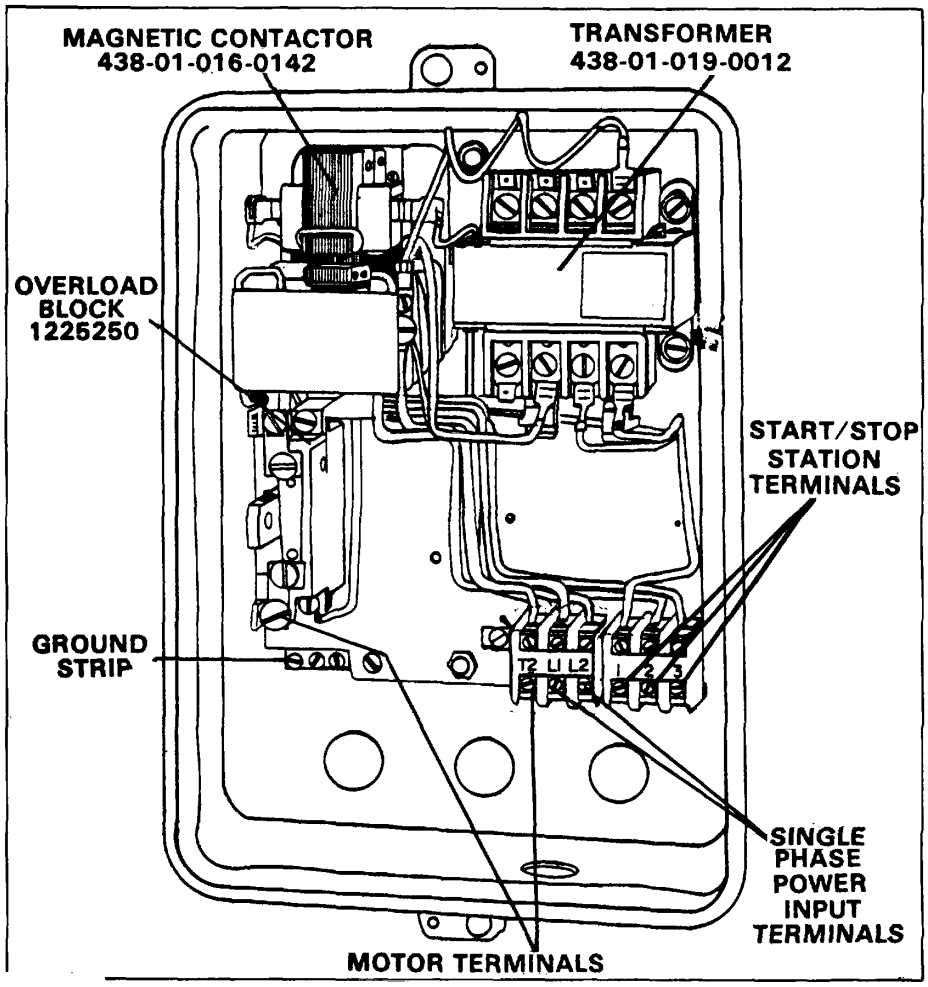


Fig. 18. - Standard Single Phase Motor Starter No. 52-540

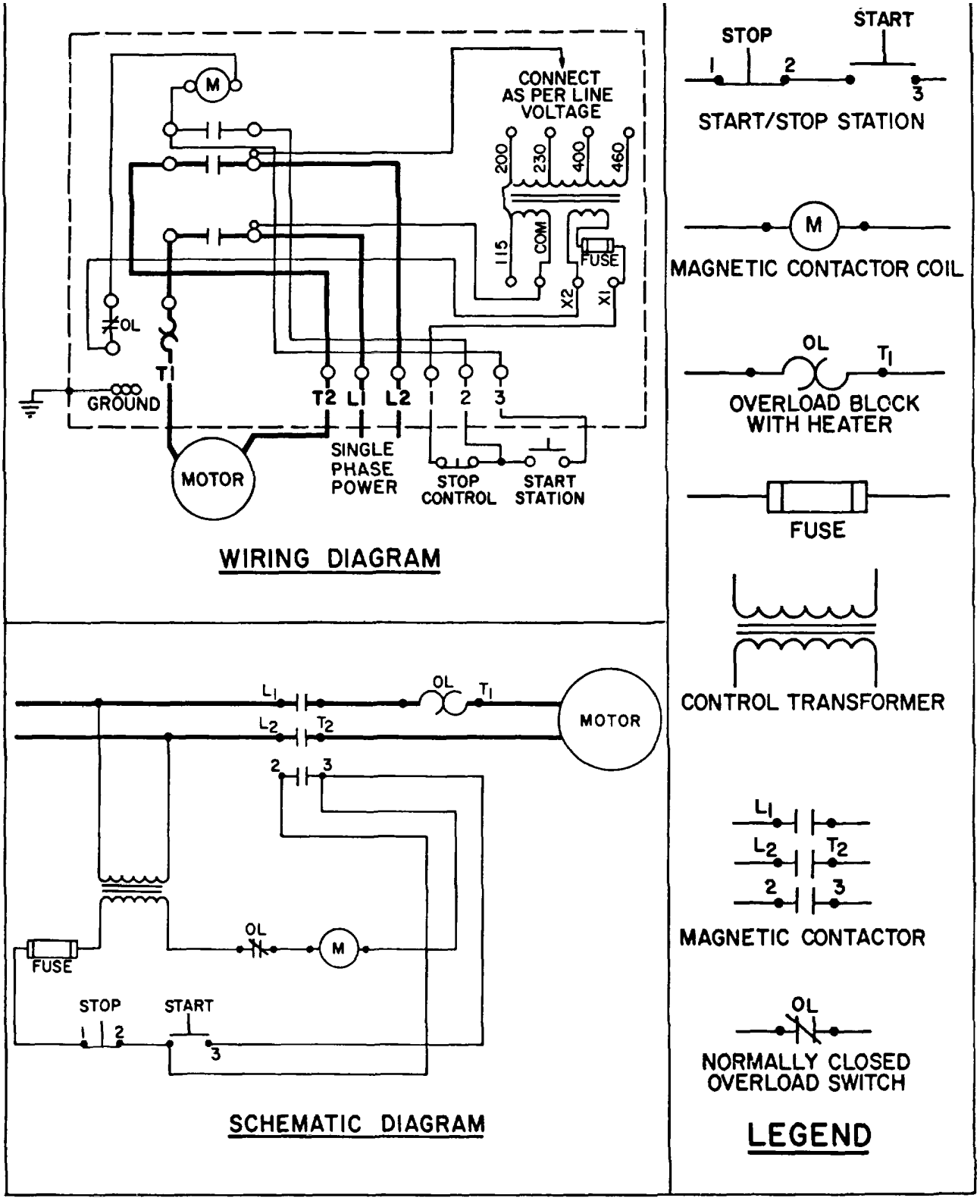


Fig. 19. - Wiring Diagram and Schematic Diagram of The Single Phase LVC Motor Starter No. 52-540

INSTRUCTIONS FOR CONNECTING THE SINGLE PHASE MOTOR STARTER TO THE POWER SUPPLY

In general, stationary tools ordered with a single phase motor 1-1/2 horsepower or less are shipped from the factory with a cord set and plug. No field wiring is necessary.

Stationary tools ordered with a single phase motor greater than 1-1/2 horsepower must be wired in the field. The single phase LVC motor starter should be wired as follows:

Refer to Fig.**20**and remove and discard the plastic plug covering the entrance hole in the bottom of the starter enclosure. Bring the input power cord through the entrance hole. Connect the black power lead to terminal L1, the white power lead to terminal L2, and the green ground lead to the ground strip in the lower left hand corner of the starter.

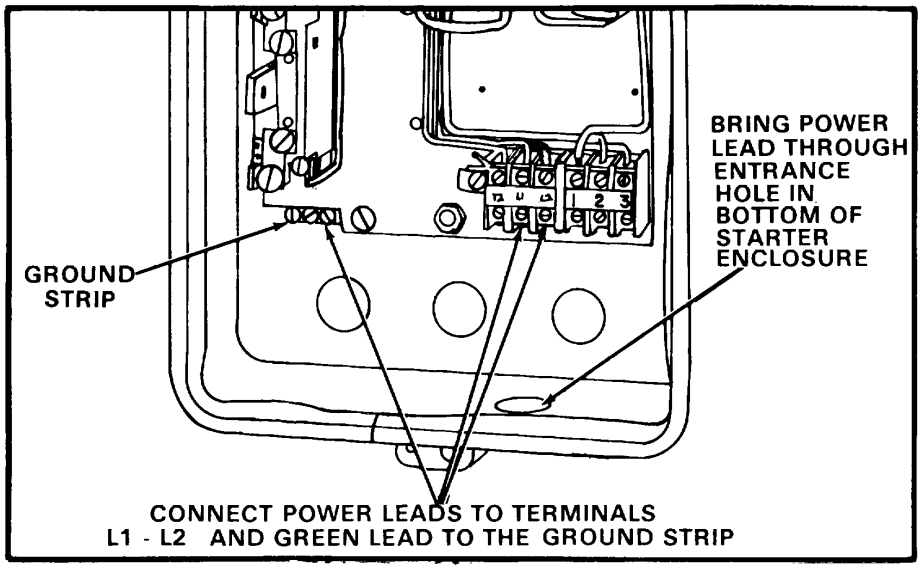


Figure 20. Wiring the Meter Starter

Several points must be stressed and closely followed when connecting the input power to the motor starter.

1. To preserve the dust-tight integrity of the motor starter, an oil-tight box connector should be used for fastening the input cable to the starter enclosure at the entrance hole.
2. If copper stranded wires are used for the input leads, the wires must be soldered dipped or tinned before they are connected to terminals L1 and L2 and the ground strip.
3. The wires must be connected to terminals L1 and L2 through the front face of the terminal block as shown in Fig. **21**. The screws on the top of the terminal block are used for clamping
the wires in the terminal block.
4. The ground strip has provisions for three ground leads. The input power, start/stop station, and motor must be grounded via the ground strip. Two ground wires must never be inserted in the ground strip under one screw. 5. If metal conduit is used in place of cable, the green ground wire from the single phase input power system is omitted.

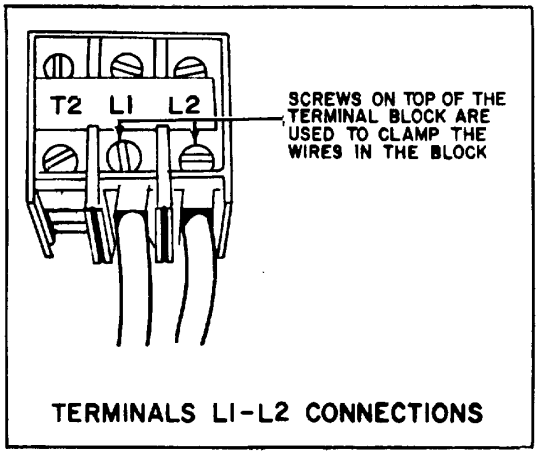


Figure 21. Connecting Wires To Terminals

THREE PHASE LVC MAGNETIC MOTOR STARTER

Fig.**22** illustrates the standard three phase LVC motor starter, Part No. 52-541.

The three phase starter consists of four basic components: (1) overload block with heaters, (2) magnetic contactor, (3) transformer, (4) start/stop station. The start/stop station is not shown in Fig.22. Neither are the input connections from the start/stop station and the input connections from the three phase motor or power supply.

A wiring diagram and schematic diagram of the three phase LVC magnetic motor starter is shown in Fig. 23.

The wiring diagram indicates the relative physical location of each component, wire, and terminal; whereas, the schematic diagram does not show the physical relationship of the components. The schematic diagram does show in straight line form the circuit functions of the various components.

The three phase LVC motor starter is comprised of a power circuit and a control circuit. The diagrams in Fig23 illustrates the power circuit with heavy lines to represent heavy gage wire sized for the motor current; whereas, the control circuit is shown with light lines in the diagrams to represent light gage wire sized for control current. In the motor starter, the power circuit is wired with black wires and the control circuit is wired with red wires.

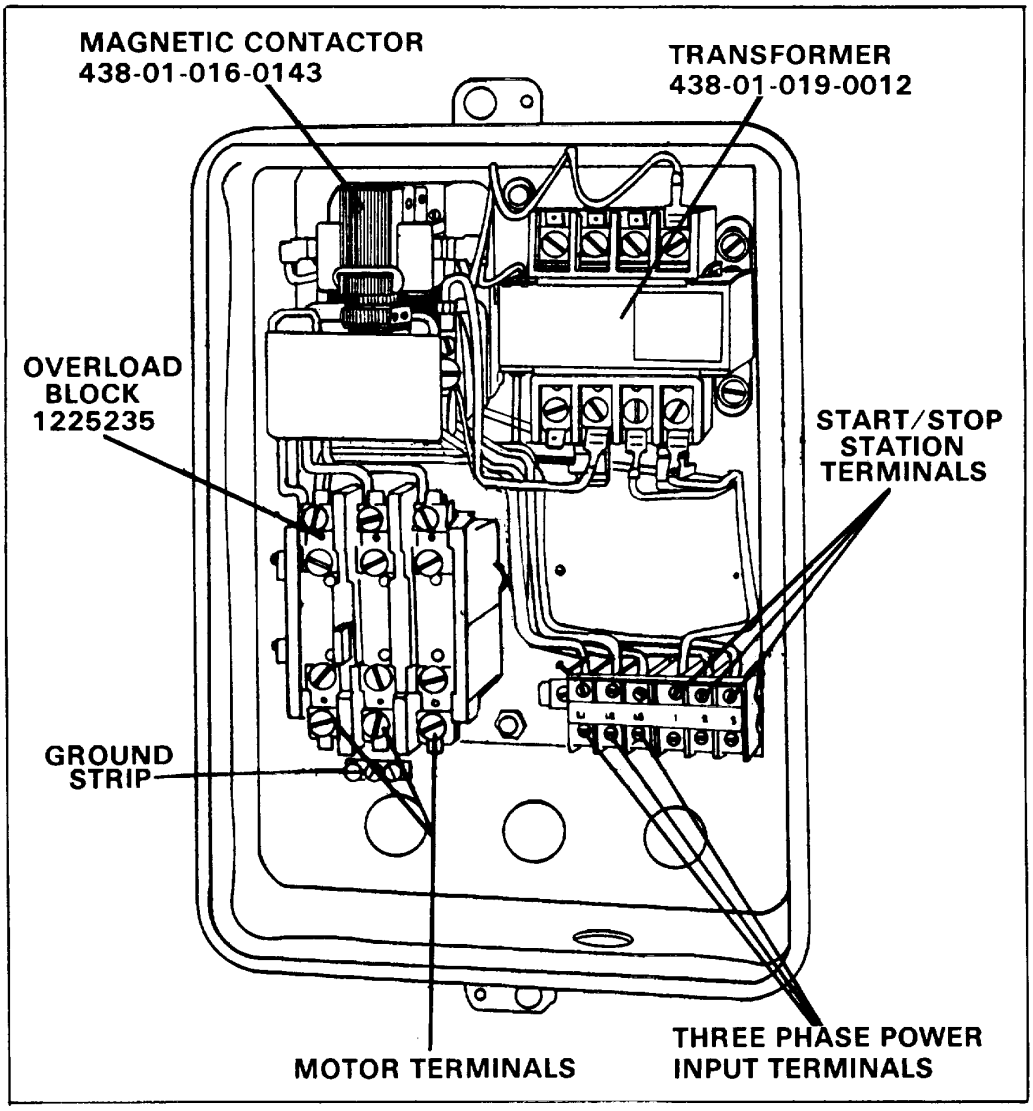


Fig. 22. - Standard Three Phase Motor Starter No. 52-541

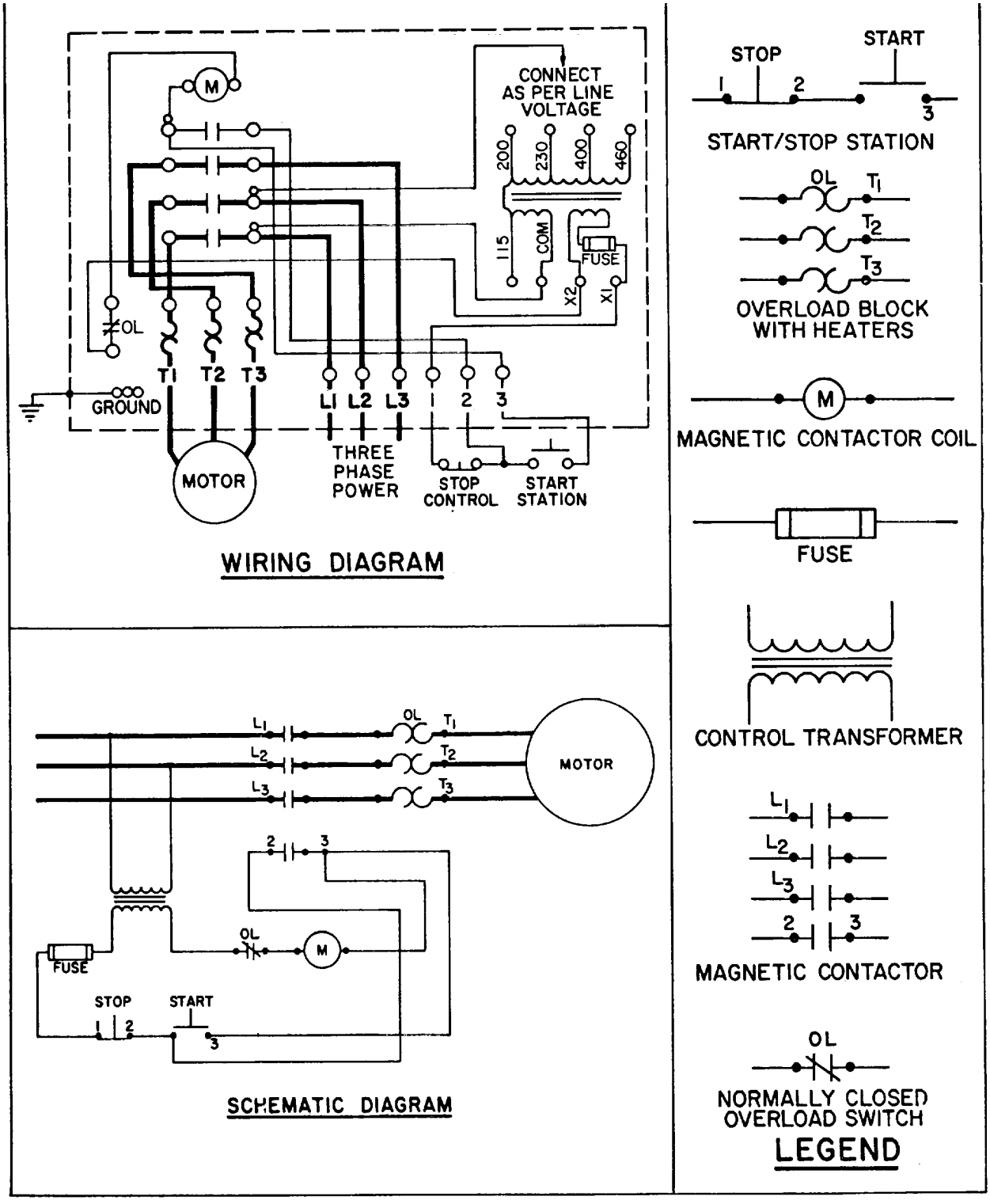


Fig. 23. - Wiring Diagram and Schematic Diagram of The Three Phase LVC Motor Starter No. 52-541

INSTRUCTIONS FOR CONNECTING THE THREE PHASE MOTOR STARTER TO THE POWER SUPPLY

All three phase motor starters must be wired in the field as follows: Refer to Fig.**24** and remove and discard the plastic plug covering the entrance hole in the bottom of the starter enclosure. Bring the three phase power lead through the entrance hole. Connect the red, white, and black power leads to terminals L1-L2-L3 and the green ground lead to the ground strip in the lower left-hand corner of the starter enclosure.

NOTE: If the machine runs backwards once the motor is turned on, simply interchange any two of the three input power leads in terminals L1-L2-L3.

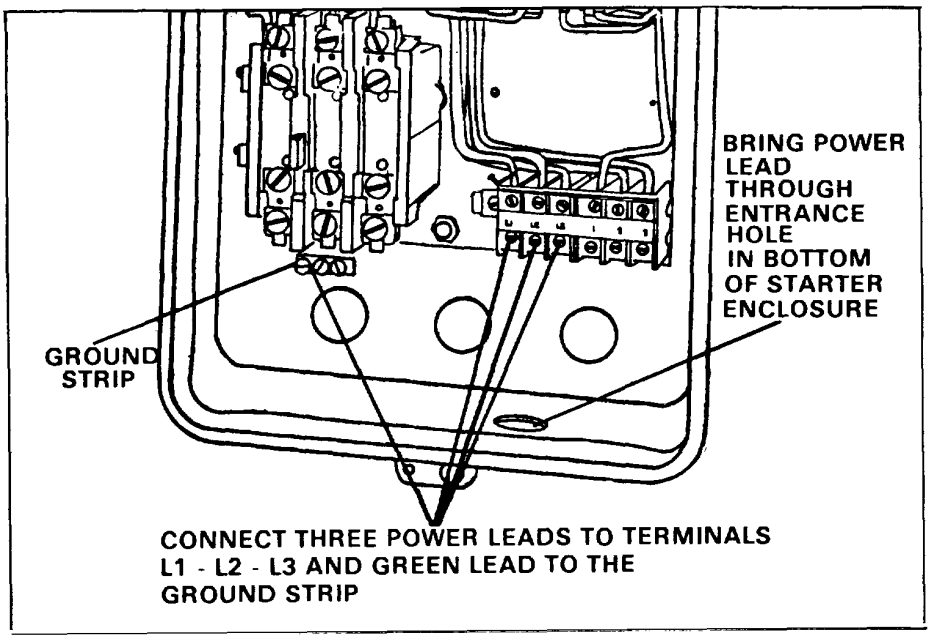


Figure 24. Wiring Three Phase Motor Starters

Several points must be stressed and closely followed when connecting the input power to the motor starter.

1. To preserve the dust-tight integrity of the motor starter, an oil-tight box connector should be used for fastening the in- put cable to the starter enclosure at the entrance hole.
2. If copper stranded wires are used for the input leads, the wires must be soldered dipped or tinned before they are connected to terminals L1-L2-L3 and the ground strip.
3. The wires must be connected to terminals L1-L2-L3 through the front face of the terminal block as shown in Fig. **25**. The screws on the top of the terminal block are used for clamping the wires in the terminal block.
4. The ground strip has provisions for three ground leads. The input power, start/stop station, and motor must be grounded via the ground strip. Two ground wires must never be inserted in the ground strip under one screw.
5. If metal conduit is used in place of cable, the green ground wire from the three phase input power system is omitted.

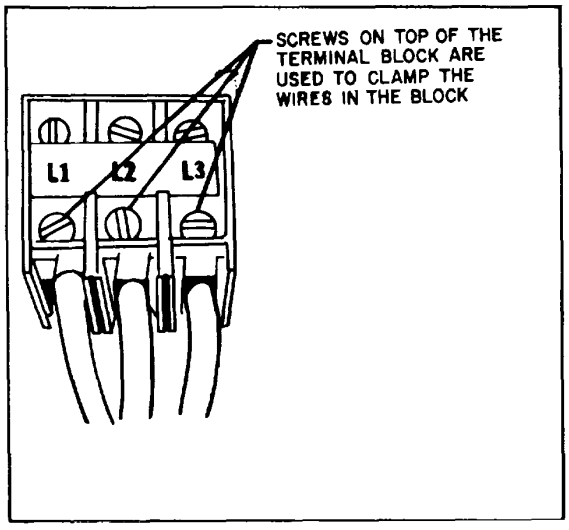


Figure 25. Terminals L1-L2-L3 Connections

SPECIAL THREE PHASE MAGNETIC MOTOR STARTER FOR OPERATION FROM 575 VOLT THREE PHASE POWER SYSTEMS

Fig. **26**,illustrates the special LVC starter which has been designed for use exclusively on 575 volt, three phase power systems.

The only difference between the 575 volt three phase LVC starter and the standard three phase starter, shown in Fig. **22**, is the control transformer.

The control transformer in the standard three phase starter, shown in Fig.**22**, has a multi-tapped primary which enables the starter to be used from either a 115, 200, 230, 400 or 460 volt three phase power system. In the special 575 volt three phase starter, the control transformer has a 575 volt primary so that the starter will only function from a 575 volt three phase power system.

The instructions for connecting the power supply to the special 575 volt starter are identical to the instructions for connecting the power supply to the standard three phase motor starter. See instructions for connecting the power supply to the three phase motor starter on page **24**.

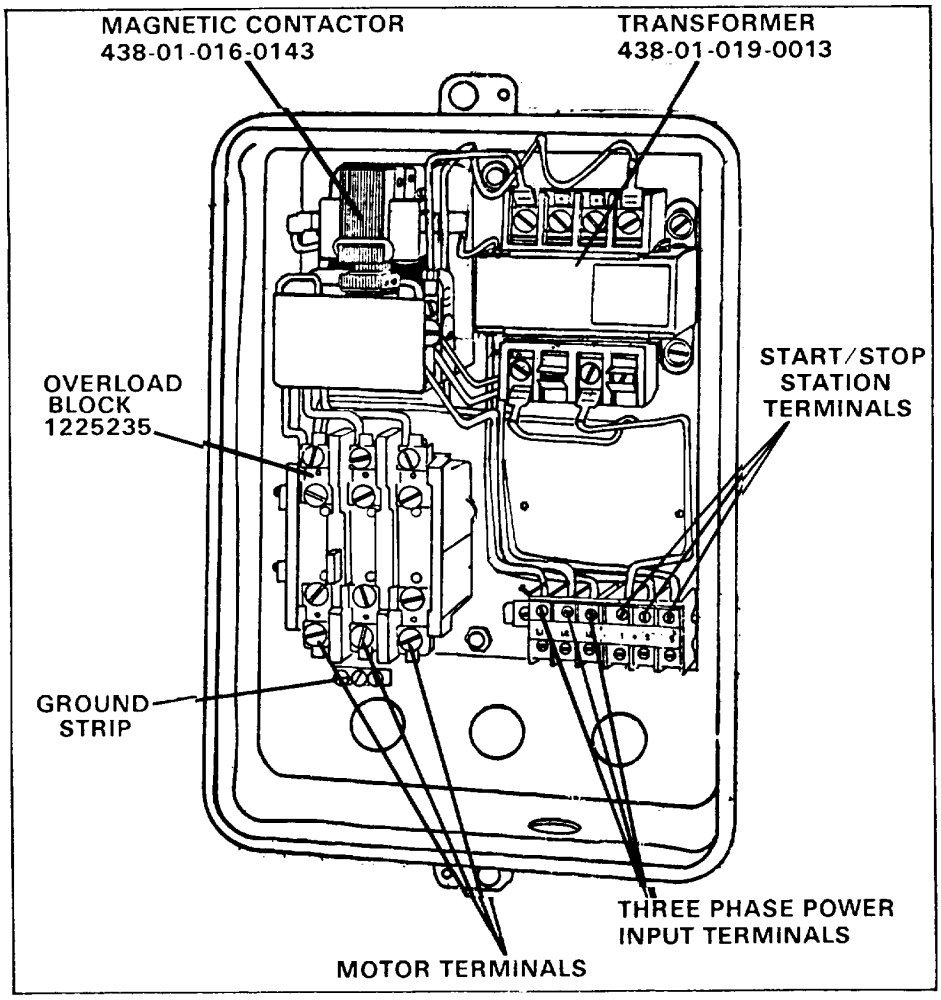


Figure 26.- Special Three Phase Motor Starter for Operation From 575 Volt Three Phase Power Systems Part 438-01-316-0076

SPECIAL SINGLE PHASE LVC REGENERATION MOTOR STARTER

The starter is a special unit in that three motor leads are connected to the starter so that the starter will open and close the motor start winding through one of the poles of the magnetic contactor.

Fig. **27**, illustrates the special single phase LVC regeneration motor starter, Part No. 438-01-316-0077.

A wiring diagram and schematic diagram of the special single phase LVC regeneration motor starter is shown in Fig. **28**.

The wiring diagram indicates the relative physical location of each component, wire, and terminal; whereas, the schematic does not show the physical relationship of the components. The Schematic diagram does show in straight line form the circuit functions of the various components.

The single phase LVC-regeneration motor starter is comprised of a power circuit and a control circuit. The diagrams in Fig. **28**, illustrates the power circuit with heavy lines to represent heavy wire gage sized for the motor current; whereas, the control circuit is shown with light lines in the diagrams to represent light wire gage sized for control current. In the starter, the power circuit is wired with black wires and the control circuit is wired with red wires.

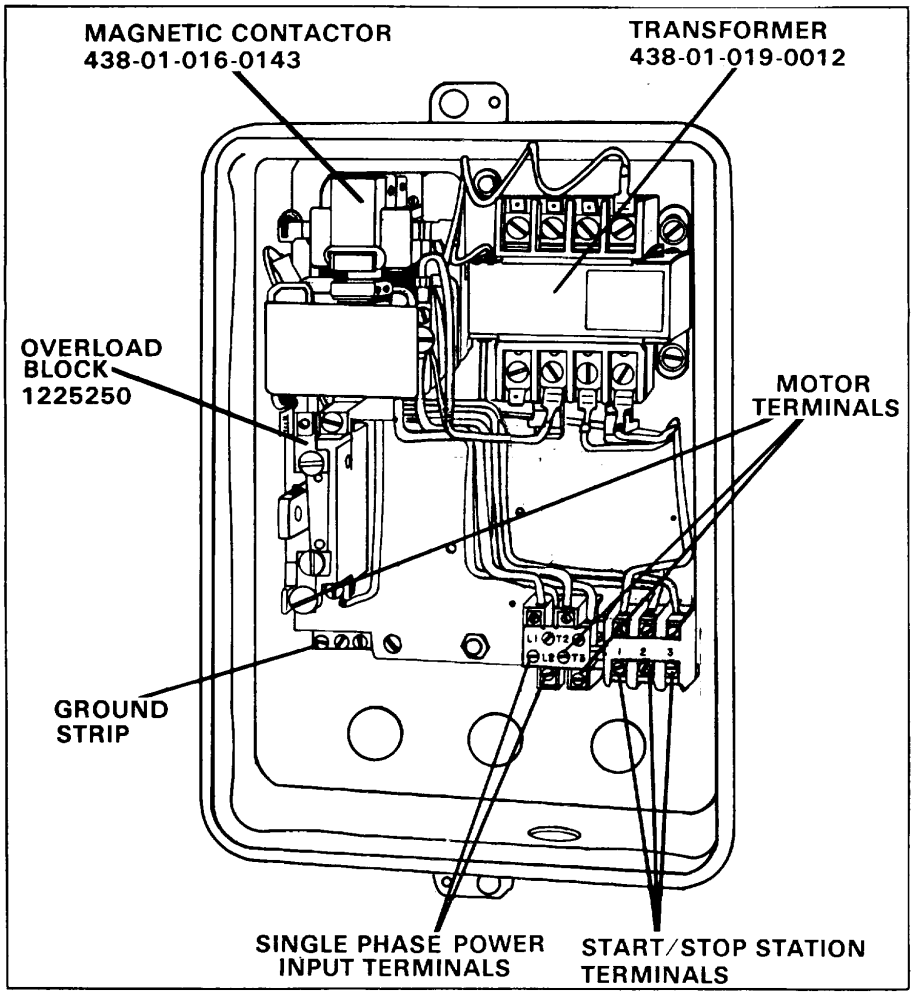


Figure 27. - Special Single Phase LVC Regeneration Motor Starter Part 438-01-316-0077

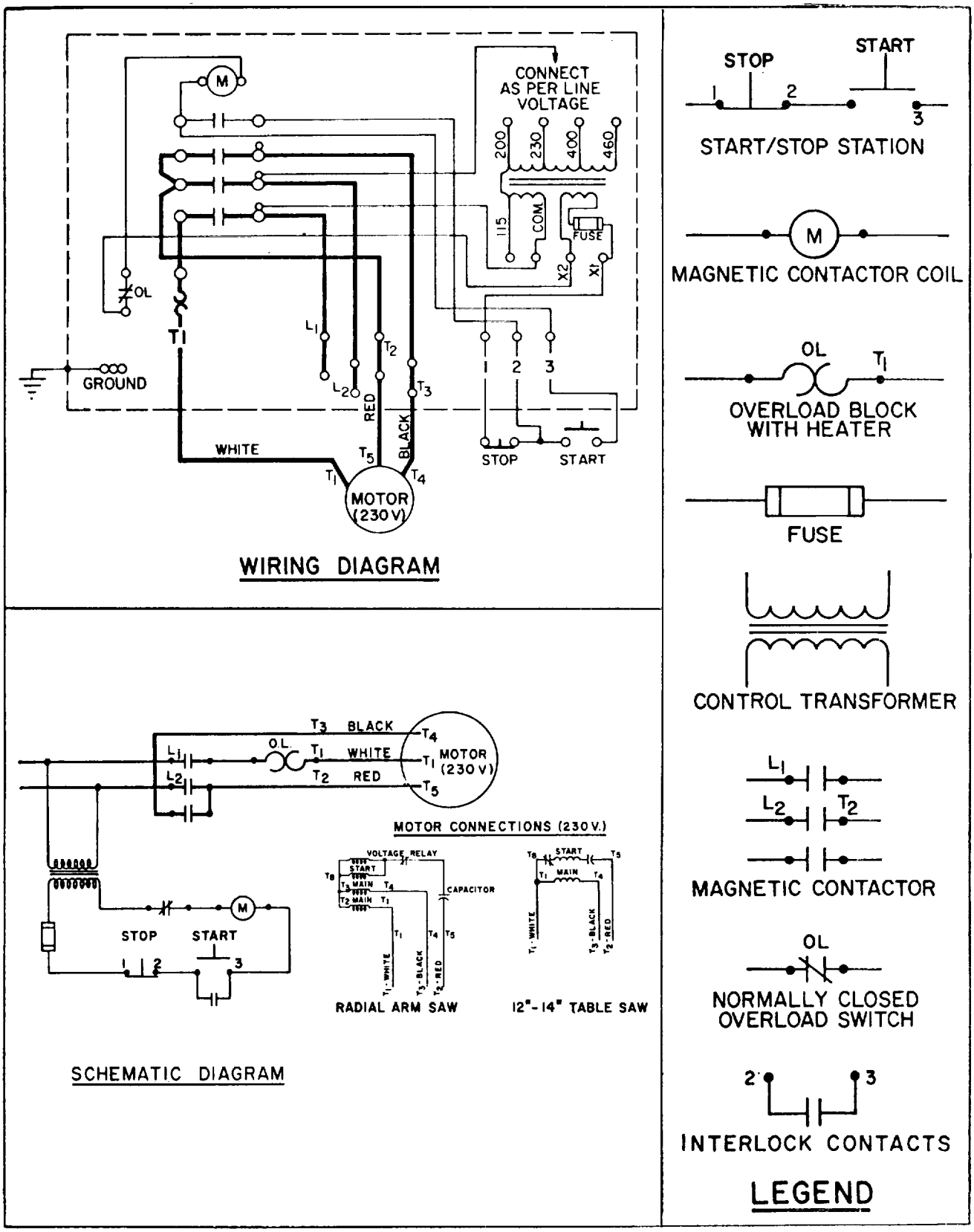


Figure 28. - Wiring Diagram and Schematic Diagram of the Special Single Phase LVC Regeneration Motor Starter

INSTRUCTIONS FOR CONNECTING THE SINGLE PHASE REGENERATION MOTOR STARTER TO THE POWER SUPPLY

All single phase regeneration starters must be wired in the field as follows:

Refer to Fig. **29** and remove and discard the plastic plug covering the entrance hole in the bottom of the starter enclosure. Bring the single phase power lead through the entrance hole. Connect the black power lead to L1, the white power lead to L2, and the green ground lead to the ground strip in the lower left-hand corner of the starter.

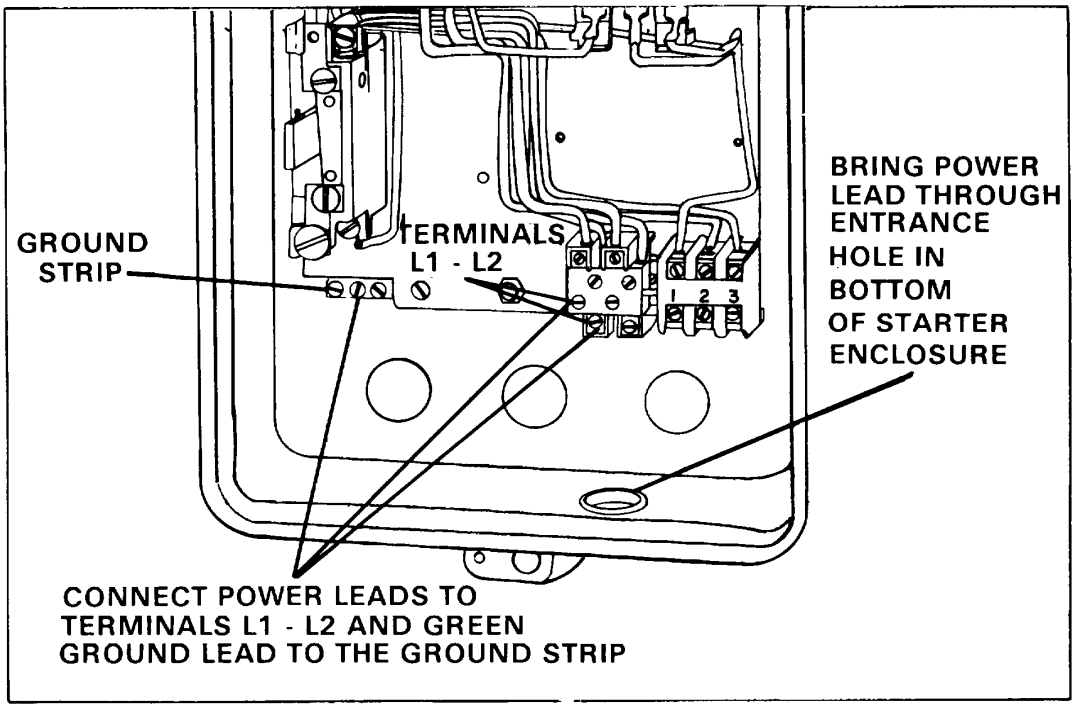


Figure 29. Wiring Single Phase Regeneration Starters

Several points must be stressed and closely followed when connecting the input power to the motor starter.

1. To preserve the dust-tight integrity of the motor starter, an oil-tight box connector should be used for fastening the in- put cable to the starter enclosure at the entrance hole.
2. If copper stranded wires are used for the input leads, the wires must be soldered dipped or tinned before they are connected to terminals L1 and L2, and the ground strip.
3. The wires must be connected to terminals L1 and L2 through the front face of the terminal block as shown in Fig. **30**. The screws on the top of the terminal block are used for clamping the wires in the terminal block.
4. The ground strip has provisions for three ground leads. The input power, start/stop station and motor must be grounded via the ground strip. Two ground wires must never be inserted in the ground strip under one screw
5. If metal conduit is used in place of cable, the green ground wire from the single phase input power system is omitted.

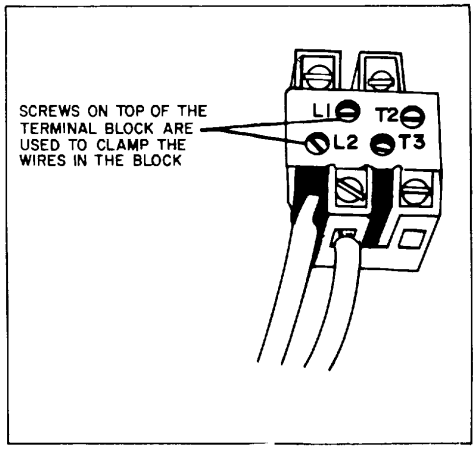


Figure 30. Terminals LI-L2 Connections

CHANGING VOLTAGE OF LVC MOTOR STARTERS

If it ever becomes necessary to operate a stationary power tool from a line voltage other than the voltage for which the tool was originally wired, three steps must be followed to modify the electrical package for operation from the new line voltage. Disconnect Motor Starter from power source and proceed as follows:

STEP 1-Remove the motor junction box cover and change the motor lead connections for the proper line voltage as shown on the motor nameplate.

STEP 2 - Change the primary -of the control transformer for the proper line voltage, as follows:

The control transformer supplied with all starters, except the 575 volt three phase starter, has a multi-tapped primary for operation from either a 115, 200, 230, 400 or 460 volt power system.

When changing voltage of an LVC motor starter, the transformer primary pigtail must be changed corresponding to the new input voltage. See Fig. 31.

NOTE: For 208 volt power systems, connect the transformer primary to the 200 volt tap, not the 230 volt tap.

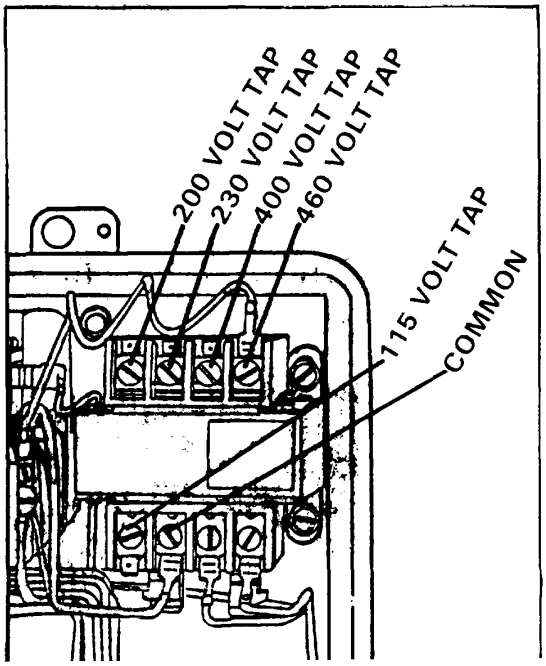


Figure 31. - Changing Voltage

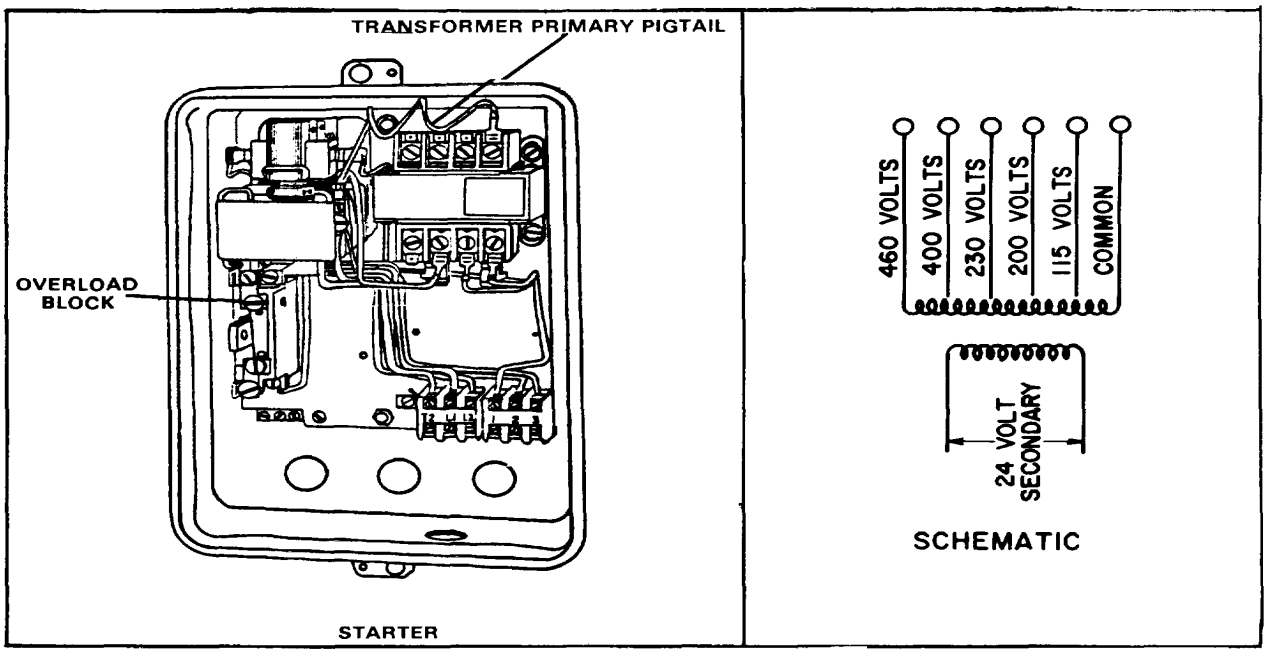


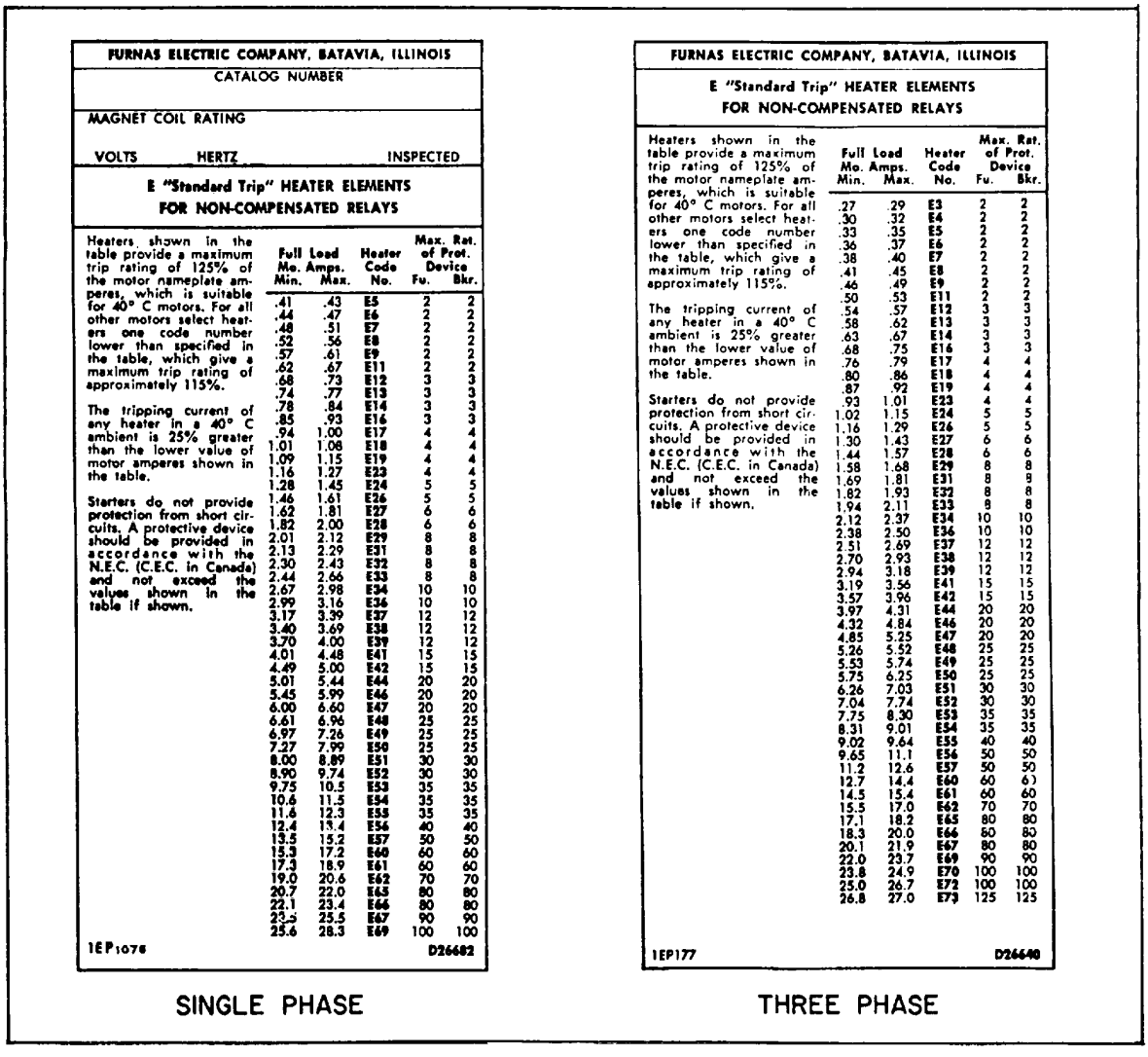
Figure 31. - Changing Voltage

STEP 3 - Change the heater elements in the overload block, Fig. **31**, for the proper voltage/ampere rating shown on the motor nameplate.

For every LVC motor starter, a heater coil chart is located on the inside cover of the motor starter enclosure. See Fig. **32.**

Note from the motor nameplate, the full load current for the new line voltage. Select the heater or heaters one code number lower than specified in the table of the heater coil chart which will give a maximum trip rating of approximately 115% of the motor nameplate current.

For example on three phase starters, assume it is necessary to pick a heater for a motor with a nameplate rating of 10.6 amperes. Reference to the heater coal chart in Fig. **32**. Shows that a 10.6 full load motor ampere rating corresponds to a heater code number, E-56. Thus, heater number, E-55, should be specified which will give a maximum trip rating of approximately 1.15 x 10.6 = 12.2 amperes.



FURNAS ELECTRIC COMPANY, BATAVIA, ILLINOIS

CATALOG NUMBER

MAGNET COIL RATING

VOLTS HERTZ INSPECTED

E "Standard Trip" HEATER ELEMENTS
FOR NON-COMPENSATED RELAYS

Heaters shown in the table provide a maximum trip rating of 125% of the motor nameplate amperes, which is suitable for 40° C motors. For all other motors select heaters one code number lower than specified in the table, which give a maximum trip rating of approximately 115%.

The tripping current of any heater in a 40° C ambient is 25% greater than the lower value of motor amperes shown in the table.

Starters do not provide protection from short circuits. A protective device should be provided in accordance with the N.E.C. (C.E.C. in Canada) and not exceed the values shown in the table if shown.

Full Load Mo. Amps. Min.	Max.	Heater Code No.	Max. Rat. of Prot. Device Fu.	Bkr.
.41	.43	E5	2	2
.44	.47	E6	2	2
.48	.51	E7	2	2
.52	.56	E8	2	2
.57	.61	E9	2	2
.62	.67	E11	2	2
.68	.73	E12	3	3
.74	.77	E13	3	3
.78	.84	E14	3	3
.85	.93	E16	3	3
.94	1.00	E17	4	4
1.01	1.08	E18	4	4
1.09	1.15	E19	4	4
1.16	1.27	E23	4	4
1.28	1.45	E24	5	5
1.46	1.61	E26	5	5
1.62	1.81	E27	6	6
1.82	2.00	E28	6	6
2.01	2.12	E29	8	8
2.13	2.29	E31	8	8
2.30	2.43	E32	8	8
2.44	2.66	E33	8	8
2.67	2.98	E34	10	10
2.99	3.16	E36	10	10
3.17	3.39	E37	12	12
3.40	3.69	E38	12	12
3.70	4.00	E39	12	12
4.01	4.48	E41	15	15
4.49	5.00	E42	15	15
5.01	5.44	E44	20	20
5.45	5.99	E46	20	20
6.00	6.60	E47	20	20
6.61	6.96	E48	25	25
6.97	7.26	E49	25	25
7.27	7.99	E50	25	25
8.00	8.89	E51	30	30
8.90	9.74	E52	30	30
9.75	10.5	E53	35	35
10.6	11.5	E54	35	35
11.6	12.3	E55	35	35
12.4	13.4	E56	40	40
13.5	15.2	E57	50	50
15.3	17.2	E60	60	60
17.3	18.9	E61	60	60
19.0	20.6	E62	70	70
20.7	22.0	E65	80	80
22.1	23.4	E66	80	80
23.5	25.5	E67	90	90
25.6	28.3	E69	100	100

1EP1076 D26682

SINGLE PHASE

FURNAS ELECTRIC COMPANY, BATAVIA, ILLINOIS

E "Standard Trip" HEATER ELEMENTS
FOR NON-COMPENSATED RELAYS

Heaters shown in the table provide a maximum trip rating of 125% of the motor nameplate amperes, which is suitable for 40° C motors. For all other motors select heaters one code number lower than specified in the table, which give a maximum trip rating of approximately 115%.

The tripping current of any heater in a 40° C ambient is 25% greater than the lower value of motor amperes shown in the table.

Starters do not provide protection from short circuits. A protective device should be provided in accordance with the N.E.C. (C.E.C. in Canada) and not exceed the values shown in the table if shown.

Full Load Mo. Amps. Min.	Max.	Heater Code No.	Max. Rat. of Prot. Device Fu.	Bkr.
.27	.29	E3	2	2
.30	.32	E4	2	2
.33	.35	E5	2	2
.36	.37	E6	2	2
.38	.40	E7	2	2
.41	.45	E8	2	2
.46	.49	E9	2	2
.50	.53	E11	2	2
.54	.57	E12	3	3
.58	.62	E13	3	3
.63	.67	E14	3	3
.68	.75	E16	3	3
.76	.79	E17	4	4
.80	.86	E18	4	4
.87	.92	E19	4	4
.93	1.01	E23	4	4
1.02	1.15	E24	5	5
1.16	1.29	E26	5	5
1.30	1.43	E27	6	6
1.44	1.57	E28	6	6
1.58	1.68	E29	8	8
1.69	1.81	E31	8	8
1.82	1.93	E32	8	8
1.94	2.11	E33	8	8
2.12	2.37	E34	10	10
2.38	2.50	E36	10	10
2.51	2.69	E37	12	12
2.70	2.93	E38	12	12
2.94	3.18	E39	12	12
3.19	3.56	E41	15	15
3.57	3.96	E42	15	15
3.97	4.31	E44	20	20
4.32	4.84	E46	20	20
4.85	5.25	E47	20	20
5.26	5.52	E48	25	25
5.53	5.74	E49	25	25
5.75	6.25	E50	25	25
6.26	7.03	E51	30	30
7.04	7.74	E52	30	30
7.75	8.30	E53	35	35
8.31	9.01	E54	35	35
9.02	9.64	E55	40	40
9.65	11.1	E56	50	50
11.2	12.6	E57	50	50
12.7	14.4	E60	60	60
14.5	15.4	E61	60	60
15.5	17.0	E62	70	70
17.1	18.2	E65	80	80
18.3	20.0	E66	80	80
20.1	21.9	E67	80	80
22.0	23.7	E69	90	90
23.8	24.9	E70	100	100
25.0	26.7	E72	100	100
26.8	27.0	E73	125	125

1EP177 D26690

THREE PHASE

Figure 32. Changing the Heater Elements

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JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches

1 Meter = 100 Centimeters = 1,000 Millimeters = 39.37 Inches

1 Kilometer = 1,000 Meters = 0.621 Miles

SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches

1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet

1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches

1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces

1 Liter = 1,000 Milliliters = 33.82 Fluid Ounces

TEMPERATURE

5/9 (°F -32) = °C

212° Fahrenheit is equivalent to 100° Celsius

90° Fahrenheit is equivalent to 32.2° Celsius

32° Fahrenheit is equivalent to 0° Celsius

9/5 C° +32 = F°

WEIGHTS

1 Gram = 0.001 Kilograms = 1,000 Milligrams = 0.035 Ounces

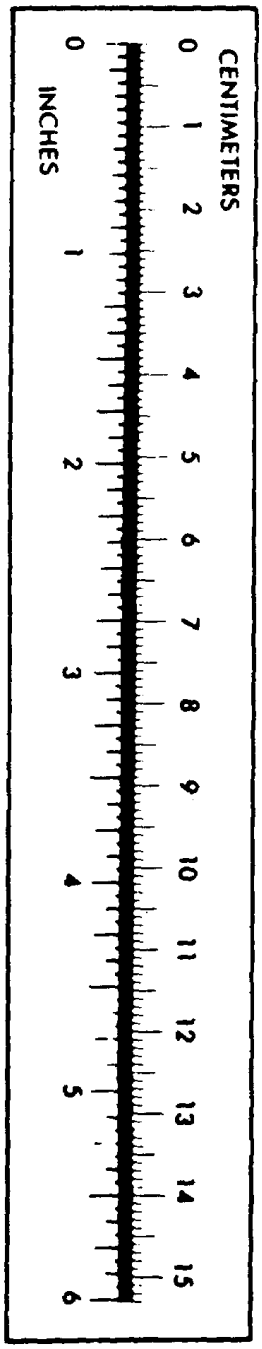
1 Kilogram = 1,000 Grams = 2.2 Lb.

1 Metric Ton = 1,000 Kilograms = 1 Megagram = 1.1 Short Tons

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds Per Square Inch	Kilopascals	6.895
Miles Per Gallon	Kilometers Per Liter	0.425
Miles Per Hour	Kilometers Per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds Per Square Inch	0.145
Kilometers Per Liter	Miles Per Gallon	2.354
Kilometers Per Hour	Miles Per Hour	0.621



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