

**1541 DISK DRIVE
ALIGNMENT PROGRAM**

*NO SPECIAL EQUIPMENT
NEEDED TO ALIGN DRIVE*

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**C S M SOFTWARE
P.O. BOX 563
CROWN POINT, IN**

NOTICE: PLEASE READ

CAUTION

Exercise extreme care when working on the disk drive. 117 volts is present inside the disk drive. Shock hazard exists whenever the disk drive is removed from its case.

Duplicate disks are available for only \$10.00. Send check or money order to:

C S M SOFTWARE
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CROWN POINT, IN. 46307

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CAUTION:

Exercise extreme care when working on the disk drive. 117 volts is present inside the disk drive. Shock hazard exists whenever the disk drive is removed from its case.

1). DISASSEMBLY

- a). Remove power cable and serial bus.
- b). Turn unit up side down and remove 4 screws that hold case together
- c). Turn unit right side up and remove six screws attaching unit to the case.
- d). Remove two screws that retain the metal cover plate. Remove metal cover plate and disconnect the wires to the LED.
- e). Remove the unit from its case.
- f). Attach the power cable and the serial bus

2). LOADING THE PROGRAM

- a). Disconnect your printer, modem, joysticks, expansion boards and any other attachments that are not essential for the operation of the program. This program will use all of the computers internal memory. Some printers and modems will cause interference with the operation of this program.
- b). If you are going to align one drive and load the program from a different drive, you will need to hook both drives up at this time. Turn the power off on the drive that is to be aligned.
- c). Insert the program disk - drive 8 or 9
- d). LOAD "BOOT",8,1 or LOAD "BOOT",9,1

If the program won't load try:
OPEN15,8,15,"IØ:" (RETURN)

- e). Don't try to list the directory (\$). It has been specially modified to prevent listing.
- f). Wait for program to load - appx. 2 minutes
- g). The red light may flash during the program load. This is normal for this program.
- h). If you are loading the program on one drive and are aligning another, turn on the 'sick' drive when the program prompts you to do so. Then turn the power off on the drive that was used to load the program.
- i). DO NOT PRESS THE 'RESTORE' KEY. This will cause the program to lock up. If you should accidentally press the RESTORE key it will be necessary to re-load the program.

3). DEVICE NUMBER

- a). Whenever you enter the menu you will be asked to enter the device number of the drive. This program will only work on device 8 or 9. If you are working on a drive that has a device number of 10 or 11 you will have to temporarily bridge across the jumpers for the device number.
- b). Once you have entered the proper device number, you only have to press RETURN at the prompts. The computer will remember the number for you.

4). CHECK SPEED

- a). Press the 1 key when asked "WHICH FUNCTION ?".
- b). Insert a blank formatted disk. Don't use the CALIBRATION DISK!
- c). Press 'SPACE' at the prompt
- d). After a few seconds the speed will be displayed on the screen. 100.00 % is the ideal speed. The speed should be from 99.88 % to 100.12 %. Anywhere within these limits is acceptable. You will not be able to adjust the speed exactly to 100.00 % on every drive or with every disk. Just set the speed as accurately as possible.
- e). If the speed is not within the limits, try another disk. Some disks have an exceptionally large amount of drag and give poor results.
- f). If the speed is still not within the limits, you will need to adjust the speed.
- g). Press space to end the test and return to menu.

5). ADJUST SPEED

- a). Turn the unit on its side so that you have access to the bottom. The front of the drive should be facing you.
- b). Locate the speed adjusting screw. You can find this by looking through the small hole at the front, upper corner of the drive (see figure 1 OR 5). If you have one of the newer drives the screw will be located on the top of the drive near the front (see figure 5).
- c). With the speed check running, SLOWLY turn the screw one direction and then another. Note the change in speed and rotate the screw accordingly. If the speed is getting farther from the desired limit, reverse the direction of the screw. Continue adjusting until the speed is within acceptable limits. Press SPACE to end.

5.) CHECK ALIGNMENT

The BEST check of your disk drive's alignment is its ability to read commercially prepared software. When the disk drive is in alignment, the disk drive will not return very many LOAD ERRORS. As the head starts to move out of alignment, a greater number of errors will be noticed.

Eventually, the drive will be so far out of align that the drive will only read the disks that have been formatted on it since it has been out of alignment. It is possible to have the read/write head so far out of alignment that the disk drive will actually start to come back into alignment. The read/write head is logic seeking and will find its own way once it has been brought into alignment.

Another very good check is the PERFORMANCE TEST on the disk that comes with your disk drive. Problems with the drive reading and writing to track #1 or #35, will generally be related to alignment.

You may also use the CHECK ALIGNMENT function of this program. Remember that the disk drive may be so far out of alignment, that the drive is starting to come back into align (one track off). Use the following method to check your alignment.

- a). Press the 3 key when asked "WHICH FUNCTION ?".
- b). Insert the CALIBRATION DISK supplied with this program. Be sure that the write protect notch is NOT covered on the calibration disk.
- c). Press 'SPACE' to continue. The program will start to run. It will continue running until you press space to stop it. This will allow you to obtain an average value that will indicate the quality of alignment.
- d). You will see track and sector numbers appear on the screen. The disk drive is reading and writing to these tracks and sectors. If the disk drive is able to read and write to the sectors on a particular track, the message 'OK' will appear along side the sector numbers. If the disk drive cannot read or write to a particular sector, an error message will be displayed.
- e). If the error message appears, you will need to align you disk drive. Read section (f) and (g) carefully then proceed to ADJUST ALIGNMENT.
- f). After track 35 has been checked, a 'TIMING NUMBER' (T. N. #) will appear on the screen. This number keeps a running count of the time required to access the information from the disk. The faster the access time the lower the T. N. # will be. The lower the T. N. # the better. On most disk drives the T. N. # will accurately reflect the relative alignment of the disk drive by keeping track of the time required to find the next block of information. If the head is out of alignment, it will take more time to find the next block of information. The T. N. # should be appx. 100. This will vary from drive to drive and a T. N. # of 100 may not be obtainable on every disk drive. The most important factor is to obtain the LOWEST number possible on YOUR PARTICULAR drive. This will reflect the best alignment possible on your drive.
- g). The T. N. # is a very sensitive number. It may vary slightly even on the best of disk drives. Make at least 5 checks of the timing number every time you check or adjust the disk drive alignment. Try to obtain an average value rather than relying on just one reading.

7). ADJUST ALIGNMENT

Two methods of adjusting the disk drive's alignment are used by this program. Each method has its own advantages. The disk drive should be aligned by both methods. Some may be more accurately aligned by one method or the other. You may prefer to use one method or a combination of both methods. You should always check the drive by both methods, even if you only use one method of aligning.

The first method seems to work better on drives that are not in as good a shape as they could be. The second method may work better on drives that are in very good condition. Be sure to use both methods on each and every drive until you become experienced with the program.

ADJUST 'BUMP' & ALIGNMENT (function 2)

- a). With the disk drive on its side and the front facing you, locate the stepper motor on the bottom side of the drive.
- b). Scribe a line on the stepper motor and the drive housing to provide a reference point (starting point).
- c). Next find the stepper motor mounting screws (see figure 1). Loosen these screws so that the stepper motor will just turn freely. Don't over loosen the screws. Remove all the adhesive from the screws.
- d). Keep one hand on the stepper motor at all times to prevent it from slipping. If you want to remove your hand, snug down the stepper motor mounting screws.
- e). It will be necessary to remove the circuit board on most disk drives (see steps b-f of CHECK END STOP). You will have to see the clearance between the cam and the end stop. If you remove the circuit board, you should use a small fan to keep the power transistors from overheating.
- f). Press the #2 key when ready.
- g). Use the 'B' key to bump the stepper motor. When the 'B' key is used the busy (red) light will flicker slightly. This indicates that you are in the bump mode.
- h). Use the 'S' key to set the alignment. When the 'S' key is used the busy (red) light should (will) be steady. It may be necessary to press the key several times in order to change modes. When the program is put in the set mode, the read/write head will move to track 18, then move back to track 1.
- i). With the program in the SET ALIGNMENT mode, the drive will read the information from track 1. Carefully rotate the stepper motor until the busy light stays on continuously. Rotate the stepper motor in either direction and find the CENTER POINT of adjustment. Watch the clearance between the end stop and the cam. The gap will help you to determine the center point of alignment. If you rotate the stepper motor too far in either direction, you will notice that the motor will actually step the read/write head back in to alignment. Find the center point of adjustment without making the motor step in either direction.
- j). Once the center point of alignment has been found, press the 'B' key. This will cause the stepper motor to bump the cam against the end stop. After the bump has occurred, it will be necessary to compare the clearance between the end stop and the cam with the clearance obtained during the set mode. They should be similar in clearance. There must be clearance between the cam and the end stop (appx 0.010") after the bump. The bump must be a solid and hard bump to achieve the best results.
- k). It may be necessary to repeat steps 'i' and 'j' several times in order to find the proper location.
- l). Tighten the mounting screws on the stepper motor and recheck adjustment.

ADJUST ALIGNMENT (function 3)

- a). Be sure function 2 is set properly BEFORE proceeding. With the disk drive on its side and the front facing you, locate the stepper motor on the bottom side of the drive.
- b). Scribe a line on the stepper motor and the drive housing to provide a reference point (starting point).
- c). Next find the stepper motor mounting screws (see figure 1). Loosen these screws so that the stepper motor will just turn freely. Don't over loosen the screws.
- d). Keep one hand on the stepper motor at all times to prevent it from slipping. If you want to remove your hand, snug down the stepper motor mounting screws.
- e). With the alignment program running, slowly rotate the stepper motor in either direction. Rotate the motor just a fraction of an inch, and watch the screen. If more errors appear, or the timing number becomes larger, try rotating the stepper motor in the opposite direction. Do not be in a hurry to make these adjustments. Make small adjustments and check the timing number often.
- f). After track 35 has been checked a 'TIMING NUMBER' (T. N. #) will appear on the screen. If an error occurred on any track the timing number will not be valid. Only use the T.N.# if all the tracks report OK. This number keeps a running count of the time required to access the information from the disk. The faster the access time, the lower T.N.# will be. The lower the T.N.# the better (the timing number is only valid if no errors have occurred). On most drives the T.N.# will accurately reflect the relative alignment of the disk drive by keeping track of the time required to find the next block of information. If the head is out of alignment, it will take more time to find the next block of information. The T.N.# should be approx. 100. This will vary from drive to drive and a T.N.# of 100 may not be obtainable on every disk drive. The most important factor is to obtain the lowest number possible on your particular drive. This will reflect the best alignment on your drive. Timing numbers have been observed from a low of 98.25 to a high of 104.5 on different drives. Just try to obtain the lowest number for your drive.
- g). The T.N.# is a very sensitive number. It may vary slightly even on the best of disk drives. Make at least 5 checks of the timing number every time you adjust the disk drive alignment. Try to obtain an average value rather than relying on just one reading.
- h.) Once the lowest timing number has been obtained, snug down the mounting screws and re-check the alignment. Recheck the 'BUMP' to verify its proper operation, adjust if necessary.

- 8). CHECK/ADJUST END STOP
 - a). Be sure that steps 5 and 7 have been properly performed before proceeding (very important)!!
 - b). Remove any disk from the drive, turn the disk drive off and remove the power cord. You may leave the serial bus attached.
 - c). Place the disk drive in the normal position (right side up, and the front facing you). Remove the screws that attach the circuit board to the frame (see figure 2).
 - d). Carefully lift the circuit board and rotate it to the left. You may need to re-route some of the wires that are attached to the board in order to move the board far enough to expose the end stop (see figure 3). Sometimes it is easier to remove the connectors before trying to move the board.
 - e). Place an insulating material between the board and the metal frame of the disk drive to prevent accidental short circuits (Cardboard cut to the size of the board works well).
 - f). Hook up any connectors that may have been removed earlier, the power cable, the ground wire (jumper wire) and turn on the power. The jumper wire should be attached to the ground pad at the left rear of the circuit board (at the screw hole) and to the metal frame of the drive (see figure 3).
 - g). Insert the CALIBRATION DISK.
 - h). Press the 4 key when asked "WHICH FUNCTION ?".
 - i). Remove the disk from the drive when asked to do so, NOT BEFORE (very important). Press space to continue.
 - j). Very carefully insert a 0.010" feeler gauge between the cam and the end stop. If the gauge will not go, do not force it.
 - k). If the clearance is not 0.010", then remove the screw that holds the end stop in place. Remove the end stop and clean any adhesive from the end stop and from the mounting pedestal. Re-install the end stop and adjust.
 - l). Press 'R' to reset the clearance if necessary. USE CARE WHEN ADJUSTING. If you should bump the cam or move it in any way, re-insert the calibration disk and press SPACE. Repeat steps (g) through (m). It is a good idea to repeat this procedure even if you don't think that you have moved the cam.
 - m). Press 'SPACE' to end.
 - n). Recheck the 'BUMP' and 'ALIGNMENT' of the disk drive.
 - o). On most disk drives, the end stop clearance will be reset to the proper clearance when the 'BUMP' and 'ALIGNMENT' functions have been properly set.

9). FORMAT DISK

- a). Press the 5 key when asked "WHICH FUNCTION ?".
- b). Insert a blank disk. DO NOT USE THE CALIBRATION DISK. Formatting the disk will erase any information from the disk.
- c). After formatting the disk, verify the alignment procedure with the newly formatted disk. Use the newly formatted disk as the calibration disk and repeat the alignment procedure.
- d). If the drive is in alignment and the mechanical parts of the drive are sound, there should not be any significant difference between the CALIBRATION DISK and the newly formatted disk.
- e). If there is a significant difference between the two disks, consult the trouble shooting section.

10). ASSEMBLY

- a). Once you are satisfied with the alignment job, it will be necessary to coat the screw heads on the stepper motor and the end stop with an adhesive. This adhesive should prevent the screws from loosening during use.
- b). Re-assemble the disk drive in the reverse order of disassembly.

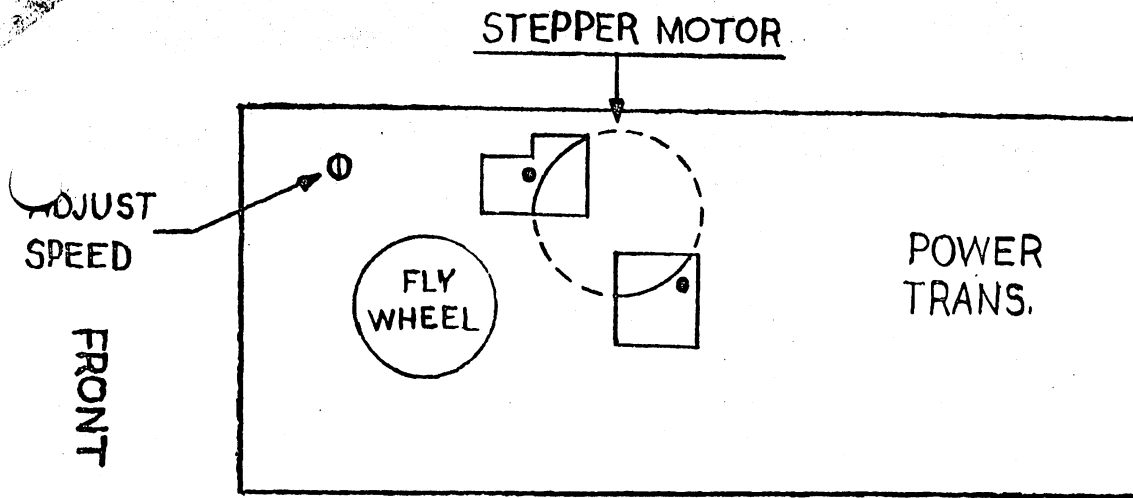


FIG. 1 BOTTOM VIEW

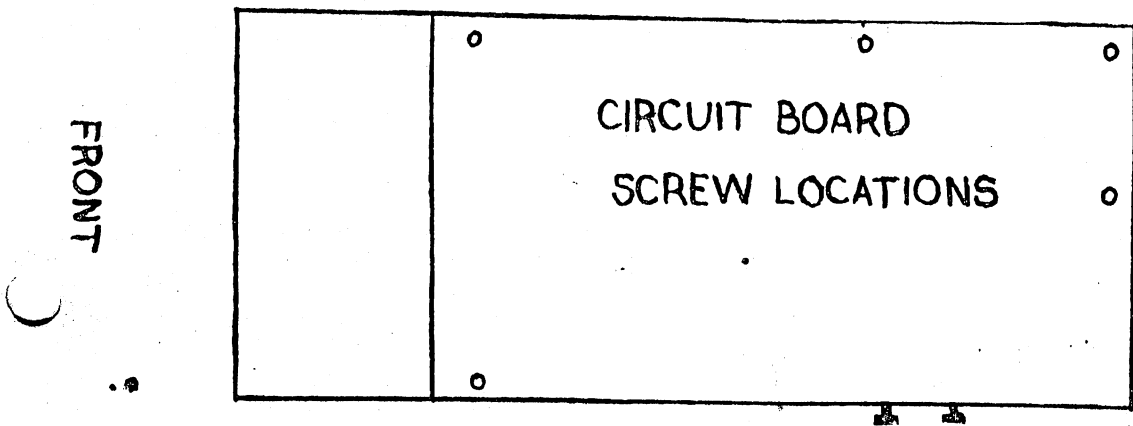


FIG. 2 TOP VIEW

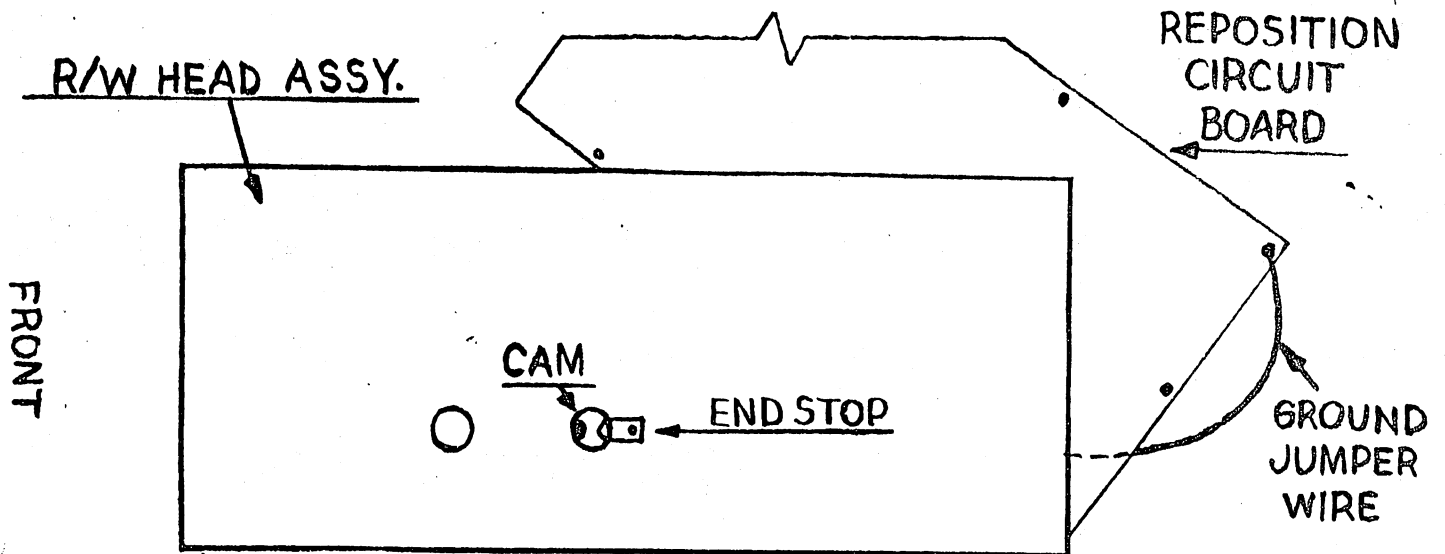


FIG. 3 TOP VIEW

11). TROUBLE SHOOTING

2). Loading the program

- a). If the program does not load properly, it may be necessary to initialize the disk drive. Type in the following line before loading the program:

OPEN 15,8,15,"IO:":CLOSE 15 (press 'RETURN')

Then load the program normally:

LOAD "BOOT",8,1 or LOAD "BOOT",9,1 (press 'RETURN')

Be certain all non-essential equipment is not connected to the computer or disk drive. Disconnect the printer interface, modem, joysticks, cartridges and expansion boards.

- c). Some disk drives may be so badly out of alignment that they may not be able to load this program. Try a friend's drive to load the program on.
- 4). Speed Check
- a). If you are unable to set the speed to the desired limits, this is an indication of a hardware mal-function. This type of repair is beyond the scope of this program. It may also be a result of a worn drive belt. Remove the belt and turn it over. Many times this will temporarily correct the problem. It will be necessary to order a new belt from your dealer.
- 6). Alignment Check
- a). If the newly formatted disk does not give the same results as the CALIBRATION DISK repeat the alignment procedure. All of the criteria for adjustment must be set. The 'BUMP' must perform normally, track #1 must be at or near the center of adjustment and the drive must be able to read and write to all the tracks. All the functions must be obtained with the same adjustment of the stepper motor. Sometimes a compromise must be made to obtain the most satisfactory results.
- b). Occasionally, the disk drive cannot be properly aligned due to a mechanical failure. These conditions are not very common, but they do occur. The most common of these mechanical problems, is a worn stepper motor. Replacements are hard to come by and can be quite expensive. Try all the following procedures, if you feel the stepper motor may be at fault.
- c). If you unable to adjust the stepper motor so that the disk drive will read and write to all tracks and sectors, there may be a hardware problem. Re-load the program and start over. If you are not able to bring the head into alignment, the disk drive may be damaged beyond repair (this condition is rare).
- d). If you ARE ABLE to read and write to all the sectors when using the CALIBRATION DISK, and you ARE NOT ABLE to read and write to all sectors when using the newly formatted disk, this is an indication of a worn stepper motor or IMPROPER ALIGNMENT. A badly worn stepper motor will still allow the disk drive to read and write to a properly formatted disk (i.e the CALIBRATION DISK), but it may not allow the proper formatting of other disks. Be sure the 'BUMP' is correctly adjusted. Recheck the alignment procedure and adjust if necessary (SEE THE 'FIX').

-) . End Stop Adjustment
 - a) . Problems with the end stop adjustment will be reflected in the improper formatting of disks or in the inability to read and write to track #1. If the problem is corrected soon enough (i.e. when the drive first gives signs of having problems), the disk drive will last almost indefinitely. Those disk drives that have been 'beat to death' may not be able to be completely fixed with only an alignment. The best alignment job is only as good as the mechanical condition of the equipment. A good alignment job will not correct bad mechanical equipment.
 - b) . Worn stepper motors will not allow proper adjustment of the end stop. The stepper motor moves the read/write head from track to track. It does not require much effort to move the head from track to track. When you try to read a 'bad block' or format a disk, the cam is 'bumped' against the end stop. This bumping puts tremendous stress on the stepper motor. Try to avoid using disks that have 'bad blocks' on them. 'Bad blocks' may be detected on the original disk by a loud clicking sound during the program load.
 - c) . If after aligning the drive, you determine that the stepper motor is at fault, don't give up. Try the 'fix'. Try to vary the clearance on the end stop. Many times a small change can make a difference.
- 9) . Disk Format
- a) . If the disks that are formatted on the newly aligned drive will not read and write to every track and sector, there may be a problem with the stepper motor. SEE ABOVE.
- If, after aligning the drive, you determine that the stepper motor is at fault, don't give up. Many drives will work perfectly in the read/write mode even with worn stepper motors. Try opening up the clearance between the end stop and the cam (0.012" or more). I have successfully aligned disk drives that have had worn stepper motors. It just takes a little more time.

After the alignment procedure has been completed, and if the drive will not function properly, mechanical mal-function should be suspected.

10). 'THE FIX'

This is a 'fix' that has brought many sick disk drives back to life. I can not guarantee that this will 'fix' your drive or even help. Every disk drive that I align gets this 'fix'. It has work for me.

Many disk drive alignment problems have been traced to the cam slipping on the stepper motor shaft. The 'fix' relies on pinning the cam to the shaft. Some people use glue or adhesive to retain the cam. Use whatever method you prefer. If you pin the shaft, first align the drive to insure that everything is functioning normally before pinning the drive.

- a). Remove the read/write head assembly (this is the metal and plastic device that the disk fits into). It will be necessary to disconnect all the connectors to the assembly. Remove the 4 screws that attach the assembly to the frame. Lift the assembly up and forward.
 - b). There is a small screw attached to the stepper motor cam. This screw retains the band that moves the read/write head. CAREFULLY remove the adhesive and the screw, do not damage the metal band.
 - c). Cut the tie wraps that secure the wires to the stepper motor. Remove the screws that hold the stepper motor. Remove the stepper motor with the cam attached. It is not necessary to remove the cam from the stepper motor to perform this operation.
 - d). Drill a 1/16 inch diameter hole thru the cam, the stepper motor shaft, and out the other side of the cam. (see figure 4). Use lubricant to prevent the aluminium cam from siezing on the drill (ordinary bar soap works for me).
 - e). Insert a 1/16 diameter roll pin (spring pin). Coat the pin with loctite prior to installation.
 - f). Install the stepper motor, using care not to damage the metal band. Install the read/write head and attach the connectors. Secure the wires with tie wraps or tape.
 - g). Align the disk drive.
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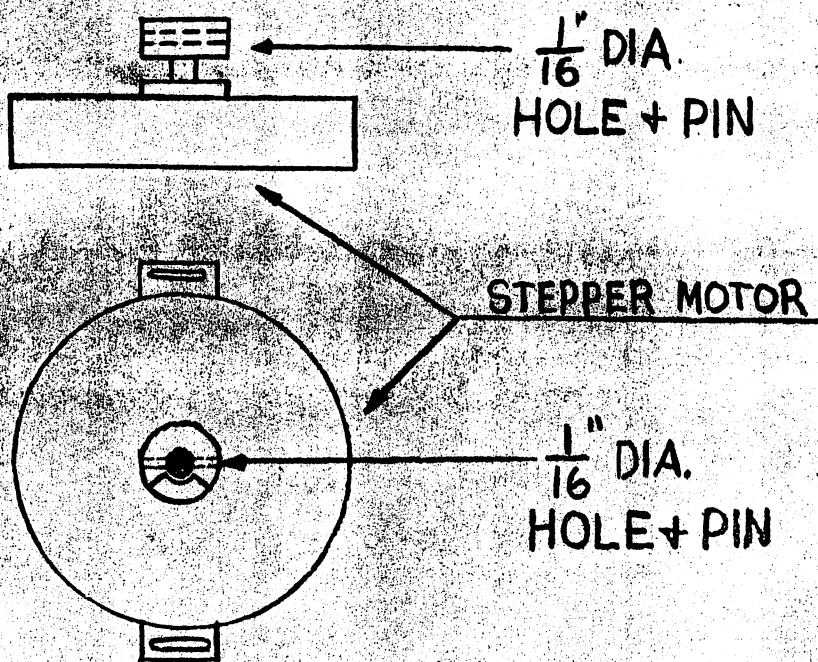


FIG 4

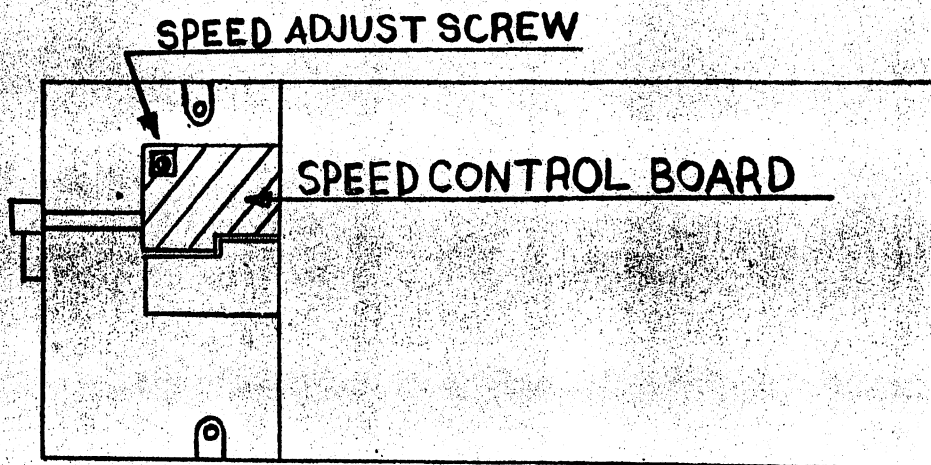


FIG 5 TOP VIEW

1541C SPEED ADJUSTMENT LOCATION