Release

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HH Roberts

Ann Yang Lathe Operation Manual

Anilam 4200T

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SECTION 1

CAUTION

IMPROPER OPERATION OR IMPROPER MAINTENANCE OF THIS MACHINE MAY CAUSE SERIOUS BODILY INJURY.

DO NOT OPERATE THIS MACHINE UNTIL YOU HAVE RECEIVED OPERATING AND SAFETY INSTRUCTIONS FROM YOUR EMPLOYER.

FOLLOW ALL SAFETY PRACTICES PRESCRIBED BY YOUR EMPLOYER AND OUTLINED IN THE OPERATOR MANUAL.

ALWAYS AVOID UNSAFE CONDITIONS OF OPERATION SUCH AS EXCESSIVE FEEDS AND SPEEDS.

ALWAYS BE SURE ALL SAFETY DEVICES ARE IN GOOD OPERATING CONDITION.

ALWAYS BE CERTAIN THAT SERVICE ON THIS MACHINE IS PERFORMED ONLY BY QUALIFIED PERSONNEL

Machine safety

Every effort has been made in the design and production of this piece of equipment to comply with statutory requirements and to provide a fundamentally safe machine tool. In the further interest of safety, attention should be given to the following notes:

Machine use

Responsibility for the following points with respect to machining a part must ultimately rest with the machine operator.

1. Ensure that the operator has had suitable training and possesses the required degree of skill and experience to undertake the work.
2. Provide suitable work holding and/or supporting equipment: chucks, steadies, revolving centers, vises etc.
3. Ensure that suitable tooling is provided and correctly mounted.
4. Ensure that suitable feeds and speeds are selected.
5. Use the guards that are provided with the machine.
6. Wear suitable protective devices: safety glasses, shields.

Safety rules

1. KNOW HOW TO STOP THE MACHINE BEFORE STARTING IT.
2. Read and understand all manuals for your machine.
3. Keep your machine and work area clean.
4. Before operating spinning tools, note and observe the maximum operating speed of the selected device as marked on the nameplate by the manufacturer.
5. Remove chuck keys IMMEDIATELY after use.
6. Check the load capacity of revolving centers and drivers.
7. Ensure guards are in position before operating the machine.
8. DO NOT use cracked or chipped tools.
9. STOP THE MACHINE IMMEDIATELY IF ANYTHING UNEXPECTED HAPPENS.
10. DO NOT touch revolving chucks or tools.

11. DO NOT remove tools or work from a machine without retracting the tool to a safe position and stopping the spindle.
12. ALWAYS use the E-STOP button when working in the machine envelope or when leaving the machine unattended.

Personal safety rules

1. Report any accident as soon as it happens.
2. Wear safety glasses or shields.
3. Wear safety shoes.
4. Use barrier creams if provided.
5. Wear your overalls buttoned up.
6. Roll sleeves up or button the cuffs.
7. Keep hair short or use a suitable cap.
8. Use the correct size wrench at all times.
9. Be careful of, and remove burrs and sharp edges.
10. When lifting a heavy work-piece or fixture, use the correct type of sling, ensure that it is not worn or damaged and that its safe workload is not exceeded.
11. Stand clear when lifting a work-piece or equipment by crane.
12. Obtain assistance when lifting heavy or awkward work-pieces or fixtures.
13. DO NOT wear rings, watches, ties, etc. when operating a machine.
14. DO NOT keep sharp tools in pockets.
15. DO NOT manually lift heavy equipment.
16. DO NOT wash hands in coolant.
17. DO NOT remove chips or cuttings with bare hands; use a rake or chip hook.
18. DO NOT use rakes or chip hooks with enclosed handles.
19. DO NOT use files, scrapers, etc., on machines.
20. DO NOT lean on the machine.
21. DO NOT tamper with electrical equipment.

SECTION 2

Machine lifting

Lifting the machine

The machine should be lifted using a forklift truck or crane as illustrated in Figure 2-1 Ensure that the forklift truck or crane has sufficient capacity. Please see machine specifications for machine weights.

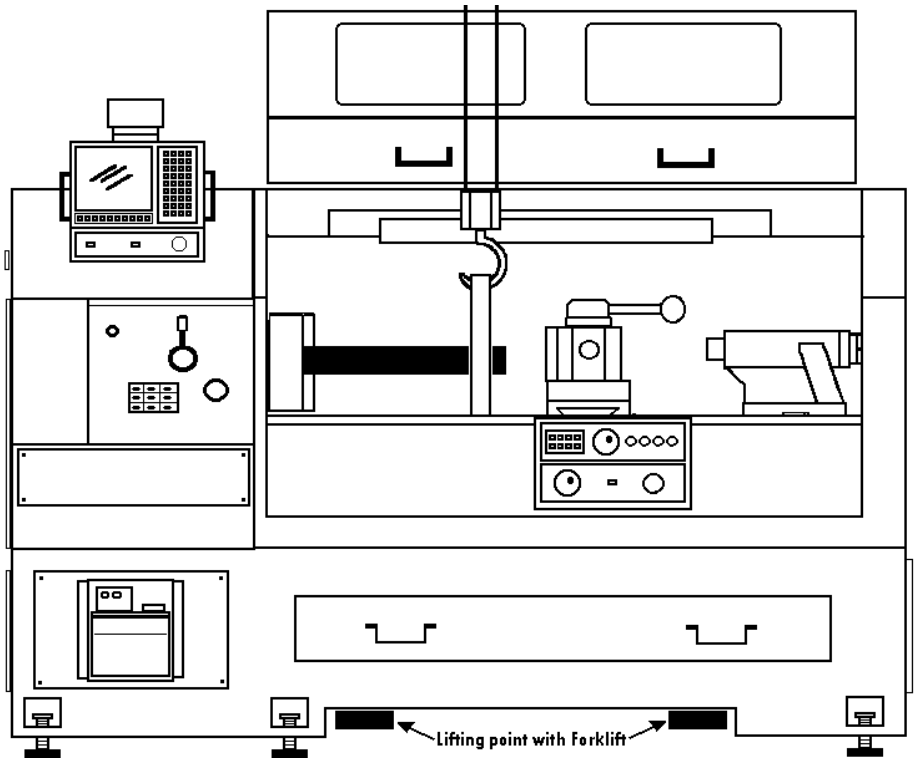

Figure 2-1

Inspection

Check your delivery slip against the accessories that were ordered with the machine. If there is a shortage or error, report it to your dealer immediately, giving the serial number, which is stamped on the nameplate on the rear of the machine

Cleaning

All unpainted parts of the machine have been coated with an anti-rust compound. This should be thoroughly removed after the machine is installed and before moving any axis. Remove anti-rust compound with varsol and a clean cloth. Do not use paint thinners. All unpainted surfaces should be coated immediately with a light coat of way-lube.

Machine specifications

ITEMS \ MODEL			DY-380 DY-15	DY-410 DY-16	DY-470 DY-18	DY-510 DY-20
MACHINING CAPACITY	SWING OVER BED		380mm 15”	410mm 16”	470mm 18”	510mm 20”
	SWING OVER CROSS SLIDE		190mm 7.5”	210mm 8”	255mm 10”	340mm 13.4”
	DISTANCE BETWEEN CENTERS		750\1000\1500 30”\40” \ 60”	850\1250\1500\2000 33”\50” \ 60” \ 80”	850\1250\1500\2000 33”\50” \ 60” \ 80”	850\1250\1500\2000 33”\50” \ 60” \ 80”
	MAX. CUTTING LENGHT		500\750\1150 29.5”\30”\45”	500\900\1150\1650 20”\35.5”\45”\65”	500\900\1150\1650 20”\35.5”\45”\65”	500\900\1150\1650 20”\35.5”\45”\65”
SPINDLE	SPINDLE NOSE		D1-6 A2-6 (Opt)	D1-6 A2-6 (Opt)	D1-8 A2-8 (Opt)	D1-8 A2-8 (Opt)
	SPINDLE BORE		54mm 2.125”	80mm\102mm 3.25”\4.08”	80mm\102mm 3.25”\4.08”	80mm\102mm 3.25”\4.08”
	BAR CAPACITY		52mm 2”	78mm\100mm 3”\4”	78mm\100mm 3”\4”	78mm\100mm 3”\4”
	SPINDLE TAPER		MT-6	MT-6 \MT-8	MT-8 \MT-10	MT-8 \MT-10
	SPINDLE SPEED	HIGH	600-3000	140-2000	140-2000	140-2000
		MED	200-1300	50-850	50-850	50-850
		LOW	50-450	30-300	30-300	30-300
TRAVEL	CROSS TRAVEL		180mm 7”	200mm 8”	200mm 8”	200mm 8”
	LONGITUDINAL TRAVEL		500\750\1150 29.5”\30”\45”	500\900\1150\1650 20”\35.5”\45”\65”	500\900\1150\1650 20”\35.5”\45”\65”	500\900\1150\1650 20”\35.5”\45”\65”
FEEDS	MAX. RAPID TRAVERSE		6.6 M/min 260 IPM	6.6 M/min 260 IPM	6.6 M/min 260 IPM	6.6 M/min 260 IPM
	MAX FEED RATE		2 M/min 80 IPM	2 M/min 80 IPM	2 M/min 80 IPM	2 M/min 80 IPM
MOTORS	SPINDLE MOTOR		12.5 HP	12.5 HP	15 HP	15 HP
	SERVO MOTOR		2.1 Nm\4.5 Nm	2.1 Nm\4.5 Nm	2.1 Nm\4.5 Nm	2.1 Nm\4.5 Nm
	HYDRAULIC PUMP		2 HP 1.5 KW	2 HP 1.5 KW	2 HP 1.5 KW	2 HP 1.5 KW
	LUBRICATION PUMP		100Watts	100Watts	100Watts	100Watts
	COOLANT PUMP		1/8 HP	1/8 HP	1/8 HP	1/8 HP
BED	WIDTH		305 MM 12”	330 MM 13”	330 MM 13”	330 MM 13”
TAILSTOCK	QUILL DIAMETER		54 MM 2”	75 MM 3”	75 MM 3”	75 MM 3”
	QUILL TRAVEL		130 MM 5”	150 MM 5.8”	150 MM 5.8”	150 MM 5.8”
	QUILL TAPER		MT-4	MT-5	MT-5	MT-5
MACHINE	NET WEIGHT	KGS	1800\2000\2200	2100\2400\2600\3200	2150\2450\2650\3250	2200\2500\2700\3300
		LBS	3960\4400\4840	4620\5280\5720\7040	4730\5390\5830\7150	4840\5500\5940\7260

SECTION 3

Machine installation

Leveling

All machines are recommended to be bolted to the floor. This is done by cutting holes in the floor under each leveling pad and then grouting “J” bolts that pass through the leveling screws. Prior to setting the machine on the floor, install leveling pads on the underside of the leveling bolts. For proper operation the machine should be set on a substantial floor capable of supporting a uniform pressure of 50 P.S.I. After the machine is in position, it must be leveled by adjustment of the leveling bolts. Use a precision level placed on the cross slide, with the X and Z-axis in approximately the Center of travel. Adjust the outside 4 leveling bolts to obtain optimum level. Then move the Z axis along the travel and adjust the level to make the headstock and tailstock the same height. When that is done you will need to check the X-axis at both ends of travel to remove any twist in the lathe bed. The process will have to be repeated several times to obtain optimum level. Remember cast iron moves. The machine may have to sit for a couple of days in order for it to settle after shipping if it was not bolted down.

Power supply

A fused branch circuit disconnect must be provided in front of the machine. All machines have a nameplate on the electrical cabinet with the rated horsepower and current. AC power wiring must be consistent with any local codes, national electric codes and be able to withstand the voltage and current ratings applied. It is suggested that the cable entrance to the electrical cabinet on the machine is at the side or bottom of the cabinet in order to prevent coolant and oils from contaminating the electrical enclosure.

Grounding:

The 3-phase AC supply MUST be bonded to EARTH GROUND. Figure 3-1 shows the most common transformer secondary winding configurations, but not all possibilities, as there are too many transformers to depict all combinations.

Note 1: Failure to reference the secondary winding to EARTH GROUND could void warranty.

Note 2: Some types of delta wound transformers may cause problems with inverter drives.

Check incoming voltage on the three-phase supply before turning on the machine. See Powering Up The Control later in this section.

The machine must be securely bonded to earth ground. Conduit ground is not acceptable. The ground conductor must be equivalent in cross sectional area to the supply conductors minimum #8 AWG and have a green / yellow jacket or bare wire. The ground resistance must not exceed 4 ohms

Grounds are provided for two reasons:

1. Establish a low impedance path between the equipment enclosure and other material parts of the system for the protection of personnel against electrical shock in the event of an electrical failure in the machine electrics.
2. Establish a neutral reference common to all voltage sources in the system for the protection of electronic equipment against interference generated both in the machine itself and in electrical equipment in the vicinity of the machine. This interference may cause damage and / or defective operation of the equipment.

In as much as safety requirements may vary with geographic location, be sure to consult the local governing Codes, which take precedence over the following guidelines that are, in general, considered practical. These guidelines are based on the following references:

National Electrical Code 1975

California "Electrical Safety Orders" 1967

Pennsylvania "Electrical Safety Regulations" 1965

Typical earth ground effectiveness:

1. Continuous copper water pipe.	Properly buried length, depending on condition of soil. Installed below permanent moisture level. (Impedance typically 3 ohms)
2. Man-made buried electrodes	Properly installed length depending on condition of electrodes Soil. Installed below permanent moisture level. (Impedance typically below 5 ohms)
3. Other available electrodes	Such as metal frames of buildings must be well chosen and tested that they do not exceed 5 ohms.

Ground connections, wire and electrodes should not exceed 5 ohms, as measured from the equipment ground stud through the primary electrode, through earth, to another independent electrode separated by 20 feet of earth. Additional ground should be installed when necessary to insure that the impedance does not exceed 5 ohms. The ohmic measurement should be made in terms of a voltage-current relation, such as the current of a 120-volt, 100watt light bulb. When longer lengths of ground conductor are required, use a larger size cable, so that the total resistance of the cable is less than 0.075 ohms.

Multi tap isolation transformers

An isolation transformer is completely different then an autotransformer. The difference is that in isolation transformers there are six sets of windings whereas an autotransformer only has three sets of windings. Because of this there is no means of surge protection or power balancing. In an isolation transformer the first three sets of windings are only used by the primary side (incoming power) and the second set of windings are used on the secondary side (outgoing power) this is done in order to generate clean balanced power. As the two sets of windings are not connected by any means. With using the two sets of windings in this manner you get a buffering effect between the in coming power and outgoing power. Spikes generated in the power lines will be absorbed in the windings by a fair amount.

The following will explain the basics of reading the nameplate and connecting an isolation transformer. See figure 3-1.

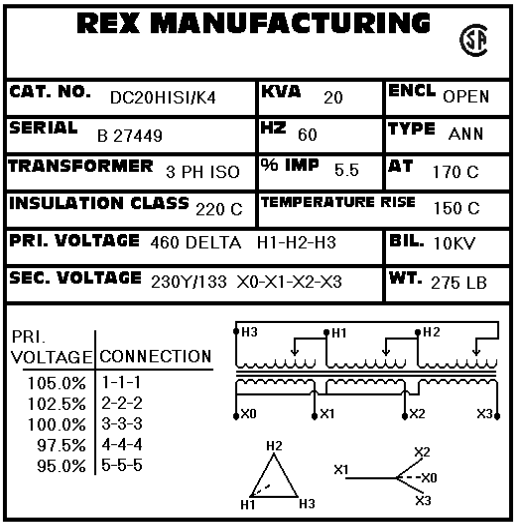

FIGURE 3-1

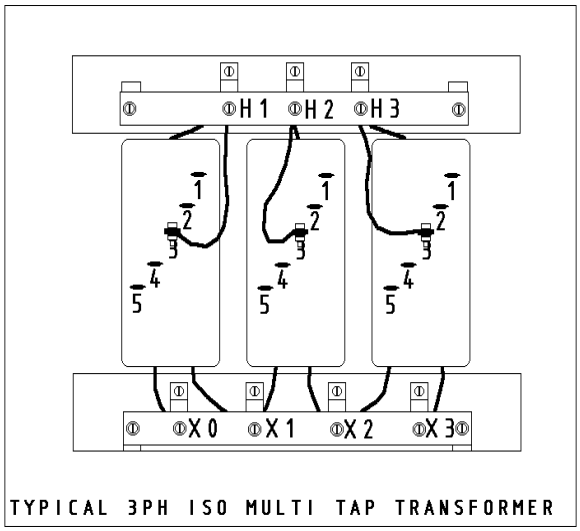

FIGURE 3-2

Please note the following on the nameplate you will find **PRI. VOLTAGE** this is the incoming power from the building on this e.g., it is **460 V DELTA H1-H2-H3,** the H1, H2 and H3 represent that the incoming 3PH get connected to the terminal blocks with these labels. See figure 3-2.

Below this you will find **SEC. VOLTAGE** this is the out going power to the machine tool **230Y/133 X0-X1-X2-X3,** the X1, X2 and X3 represent that the outgoing 3PH get connected to the terminal blocks with these labels. See figure 3-2. The X0 terminal block gets connected to ground this is called referencing the transformer to ground, which balances the three phases by making each line the same voltage. This is a very important part of any CNC machine tool installation. With out grounding the X0 you will be asking for all types of problems. If a customer has a machine that is acting funny but you can't find any problem you will most likely find the X0 is not connected to ground.

Below this you will find the Multi tap specifications. In this example the Pri. Voltage has 5 different input adjustments. They are 105.0%, 102.5%, 100.0%, 97.5% and 95% this means if your incoming power is not exactly 460 Volts you can adjust the output of the transformer by changing the taps, below is a table for this example.

Input Voltage	Percentage	Connection Taps
483V	105.0%	1-1-1
471V	102.5%	2-2-2
460V	100.0%	3-3-3
448V	97.5%	4-4-4
437V	95.0%	5-5-5

In order to make this adjustment if you refer to figure 3-2 you can see the multi taps located on the main body of each winding. There are three different wires going to the rings that are mounted on each winding. Each ring is labeled with numbers and you must move these wires to the corresponding number. For this example you have 480V incoming to the transformer, so you must move the wires to the rings labeled 1 on each winding. Now the incoming power is 480V and by using the multi taps we can adjust the transformer to output 230V. If you input 480V to this transformer and didn't adjust the multi taps then the transformer would output 241V to the machine, which is too high and may cause problems.

The last part of checking the power going to the machine is to check the line voltage to the machine by comparing the line voltage of each leg of power. This is done by using your meter and checking each phase to ground. If the transformer is grounded correctly then each phase to ground should be with in 5 Volts.

Air supply

The machine requires a ½" supply line direct from the compressor or from a main header supply capable of supplying a steady 90 PSI. at 3 CFM. for maximum operation of the automatic chuck clamping unit.

Powering up control

When you are ready to power up the control for the first time you must make the following checks.

1. Incoming power: check that the incoming power is within the following tolerance:

   For 230V machines the incoming voltage must be between 220V- 240V

   For 460V machines the incoming voltage must be between 440V- 480V

2. Control Transformer: check that the control voltage is between 110V-120V. You can adjust the output voltage by changing the input taps on the transformer.
3. 5V DC power: check the 5V DC supply to the control. This can be done by removing the cover on the console and measuring the 5V DC plug on the hard drive mounted to the side of the monitor. The tolerance of this voltage is 5.0V-5.2V. If you need to adjust the voltage you will find the power supply mounted inside the electrical cabinet on the right side wall. Note: There are three supplies; the supply for the 5V DC to the control is mounted on the top and it supplies 5V DC, +15V DC and –15V DC to the computer. Make the required adjustment using the adjustment pot.
4. Check the axis drive setup and tuning. See section 4 Maintenance under Axis Drive Setup and Tuning.

Additional devices

If additional devices are to be mounted and driven off the machine supply, make sure they are suppressed in accordance with Anilam's requirements as described in their installation manual.

We only recommend these modifications be done by trained service engineers familiar with the Anilam controls.

SECTION 4

Maintenance

Below are two drawings to be used to identify different parts of the machine. By using the recommended maintenance schedule listed below you should be able to keep your machine operational for years of service.

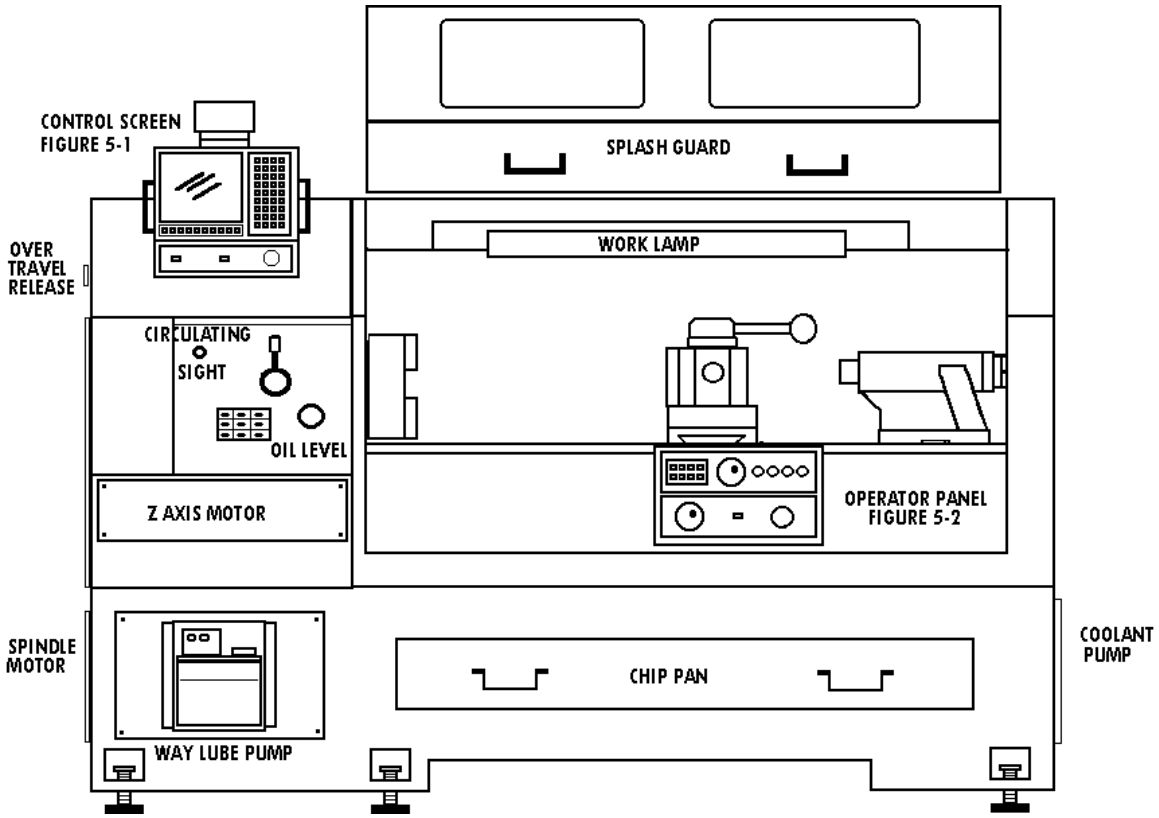

Figure 4-1

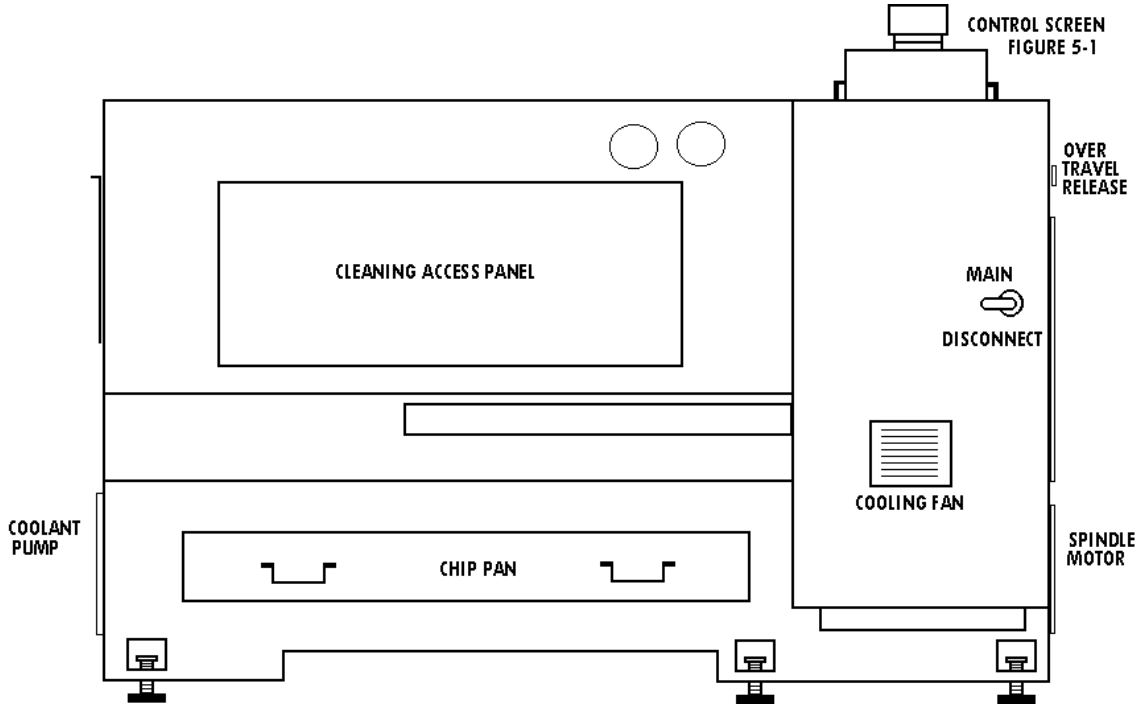

Figure 4-2

Daily:

1. Check and fill way lube.
2. Check and fill airline oil. Be sure to use air tool oil (if equipped).
3. Drain water from catcher (if equipped).
4. Clean off limit and over-travel switches.

Weekly:

1. Check and fill way lube.
2. Check and fill airline oil. Be sure to use air tool oil (if equipped).
3. Drain water from catcher (if equipped).
4. Clean off limit and over-travel switches.
5. Clean the cabinet filters.
6. Check all cabinet fans.
7. Check the coolant system and clean out sludge.

Monthly:

1. Check and fill way lube.
5. Check and fill airline oil. Be sure to use air tool oil (if equipped).
2. Drain water from catcher (if equipped).
3. Clean off limit and over-travel switches.
4. Clean the cabinet filters.
5. Check all cabinet fans.
6. Check the coolant system and clean out sludge.
7. Grease hydraulic chuck (if equipped).
8. Clean chips from turret (if equipped).
9. Check for water in air cylinders (if equipped).
10. Check way lube delivery to axis slides.
11. If necessary remove way wipers and clean. Do not allow contaminants to get under slides.

Twice yearly:

1. Check and fill way lube.
2. Check and fill airline oil. Be sure to use air tool oil (if equipped).
3. Drain water from catcher (if equipped).
4. Clean off limit and over-travel switches.
5. Clean the cabinet filters.
6. Check all cabinet fans.
7. Check the coolant system and clean out sludge.
8. Clean all cabinet fans.
9. Clean chips from turret (if equipped).
10. Check for water in air cylinders (if equipped).
11. Drain and refill the headstock oil.
12. Check way lube delivery to axis slides.
13. If necessary remove way wipers and clean. Do not allow contaminants to get under slides.
14. Clean machine top to bottom.
15. Check cable carriers for signs of chafing or pulling of cables and hoses.
16. Adjust gibs where necessary.

17. Check machine level and tighten hold down bolts where necessary.
18. Check electrical connections and plugs.
19. Grease the power chuck (if equipped).

Automatic way lubricator

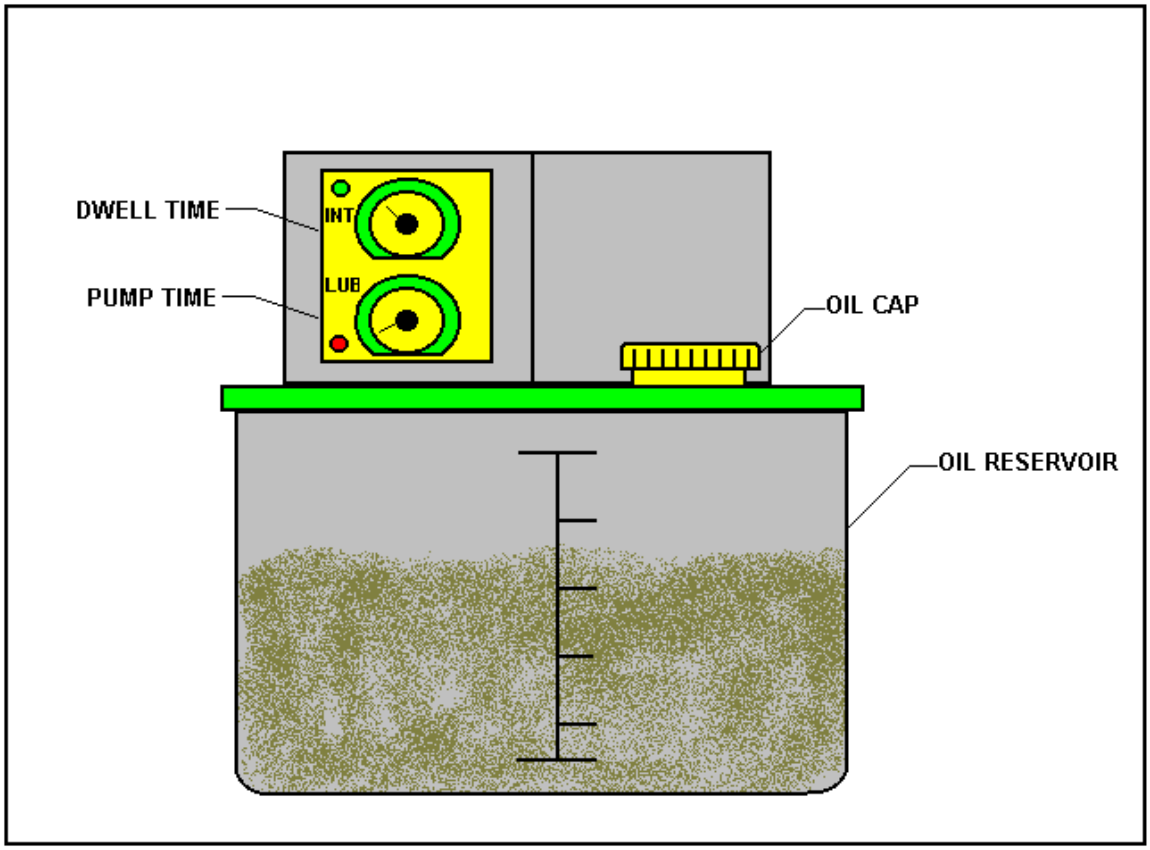

figure 4-3

A lubricator located at the front of the machine (figure 4-1) automatically lubricates ball screw nuts and way surfaces at timed intervals. (Figure 4-3) The following are the recommended factory settings. Pump time should be set to 10 Seconds, and the dwell time set to 30 minutes. The only adjustment should be made to the dwell time interval, for more oil decrease the dwell time or for less oil increase the dwell time.

Regularly inspect the ways to insure that the slide-ways always have a film of oil. If the lubricant in the reservoir is not replenished, a level switch will automatically disable the automatic mode of the machine and display an alarm message. It is recommended that the lubrication be topped up every eight hours. A lubricant with a viscosity of 300 - 350 SUS at 100°F is recommended. (See oil chart) Ball-screw bearings are pre lubricated with grease and sealed, so require no additional lubrication.

Headstock gear box

The headstock uses a re-circulating pump that is always circulating the oil in the headstock. There is an oil level and circulating sight mounted in the front of the headstock (figure 4-1). The recommended oil is a high grade S.A.E. No. 30. The headstock gearbox oil must be drained and flushed after the first 150 hours of operation. A small percent of kerosene may be added to the gearbox to flush out dirt and sediment. Operate the spindle for several minutes with out load so that the flushing oil can circulate through the reservoir and remove the dirt. The flushing oil must then be drained and new oil added. Do not flush with solvents. Thereafter, the oil should be flushed and drained every 1000 hours of operation.

Hydraulic oil

For satisfactory operation of the chucking cylinder it is recommended to use hydraulic oil whose viscosity is 30~50 SUS at 100°F is recommended. Equivalent to ISO VG32 and VG46. The hydraulic oil should have anti-abrasive and anti-foaming characteristic, in order to retain good performance of the chucking cylinder.

Oil chart

Company	Head stock	Way lube	Hydraulic	Coolant
Oil type	S.A.E. No. 30	S.A.E. No. 68	S.U.S. No. 32	Semi-Synthetic
Sunoco	SUNEP 100	WAY LUBE 68	SUNVIS 832	N\A
Shell	OMALA 100	NONNA T68	TELLUS 32	DROMAS B
Esso	SPARTAN P100	FEBIS K68	NUTO H32	EXXCOOL 2000
Mobil	GEAR 627	VECTRA # 2	DTE 24	N\A

Axis Drive Setup and Tuning

The following will explain how to set up and tune the axis drives. There are four basic steps to follow laid out below.

1. Balancing the DSP board;

   In order to balance the DSP you must open the cover on the computer and have the control powered up and in the main CNC screen with the EMG stop pushed in.

   Then you must find and disconnect the command signal wire going to each of the drives. These wires are connected to the 24-pin connector on each drive, Pin 1 and 2. Please note which wire colour goes to these pins, as it is very important to reinstall these wires in the correct place as this determines the motor direction.

   Then attach your meter to these wires and adjust the DSP pots until the voltage is 0VDC. Repeat for each drive. When you are finished replace the command signal wire.

2. Balancing the axis drive card;

   On the control you must go to the **motion setup\Testing** utility then repeat the following for each axis drive.

   Select the axis drive you are going to set by pushing the drive letter on the keypad. Then push the soft key F6 for balance test, at this point you will be asked for the password, enter the password then push enter, then push the cycle start button.

   At this point the selected axis will display four digits beside it. Now adjust the pot on the drive card labeled ZERO until the display reads zero, when the drive is adjusted push the soft key F4 Manual, to cancel the test.

3. Balancing and setting the drive speed;

   On the control you must go to the **motion setup\Testing** utility then repeat the following for each axis drive.

   Select the axis drive you are going to set by pushing the drive letter on the keypad. Then push the soft key F7 for signal gain test, at this point you will be asked for the password, enter the password then push enter. Enter a time, we use 2 sec. then push the cycle start button.

   At this point the selected axis will begin moving back and forth. You will see a display beside F located between RPM and DWELL. Now adjust the pot on the drive card labeled SPEED until the display reads 26.000, then adjust the AC gain pot until the rise time is between 11 – 14 and the overshoot is between 1.0 – 1.5% you can use the DC gain pot to balance the over shoot in both directions.

Check the torque and O.L. pots and make sure they are both set to the maximum (full CW). When the drive is adjusted push the soft key F4 Manual, to cancel the test.

4. Tuning the motor gains;

   On the control you must go to the **motion setup\Testing** utility then repeat the following for each axis drive.

   Select the axis drive you are going to set by pushing the drive letter on the keypad. Then push the soft key F8 for Tuning gain test, at this point you will be asked for the password, enter the password then push enter, then select tuning setup enter YES for all parameters (Ki, Kd, all axis, match lag). Press F10 to exit setup.

   Press F8 again and select tuning test, enter 2 for Kp ovs%, 1 for Kd ovs% and 5 for Kp min. At this point the control will test cycle all axis. When the test has finished press F8 for tuning. Select save results to feed table only. Do not use these values for rapid gain, as it will overheat the drives.

SECTION 5

Trouble shooting

Can I/O testing

The CAN I/O Test facility provided in the CNC makes the trouble-shooting of the Can Nodes very easy and efficient. This test utility helps to trouble-shoot problems with all Can Nodes on the machine tool.

From the boot up menu select **MOTION SETUP/TESTING** then select the **CAN TEST** soft key. Below are the conditions you should see when all operations are normal.

POWER ON STATUS WITH EMERGENCY STOP PUSHED IN

Estop	Will not be highlighted.
SvOn	Will be highlighted.
+24	Will be highlighted.
SvoEn	Will not be highlighted.

POWER ON STATUS WITH EMERGENCY STOP PULLED OUT AND SERVO'S OFF

Estop	Will be highlighted if the Emg. Stop switch is working.
SvOn	Will be highlighted.
+24	Will be highlighted.
SvoEn	Will be highlighted if all elements of the Emg. Stop loop is closed.

POWER ON STATUS WITH EMERGENCY STOP PULLED OUT AND SERVO'S ON

Estop Will be highlighted if the Emg. Stop switch is working.

SvOn Will not be highlighted if the reset is seen by the CNC.

+24 Will be highlighted.

SvoEn Will be highlighted if all elements of the Emg. Stop loop is closed.

IPI Monitor

The IPI monitor is a diagnostic tool used to view the current state of the different registers used to run the machine. To access the IPI monitor screen when the control is in manual mode, press the letter P on the keypad then push enter. Below is a break down of the screen and how to interpret the information.

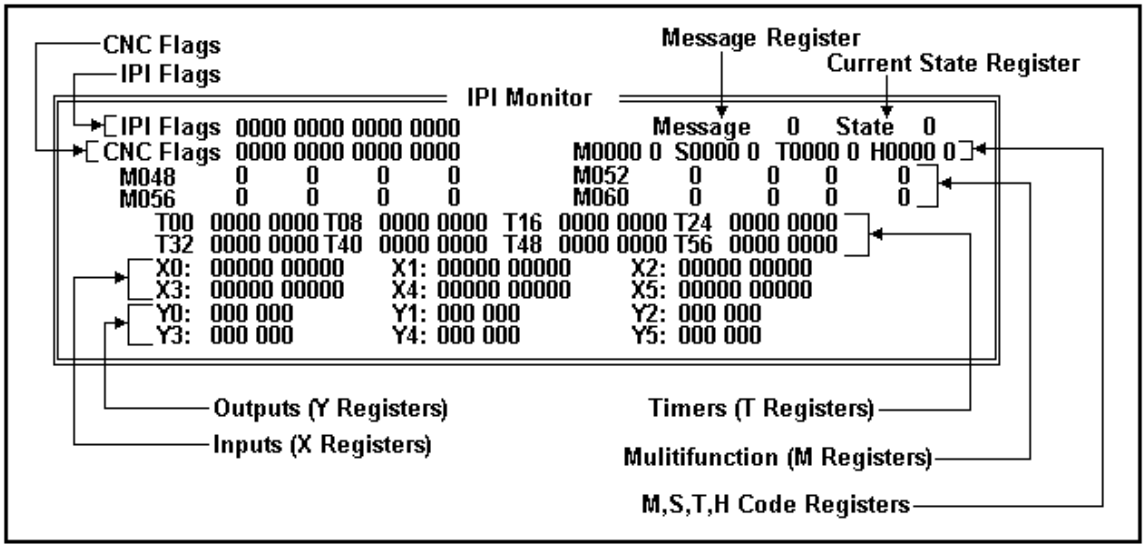

Figure 4-4

The following will explain how to read the IPI monitor screen.

IPI Flags are signals that are sent from the IPI program to the CNC control.

CNC Flags are signals that are sent from the CNC control to the IPI program.

Message Register will display the current message that is active. If the field next to the word Message is 0 then there are no active messages. If there is a number value in this field then the IPI has generated this message to be displayed. All messages are given a numeric value in the builders message setup.

Current State Register will display the current register's value.

M, S, T, H Code Registers this group of registers show the current M Codes, S Codes, T Codes and H Codes.

For example, when a command is given to the CNC control to start the spindle you command M3. The control will send the command to the IPI. At this point the command will be displayed on the screen as M0003 1. This shows that the IPI is executing the command. When the IPI is finished the command, it will clear the register. So for this example you will see the M0003 1 on the screen until the spindle starts and achieves the RPM it was commanded to run at.

The same is true for all other codes. If the command cannot be executed with in the preset time allowed in the setup utility you will get the alarm “TIME OUT IN FINISH SEQUENCE” If you do get this alarm by viewing the IPI monitor you can see the command that is not being completed.

Multifunction (M Registers) are the registers that are used in writing the IPI program. Our IPI program will always have a value in the M64. This value will be the current IPI revision. These registers are laid out in the following format.

M64 0 0 0 0 M68 0 0 0 0

The first value is register M64, the second is M65, the third is M66 and the fourth is M67 the same applies for the next set of registers, M68, M69, M70 and M71.

Timers (T Registers) are the state of all the timers used by the IPI. These registers are laid out in the following format.

T00 0000 0000 T08 0000 0000

The first value is timer T0 the second is T1, the third is T2 and the fourth is T3 the same applies for the next set T4, T5, T6, T7 and so on.

Inputs (X Registers) are the state of all the inputs that are inputted to the IPI via the Can Nodes. These registers are laid out in the following format.

X0: 00000 00000 X1: 00000 00000 X2: 00000 00000

Can Node number 0											Can Node number 1										
#	Input number										#	Input number									
0	0	1	2	3	4	5	6	7	8	9	1	0	1	2	3	4	5	6	7	8	9
	Input state											Input state									
X0:	0	0	0	0	0	0	0	0	0	0	X1:	0	0	0	0	0	0	0	0	0	0

The above table is a break down of the input registers.

Outputs (Y Registers) are the state of all the outputs that are outputted to the Can Nodes via the IPI. These registers are laid out in the following format.

Y0: 000 000 Y1: 000 000 Y2: 000 000

Can Node number 0							Can Node number 1						
#	Output number						#	Output number					
0	0	1	2	3	4	5	1	0	1	2	3	4	5
	Output state							Output state					
Y0:	0	0	0	0	0	0	Y1:	0	0	0	0	0	0

The above table is a break down of the output registers.

Cutting problems

The chart below provides a quick reference for troubleshooting cutting problems.

PROBLEM	PROBABLE CAUSE	CORRECTION
Vibration	Loose leveling screws	Re level machine
	Damaged drive belts	Replace drive belts
	Work or chuck out of balance when operating at high speed	Correct balance or reduce speed
Chatter	Tool bit chipped or not on center	Change insert or adjust tool height; avoid extreme negative rake
	Tool overhang too great	Keep overhang to a minimum or reinforce the tool for maximum rigidity
	Using improper feeds and or speeds	Check with the manufacture of the tooling for feed and speed specifications
	Gib of cross slide loose	Adjust gibs
	Work improperly supported	Adjust tailstock center, use steady rest or follow rest for long, slender shafts; minimize tailstock quill extension
	Spindle bearings worn or loose	Adjust spindle bearing preload
Work not turning straight	Bed not level	Re level machine
	Work improperly supported	Use steady rest or follow rest; reduce overhand from chuck, headstock or tailstock.
	Tailstock and/or headstock not aligned	Align tailstock
Work out of round	Work loose between centers	Adjust tailstock center
	Centers excessively worn, work centers out of round	Regrind centers; lap work centers
	Loose spindle bearings	Adjust spindle bearings

SECTION 6

Machine operation

Powering up the control

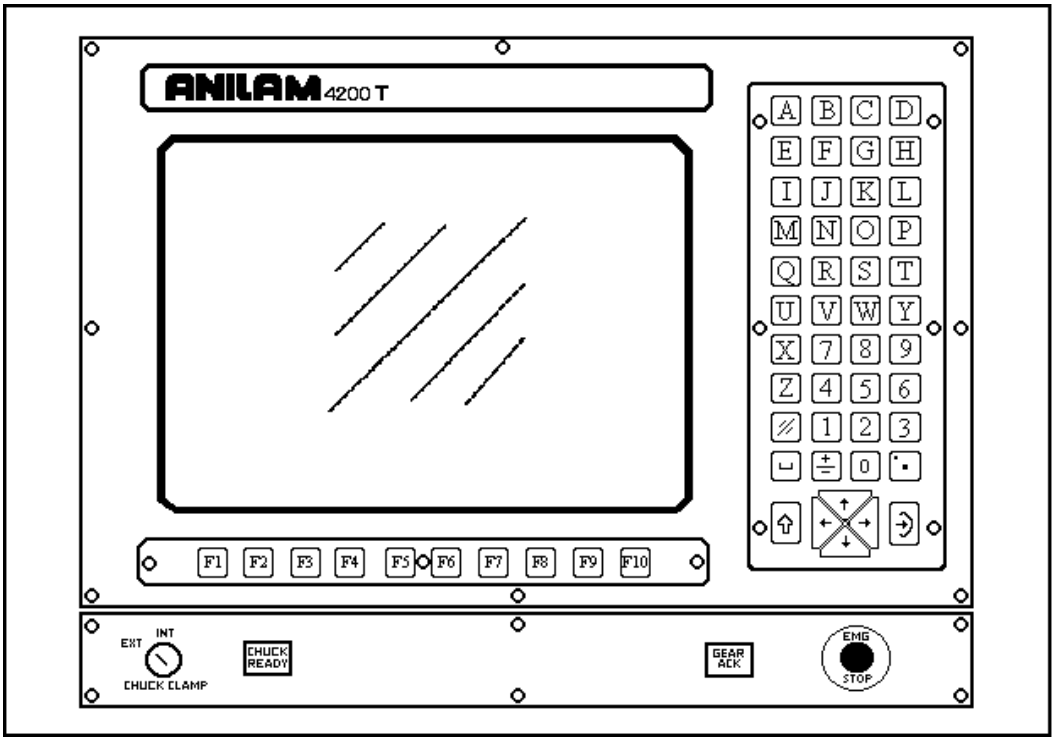

Figure 5-1

Power on

Turn on the main disconnect on the rear of the machine. (Figure 4-2) After the computer has booted up the software version screen will appear. (See figure 5-1) Push F10 (Soft-key 10) to continue. Then a selection menu is displayed on the screen, with the cursor keys, highlight CNC Control and push ENTER starts CNC software. Release the E-STOP push button and push Servo Reset.

Power off

Push E-Stop. Wait for all functions in the machine to stop and then turn off the main disconnect on the rear of the machine.

Note:

The F1 (Soft-key 1) on most screens is reserved for the HELP function.

The HELP key when pressed, will give detailed information on the functions and all soft keys available in the particular mode of operation that the HELP key was entered into from.

Manual operation

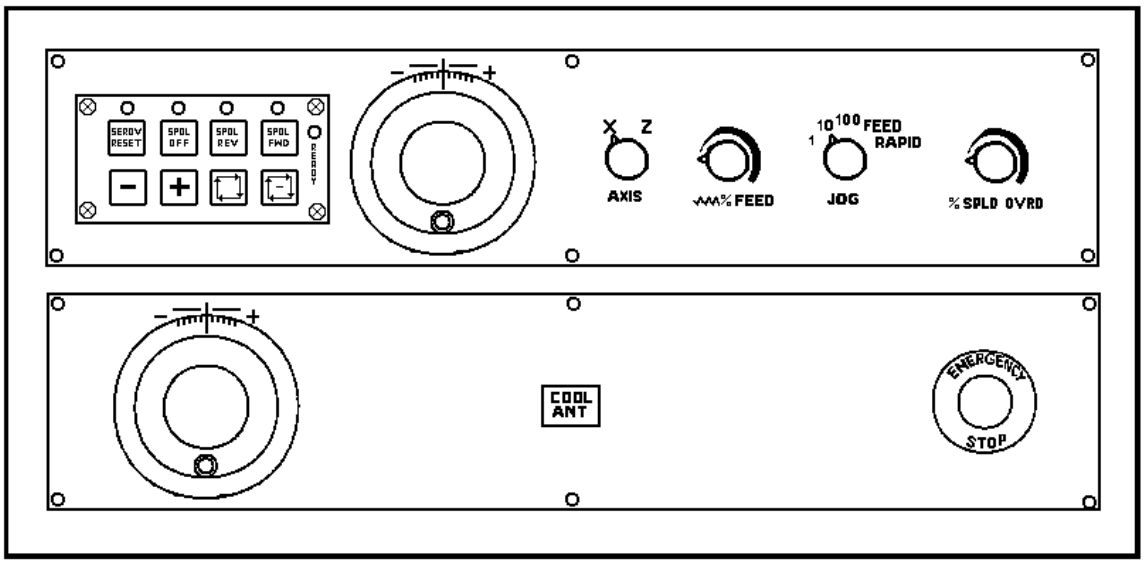

Figure 5-2

Homing

When at the main CNC screen push the shift key a new set of function keys will be displayed. Select HOME, All axis will be homed with the X-axis homing first. Or at the command line type “G28 X Z” then push cycle start. (See figure 5-1)

Feed

Set the jog selector switch on the operator panel (see figure 5-2) to FEED and the axis selector switch to the axis to be jogged then use the + / - keys to jog the axis. The % Feed override selector switch will modify the feed rate

Rapid

Set the jog selector switch on the operator panel (see figure 5-2) to RAPID and the axis selector switch to the axis to be jogged then use the + / - keys to jog the axis. The % Feed override selector switch will modify the feed rate.

Hand wheels

Select Hand-wheel (F10) from the soft-keys below the screen (see figure 5-1), If the machine is supplied with two hand wheels, then you only have to select the increment value from the operator panel using the jog selector switch and use the top hand wheel mounted on the operator panel for X axis and the lower hand wheel for Z axis. (See figure 5-2) If the machine was supplied with one hand wheel then you must select the axis and the increment value from the operator panel and use the hand-wheel to move the axis. The newer hand wheel supplied has on board axis selector switches so you are not require to use the manual panel.

Incremental jog

Select an increment value from the jog selector switch (see figure 5-2), and the axis to be jogged. Each time the + / - button is pressed the axis will move in the selected direction by the increment value selected. The % Feed override selector switch will modify the feed rate. (See figure 5-2).

Note: The incremental values are as set out below

100X = 0.0100” or 0.100 mm

10X = 0.0010” or 0.010 mm

1X = 0.0001” or 0.001 mm

The units are either inch or metric depending on the mode the control is in at the time of operation.

Over travel release

If for any reason the machines axis are driven past the soft limits in to a hard over travel, the servos will become disabled. At this point the only way to reset the servos, in order to jog the axis off the hard limit switches is to use the Over travel release button. The over travel release button is located on the end of the electrical cabinet. See figure 4-1, 4-2. The operator must have another person push and hold the button, and then reset the servos and carefully jog the axis off the hard limit switch before they release this button. This must be done with extreme caution, as the over travel release disables the protection given by the hard limit switches.

MDI operations

In the Manual mode certain functions can be executed without creating a part program. Commands are executed by typing an instruction on the COMMAND line of Manual Mode then pressing the CYCLE START key. Most programmable functions may be executed in this manner, but only one at a time. For more information on MDI operations please read the Anilam 4200T Programming manual

Spindle

In order to run the spindle you must first program and select a gear range M41-Low speed, M42-Meduim speed, and M43-High speed. Enter a spindle speed range by using either a G97 direct spindle speed or G96 constant surface speed. Then by entering a speed command S10 to S2000 being the top speed of the lathe. You will find this on the gear range nameplate on the headstock. Then enter the direction of rotation M3 (C.W) or M4 (C.C.W.) on the COMMAND line and push the CYCLE START key. The spindle may be stopped and started in both C.W and C.C.W. from the operator panel by pushing the SPDL STOP, SPDL FWD and SPDL REV push buttons. The % SPDL override selector switch on the Operator panel will modify the spindle speed (see figure 5-2)

Below are examples for programming spindle speeds.

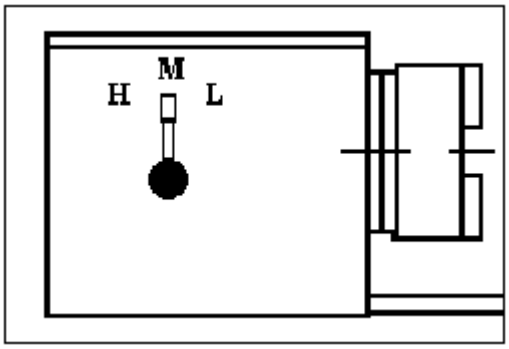

Figure 5-3

First example is to run the spindle C.W. at 200 RPM with direct spindle speed in low gear.

You must first select a gear range. Type the following at the command line.

M41 Then push CYCLE START a message will prompt you to select the low gear, At this point you must move the gear range lever to low gear (see figure 5-3) and then push the GEAR ACK button (see figure 5-1) in order for the control to know that the gear has been selected.

Then give direct speed and RPM. Type the following at the command line.

G97 S200 When you push CYCLE START the control is ready to run the spindle at 200 RPM.

Then give spindle direction. Type the following at the command line.

M3 When you push CYCLE START the spindle will rotate in the C.W. direction.

Then to stop the spindle. Type the following at the command line.

M5 When you push CYCLE START the spindle will stop and the gear range will remain active until another gear command is given.

This example is to run the spindle C.C.W. at 450 SFM with Constant Surface Speed in medium gear. Please note that in order for Constant surface speed to work correctly you must have an active tool with the correct tool length offset.

You must first select a gear range. Type the following at the command line.

M42 When you push CYCLE START a message will prompt you to select the medium gear, At this point you must move the gear range lever to medium gear (see figure 5-3) and then push the GEAR ACK push button (see figure 5-1) in order for the control to know that the gear has been selected.

Then give a maximum RPM that you want to limit the spindle to. Type the following at the command line.

G24 S2000 When you push CYCLE START the control will limit the spindle to run no faster then 2000 RPM.

Then give Constant surface speed and SFM. Type the following at the command line.

G96 S450 When you push CYCLE START the control is ready to run the spindle at 450 SFM Constant Spindle Speed

Then give spindle direction. Type the following at the command line.

M4 When you push CYCLE START the spindle will rotate in the C.C.W. direction.

Then to stop the spindle. Type the following at the command line.

M5 When you push CYCLE START the spindle will stop and the gear range will remain active until another gear command is given.

For all other operations of the machine and programming refer the Anilam programming manual supplied with your machine.

Automatic chuck

Presently your machine can be ordered with either a hydraulic or pneumatic chuck. Both types of chucks are setup to function in the same way. Please see below for operation instructions.

Your machine will have a chuck internal or external key switch (see figure 5-1). This key switch is used to tell the control if you are setting up for internal or external chucking, as this will change the state of the chuck in the clamped or unclamped position. There is also a chuck ready lamp to let you know when the CNC thinks the chuck is clamped, Thus O.K. to run the spindle. The spindle will not run when the chuck is in the unclamped position and the chuck ready lamp is not on.

There will be a chuck foot switch, used to manually cycle the chuck clamped or unclamped. If the machine splashguard is closed or the spindle is running it will lock out the foot switch. This is done to prevent the chuck from being cycled by accident when the guard is closed or running. There are also M-codes for use in a program to command the chuck to clamp and unclamp. These M-codes will work with the guard closed but not when the spindle is running. See M-code list.

With any automatic chuck you are required to adjust the chucking cylinder pressure for each application to give the proper gripping force for each setup. This may be maximum gripping force on a solid part or minimum force to prevent crushing a thin wall part. Please see below on how to adjust the pressure, as well please see the chart that shows the different pressure setting for each type of chuck.

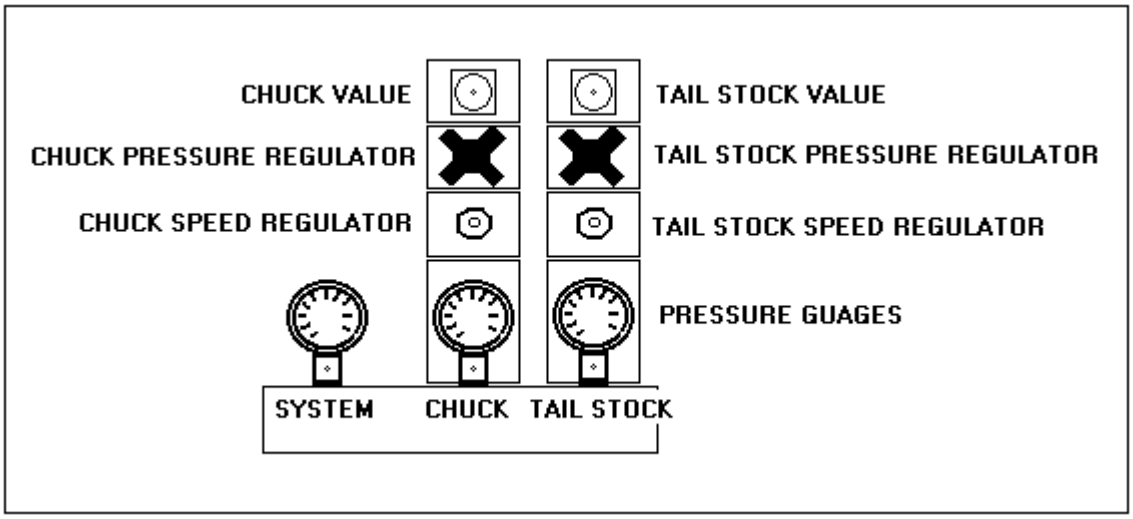

Figure 5-4

- If you have a hydraulic chuck, please see figure 5-4 there will be two pressure gauges on the hydraulic system. One of the gauges is for system pressure and the other gauge will be for chucking pressure. Adjust the pressure until the required gripping force is achieved.
- If you have both a hydraulic chuck and a hydraulic tailstock, there will be three pressure gauges on the hydraulic system. One of the gauges is for system pressure and the other two gauges will be for chucking pressure and tailstock pressure. Adjust the pressure until the required gripping force is achieved.
- On a pneumatic system you will find an air pressure regulator for adjusting the chucking cylinder pressure. Adjust the pressure until the required gripping force is achieved.

Specifications of factory equipped Strong chucks

Item / Model	Unit	N-205	N-206	N-208	N-210	N-212	N-215
Wedge plunger stroke	mm	10	12	16	19	23	23
	Inch	0.394”	0.472”	0.630”	0.748”	0.906”	0.906”
Jaw stroke	mm	5.4	5.5	7.4	8.8	10.6	10.6
	Inch	0.212	0.216	0.292	0.347	0.417	0.417
Maximum operating force	KN	17.5	21.5	34.3	44.1	56.9	71
	Kgf	1,784	2,200	3,500	4,500	5,800	7,240
	lbs/f	3,933	4,850	7,716	9,920	12,786	15,961
Maximum gripping force	KN	36	51	88	107	147	180
	Kgf	3,671	5,200	9,000	11,000	15,000	18,355
	lbs/f	8,093	11,464	19,841	24,250	33,069	40,465
Maximum pressure	Mpa	2.9	2.8	2.6	2.7	2.7	2.3
	Kgf/cm2	29.6	28.5	26.5	27.5	27.5	23.5
	psi	420	405	377	390	390	335
Maximum Speed	R.P.M.	7000	6000	4900	4100	3400	2500
Open center	mm	33	45	52	75	91	117.5
	Inch	1.300	1.773	2.048	2.955	3.585	4.629
Maximum gripping diameter	mm	135	169	210	254	304	381
	Inch	5.319	6.658	8.274	10.007	11.977	15.011
Weight	Kg	6.2	13.2	22.45	34.6	63.2	120
	Lbs	14	30	50	76	139	264
Matching cylinder	Model Number	M 1036	M 1246	M 1552	M 1875	M 2091	M 2511

Automatic turret

Presently your machine can be ordered with three types of turrets. The first is a Lio Shing hydraulic type, second is a Pragati electric type and the third type is a Duplomatic electric type. All of the above are setup to function in the same way. In order to program the turret to index to the required position you must give the following command Tx (x=position required) this command must be on a block by its self. The command can be used with two digits or four digit numbering. If the following two-digit command is given “T01”, the tool disc on the turret will rotate to the tool #1 position and activate the tool #1 length offset. You can also use a four digit command “T0101” the tool disc on the turret will rotate to the tool #1 position and activate the tool #1 length offset. If for example you want to index the turret but not have a tool offset active (used when setting new tool offsets) you can command “T0100” this will make the tool disc on the turret will rotate to the tool #1 position and activate no tool length offset (cancel tool offset). Or you could command “T0130” this would make the tool disc on the turret will rotate to the tool #1 position and activate the tool #30 length offset. Please see the Anilam 4200T-programming manual.

Automatic tailstock

Presently your machine can only be ordered with a hydraulic tailstock. There will be a tailstock foot switch, used to manually cycle the quill on the tailstock in or out. Adjust the pressure until the required push force is achieved so that the live center can support the work piece. Please note if the pressure is too high it may push the tailstock back, thus you will loose the support given by the live center and the part will come loose.

- If you have both a hydraulic chuck and a hydraulic tailstock, there will be three pressure gauges on the hydraulic system. One of the gauges is for system pressure and the other two gauges will be for chucking pressure and tailstock pressure. Please see (figure 5-4). Adjust the pressure until the required push force is achieved.

M-code list

M00	Infinite dwell	Control waits for cycle start or manual key. Similar to pressing Hold key.
M01 (option)	Optional stop	When the optional stop switch is on the control waits for cycle start or manual key. Similar to M00. If the optional stop switch is off then the control ignores the command.
M02	End of Program	Signals end of program to control. Spindle, and coolant pump turn off.
M03	Spindle forward	Signals the interface to run the spindle drive in the C.W. direction
M04	Spindle reverse	Signals the interface to run the spindle drive in the C.W.W. direction
M05	Spindle stop	Signals the interface to stop the spindle drive.
M08	Coolant on	Signals the interface to start the coolant pump
M09	Coolant off	Signals the interface to stop the coolant and high-pressure coolant pumps.
M10 (option)	Chuck clamp	This tells the interface to close the chuck jaws.
M11 (option)	Chuck unclamp	This tells the interface to open the chuck jaws.
M13 (option)	Chip conveyor on	Signals the interface to turn on the chip conveyor motor
M14 (option)	Chip conveyor off	Signals the interface to turn on the chip conveyor motor
M18 (option)	Second High-pressure coolant pump	Signals the interface to start the optional second high pressure coolant pump
M30	End of program	Signals end of program to control. Spindle, and coolant pump turn off.

M41	Low gear range	A message will prompt you to select the low gear, At this point you must move the gear range lever to low gear and then push the GEAR ACK push button (figure 5-1) in order for the control to know that the gear has been selected
M42	Medium gear range	A message will prompt you to select the medium gear, At this point you must move the gear range lever to medium gear and then push the GEAR ACK push button (figure 5-1) in order for the control to know that the gear has been selected
M43	High gear range	A message will prompt you to select the high gear, At this point you must move the gear range lever to high gear and then push the GEAR ACK push button (figure 5-1) in order for the control to know that the gear has been selected
M91	Maintenance mode on	Maintenance mode is used by train service individuals for debugging control interface problems
M92	Maintenance mode off	See above

Builder alarm list

There are two types of Messages: Error and Warnings. The differences between the two are that an Error message is fatal and a Warning is to inform you that something is wrong and the operator must correct the problem. Generally with an Error Message the machine will come to a complete stop and the problem must get fixed before the machine can run again. Below is a complete list of messages generated by H. H. Roberts and not the messages generated by Anilam for a complete list see the Anilam 4200T-programming manual or call your Dealer.

Error messages

- **SPINDLE DRIVE FAULT MUST RESET SERVO'S**

This fault is generated by the spindle drive. You can reset this error by completely powering down the machine and wait at lest 5 minutes to allow the spindle drive to reset and then power the machine back up and try to run the spindle again. If it will run, you should note what the machine was doing before

the fault in order to avoid the problem again if the problem persists or this will not clear the fault then call your dealer.

- **TURRET UNCLAMPED MUST RESET SERVO'S**

This fault is generated when the turret has not completed the clamping cycle. You can reset this error by powering off the servos and then re-indexing the turret to a different tool position. If this will not reset the turret or the problem persists then call your dealer.

- **TURRET OVERHEAT MUST RESET SERVO'S**

This fault is generated by the turret's motor. There is a thermal sensor in the motor and if the motor temperature gets to high it will trigger this alarm. You can reset this error by completely powering down the machine and wait at lest 15 minutes to allow the motor time to cool off. Then power the machine back up and try to run the turret again. If it will run, you should note what the machine was doing before the fault in order to avoid the problem again. E.G. indexing the turret too much in a short period of time. If the problem persists or this will not clear the fault then call your dealer.

- **LOW HYDRAULIC PRESSURE MUST RESET SERVO'S**

This fault is generated by the hydraulic system pressure switch. If for any reason the main hydraulic pressure drops it will generate this alarm and also stop the spindle. Possible reasons for this alarm are as follows.

1. Hydraulic motor overload tripped or fuses blown.
2. Low oil level in the reserve tank.
3. Clogged pick up filter in the reserve tank.
4. Loose wire on pressure switch.
5. The pressure switch is adjusted to close to the system pressure making any pressure fluctuations trigger a false alarm.
6. Faulty pressure switch.

- **CANNOT START SPINDLE CHUCK OPEN MUST RESET SERVO'S**

This fault is generated when a command is given to run the spindle when the chuck jaws are in the unclamped position.

Warning messages

- **GEAR RANGE NOT SELECTED**

This warning is generated when a command is given to run the spindle and there has been no gear range selected.

- **LOW WAY LUBE**

This warning is generated from the float switch mounted in the lube tank. If the switch is not in the state that the control thinks they should be in it will generate this warning. The following are the conditions that will create this warning.

- **CHANGE TO LOW GEAR THEN PUSH GEAR ACK**

This warning is generated to prompt you to select the low gear. You must complete the following in order to clear this message.

1. Note the GEAR ACK push button will be flashing
2. At this point you must move the gear range lever to low gear
3. Once the lever is moved you then push the GEAR ACK push button

The above steps are necessary, as this series of lathe are not equipped with automatic gear selection.

- **CHANGE TO MEDIUM GEAR THEN PUSH GEAR ACK**

This warning is generated to prompt you to select the medium gear. You must complete the following in order to clear this message.

1. Note the GEAR ACK push button will be flashing
2. At this point you must move the gear range lever to medium gear
3. Once the lever is moved you then push the GEAR ACK push button

The above steps are necessary, as this series of lathe are not equipped with automatic gear selection.

- **CHANGE TO HIGH GEAR THEN PUSH GEAR ACK**

This warning is generated to prompt you to select the high gear. You must complete the following in order to clear this message.

1. Note the GEAR ACK push button will be flashing
2. At this point you must move the gear range lever to high gear
3. Once the lever is moved you then push the GEAR ACK push button

The above steps are necessary, as this series of lathe are not equipped with automatic gear selection.

- **MAINTENANCE MODE ACTIVE**

This warning is generated when the M91 Maintenance Mode is active. To clear this message you must turn off Maintenance Mode by using M92.

- **TURRET MISS INDEX MUST RESET TURRET**

This warning is only generated on machines with automatic turrets. The error is to tell you that the turret has indeed to the wrong tool position. If this is a new installation the most common reason for this alarm is the turret motor is running out of phase. Try reversing the motor direction and indexing the turret again. If

the machine has been in operation then there could be a problem with the encoder position or encoder feed back.

- **NON-VALID TOOL NUMBER**

This warning is only generated on machines with automatic turrets. If a tool call greater then 8 is programmed this warning is generated.

- **SPINDLE IS RUNNING CANNOT CYCLE CHUCK**

This warning is only generated on machines with automatic chucks. If the spindle is running and a command is given to unclamp the chuck this warning is generated.

Maintenance Mode

Maintenance mode is used to set specific registers in the IPI program. These include registers to bypass some alarms. We call these keep relays, presently there are two keep relays; They are H50 for bypassing the Low Coolant alarm and H51 for bypassing the door interlock, to allow the machine to be run for testing or trouble shooting.

H-Code List

H50	Sets ignore coolant low alarm	Can only be used when Maintenance mode active
H51	Sets ignore work door interlock	Can only be used when Maintenance mode active
H81	Displays IPI Registers Range M0-M15	Can only be used when Maintenance mode active
H82	Displays IPI Registers Range M16-M31	Can only be used when Maintenance mode active
H83	Displays IPI Registers Range M32-M47	Can only be used when Maintenance mode active
H84	Displays IPI Registers Range M48-M63	Can only be used when Maintenance mode active
H85	Displays IPI Registers Range M64-M79	Can only be used when Maintenance mode active
H86	Displays IPI Registers Range M80-M95	Can only be used when Maintenance mode active
H87	Displays IPI Registers Range M96-M111	Can only be used when Maintenance mode active

H88	Displays IPI Registers Range M112-M127	Can only be used when Maintenance mode active
H89	Displays IPI Registers Range M128-M143	Can only be used when Maintenance mode active
H90	Displays IPI Registers Range M144-M159	Can only be used when Maintenance mode active
H91	Displays IPI Registers Range M160-M175	Can only be used when Maintenance mode active
H92	Displays IPI Registers Range M176-M191	Can only be used when Maintenance mode active
H93	Displays IPI Registers Range M192-M207	Can only be used when Maintenance mode active
H94	Displays IPI Registers Range M208-M223	Can only be used when Maintenance mode active
H95	Displays IPI Registers Range M224-M239	Can only be used when Maintenance mode active M224-VAR1100 M239-VAR1115
H96	Displays IPI Registers Range M240-M255	Can only be used when Maintenance mode active