CHAPTER 7

TURRETS

GENERAL

This chapter describes the operation, adjustment, assembly procedures and lubrication of the tool holding turrets. Two turrets are described: the seven position turret used on the 10 inch Cinturn Series C Turning Centers, and the six position turret used on the 12 inch Cinturn Series C Turning Centers.

The construction and operation of both turrets is similar. They vary only in the number of index stations provided and in associated variations in the drive train and coupling component.
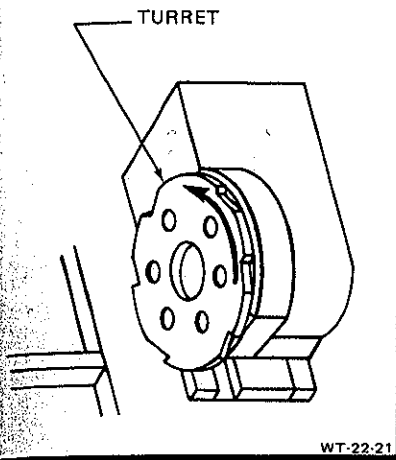
TURRET

WT-22-21

Figure 7.2-1
DIRECTION OF TURRET
ROTATION

9-LS = CLAMPED
11-LS = UNCLAMPED

TURRET POSITION	LIMIT SWITCH AND DIAGNOSTIC PANEL LIGHT		
	14—LS LT 6—7	15—LS LT 6—8	16—LS LT 6—9
1	+	0	0
2	0	+	0
3	+	+	0
4	0	0	+
5	+	0	+
6	0	+	+
7*	+	+	+

+ SWITCH ACTUATED — LIGHT ON
0 SWITCH NOT ACTUATED — LIGHT OFF
* POSITION 7 NOT USED ON 12 INCH MACHINES

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Figure 7.2-2
TURRET POSITION LIMIT
SWITCH PATTERN

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SYSTEM DESCRIPTION

The Cinturn Series C Turning Centers are equipped with a cutting tool holding turret which is supported by the cross slide. The turret is arranged to mount both id and od tools. The turret is indexed to place the desired tools into the machining position. The 10 inch models have seven index positions. An od and an id tool may be mounted at each index position, thus making a total of 14 tools available. The 12 inch models have six index positions and mount a total of 12 tools. Once indexed to the desired position, the X and Z axes are positioned to bring either the id or od tool into use.

The turret may be indexed to any position from any other position by NC program or manually entered commands. When NC program commands are used to index the turret, the desired position is specified by the program. The turret will index to this position regardless of its previous position.

The TURRET JOG push button may be used to manually index the turret. The turret is indexed one position when the push button is depressed and released. If the TURRET JOG push button is held depressed, the turret will rotate until the push button is released.

The turret always rotates in the same direction as shown in Figure 7.2-1. Rotation of the turret is powered by a hydraulic motor.

The final position of the turret is established by an accurate mechanical coupling which positions the turret independently of the indexing mechanism. A hydraulic cylinder moves the turret axially to engage and disengage the coupling. Mechanical springs provide added clamping force and assure the turret is held in position when the hydraulic system is not operating.

The following sequence of events occur when indexing the turret.

1. When a command to index the turrets is initiated, the angular position of the turret is determined by reading the three turret position limit switches: 14—LS, 15—LS and 16—LS. The limit switches give a binary coded signal to denote position as shown in Figure 7.2-2.

   If the turret is currently in the desired position, no indexing action will occur. This allows programming of an index position without adding cycle time should the index not be required. If the turret is not in the specified position, the indexing sequence will begin.

   NOTE: When the limit switches are actuated, a corresponding LED is illuminated on the Input/Output cage in electrical cabinet 3. This allows the position signal to be checked when trouble shooting. See Chapter 11.

2. Solenoid 19 is energized and the clamp/unclamp solenoid valve shifts to the unclamp position. Limit switch 9—LS is released when the turret begins to move axially to unclamp. See Figure 7.2-3 for the hydraulic diagram of the turret.

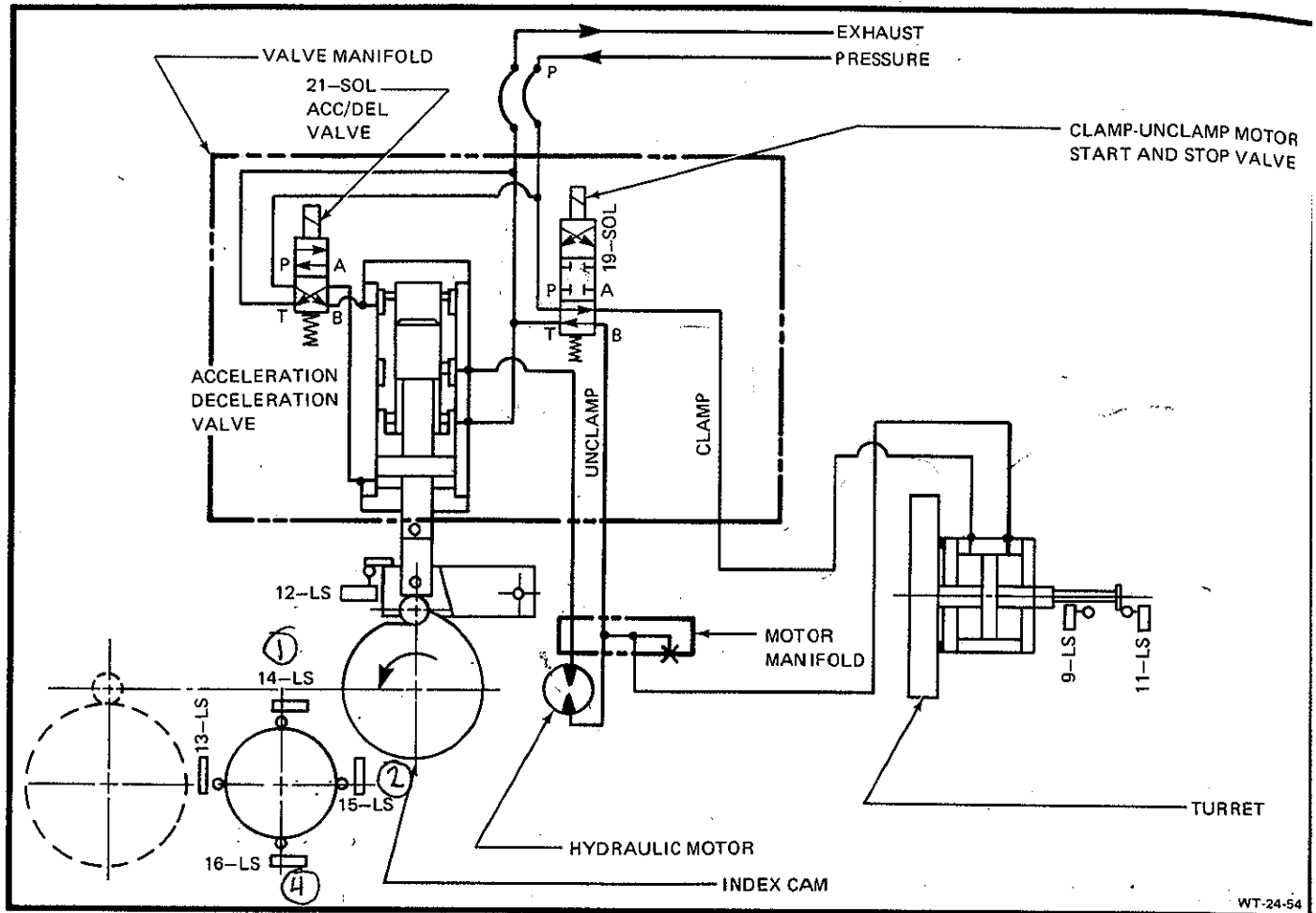3. When the turret is unclamped, limit switch 11 is actuated.

Figure 7.2-3
TURRET HYDRAULIC DIAGRAM

4. The control system calculated the number of index positions to be moved in order to reach the desired position.

5. Solenoid 21 is energized and the turret run solenoid valve shifts to the run position. The plunger of the deceleration/acceleration valve begins to retract from the cam and the hydraulic motor begins to rotate. The hydraulic motor drives the turret through a gear train in the direction shown in Figure 7.2-1. The rate of rotation increases as the valve plunger is retracted from the cam.

6. Strobe limit switch 13—LS is released between index positions and actuated at each index position. The release and reactuation of the strobe limit switch causes the control to down count one position number. Rotation of the turret continues until the turret is one position away from final position. Solenoid 21 is then de-energized and the turret run solenoid valve shifts to the stop position.

7. The deceleration/acceleration valve begins to advance towards the cam. As the plunger advances, the valve restricts the exhaust line of the hydraulic motor. This line becomes progressively more restricted and the motor decelerates. The speed of rotation of the turret is low when the plunger reaches the cam. The motor will continue to drive the indexing gear train towards final position, the lowest point of the cam.

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8. When the final position is reached, limit switch 12—LS is actuated.

9. The three position limit switches are read to make sure that the correct position has been reached.

10. Solenoid 19 is de-energized and the clamp/unclamp solenoid valve shifts to the clamp position. The turret begins to move axially to clamp.

11. When the turret is clamped, limit switch 9—LS is actuated.

12. After a timed delay, the control releases cycle hold and the indexing sequence is complete.