

# BLADE/CLAMP CONTROL

## THEORY OF OPERATION, CLAMP AND BLADE CONTROLS

Overview – The power switch supplies power from the power cord to the main circuit breaker. The main circuit breaker supplies power to the blade motor contactors (K1 and K2), a bridge rectifier in the brake circuit, and a secondary circuit breaker. The secondary circuit breaker supplies power to the clamp motor contactors (K3 and K4), and a 24 VAC transformer. The 24 VAC transformer supplies power to the contactor coils through a fuse and a network of pushbuttons, limit switches, and relays. The 24 VAC transformer also supplies power to the cutting line lamps.

Brakes – The clamp and blade motors have spring-applied brakes that lock the motors when they are not running.

Safety Circuits – The key switch, cover interlock switches, and relays K5, K6, and K7 allow operation of the clamp and blade only when safety conditions are met. The key switch allows movement of the clamp and blade only while the key is turned in the lock. The cover interlock switches allow the clamp and blade to move downward only while the cover is closed. Non-repeat relay K5 prevents double cycling if the pushbuttons are still held down at the end of the cutting cycle. Timing relay K6 allows the clamp and blade to move downward only if two pushbuttons are pushed within ½ second of each other.

Non-repeat relay K5 self-latches by the RESET pushbutton and enables the clamp and blade pushbuttons until the blade leaves the upper limit position, and for 1/8 second thereafter. When the blade leaves the upper limit position, pushbuttons continue to receive power through an auxiliary contact of K3 (clamp down) until the blade lower limit switch trips.

Timing relay K6 enables the clamp and blade pushbuttons only while, and for ½ second after:

1. All pushbuttons are at rest and the blade is up.
2. The clamp is going down and the blade is up.
3. The blade and clamp are going down.

Relay K7 prevents movement of the clamp and blade while the backgauge is moving.

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The cutting cycle sequence is clamp down, blade down, blade up, and clamp up. If desired, the clamp and the blade can be brought down together. When the safety circuits allow, the clamp and blade circuits function as follows:

1. Clamp Down- while pushbuttons S1 and S3 are held down, the coil of contactor K3 receives power from an auxiliary contactor of K1. Contactor K3 makes the motor run in the downward direction. When the clamp hits a solid surface, either a stack of paper or the deck, the clamp motor stalls (and draws high current) until one of the two pushbuttons is released.
2. Blade Down – While pushbuttons S1 and S2 are held down, the coil of contactor K1 receives power. Contactor K1 makes the blade motor run in the downward direction. At the same time, an auxiliary contact of K1 supplies power to the coil of K3, energizing the clamp motor in the downward direction. The blade motor runs in the downward direction until the blade lower limit switch opens, or until one of the pushbuttons is released.
3. Blade Up – Contactor K2 makes the blade motor run in the upward direction. The coil of contactor K2 receives power anytime all pushbuttons are released and the blade is away from its upper limit position.
4. Clamp Up – Contactor K4 makes the clamp motor run in the upward direction. The coil of contactor K4 receives power through an auxiliary contactor of K2. This occurs when the DPDT blade microswitch is completely released, close to the top of the blade's return. This occurs directly before relay K2 loses power, it is for this reason that K4 self latches. The relay will remain energized until the clamp hits its upper limit switch, which will open the circuit path.