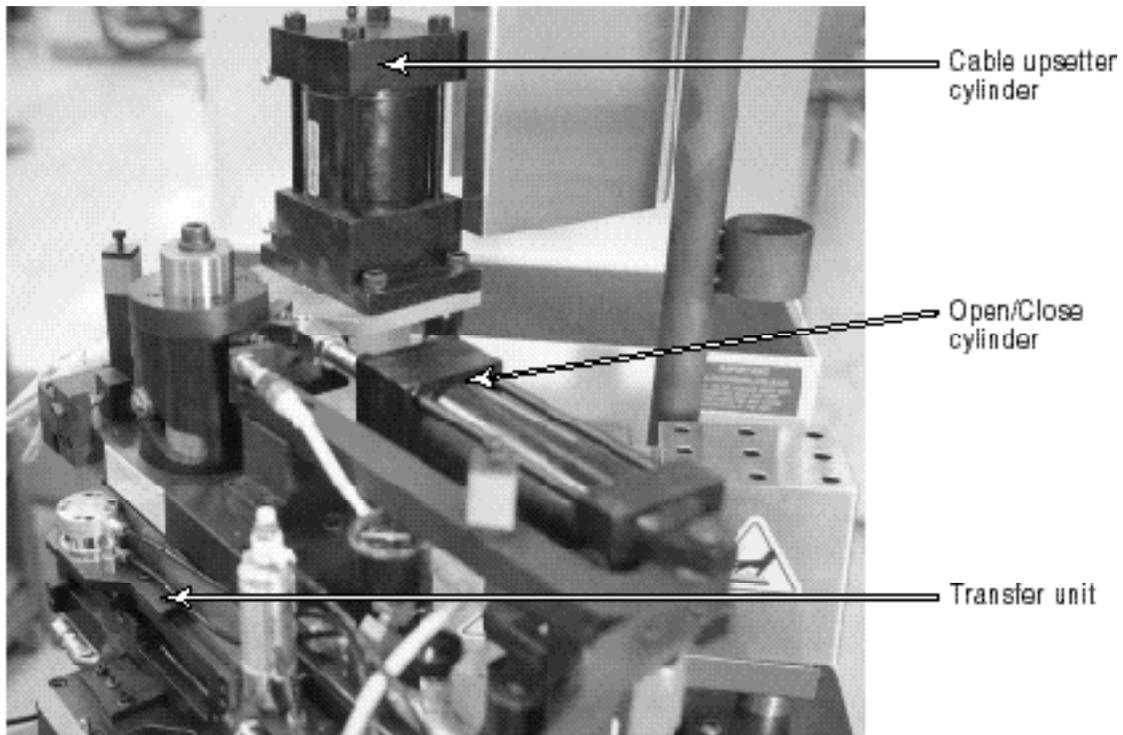

SECTION G2: CABLE PROCESSOR MODULE MAINTENANCE



Cable Processor Module overview



WARNING!

When tipping the Cable Processor Module back, (after removing the toggle arm pin), use extreme caution not to drop the Cable Processor Module. Support the Cable Processor Module until it reaches the stops. The Cable Processor Module linkage and counterbalance mechanism could be damaged, and the Cable Processor Module could break off from the machine if it is dropped onto the stops.



CAUTION!

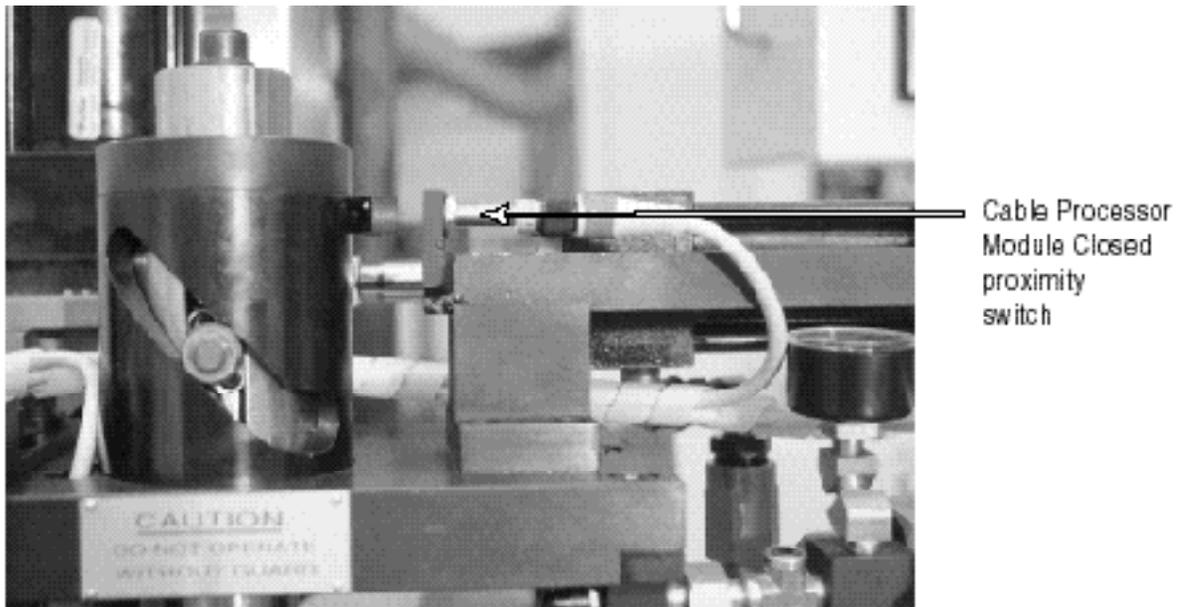
Regular inspection of all guards, protective devices, point of operation safeguarding systems and mechanically loaded components is recommended. Component devices or guarding which show signs of wear, fatigue (cracks, distortion), or damage of any type should be replaced immediately.

Cable Processor Module Closed proximity switch

The Cable Processor Module Closed proximity switch closes when the tool faces are together. If something (debris, a strand of wire or an out-of-position component) holds the tool faces apart during a cycle, the switch will not close and the cycle will stop.

The Cable Processor Module Closed proximity switch is set as follows:

1. Turn the machine control power on and turn the Setup/Run key selector switch in the setup position.
2. Remove the large guard which covers the Cable Processor Module and open the transfer unit swing-out arm. Clean the tool faces to ensure nothing is between them which will hold them apart.
3. Place a piece of paper on the fixed tool, 0.1 mm (.004 inches) thick.
4. Close the transfer unit swing-out arm and lock it in place with the latch.



5. Select the Setup Oph1 screen on the Operator Interface Terminal (if it was not already displayed when the key selector switch was moved to the setup position). Press the Head Close icon. The tooling will close on the piece of paper. Loosen the two screws which hold the switch actuator to the cam assembly.

-
6. Select the Oph Diagnostics screen. Move the actuator away from the switch, (if you were looking down on the main slide, the actuator should be moved in the counterclockwise direction). Slowly slide the actuator towards the switch until the Head Closed icon indicates the switch is closed. Tighten the two screws which hold the actuator to the cam assembly.
 7. Select the Setup Oph1 screen and open the main slide by touching the Head Open icon. Open the transfer unit swing-out arm and remove the paper. Fold the paper in half and place it between the tool faces. Close the swing-out arm and lock it. Close the main slide by touching the Head Close icon. Display the Oph Diagnostics screen and check the status of the Head Closed switch. If the Head Closed switch is set correctly, it will not close with the two pieces of paper between the tool faces. If the Head Closed icon indicates that the switch is closed, repeat the above procedure until the switch will close with one thickness of paper between the tool faces and will not close with twice the thickness of paper.
 8. When the switch has been properly set, replace the guarding.

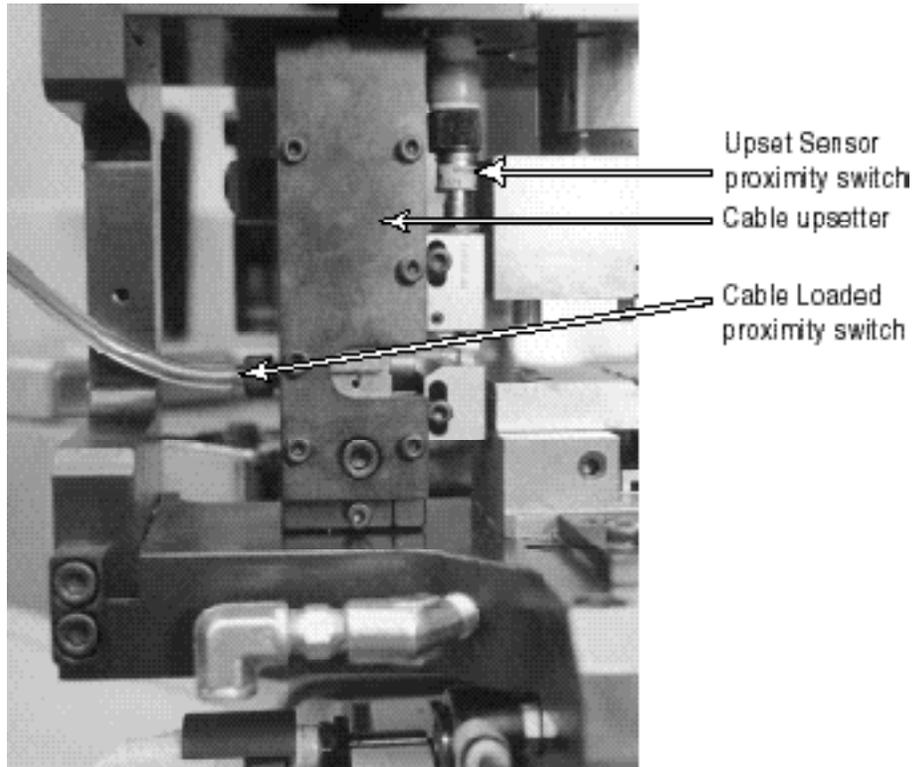
Note: An improperly set Cable Processor Module Closed switch can be a safety hazard. Take the time to set the switch properly. The switch should be set (or at least checked) whenever tooling is installed.

If the proximity switch must be replaced, the correct spacing between the end of the proximity switch and the switch actuator is 0.6 mm (.025 inch).

The Cable Processor Module Closed switch is designed to “over-travel” in the event the Cable Processor Module is closed with part or all of the tooling missing.

The cable upsetter and the Cable Loaded proximity switch

Complete assembly drawings for the cable upsetter can be found in Section L: Cable Processor Module Reference Drawings.



Operation of the cable upsetter

When a cable is loaded into the cable upsetter and is pushed against the anvil, the anvil moves back approximately 0.5 mm (.020 inch). This movement causes the Cable Loaded proximity switch to close. If the Setup/Run key selector switch is in the run position and the Run Semi-automatic mode has been selected, the system cycle will start.

The cable upsetter sequence is as follows:

1. The cylinder advances and drives a lever which changes vertical (cylinder) motion to horizontal motion.
2. The lever pushes the rear slide forward.
3. The back end of a second lever rides up the ramp on the rear slide using the roller.
4. The front end of this lever closes the upper jaw onto the cable.

-
5. The lever pivots on the eccentrically ground pin.
 6. When the roller reaches the flat part of the rear slide the jaws should be clamped tightly on the cable.
 7. The remaining movement in the rear slide drives the front slide and the anvil against the end of the cable until it stops against the upper and lower jaws, producing the upset on the end of the cable.

Adjustments to the cable upsetter

Upset diameter

The upset length is set by Fishertech according to the customer's specifications. However, the upset diameter can be adjusted by changing the length of the cable which gets inserted beyond the jaws, against the anvil. An adjusting bolt can be turned clockwise to bring the front slide forward and reduce this length of cable. Consequently, the upset will be smaller in diameter. Turning the adjusting bolt counterclockwise will push the front slide back and allow more cable to be upset. The resulting upset will be larger in diameter.

Jaw locking pressure

Turn the machine control power on and turn the Setup/Run key selector switch to the setup position. Remove the clamping block which clamps the eccentric pin in place. Turn the eccentric pin such that the upper jaw of the cable upsetter moves up as high as possible. Select the Setup Oph2 screen and advance the cable upsetter. Using a flat head screwdriver, turn the adjusting cam to the right or to the left until the jaws come together. Install the clamp block. Retract the cable upsetter.

Cable Loaded switch

To replace the proximity switch and set the Cable Loaded switch, proceed as follows. Turn the Setup/Run key selector switch to the setup position. Select the Oph Diagnostics screen. Install the shoulder nut on the new proximity switch assembly. Thread the nut as far up the switch as possible. Gently thread the switch into the front slide in the cable upsetter. Do not twist the cable in any way while threading into the front slide. Thread the proximity switch in until it stops. Do not force the switch any farther after it stops turning. Turn the switch out approximately 1 turn. Connect the proximity switch to the correct receptacle on the multi-port interface.

There are two possible approaches to setting the switch after the electrical lead has been connected. The Cable Loaded switch icon will either show an open or a closed message.

(a) If the Cable Loaded switch icon indicates closed:

Remove the electrical lead and turn the proximity switch out 1/4 turn. Reconnect the electrical lead. Continue to do this until the Cable Loaded switch icon indicates open. At this point, pushing on the anvil should cause the switch to close. When the switch is set correctly, pushing on the anvil will close the switch and it will open when the anvil is released. Finger tighten the shoulder nut.

(b) If the Cable Loaded switch icon indicates open:

Push on the anvil and check if the Cable Loaded switch indicates closed. If the switch does not indicate closed, disconnect the electrical lead and turn the switch in approximately 1/4 turn. Reconnect the electrical lead and push on the anvil again. Continue to do this until the switch closes when the anvil is pushed and opens when the anvil is released. Finger tighten the shoulder nut.

Air pressure

The cable upsetter operates at the machine line pressure. There are no flow controls on the cable upsetter.

Positioning the upset in the tool cavity

The position of the upset in the cavity can be adjusted by moving the position of the entire cable upsetter. To move the cable upsetter, (and consequently the position of the cable upset in the cavity), remove the large guard from the Cable Processor Module. Loosen the two socket head screws which hold the cable upsetter to the Cable Processor Module frame. Turn the jacking bolt to move the position of the cable upsetter. Turning the bolt clockwise will move the cable upset forward in the cavity. Turning the bolt counterclockwise will move the cable upset towards the back of the cavity. Replace the large guard when the upset has been correctly positioned in the cavity.

Cable-In-Place (Part-In-Place) switch

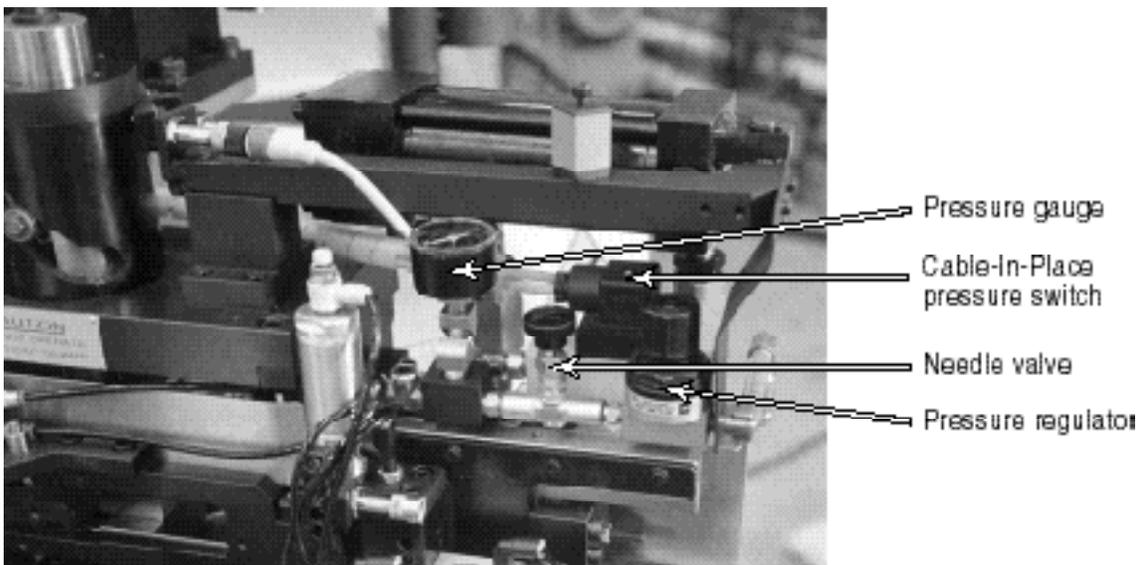
Operation of Cable-In-Place switch

The Cable-In-Place pressure switch is used to signal to the Programmable Logic Controller when a cable or component is correctly positioned in the tool. The switch works together with the upset sensor and the Cable Processor Module Closed proximity switch to ensure that an injection only takes place when an cable upset is sensed, the tool faces are together and there is a cable in the tool.

Air is supplied to the air switch circuit as long as the control is on and the melt pot is at operating temperature. The switch closes when a cable pushes up the safety pin in the movable tool and seals off the flow of air passing through the tool. The pressure in the switch circuit builds sufficiently to cause the switch to close, and an input is made to the PLC allowing an injection to take place. After an injection is made and the main slide opens, the safety pin drops down and air flows through the movable tool again. The pressure switch opens as air exits through the small hole in the front of the movable tool.

If the safety pin does not drop down after the main slide opens, the Cable-In-Place input signal to the PLC will not turn off. In this case, an alarm will be triggered and further machine operation will be inhibited until the alarm is acknowledged and the problem, (the reason why the safety pin did not drop), is repaired.

See Section G5: Troubleshooting for more details on alarms.



Adjustments to the Cable-In-Place switch

Air pressure switch: The pressure switch circuit consists of an air regulator, a needle valve, an adjustable pressure switch and a pressure gauge.

To set the Cable-In-Place switch:

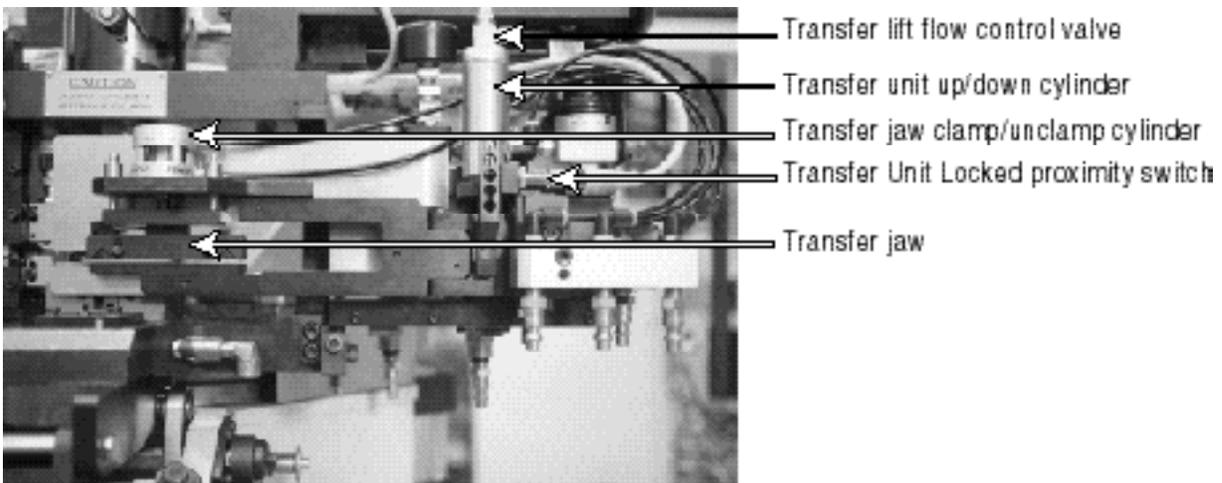
1. Cycle the system to position a cable in the terminating position.
2. Turn the Setup/Run key selector switch to the setup position. Remove the large guard from the Cable Processor Module. Select the Setup Oph1 screen. Lower the lift by pressing the Transfer Down icon.
3. Open the needle valve wide open. Close the tooling by pressing the Head Close icon. Adjust the pressure regulator to 1.4 bar (20 psig).
4. Open the tooling and remove the cable or component. Turn the needle valve in, (clockwise), until the pressure at the gauge is approximately 0.3 bar (4 psig).
5. Place the cable, or component, back in the tool and close the tooling.
6. Select the Oph Diagnostics screen.
7. The pressure switch can now be adjusted. The Cable-In-Place icon will indicate either Closed or Open. If the switch is closed, turn the adjusting screw on the end of the pressure switch clockwise, until the icon indicates open.
8. Turn the screw slowly counter-clockwise until the icon indicates closed.
9. If the switch is open, slowly turn the adjusting screw counter-clockwise until the icon indicates closed.
10. Check the switch setting by opening and closing the head, (with the cable still in position), while checking the switch status on the Oph Diagnostics screen. The switch should close when the tooling is closed on the cable and it should open when the tooling is open.
11. Replace the large guard.

The transfer unit and the Transfer Unit Locked proximity switch

Complete assembly drawings for the transfer unit can be found in Section L: Cable Processor Module Reference Drawings.

Operation of the transfer unit

The transfer unit simultaneously transfers upset cables from the cable upsetter to the cavity tool cavity and terminated cables from the cavity tool to the degating station. It also lifts and lowers the cables from the low (upset, terminate and degate positions), to the high (transfer) positions.



Adjustments to the transfer unit

Transfer jaw alignment

The upper jaw and the lower jaw are not dowelled to the swing-out arm. There is sufficient play in the jaws for them to be easily squared with the tooling. It is sufficient to align the jaws with the transfer unit arm. If the jaws are not aligned with the transfer unit arm, loosen the jaws, (with the jaws advanced or clamped together), and align them with the transfer unit arm.

Even clamping pressure

The clamping pressure should be the same on both cables when they are in the transfer jaws. Fishertech sets this clamping force during assembly. If it changes (becomes uneven) shims can be used to correct the problem or call Fishertech for assistance.

Up/down and left/right stops

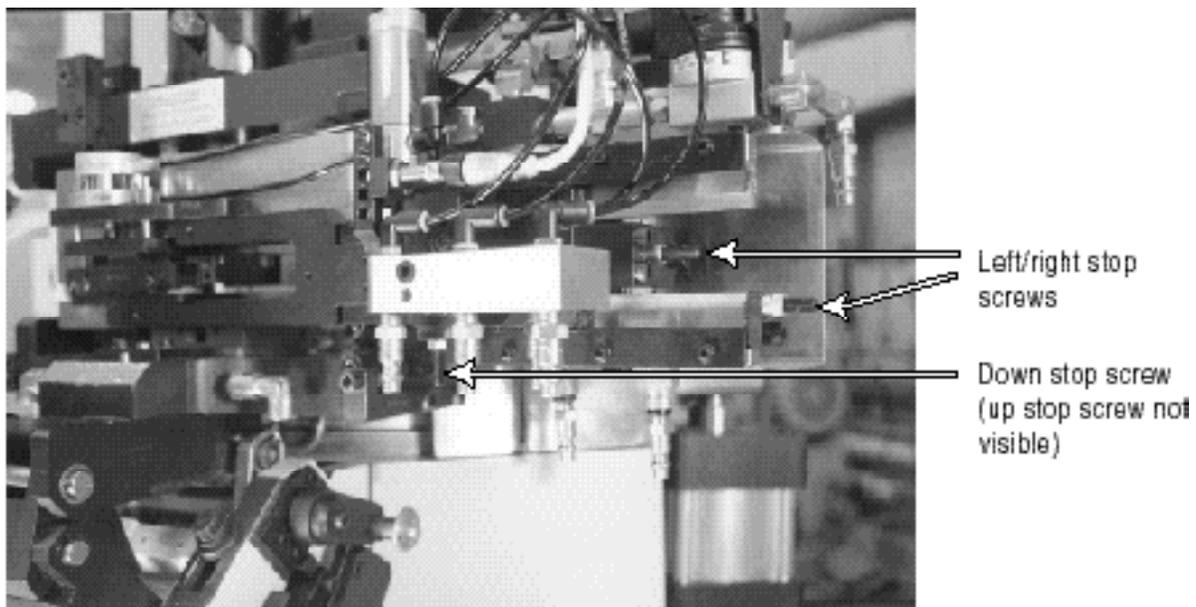
It is very important that these four stops be set properly and checked periodically to maintain smooth transfer unit operation. There are adjusting bolts for the up/down position of the transfer unit and adjusting bolts for the left/right position of the transfer unit.

To set the UP position of the transfer unit:

The UP position of the transfer unit should be adjusted so that a cable can exit the cable upsetter without being dragged across any part of the cable upsetter.

Usually this stop can be set by turning the adjusting bolt up until the bolt no longer touches the transfer unit (ie the transfer unit will not go up any further) and then turn the bolt down 1/2 or 1 full turn.

It is important not to set the UP stop too low. If it is set too low, the terminated cables will not be raised sufficiently high to clear the tooling after they are ejected.



The down and left/right positions of the transfer unit are adjusted as follows:

1. Turn the Setup/Run key selector switch to the setup position.
2. Select the Setup Oph1 screen.
3. Open the transfer jaws by touching the Clamp Open icon.

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4. Place a new cable in the left side of the transfer jaws and clamp it in position by touching the Clamp Close icon. The cable should be positioned such that it extends to, but not beyond, the cavity in the fixed tool.
 5. Lower the cable into the fixed tool cable channel by touching the Transfer Down icon.
 6. Adjust the right stop and down stop, such that the cable gets deflected slightly up, (by setting the down stop lower than the cable channel), and the deflected portion is right in the middle of the cable channel. (If the right stop is turned in and out, the end of the cable will move back and forth past the center of the cable channel). The right and down stops are now set.

To set the left stop, proceed as follows:

1. Turn the Setup/Run key selector switch to the setup position.
2. Select the Setup Oph1 screen.
3. Open the transfer jaws by touching the Clamp Open icon.
4. Place a new cable in the right side of the transfer jaws and clamp it in position by touching the Clamp Close icon. The cable should be positioned such that it extends to, but not beyond the cavity in the fixed tool.
5. Move the transfer unit left by touching the Transfer Left icon. (This will position the cable directly above the fixed tool).
6. Lower the cable by touching the Transfer Down icon.
7. Adjust the left stop to position the cable in the center of the cable channel. Use the same procedure used when setting the right stop. The left position stop is now set.

Flow controls

There are flow controls on the transfer cylinder and the lift cylinder, (only on the up (advance) side of the lift cylinder). Cylinder motion is regulated by controlling the flow of air exiting the various cylinders.

To adjust the transfer arm left motion, adjust the flow control on the transfer arm left end of the cylinder.

Likewise, to control the transfer arm right motion, adjust the flow control on the transfer arm right end of the cylinder. Transfer arm motion is set at Fishertech and need not be reset.

Note: If the flow controls are adjusted, the operation of the machine could be affected. If either the left or right motion is too fast, the transfer arm will hit the stops with unnecessary force.

The flow control for the lift up motion of the transfer arm, (on top of the lift cylinder), is adjusted at Fishertech so that the ejector advance motion and the transfer arm lift motion are approximately the same.

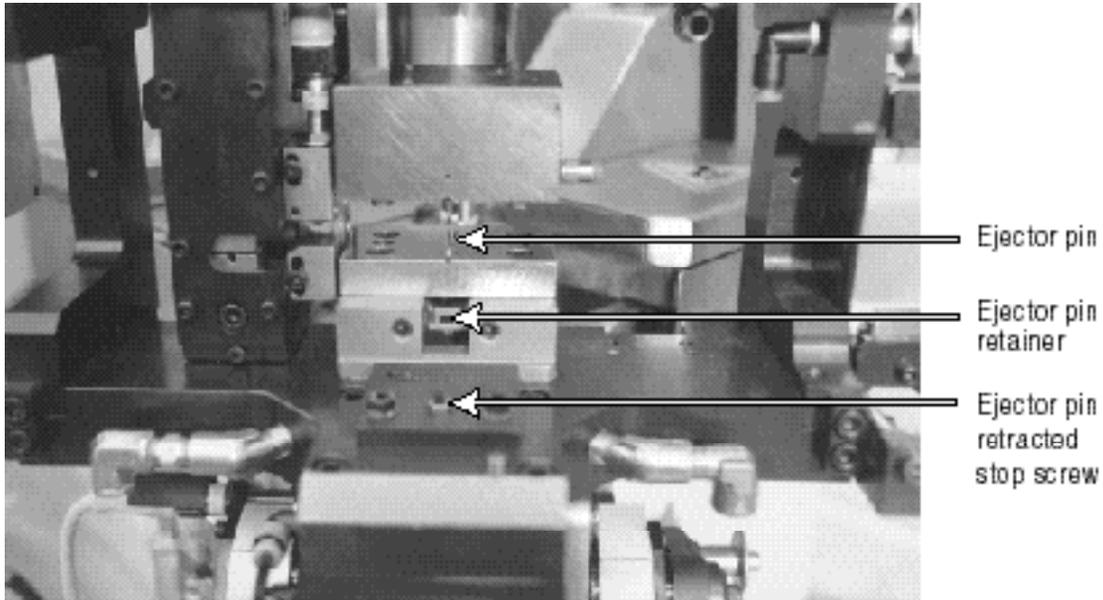
It is important that the transfer arm lift motion is not faster than the ejector motion. If it is, the cable can be pulled through the transfer arm jaws and the termination will not be in the proper position at the degating station.

In/out position of the transfer unit

The position of the transfer unit jaws in relation to the tooling is easily adjusted.

Loosen the bolts which hold the transfer unit to the Cable Processor Module. Turn the transfer unit adjusting bolt to position the transfer arm jaws in the desired location. The transfer jaws (upper and lower) may have to be moved to accommodate different tooling.

Ejector system



Operation of the ejector system

The ejector system consists of a built-in pneumatic cylinder (built into the Cable Processor Module frame), a lever, an ejector shaft, an ejector pin retainer and a number of ejector pins.

When activated, the cylinder moves the lever which moves the ejector shaft. One end of the ejector shaft houses the ejector pin retainer. To eject the part, the piston end of the lever moves down, moving the shaft end of the lever up. In the “at rest position”, the ejector system has the piston up and the ejector shaft down.

Adjustments to the ejector system

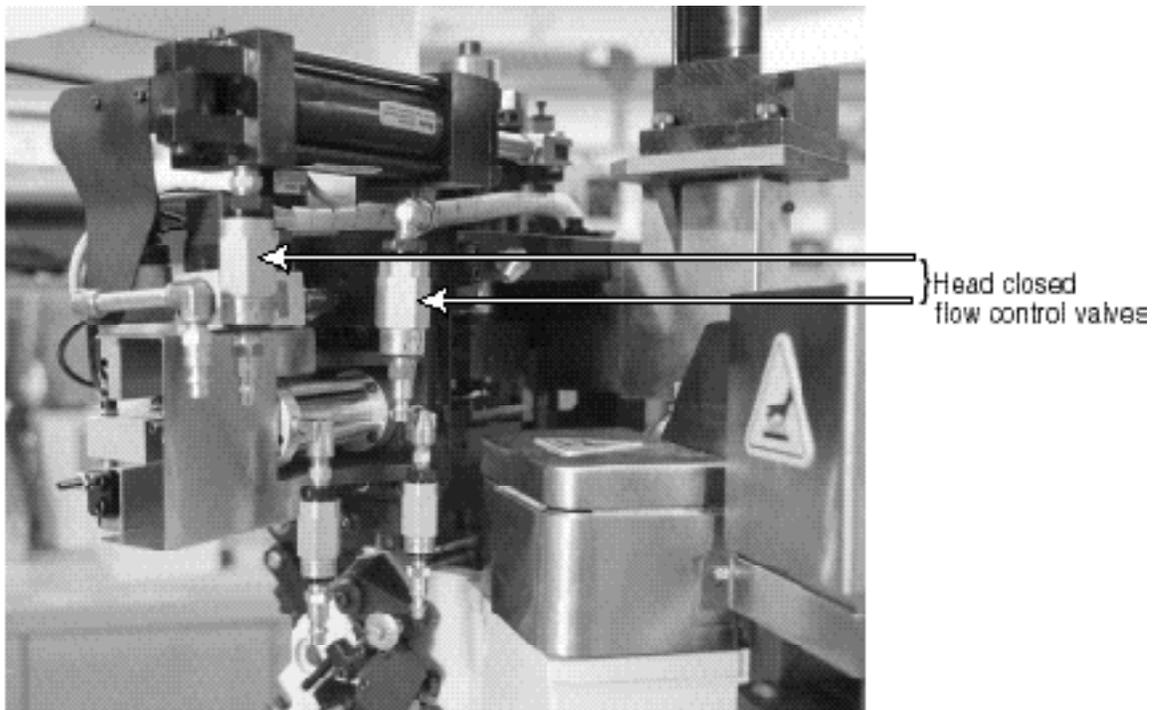
Setting the ejector pin position in the cavity

In the retracted position, the ejector cylinder is held against an adjustable stop by pneumatic pressure. The stop is a set screw fitted with a lock nut. Several assemblies should be produced, and the ejector pin position checked before an adjustment is made. If the set screw is turned down, (clockwise), the ejector pins will be raised. If the adjusting screw is turned up, (counter-clockwise) the ejector pins will be lowered.

Flow control valve adjustments

With the exception of the cable upsetter, all of the pneumatic circuits have flow control valves provided to allow for regulation of cylinder speed. The flow controls are installed so that the exhaust air is being controlled.

All of the flow control valves are factory set so that all cylinders move quickly with no slamming at the end of their stroke.

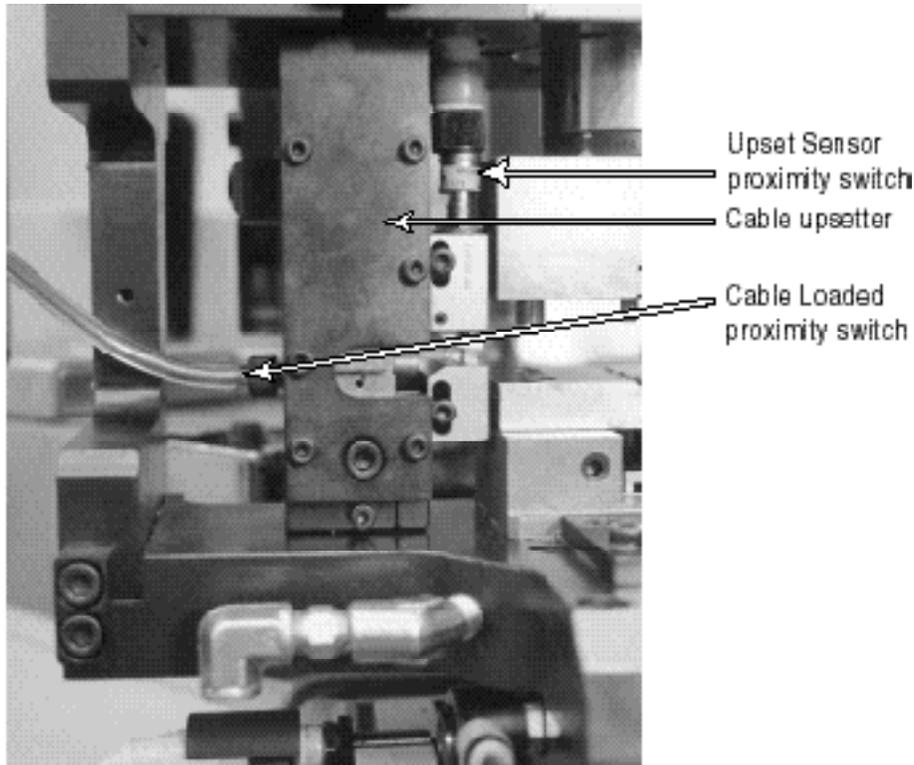


Note: The flow control valves should not be adjusted in an attempt to increase cycle rate as damage to pneumatic and mechanical components could result.

The upset sensor and Upset Sensor proximity switch

Operation of the upset sensor

When properly set, the upset sensor can distinguish between an upset cable and a non-upset or a poorly upset cable. If an upset is not detected, the system will not inject alloy, thus preventing a termination from being cast on a poorly upset cable or a non-upset cable.



The upset sensor consists of a bottom block, a top block with a flapper and a proximity switch. When an upset cable is transferred between the bottom and top blocks, the upset is lifted slightly and it hits the flapper, pushing it up. If the upset is sufficiently large, the flapper will move up enough to close the proximity switch. A poorly upset cable will not move the flapper high enough to close the switch. A cable with no upset should pass straight through the upset sensor without coming in contact with the flapper.

Complete assembly drawings for the upset sensor can be found in Section L: Cable Processor Module Reference Drawings.

Adjustments to the upset sensor

Setting the upset sensor

Before setting the upset sensor, the transfer unit stops must be properly set.

The upset sensor is set as follows:

1. Turn the Setup/Run key selector switch to the setup position.
2. Select the Setup Oph2 screen.
3. Upset several cables manually (using the Upsetter Advance and Upsetter Retract icons). Ensure that the upset diameter meets specifications and will fit comfortably in the cavity. Four cables with proper upsets will be sufficient for setting the upset sensor.
4. Select the Setup Oph2 screen.
5. Open the transfer arm jaws by touching the Clamp Open icon.
6. Place a new cable in the left side of the transfer arm jaws.
7. Hold the cable in place by touching the Clamp Close icon. The cable should be positioned such that the end extends to the cavity of the tooling, but not beyond the cavity.
8. Remove the air lines from the transfer unit.
9. Remove the stainless steel guard from the front of the cable upsetter to gain access to the upset sensor.
10. Slide the transfer unit left, (with the cable clamped in position), until the cable is positioned over the lower block of the upset sensor.
11. Adjust the lower block such that it just comes in contact with the cable.
12. Tighten the screw which holds the lower block in place.
13. Slide the transfer unit back to the left and replace the air lines.
14. Select the Oph Diagnostics screen.
15. Slide one of the four correctly upset cables slowly over the bottom block of the upset sensor.

-
- 16.** Adjust the top block, (which houses the flapper and proximity switch), such that the flapper is deflected up just enough to close the proximity switch. When the proximity switch closes, the Cable Upset icon will indicate closed.
 - 17.** Adjust the upper block so that all four of the correctly upset cables will activate the Upset Sensor switch. A new cable or a cable with a small upset should be tested in the same manner to ensure the switch does not close.
 - 18.** Replace all guarding.

Replacing the Upset Sensor proximity switch

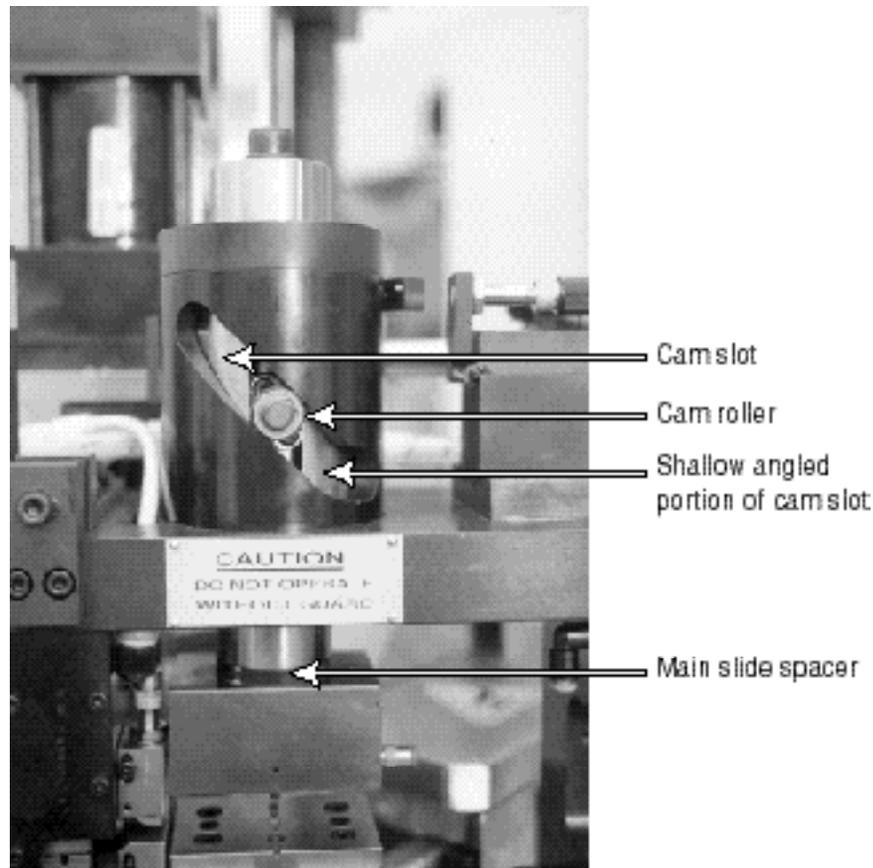
- 1.** Turn the Setup/Run key selector switch to the setup position.
- 2.** The Upset Sensor proximity switch is a threaded barrel type device.

To replace the switch,

- 1.** Remove the upper block and undo the switch electrical connector.
 - 2.** Undo the retaining nut and unscrew the switch.
 - 3.** Thread a new switch into the upper block so that the proximity switch is flush, (or slightly back), from the face of the block.
 - 4.** Connect the electrical lead to the new switch.
 - 5.** Select the Oph Diagnostics screen.
 - 6.** Move the flapper slightly. The Cable Upset icon should indicate closed when the flapper is moved only a very small amount. There should be additional travel of the flapper after the switch closes.
- 3.** Replace all guarding.

Cam slot/cam roller alignment

During the close and lock motion of the Cable Processor Module, a cam roller travels in a cam slot in the Cable Processor Module housing. The Cable Processor Module is locked when the roller has just started into the shallow angled portion of the cam slot.



The shut height of the tooling determines how far along the locking portion of the cam slot the roller will travel. The shut height of the Cable Processor Module is factory set at 51 mm (2.0 inches). This is accomplished by grinding the spacer on the end of the main slide to give the correct distance between the end of the spacer and the surface of the fixed tool holder when the roller is in the correct position in the locking portion of the cam slot.

Note: If the shut height of the tooling is too large, it is possible that the roller will never engage the locking portion of the cam slot.

If the pin does not travel far enough into the shallow angled portion of the cam slot (tool shut height too large), the tool faces may be free to separate during injection, causing flash or allowing the escape of molten alloy from the cavity.

Note: The Cable Processor Module Closed switch must be closed for an injection to take place. If debris or a wire strand holds the tool faces sufficiently far apart so the roller does not engage the locking portion of the cam slot, an injection should not take place as the switch will not close. Therefore, the situation described above only refers to a tool set with an excessive shut height and the Cable Processor Module Closed switch set to this tooling.

If the tool shut height was too small, it is possible for the roller to “bottom out” in the cam slot before tooling is actually closed. Again, the Cable Processor Module Closed switch would have to be set to this incorrect tool installation for an injection to take place.

Shut height adjustment

The shut height is the linear dimension on the Cable Processor Module between the fixed tool holder and the movable tool mounting surface when the Cable Processor Module is in the locked position (when the roller is in the correct lock position in the cam slot). The shut height is factory set at 51 mm (2.0 inches).

Changing adjusting spacer

If required, the thickness of the adjusting spacer on the end of the main slide can be altered to ensure that the roller and cam slot are in the proper relationship when the Cable Processor Module is closed and locked to the specified shut height.

Non-Fishertech replacement parts

Placing a shim behind the mainslide spacer may be necessary if a replacement tool is manufactured by someone other than Fishertech, and the shut height is too small. The Cable Processor Module should be periodically checked to ensure that the shut height is properly adjusted.

Cable Processor Module removal and installation



WARNING!

When the Cable Processor Module must be tipped back, (after removing the toggle arm pin), use extreme caution not to drop the Cable Processor Module. Support the Cable Processor Module until it reaches the stops. The Cable Processor Module linkage and counterbalance mechanism could be damaged, and the Cable Processor Module could break off from the machine if it is dropped onto the stops.

Cable Processor Modules (and other operating heads) are easily removed from the machine, allowing a basic machine to produce assemblies using different operating heads, as well as allowing the Cable Processor Module to be removed from the machine for maintenance.

The following steps outline the procedure recommended by Fishertech for removing and installing the Cable Processor Module:

Removal of the Cable Processor Module

1. Disconnect the electrical connectors and pneumatic lines between the machine and the Cable Processor Module.
2. Disconnect the coolant lines between the machine, the Cable Processor Module and tool.
3. Remove the moving mechanism lever pin to allow the toggle arm to rotate back slightly.
4. Remove the hinge pin securing the Cable Processor Module to the moving mechanism toggle arm, being careful not to allow the module to fall forward and damage the nozzle. The alignment pin can be used to assist in the removal of the hinge pin.
5. Remove one retaining ring from the pin holding the rear link of the Cable Processor Module to the moving mechanism. While securing the Cable Processor Module, carefully push the rear link pin out using the alignment pin.
6. Remove the socket-head cap screws which secure the Cable Processor Module counterbalance mechanism to the moving mechanism.
7. Carefully remove the Cable Processor Module from the moving mechanism.

Installation of the Cable Processor Module

1. Place the Cable Processor Module on the moving mechanism, positioning the rear link in the moving mechanism recess. Insert the rear link pin through the moving mechanism and the Cable Processor Module rear link. Install the retaining ring on the rear link pin.
2. Carefully guide the Cable Processor Module forward so the front bushings in the module housing slide between the bushings in the toggle arm. Install the hinge pin, using the alignment pin to align the bushings while installing the hinge pin.
3. Install the socket-head cap screws to secure the Cable Processor Module counterbalance mechanism to the moving mechanism.
4. Push the Cable Processor Module slightly forward such that the moving mechanism lever pin can be installed.
5. Connect the pneumatic lines and electrical connectors between the machine and the Cable Processor Module.
6. Connect the coolant lines between the machine, the Cable Processor Module and tool.